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Electronic Scholarly Journal Publishing

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ABSTRACT

Discussions about the scholarly use of electronic journals have spanned more than three decades. This review of the literature identifies key milestone works in the evolution of electronic journals. Included in this review are alternative proposals for the management practices for these journals, historical identification of key projects and experiments, and research on the acceptance of these journals by the academic community. The researchers found that references to scholarly electronic journals are voluminous and cross almost all of the academic and professional disciplines. However, many of these references only acknowledge the existence of electronic journals and are frequently redundant. The researchers found that there is an uneven distribution of knowledge about journals, both electronic and otherwise, as well as about scholars' relationships to them, both present and future. Traditional publishers have either not pursued systematic evaluation of the uses of their experiments and projects or, if they have, they have elected not to make the information public. What was apparent is that the relationship between publishing and the scholarly community has become destabilized. While there is considerable discussion by advocates of electronic scholarly publishing about how the process should be change, we found surprising little research that provides insights into variables that will influence the ultimate acceptance of these journals by the academic community.

INTRODUCTION

Perhaps no other segment of the publishing industry has received as much scrutiny as the scholarly journal. Even before an electronic alternative was considered viable, dissatisfaction with elements of the traditional printed journal was evident. The literature is replete with complaints chiefly focused on subscription costs and the length of time from submission of manuscript to publication. Electronic distribution of journals has been seen by some as the possible solution to these concerns. This discussion has now spanned decades, but only recently is there evidence of a tentative embrace of the scholarly journal in electronic form. In 1998, most of the major publishing houses are offering some form of electronic product aimed at the academic marketplace. The purpose of this chapter is to review the literature that has led up this possible transformation of scholarly publishing.

Reviewing this literature proved to be exceptionally complicated because the literature is so broadly dispersed across disciplines. Few disciplines have ignored the possibility of an electronic alternative to traditional paper-based publishing. In reviewing the large number of citations located we found a surprising amount of redundancy in the literature. In part this is a reflection of the parochial view that the average academic or practitioner maintains regarding the professional literature he or she consults. Therefore it is not uncommon for a writer in one discipline to present an idea, unaware that the same idea had been presented earlier by another writer in another

discipline, or for one writer to publish essentially the same ideas within a number of disciplines or areas that could be affected by changes in the scholarly publishing process. Another surprise is the number of electronic journals that are claimed to be the first ever created. Among other things, in this review we hope to clarify the historical discrepancy.

While there are hundreds of references to electronic scholarly publishing, many articles are concerned merely with the fact that such a medium exists. Frequently this literature fails to go beyond the initial “gee whiz” phase that is common with the introduction of a new technology. Quite naturally there are many works published electronically that speak at length to this topic, at this time a debate is taking place regarding the proper place of scholarly work in an electronic environment (DENNING & ROUS; KLING & COVI; SCHAUDER). One valid concern is the stability of these works. In any writing that cites references an underlying premise is that the work cited is locatable, within reason, by the reader. Granted, some materials such as conference proceedings and reports may not be easily found, - such as the report to the National Science Foundation (SHERIDAN ET AL.), which is available only through the MIT archives. Despite all efforts, the print world still provides a higher level of assurance that a work is obtainable than does the current electronic world. We, therefore, are caught in a bit of a dilemma because to ignore electronically produced works would not be consistent with the spirit of the chapter at hand, while at the same time, we must also cite works that can be accessed in the future.

In this chapter we focus on the scholarly journal, which traditionally has been

seen as the most practical vehicle by which researchers are able to communicate their findings to others (PEEK Chapter 1). Hence, scholarly journals also have been referred to as scholarly communication. In the print world, the wedding of these two concepts would have little consequence for a literature review. In the electronic world, however, the advent of computer-mediated communication (CMC) has thrown the long-standing definition of scholarly communication into turmoil because the CMC literature has explored how researchers have used computer networks to communicate with each other, independent of print journals.

Further, the overarching concept of scholarly communication becomes more problematic in contemporary times as the time delay in getting scholarly works to print detracts from the usefulness of the print medium as a vehicle for disseminating scholarly research. GUÉDON states that “printed scholarly journals . . . act more like archival and legitimizing tools than like communication tools. Print technology implies long publication delays . . . The main consequence is that the communication function of journals has essentially broken down” (PEEK & NEWBY, p. #79). Therefore, in this chapter we focus only on literature directly related to the publishing of scholarly journals, although, some of the works we cite do refer to both electronic journals and CMC. The cited sources are in English; mostly originating from the United States and Great Britain.

As we examined the literature it became clear that no published work had yet provided a comprehensive historical context for the evolution of the scholarly electronic journal. We begin, therefore, with a brief history of the development of the idea of the

scholarly journal in formats other than print. Next we discuss models, visions, and possible scenarios for the future of scholarly publishing, which tend to focus on dissemination and management structures of the publishing process. Then we identify electronic publishing experiments representing the large number of electronic journals that have come online. We then discuss the acceptance of electronic journals by the academic community. Finally, we present an overview of the status of research on electronic scholarly journals. Space limitations have required the exclusion of related discussions about copyright and managerial concerns such as archival practices and long-term retrieval.

BACKGROUND

Activities in this field now span more than three decades beginning with the first experiments in electronic scholarly publishing in the 1960s. However, little was published on the subject of electronic publication, scholarly or otherwise, until the early 1970s. One much earlier article, however, is considered to have set the stage for the coming changes in thought concerning publication formats: BUSH's famous 1945 article "As We May Think." In this article Bush proposes the "memex," a sort of interactive desk making use of pieces of microfilm that the user could organize into "trails . . . exactly as though the physical items had been gathered together to form a new book." (BUSH, section 7). At that time, dissatisfaction with the utility of print for scholarly uses was already becoming evident (PEEK & BURSTYN). The problem faced by the scholarly community was the decreasing effectiveness of print as a publication medium;

as new technologies produced new data storage media, these were drafted into service as solutions to this problem. Bush's memex reflected the idea that microfilm provides a greater degree of interactivity than print; a now debatable proposition.

The first paper journal to be published in an electronic format was *Chemical Titles*, a current-awareness publication of the Chemical Abstracts Service, in 1962, followed by *Chemical-Biological Activities* in 1965, both of which were produced on magnetic tape. (BARKER ET AL.). *Chemical Titles* is still in production; *Chemical-Biological Activities* went out of production in the early 1990s. In 1972, ten years after the first issue of *Chemical Titles*, SONDAK & SCHWARTZ (1972; 1973) published what is generally acknowledged to be the first article to propose a "paperless" scholarly journal (see LANCASTER, 1995). Sondak & Schwartz's paperless journal was to be produced on magnetic tape for library subscribers, and on microfilm for individual subscribers (SONDAK & SCHWARTZ, 1972; SONDAK & SCHWARTZ, 1973). The journal on magnetic tape did not succeed, however, and there is no literature explaining why. One could speculate that the journal on magnetic tape did not provide a sufficient degree of interactivity, and that the computer hardware that was being used at the time did not offer sufficient speed and ease of use to make the use of such journals appealing. Another explanation could be made that the scholarly community was not, at the time, ready to accept a journal in any format other than paper.

It is not clear who first proposed a scholarly journal produced exclusively in an electronic format, several authors arrived at this same idea during the mid- to late-1970s.

In 1975, in a report to the National Science Foundation (SENDERS ET AL.) proposed mass storage of journal articles on computer disks. They were also the earliest to realize the drawbacks of the electronic medium for storage of published scholarly works: a great deal of computer memory is required, access time may be slow, and the articles themselves must be read-only so as to prevent alteration. They also mention that, prior to 1975, the National Science Foundation had conducted a feasibility study of an Editorial Processing Centre, “an electronic system for the preparation of scientific journals” (SENDERS ET AL., p.# 55). In 1978, ROISTACHER proposes a virtual journal, to be established by scholars with access to a time-sharing computer; he credits the term “virtual journal” to Robert I. Bell of UCLA’s Campus Computing Network (p. #24).

The earliest experiment in electronic scholarly publishing was the Electronic Information Exchange System (EIES), which was carried out at the New Jersey Institute of Technology from 1976 to 1981 (TUROFF; TUROFF & HILTZ;). Even now, EIES remains one of the most visionary and revolutionary efforts with regards to its treatment of the general concept of publication. At its inception, EIES had only one model for all of its publications, based on traditional print publications; however, over time and with use, four distinct forms of electronic journals evolved: (1) Newsletters were based on traditional print newsletters for special interest groups and societies; they were produced on a regular schedule, and were not peer reviewed.(2) The Unrefereed Free for All format was totally unrefereed, in that any subscriber to the EIES system could submit papers, as well as comments on other submitted papers. This format resembles HARNAD’s (1990)

Scholarly Skywriting model in that scholarly work was submitted for critique prior to formal editorial and publication process, and ideas could be exchanged freely and quickly. (3) The Classical Model, with Variations format duplicated in all essentials the traditional process of scholarly publication in print. The first publication to follow this model was the Mental Workload project, which began in mid-1979 (SHERIDAN ET AL.), and was “advertised, refereed, edited, copyrighted, and mass distributed-just as are traditional journals” (TUROFF & HILTZ, 1982, p.#197).

Finally, the (4) Tailored and Structured ‘Journals’ format only superficially resembled traditional print journals, and indeed represented, at the time, an entirely new form of publication. The first journal in this area was *Legitech*, a forum used by state science legislation advisors and federal representatives, which started in January 1978 (TUROFF & HILTZ, 1980). A *Legitech* user would submit a request for information to the forum, and other users would submit responses. Each user could then choose whether to receive future responses. When a certain critical mass of responses had been posted, a user could compile a brief containing the original inquiry and all responses to it, essentially a transcript of a lengthy online conversation; this brief was then published in a publicly accessible notebook. The organization of user discussion between users on *Legitech* is comparable to that of today’s listserv or Usenet newsgroup, and the compiled brief is an archive of the entire contents of a discussion thread.

NONTRADITIONAL MODELS

Dissemination

Concerns about specific management practices are central to all discussions of the changing manner in which scholars produce and disseminate their work. The literature on the management of electronic publishing and archiving describes models can be expressed as the questions How? and Who?: the first set of models suggest how dissemination should be implemented and the second set suggest who is responsible for maintenance and policy making. The opportunities afforded by electronic publishing challenge all parts of the management process from peer review to the long-term preservation of the record. The distinction between scholarly publishing and scholarly communication that is so clear in the world of print-based publication where published works are what is contained in a journal and communication is everything else, becomes blurred in the arena of electronic scholarly publishing. In the sense that everything produced in a networked environment is available to every user with access to the network, it is all published material. However, the material is not necessarily reviewed. Further, the organization that manages the networked environment may choose to impose differing degrees of review on different materials, just as some listservs today are moderated and some are not. Moreover, the greater the degree of moderation of particular materials, the closer to an approximation of peer review, and indeed, the management of a particular networked environment may make the arbitrary decision that *these* moderated materials are in fact publications, but that *those* are not.

HARNAD (1990) defines Scholarly Skywriting as the “almost instantaneous” process of interactive communication that is made possible by the technology of networked environments. Harnad’s Skywriting is technically nothing more than email, as it possesses the potential to allow close to real-time conversations among the members of large groups. The use of the word skywriting makes explicit the idea that a networked environment provides a format in which scholars can “get their ideas up there” and, like skywriting, have their words viewed by an enormously large number of people.

Harnad suggests that, in the print medium, “the archiving of scientific ideas is *already* on a continuum, with varying degrees of formality, reliability, and even of peer validation,” and that therefore “it is natural to transpose all of this into the electronic medium as well.” To implement this continuum in the electronic environment, Harnad proposes “bi-directional quality control mechanisms”: the vertical dimension is “a pyramidal hierarchy of email groups” in which read/write access is provided “based on the contributors’ degree of expertise, specialization, and their record of contributions in a given field” (1990,p.# 343); the horizontal dimension takes the material that has been produced at all levels of the hierarchy, subjects it to a traditional peer review process, and electronically archives it. Harnad suggests that “scholarly inquiry in this new medium . . . is likely to become a lot more participatory” (p.# 344) as scholars can exchange ideas at a speed approaching that of natural conversation.

Similar to Harnad, GUÉDON envisions the Seminar becoming the primary mode of scholarly communication and publishing, encompassing both of these concepts. A

Seminar is a subject-specific discussion group allowing scholars easy access to each other, as well as providing a vehicle for the rapid flow of ideas, rather than having to wait for “the slow, jerky process of putting small, discrete articles inside slightly larger packages called *journal issues*” (GUEDON, p.# 82). The Seminar is conceived of as an “eco-museum” approach to scholarship; an individual Seminar would contain both information specific to a field of scholarly inquiry, as well as information intended to make that field comprehensible to an outsider. As Guédon puts it, “the territory [i.e., scholarly inquiry] crisscrosses itself along a multiplicity of perspectives, each of which corresponds to the interrogation of a particular group addressed to another” (p. # 84). Scholars need not write exclusively for their peers in their narrowly focused field, but could communicate to scholars in other fields, using the Seminar as the forum. Informational links could be established across a single Seminar, as well as between seminars, thus bridging the gap between differing fields of study. This approach treats scholarly inquiry as an immense hypertext, with any one informational source linking to many others.

Neither Guédon’s Seminar nor Harnad’s Scholarly Skywriting models discusses the issues involved in actually managing the proposed electronic. These models serve as ideals or abstract concepts upon which actual electronic publishing projects can be built. Harnad did, however, go one step further on 27 June 1994, when he posted his now-famous Subversive Proposal to the electronic discussion list VPIEJ-L (hosted by the Virginia Polytechnic Institute) (OKERSON & O’DONNELL). This proposal suggested

that every author of esoteric works in the world (Harnad defines esoteric as “non-trade, no-market scientific and scholarly publication”) establish a public FTP archives. Further, the proposal suggests that with the establishment of such an archive, the “transition from paper publication to purely electronic publication (of esoteric research) would follow suit almost immediately.” (OKERSON & O’DONNELL, p.#11)

Related to Harnad’s subversive FTP archive is GARDNER’s (1990) Electronic Archive which, like Harnad’s FTP archive, is founded on the premise that the article is the fundamental unit of scholarly publication. Retaining the article as the fundamental unit, both Gardner’s and Harnad’s archives simply change the method of access to the article. However, while Harnad’s FTP archive leaves it to users to know about and access articles on their own, Gardner’s Electronic Archive formalizes the process of dissemination. Gardner’s Archive publishes one or more articles on demand in any format users specify, from onscreen to bound as a traditional print journal. The Archive “*personalize[s] the journal*. People can get the articles they want as they are published, based on their own definition of their professional needs” (GARDNER, 1990, p.#336); rather than purchasing every article published by a particular publisher under a particular journal title, users can select only articles they wished to purchase. Gardner points out that this idea is similar to the print publication of “separates,” a scheme with which several academic societies had already experimented.

Gardner does not discuss the review process that an article must undergo in order to be accepted into the Electronic Archive, but there is no reason the traditional review

process for print publications cannot be used, or any variation thereof. Harnad addresses this issue slightly when he suggests that “NO scholar would ever consent to WITHDRAW any preprint of his from the public eye after the refereed version was accepted for paper ‘PUBLICATION” (OKERSON & O’DONNELL, p.#12) [emphasis author’s], suggesting that the scholar would voluntarily submit preprints to review by every interested scholar in the world (not to mention simply everyone, scholar or not, with access to an FTP connection). Once an article is published in print, Harnad goes on to suggest, “everyone would, quite naturally, substitute the refereed, published reprint for the unrefereed preprint” (OKERSON & O’DONNELL, p.#12). Ignoring the obvious copyright issues involved in a scholar making available a work that was published elsewhere, Harnad leaves it to the authors to make their own works accessible in the FTP archive. Gardner, on the other hand, suggests that once the article is accepted into the Electronic Archive, the editorial process should not differ significantly from the traditional editorial process for print publication, although, as one might expect, he suggests the use of electronic delivery methods, specifically, fax and email, instead of the postal service. Indeed, the only significant departure from the traditional publication process that Gardner suggests is the use of automated software to perform cataloging and indexing functions: assigning a call number to the article, establishing links to other articles in the archive that the author has cited, assigning indexing terms and keywords to the article, and sending out mail (electronic and paper) to subscribers to the archive service who, judging by their previous publishing requests, may be interested in the

newly published article.

Inspired by Gardner's Electronic Archive is Mani's model of the MEGAJOURNAL. (MANI; PEEK & BURSTYN). The MEGAJOURNAL, as a central repository for all published articles in a specific scholarly field, is a cross between a peer-reviewed scholarly journal and an archive. This model differs in scope from Harnad's and Gardner's archives but is the same organization in that it is discipline-specific, rather than universal. The organization of the MEGAJOURNAL is reminiscent of the "bi-directional quality control mechanisms" (HARNAD, 1990, p. #343) of Harnad's Scholarly Skywriting model in that it "will have a hierarchical, pyramid structure; the apex being formed by the papers which go into today's high-quality printed journals and the lowest . . . being formed by contributions that . . . constitute some of today's conference and workshop papers" (MANI, introduction). The MEGAJOURNAL also allows for interdisciplinary pursuits with the ease of Guédon's Seminars due to the fact that "interdisciplinary pyramids can be created by mere use of appropriate pointers to the papers in the areas from which the interdisciplinary area is formed" (MANI, section d).

A further refinement of this same concept is the Acquisition-On-Demand model of the Coalition for Networked Information (CNI). Like the MEGAJOURNAL, the Acquisition-On-Demand model is proposed as a discipline-specific archive; BAILEY (1992) states that "it would be theoretically possible to construct a monolithic, universal article archive," like Harnad's FTP archive, but that it "appears to be both unlikely and undesirable in this decade" to do so (p.#78). Individual articles are stored on one or more

file servers, which can be accessed on demand and priced according to use. Bailey states that there is no reason electronic publications must be tied to fixed publication schedules like print journals; electronic publications can be released at irregular intervals. Thus, the traditional concept of journals may vanish entirely, and publication may simply mean accessing a single article from that archive (BAILEY, 1992, p. 79). This is fundamentally no different from the concepts behind Harnad's and Gardner's archives, as both posit user access to individual articles as intrinsic to the nature of the archive and thus to the consequent breakdown of the traditional journal structure. The movement from Harnad's FTP archive and Gardner's Electronic Archive, to the MEGAJOURNAL, to the CNI's Acquisition-On-Demand model, exemplifies the conceptual development of an increasingly specific implementation of an essentially similar model.

Maintenance and Policy Making

HURTADO (1996) states that academic institutions must collaborate on electronic publishing projects, in order to exchange expertise and experience, as well as avoid the all-too-common problem among noncommunicating users of new technologies of reinventing the wheel. Hurtado therefore suggests that a consortium of universities jointly create a forum for not-for-profit academic publication, because "it is generally conceded that university presses set the standard of quality in academic publications" (p. #206). In addition to the universities in these consortia, Hurtado stresses the importance of including academic societies for their expertise in the dissemination of research in journals published by the societies themselves. Regardless of what other organizations

join the consortia, Hurtado says that only academic institutions and societies should have voting privileges, thus ensuring that the consortia are run by those who best understand the needs of scholarly publication: the scholars themselves. The consortia should be multidisciplinary or cross-disciplinary, although specific disciplines may set up special forums unique to their own needs. Additionally, the consortia should be international in scope, just as the Internet is international; this raises new issues of governance, because the laws that govern the Internet (such as they are) and the maintenance of its physical hardware are regulated at the national level.

OKERSON's (1992) Circle of Gifts proposes a model of electronic publishing that, to a certain extent, already exists. The Circle of Gifts, unlike other models, does not propose either a single archive or a single entity that maintains the archive; instead, individual organizations provide unique services to each other, and are repaid with other unique services. Published information is owned by the scholars or institutions that created it or funded its creation, and owners can distribute this information as they see fit. Similar to many interlibrary loan services currently in existence, the services provided by The Circle are free to member organizations, and then charged on a cost recovery basis "to the extended scholarly community; and sold at cost plus to for-profit purchasers" (p. #93). Overarching the Circle of Gifts model is the research cooperative, essentially an agreement between participating organizations, that, like a library consortium, states common goals and services. Like Hurtado's model, Okerson's Circle of Gifts requires cooperation among academic institutions and possibly academic societies toward the

common end of electronic publication.

Alternatively, YOUNG proposes a Corporation for Scholarly Publication (CSP). This model of networked scholarly publication is funded and governed by a combination of government, commercial, academic, foundation, and private agencies. The primary source of funding is federal subsidies, making the CSP analogous to the Corporation for Public Broadcasting. The CSP is responsible for the dissemination of scholarly research, “especially that research that is performed through federally administered grants and contracts” (YOUNG, p. #101). Essentially, this model proposes that academic scholarship be federally subsidized, an idea that might not be well received outside academic circles. An additional drawback of this model is that it places the federal government in competition with commercial industries. Young himself admits that “publication of research funded by federal sources in a Corporation for Scholarly Publishing might . . . divert valuable material from the commercial and society scholarly publishers’ products” (p.101). This raises issues of how to govern the distribution of scholarly publications, which currently is more or less governed by publishers’ sales of reprints and fair use laws. Further, and more ominously, if the federal government were to fund scholarly research, the CSP, like the National Endowment for the Arts, would have the ability to select which avenues of research should be funded and which should not.

EXPERIMENTS AND PROJECTS

At first glance, it may appear that the history of electronic scholarly publishing is

littered with the corpses of failed efforts (see Table 1). This is not truly the case as the items are experiments: investigations or trials of different aspects of electronic scholarly publishing, intended to be of a limited duration, with the mistakes and failures meant to be as illuminating as successes. Projects, on the other hand, are endeavors that are intended to be ongoing.

Network Delivery Experiments

Network delivery experiments are divided into two categories: 1) those that published original material, including EIES and BLEND, and 2) those that converted previously published print material into electronic formats, including STELAR, CORE, TULIP, and Red Sage. Experiments that published original material were conceived of as explorations “of an electronic communication network as an aid to writing, submitting and refereeing papers, and also as a medium for other types of scientific and technical communication” (SHACKEL, 1982). The experiments that converted previously published print material were conceived as controlled environments in which to explore alternative methods of access to scholarly work. The difference in stated intent is worth noting: experiments that published original material were concerned with new methods of scholarly communication, whereas experiments that converted previously published print material into electronic formats were concerned with new methods of distribution.

Table 1: Network Delivery Experiments

| Name of Project | Dates of Operation | Interface | Institutions Involved | Intent |
|--|---------------------------|---|---|--|
| Electronic Information Exchange System (EIES) | 1976-1981 | Project-specific | New Jersey Institute of Technology | Original material |
| Birmingham and Loughborough Electronic Network Development (BLEND) | 1980-1985 | NOTEPAD | British Library Research & Development Department (BL R&DD) et al. ¹ | Original material |
| STELAR | 1991-1995 | WAIS, WWW | NASA et al ² | Print material converted to electronic |
| CORE | 1991-1995 | XSCEPTER (X-window Scientific Electronic Publishing and Text Retrieval) | Cornell, Bellcore, ACS, ChemAbs, OCLC | Print material converted to electronic |
| The University Licensing Project (TULIP) | 1991-1996 | Institution-specific | Elsevier Science et al ³ | Print material converted to electronic |
| ELVYN | 1992-1995 | Institution- | British Library | Dual publishing |

¹ British Library Research & Development Department (BL R&DD), The University of Birmingham, Loughborough University

² National Aeronautics and Space Administration (NASA), American Astronomical Society (AAS), The Astronomical Society of the Pacific, American Institute of Physics (AIP), The Library of Congress, The National Science Foundation (NSF), University of North Carolina at Chapel Hill

³ Elsevier Science, Carnegie Mellon University, Cornell University, Georgia Institute of Technology, Massachusetts Institute of Technology, University of California, University of Michigan, University of Tennessee, University of Washington, Virginia Polytechnic Institute and State University (Virginia Tech)

| | | | | |
|----------|-----------|--|--|--|
| | | specific: SGML, PostScript, TeX | Research and Development Department (BLR&DD) et al ⁴ | |
| Red Sage | 1992-1996 | RightPages | AT&T Bell Labs, Springer-Verlag, UCSF | Print material converted to electronic |

¹ British Library Research & Development Department (BL R&DD), The University of Birmingham, Loughborough University

¹ National Aeronautics and Space Administration (NASA), American Astronomical Society (AAS), The Astronomical Society of the Pacific, American Institute of Physics (AIP), The Library of Congress, The National Science Foundation (NSF), University of North Carolina at Chapel Hill

¹ Elsevier Science, Carnegie Mellon University, Cornell University, Georgia institute of Technology, Massachusetts Institute of Technology, University of California, University of Michigan, University of Tennessee, University of Washington, Virginia Polytechnic Institute and State University (Virginia Tech)

¹ British Library Research and Development Department (BLR&DD), Institute of Physics Publishers (IoPP), Standing Conference of National and University Libraries (SCONUL), Imperial College of Science, Technology and Medicine of University College London, University of Hertfordshire, University of Exeter, Cavendish Lab of University of Cambridge, Loughborough University, The University of Manchester, University of Oxford, Harwell Laboratory of the Atomic Energy Authority, Chalmers University of Technology Sweden

The group of experiments that published original material further divides into two subcategories: those that published material exclusively electronically, and those that published material simultaneously in both electronic and print formats. Like the

⁴ British Library Research and Development Department (BLR&DD), Institute of Physics Publishers (IoPP), Standing Conference of National and University Libraries (SCONUL), Imperial College of Science, Technology and Medicine of University College London, University of Hertfordshire, University of Exeter, Cavendish Lab of University of Cambridge, Loughborough University, The University of Manchester, University of Oxford, Harwell Laboratory of the Atomic Energy Authority, Chalmers University of Technology Sweden

experiments that converted previously published print material, ELVYN, the only dual-publishing experiment listed in Table 1, was exploring alternate methods of access to scholarly material. At the time that these experiments were taking place, the economic viability as well as the stability of the electronic medium for scholarly publication was still being widely questioned by the scholarly community. The publishers involved in these experiments were “seek[ing] to supply each customer library with a format suiting its own particular needs” (WOODWARD & ROWLAND) or letting user demands determine the feasibility of pursuing electronic publishing.

It should be mentioned that the interfaces for these experiments, although quite different in technical details, were remarkably consistent in functionality. The only major differences were the methods of access to and presentation of the electronic materials, the inclusion or lack of inclusion of graphics with textual material, and the complexity of the search capabilities. Interfaces are discussed in greater depth in a subsequent section.

Network Delivery Projects

The development of the World Wide Web was a boon to electronic journal projects. As noted above, much of the literature on electronic publishing experiments states that one difficulty of implementation was the fact that, at the time the experiment was underway, no format in existence could easily and cleanly integrate text and graphics into a viewable page. Ironically, the later experiments were being conducted at the same time that the World Wide Web (with graphics capability) was being invented. It was not until the mid-1990s, however, that the World Wide Web entered the mainstream of

public consciousness, so those in charge of the experiments may not even have known about its existence.

At some point in their development, all the early electronic publishing projects moved to a Web-based format. There is no literature that documents this period, so statistics are difficult to find. According to PEEK (1995), the NewJour archives as of September 1996 contained 1,272 electronic journal titles, and the current archives, from July 30, 1995 to December 1, 1995, contained 625 titles. As of this writing, in mid-September 1998, the NewJour archives contains 6,365 titles. Because NewJour is not confined to scholarly journal titles, the number of Web-based scholarly electronic journals is clearly less than the numbers stated here. Nevertheless, the limitations of space prevent us from addressing all of the Web-based scholarly electronic journals currently in existence. Rather, the electronic journals listed in Table 3 are some of the earliest to be published on the Bitnet and Internet that have since migrated to the Web. Because they were early comers to the electronic format, these journals also received more press than those that went online later. As more journals were published electronically, the change became less noteworthy; therefore there is little literature on electronic publishing projects past the early 1990s.

All of the electronic journals listed in Table 2 currently have Web-based interfaces, but they bear the marks of their humble beginnings of pre-Web technologies. The earliest network delivery projects include *Comserve*, *Psycoloquy*, and *High-Energy Physics-Theory* (HEP-TH) *PostModern Culture*, *Pubic-Access Computer Systems*

Review, The Interpersonal Computing and Technology and *The Online Journal of Clinical Trials* (Table 2). All of these journals continue to publish.

The first project, starting in 1986, was Comserve, funded by the Communication Institute for Online Scholarship (CIOS) as a forum for the communication discipline (STEPHEN & HARRISON, 1992, 1994; HARRISON & STEPHEN, 1993). Comserve is a collection of several public and private so-called hotlines, or forums for computer-mediated communication, not all of which were intended to contain journal-quality publishable material (STEPHEN & HARRISON, 1994). Comserve's hotlines bear a strong resemblance to GUÉDON's proposed Seminars. Originally, Internet users interacted with the hotlines via email, through automated processes, although Bitnet users had access to a menu-driven interface. Today, Comserve has a World Wide Web interface, and also maintains an email interface. Ironically, by 1990, Comserve was so popular, and was being accessed so often, that "a number of changes were then enacted in an attempt to *discourage* contact and experimentation from network users who were not primarily invested in the communication discipline" (STEPHEN & HARRISON, 1994, p. 769).

Table 2: Early Network Delivery Projects

| Name of Project | Date Begun | Institutions Initially Involved |
|--|-------------------|---|
| <i>Comserve</i> | 1986 | Communication Institute for Online Scholarship |
| <i>Interpersonal Computing and Technology Journal (IPCT-J)</i> | 1993 | Association for Educational Communications and Technology et al. ⁵ |
| <i>High-Energy Physics-Theory (HEP-TH)</i> | 1991 | American Physical Society (APS) et al. ⁶ |
| <i>Online Journal of Current Clinical Trials</i> | 1992 | American Association for the Advancement of Science |
| <i>Postmodern Culture</i> | 1990 | University of Virginia's Institute for Advanced Technology in the Humanities. |
| <i>Psychology</i> | 1990 | American Psychological Association |
| <i>Public-Access Computer Systems Review (PACS-Review)</i> | 1990 | University of Houston Libraries |

One of the hotlines in Comserve was the Electronic Journal of Communication/La Revue Electronique de Communication (EJC/REC), which was organized by the CIOS in 1990 to be a “risk[y] test of the ability of the networks to support scholarly communities;” it has since become the official scholarly journal of the CIOS (STEPHEN & HARRISON, 1992, 1994; HARRISON & STEPHEN, 1993). EJC/REC is a peer-

⁵ Association for Educational Communications and Technology, Georgetown University, University of Maryland, Baltimore County, Northern Arizona University.

⁶ American Physical Society (APS), Los Alamos Laboratory, National Science Foundation (NSF).

reviewed scholarly journal, that differs from traditional print publication only in its method of distribution, which is via an email distribution list.

Similar in nature is Psycholoquy, which owes its initial existence almost entirely to the efforts of Harnad. Psycholoquy was established as an FTP archive as suggested in Harnad's Subversive Proposal. At some point in its history, Psycholoquy was also given Gopher, listserv, and Usenet interfaces to the same material that was available via FTP. Today Psychoquy is a refereed international, interdisciplinary electronic journal sponsored by the American Psychological Association. Now a web-based publication, a future generation of Psycholoquy, called HYPER-Psycholoquy is under development at the time of this writing.

In a similar vein is the High-Energy Physics — Theory (HEP-TH) archive. HEP-TH uses an entirely automated process for submission and indexing of articles. The archive also contains bulletin board-like functionality by which “researchers who might not ordinarily communicate with one another can quickly set up a virtual meeting ground, and ultimately disband if things do not pan out” (GINSPARG, 1996, p. 3 of 8). The HEP-TH archive is not intended to contain exclusively journal articles, but rather is designed to be, like Comserve, a forum for scholarly communication, reminiscent of GUÉDON's Seminars.

The Online Journal of Clinical Trials (OJCT) was noteworthy because it was the first electronic journal that was published by a traditional publisher and the first to incorporate graphics. The journal struggled though its first year until the AAAS was

successful in lobbying *Index Medicus* and *Medline* to include the journal. (PEEK, 1994)

OJCT was not the only electronic journal that sought out inclusion or received in the indexing and abstracting services. *Postmodern Culture* is indexed in Arts & Humanities Search. *Interpersonal Computing and Technology* is included in ERIC, as is the *Public-Access Computer Systems Review* and the *Electronic Journal of Communication*.

CD-ROM Delivery Projects

An interesting characteristic of the CD-ROM publishing projects is that they are projects, and not experiments: all the projects listed in Table 3 are still in operation at the time of this writing. This may be interpreted as a statement about the permanence of CD-ROM media. More likely, however, it is an indication of the maturity of electronic scholarly publishing: by the time these CD-ROM projects were begun in the early 1990s (with the exception of ADONIS, which was begun a full decade before the rest), electronic publishing was reasonably well established and accepted by the scholarly community. Jasperse, in an article about the ‘100 Rivers on Disk’ project, requested all users to evaluate software that was then being distributed on 3½-inch or 5¼-inch diskettes (JASPERSE, 1991, p. 4), but the project was ultimately released on CD-ROM as a part of *The New Zealand Journal of Marine and Freshwater Research*. In a later article, Jasperse indicates that the opinions of users of ‘100 Rivers on Disk’ “that paper journals be *replaced* by CD-ROM journals was highly skewed toward undesirability . . . yet, *supplementing* paper journals with CD-ROM and/or an online database was highly

skewed toward desirability” (JASPERSE, 1994, p. 779-780).

Table 3: CD-ROM Delivery Projects

| Name of Project | First Issue Date | Interface | Institutions Involved | Scope |
|--|-------------------------|---|--|--|
| ADONIS | 1980 | dedicated workstation | Academic Press et al. ⁷ | Print material (journal titles from all publishers involved) converted to electronic |
| New Zealand Journal of Marine and Freshwater Research (NZJMFR) | 1992 | Hypertext by Romware authoring software | Royal Society of New Zealand | Dual publishing of pre-existing journal |
| CD-ROM Acrobat Journals Using Networks (CAJUN) | 1993 | Adobe Acrobat, network delivery | John Wiley & Sons et al. ⁸ | Print material (9 Wiley Computer Science journals & 1 book series) converted to electronic |
| ExtraMED | 1994 | Idealist | Informania Ltd., World Health Organization (WHO) | Dual publishing of specialized journals, many not indexed by indexing services |

With the CD-ROM delivery projects, as with the network delivery experiments,

⁷ Academic Press, Blackwell Scientific Publications, Elsevier Science Publishers, Pergamon Press, Springer-Verlag, John Wiley & Sons.

⁸ John Wiley & Sons, Electronic Publishing Research Group at the University of

come a wide range of interface implementations. The most extreme solution is that of the ADONIS project, which involves proprietary software and three proprietary cards that are installed in a dedicated workstation specifically to run the ADONIS CD-ROMs (the workstation was intended to be useful for other library purposes as well) (STERN & CAMPBELL, 1989). *The New Zealand Journal of Marine and Freshwater Research* (the first scholarly CD-ROM database to be produced outside of the United States or Great Britain) does not require a dedicated workstation, but does have its own interface that provides hypertext-style access to the material (JASPERSE, 1994). Likewise, Blackwell Scientific Publishers developed its own interface for ExtraMED. The CAJUN project takes a different tack entirely by presenting material in the commercially available Adobe Acrobat software (PDF file) format (SMITH ET AL.). As with the network delivery experiments, the interfaces of the CD-ROMs are all different, but the functionality remains fairly consistent: all allow searching of articles by author, title, subject, or other metadata field.

ACCEPTANCE BY THE SCHOLARLY COMMUNITY

When first introduced, electronic scholarly journals met with considerable resistance from the academic community. The principal reasons were common to electronic publishing in general: the superior portability of paper over electronic formats, the lack of a common interface, the quality of viewing technologies (BAILEY 1994; GRENQUIST). However, the academic community has had other concerns about

electronic journals, some similar to those in the mainstream press and others unique to academia.

Journal Content

The most intriguing argument against the usefulness of the electronic scholarly journal calls into question the intellectual validity of scholarly work published in an electronic format. According to this argument, the decrease in time taken to publish a work electronically from the time required to publish a work in print diminishes the rigor of the review process, and thus the intellectual weight of the resultant scholarly work (KLING & COVI). This argument falls short, however, when one suggests, as GARDNER (1990) does in his proposal for an Electronic Archive, that the process of peer review for an electronic scholarly journal is conducted in precisely the same manner as the traditional review process for a print journal. According to this counter argument, it takes no less time for an author to write an article than it ever did, and it takes no less time for reviewers to critique it than it ever did. However, the speed of transmission between author and reviewer is increased by the use of electronic forms of communication, such as email, and the speed of publication is increased by eliminating the time-consuming printing process; ultimately, it is only the publication format that is changed, and the content suffers not at all.

Lack of content has always been a factor weighing against acceptance of the electronic journal by the scholarly community. Many of the early electronic publishing experiments published electronically only journal titles produced by a single publisher,

thus restricting the amount of material available in the electronic medium. The availability of material is summed up by LYNCH's (1995) discussion of the TULIP experiment. Lynch states that "because Elsevier did not completely dominate scholarly publishing in any discipline," TULIP failed to achieve the critical mass of subject-specific information required to make the use of the materials compelling for subject specialists (p. 12). He concludes that "production of future electronic information systems, if they are to achieve real user acceptance, must achieve critical mass" (p. 22). The same statement could be made about most of the early experiments; indeed, the Mental Workload experiment in EIES was, in the end, evaluated to be less than a complete success because "the twenty or so actual participants did not in fact generate enough 'publishable' material" (SHERIDAN ET AL. p. 73). An experiment such as STELAR, which was confined to astrophysics literature, had a focus narrow enough that it could potentially have achieved critical mass; unfortunately, none of the available literature on STELAR addresses this issue.

Interfaces

Another major factor that limited the usability of the early experiments was the interface. Most of the experiments developed proprietary interfaces that users were required to learn before they could access the published material. Some experiments, such as EIES, involved multiple interfaces. The Mental Workload experiment included systems similar to current electronic email, chat, and bulletin board operations (SHERIDAN ET AL). The Legitech experiment had a system similar to current listserv

functionality (JOHNSON-LENZ & JOHNSON-LENZ). Like EIES, TULIP had its own interfaces, although unlike EIES, and complicating matters further, the participating TULIP institutions were given the latitude to develop interfaces specifically to meet their own unique requirements. All of the TULIP interfaces necessarily shared similar functionalities, including the ability to search, browse, view, print, save, and fax individual articles, but there was no standardization, thus requiring every participating site to reinvent the wheel (BORGHUIS ET AL.). In a similar vein, proprietary interfaces were developed for the Red Sage and CORE projects, although unlike EIES and TULIP, these interfaces took the intent of the projects into consideration from the outset, rather than allowing the interfaces to evolve as the projects evolved.

Few experiments used any sort of standardized software for their interface. STELAR made use of the newly invented World Wide Web as an interface, and it also made use of a proprietary X Windows-based WAIS client (VAN STEENBERG). Participating ELVYN libraries were allowed to develop their own delivery mechanisms, which ranged from proprietary software to the World Wide Web (ELVYN). BLEND was the only project to use a standard interface exclusively by adopting the commercially available NOTEPAD software (SHACKEL & PULLINGER).

In short, this wide variety in interface design can be considered a major factor contributing to the disappointing results of the experiments. Certainly it is true that at the time these experiments were underway, computers were not as widespread in academia as they are today, and therefore some scholars would have had a serious learning curve

merely to use the equipment effectively (BORGHUIS ET AL. p. 73). More important is convenience: users will employ the means that is most convenient for accessing the information they need (SHERIDAN ET AL.).

Formats and Delivery

Another issue in many of the early experiments and projects is the format in which text and graphics were presented. Literature on the TULIP, Red Sage, and CORE experiments, for example, states that they presented the entire page in bitmap image format. The bitmap format was one of the earliest formats in which to store image data, and was therefore an obvious choice at the time these projects were starting up. There is, however, some vagueness in the literature; it is uncertain whether the word bitmap refers to files in bitmap format (that is, with a .bmp extension), or whether it merely indicates any digitally rendered image. Bitmap (.bmp) files are, at any rate, extremely large, and take a long time to download and display on a monitor. Bitmaps are therefore impractical for any sort of networked environment, especially when speed of access is a consideration. Today, the newer formats used to store image data, improvements in data compression, and increased speed of telecommunication have made speed nearly a non-issue. Beyond these concerns, BAILEY (1992) states that text-only formats are inadequate for the electronic publication of scholarly research, and that a new format is required that will allow for the integration of text with color images, tables, charts, and other graphics. The subsequent popularization of the World Wide Web, and the Web's ability to integrate formats, allows publication of multimedia materials with an ease that

was merely hoped for even five years ago, and that will undoubtedly continue to improve.

A more serious problem with storing pages of text as image files is that such images are not searchable, as the page would be if it were stored as text. Each file, as an image, must be indexed separately, and thus progress is not really made from the print format. The TULIP experiment hit on a compromise in which each page image was converted to text using optical character recognition (OCR) software, and this OCR-generated text was made available. Unfortunately, “the uncorrected ASCII text was unusable for viewing, since it omitted or misinterpreted the equations, Greek letters, and other nontextual information, and made numerous errors in recognizing the text itself” (LYNCH, 1995. p. 15). Thus it appears that these experiments were victims of insufficient technology.

In a study conducted on ELVYN, InfoTrain, and Café Jus, ROWLAND ET AL (1997) found that the inadequacy of Internet infrastructure is a factor undermining the acceptance of electronic journals, noting that “users in Europe are well aware of the need to do their networking in the morning, when it is the middle of the night in North America” (p. 72). However, they also found that users were fairly tolerant of the slow delivery of information. They caution that because the network is slow and congested, publishers must minimize the number of screens that users must navigate in order to get from the site’s initial page to an article of interest.

In this same study, the authors also suggest that the use of Adobe Acrobat’s Portable Document Format (.pdf) could possibly reduce the acceptability of electronic

journals. While electronic journals must be designed for viewing on a computer screen, Adobe Acrobat and related viewers are based on the traditional vertical format of paper publishing, not the horizontal format of a computer screen. PEEK ET AL found that most traditional publishers are choosing proprietary formats instead of the HTML format used on the Web. Although these proprietary formats do maintain original page integrity, ROWLAND ET AL (1997) suggest that this appearance factor may undermine acceptance by the users.

User and Social Implications

Over time, the electronic journal in purely electronic display format has come to be more widely accepted by the scholarly community. In WARKENTIN's recent survey of Germanists in Canada, a field the author claims is very conservative and traditional, only 36% percent of respondents subscribed or used electronic journals, yet 58% indicated they would be willing to submit an article to an electronic journal. Hence, he states, the "majority are willing to give qualified support to the idea of 'electronic' scholarship" (p. 42). Curiously, greater support for electronic journals was offered by those with more than 20 years in the profession than those with 11 to 20 years. Indeed, students made use of electronic journals least of any group in the field; graduate students were not prepared to cite electronic journals in their dissertations for fear that a member of their dissertation committee would object.

Other studies indicate that there is little resistance to electronic publishing in the scholarly community. In BUTLER's survey of sociologists of science who had published

works in electronic journals, 21% indicated that they believed their contributions to electronic publications were viewed by their colleagues as equal in importance to their contributions to print publications. Of those surveyed, 43% indicated that they believed their electronic contributions were viewed as less important than their print publications. However, Butler attributes this latter figure to a persecution complex on the part of contributors to electronic journals, as 63% indicated that they believed that their colleagues viewed electronic publications as “not ‘real’ publication,” though only 9% could provide any solid facts to support this belief (BUTLER). In support of Butler’s conclusion is the fact that many educational institutions now view electronic publications as valid supporting material for tenure requirements (KELLEY ET AL).

It is apparent that the relationship between publishing and the scholarly community has destabilized. However, there is surprisingly little research that provides insights into the impact of these possibly changed relationships on the academic community. As SILVERMAN observes, one problem with this literature is that it presumes a universal academic community, ignoring how each discipline develops its own truth. Further, much of the work to date has been exceedingly optimistic, with critics focusing on mechanical issues such as long-term storage and retrieval. Little work focuses on possible negative consequences to scholarship. As SILVERMAN also notes, “The electronic journal promises to make it evident when a paper is of utter nonconsequence to the community by spawning no reactions, or hostile and nonconfirming ones. This publicness will be somewhat like the ratings that appear in

movie reviews” (p. 63).

HURD ET AL offer some key questions about interactive electronic journals. “If a manuscript or document is dynamic, what is the ‘archival’ version? Which is the copyrighted version? Who is responsible for updating text? Who is (are) the author(s)” (p. 105). Despite these questions, the authors state that as long as electronic journals are identical to the print journals, their utility and use will be limited.

There is evidence, however, that electronic journals are making inroads into the mainstream of scholarly work. Using citation analysis on data collected in February 1996, HARTER identified “top-five most highly cited ejournals are Bulletin of the American Mathematical Society, the Online Journal of Current Clinical Trials (OJCCT), PACS Review, Digital Technical Journal, and Psycholoquy” (p. 515). However, the study concluded that electronic journals (ejournals) have made limited impact in the research process. But HARTER also concluded that three journals, OJCCT, PACS Review, and Psycholoquy show considerable promise and may eventually become key journals in their respective fields.

RESEARCH AND DEVELOPMENT

Earlier in this chapter we describe the evolution of scholarly electronic journals and present the models proposed alternative forms of scholarly communication. However, few of these models have been implemented to any extent, with the exception of preprint databases that have gained acceptance in high-energy physics, a field that had relatively early access to computers when compared to other academic disciplines. This

is not surprising, given the nature of the funding sources of the projects and experiments undertaken to date. Further, the experimentation has relied primarily on amateurs who develop such projects as labors of love. BROWEN & SMITH observe that “the current diversity of form in electronic scholarly publishing will not last as amateur burnout occurs, and amateurs are replaced by traditional publishing companies” (p. 143).

Perhaps it is a combination of several factors that has affected the uneven knowledge about journals (electronic or otherwise) and the scholars’ relationship (present and future) to the journals. Advocates for electronic journals, frequently the editors themselves, probably have little time to conduct research on scholarly electronic publishing. Indeed, their field of expertise may be outside the realm of social and behavioral. Traditional publishers have either not pursued systematic evaluation of the uses of their experiments and projects or have elected not to make the information public. Doctoral students may be reluctant to pursue such topics for dissertations because of committee disapproval or methodological uncertainty in the measurement of parameters in electronic environment.

Despite many references on the subject, an understanding of the influence of electronic journals on scholarship is still not well developed. The literature is filled with discussions about the costs, the delays, the shortcomings of the interfaces, and concerns about peer review, and about acceptance of the electronic journals in the tenure and promotion processes. Yet, little research focuses on actual uses of scholarly journals, print or electronic, or for that matter, what scholars really want.

With the exception of databases such as those of the Institute for Scientific Information (ISI), which provides information on article citations, knowledge about the behavior of users of scholarly journals is quite shallow. Although scholars complain about the slowness of journal publishing, it is unclear how many scholars, and in which disciplines, are concerned. If the issue is legitimate, then scholars should find the availability of electronic journals appearing weeks or months before the print version compelling, perhaps compelling enough to change their behaviors and embrace an electronic alternative. Then again, if the speed improvement is only negligible or may not exist at all (in a parallel publishing environment), the motivation may be far less.

Another area that bears examination is the possible variance between journals published by academic societies and journals strictly for institutional purchase. Advocates for electronic journal publishing have primarily focused on the high-cost journals to which fewer and fewer institutions are able to subscribe. We found no significant discussion about scholars' perspectives on the journals that they receive directly as members of academic societies. Although projects like the new Digital

Library of the Association for Computer Machinery (ACM) will certainly provide insights into these behaviors, the ACM obviously pre-disposed toward computing. It is not clear whether scholars in other disciplines will be as interested in receiving or viewing online the same journals they receive in print. It is also possible that if institutions subscribe to online versions of society journals scholars may decide to discontinue memberships if the primary reason for belonging to a particular society is to obtain the journal.

Without knowledge of actual behaviors of scholarly journals in general, there is no basis for making comparison studies. The area of faculty verses student use is particularly deficient because, according to NIMIJEAN students have typically been overlooked. We found this to be true because most studies do focus on faculty populations and if students were also surveyed, the results are often collapsed in such a manner that the specifics of the student responses are not available. The role of student use could be particularly important because the way in which students are socialized about the use of electronic journals could play a critical role in their journal acceptance. If students are made to feel that the inclusion of references to electronic journals is unacceptable to faculty members, they may view such journals as having less quality than the print versions. Alternatively, research on student behaviors may also illustrate that the acceptance of electronic journals may indeed be generational and this may play a significant role in the evolution of electronic scholarly journals.

Much of the research points to the failure to develop an effective interface or the

slowness of the equipment as a major deterrent to the acceptance of electronic journals. The universal nature of the World Wide Web, as well as improvements in the technological infrastructure at many colleges and universities, has removed this barrier for some members of the academic community. The problem is determining the size of this population. For example, we know of a small college in Boston that has a Web site mounted on a commercial provider, but only the librarian has Internet access and an email account. While this may be an anomaly, it does generate concerns about the readiness of the international academic community to embrace electronic scholarship.

At the beginning of this chapter we stated our intent to examine only literature on the electronic scholarly journal and on that the use of computer mediated communication (CMC) by scholars. We find it difficult to discern the extent to which findings in CMC research reveals future use of electronic scholarly journals. Certainly computer mediated communication has blurred the boundaries of the expression scholarly communication and may ultimately play a significant role in determining the willingness of scholars to embrace electronic journals and to effect significant changes in the traditional peer review process.

CONCLUSION

The future of the electronic scholarly journal remains unclear. While there are pockets of innovation, much of the publishing vista remains the same. However, it is too premature to conclude that the future of scholarly publishing can be based on the present situation. Regrettably since we know little about the psychological or technological

readiness embrace electronic scholarly journals, predictions prove difficult.

Some research findings must be viewed in the proper context. Speed of retrieval, interface design, and quality of the viewing experience are hardly complaints limited solely to the genre of electronic journals. Why would any scholar wish to view electronic journals, or any other electronic information, if the overall technology can not provide a satisfactory experience? As such, it is not surprising that the future of electronic scholarly journals may be seen by some as bleak.

Possibly every viable alternative model for the publication of scholarly work has been proposed over the course of three decades. These models provide evidence that there is dissatisfaction with the traditional scholar-publisher-library relationships. Had the Internet not emerged, it seems unlikely that alternative forms of scholarship would have found expression. Yet despite the attention that scholarly electronic journals have generated in almost every discipline, we have a limited base of research on electronic journals to draw from. Therefore it is difficult to determine from the available research how interested the majority of scholars are in changing the scholarly publishing process.

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