

# On the Future of Electronic Academic Journal Publication: Technology, Economics, and Sociology

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Recent discussions about the future of electronic publication have tended to focus almost exclusively on questions of technology and economics: Are the technological capabilities of the Internet or the World Wide Web sufficient to support the publication requirements of academic journals? Do the economics of current or foreseeable technological solutions enable substantial savings and efficiencies over paper publication? These are no doubt important questions, worth contemplating and worth arguing about. But it is important to remember that a discipline's network of print journals is more than just a conduit for information transmission; it is part of a system of scholarly communication. In the exhortations to move toward electronic publication, the historical and sociological character of disciplinary systems of communication seems largely to have been forgotten.

A system of scholarly communication reflects and is the historical outcome of a set of research practices, cognitive processes, and social conventions that researchers use to generate knowledge in a discipline. Each discipline's communication system consists of the ways that scholars share preliminary information with each other and present knowledge to be ratified, the forms that knowledge is assumed to take (conference papers, articles, books, etc.), the appropriate venues for sharing knowledge (particular conferences and colloquia, publication in particular journals), and a hierarchy that distinguishes between levels of importance and accomplishment among individuals and products. And, although we might not have fully realized this until recently, a system of scholarly communication also identifies appropriate media (face-to-face meetings, print) in which scholarly communication takes place.

The literature is replete with predictions about the future of traditional scholarly communication systems as well as proposals for alternative systems given the

possibilities presented by the Internet and the World Wide Web. Traditional print journals are thought to face "impending demise" according to Odlyzko (1994), who calculates that, in mathematics, the exponential growth of the literature combined with the power and availability of existing technology will make traditional paper journals "irrelevant to mathematicians' needs within 10 years." In predicting how fast mathematics will move to the technologically superior system of electronic publication what remains unknown is "how soon the necessary infrastructure of editorial systems can be developed, and how quickly it will be accepted by the community."

Harnad's "subversive proposal" (1995) is an elegant plan for undermining and then re-engineering the traditional publication process rendered possible through scholars' agreements to make preprints of their work available through anonymous ftp/http. When a paper is accepted for publication, scholars would "quite naturally substitute the refereed, published reprint for the unrefereed preprint" (Harnad, 1995, p. 12). Since such a system makes scholarship available for substantially lower costs, "paper publishers will have to restructure themselves (with the cooperation of the scholarly community) so as to arrange for the much-reduced electronic only page costs. . . or they will have to watch as the peer community spawns a brand new generation of electronic-only publishers who will" (p. 12). Key to this proposal is the need to "Get all scholars to make ALL preprints of their work available publicly, by anonymous ftp/http NOW. The rest (replacing the preprint in due time by its refereed version, including in the archive 'reprints' of previously published articles, etc. etc.) will take care of itself as the house of cards falls" (Okerson & O'Donnell, p. 33).

These arguments are devoted to establishing the technological and economic feasibility of electronic publication, so it is easy to assume that scholars' decisions to transition to electronic publication depend solely upon the success of these arguments. Indeed, the arguments are quite persuasive and we too are convinced, as are most writers on the subject, that there are no technological impediments to electronic systems of scholarly communication and that substantial economic advantages can be achieved. Some die-hard traditionalists continue to argue against electronic publication on the grounds that such publications may lack a permanent archive, fail to establish sufficient peer review, or that prestige levels will be lost. However, proponents of electronic publication argue that there is no reason in principle why electronic journals and other publication mechanisms cannot supply the same services for their disciplines (Odlyzko, 1994; Okerson & O'Donnell, 1995). Increasingly, Ginsparg's (1995) highly successful preprint distribution system in high energy physics is held up as an example of an electronic distribution system that demonstrably works and appears to satisfy the needs of scholars in that discipline.

But if these factors were all that mattered, why have the vast majority of schol-

ars in academia not yet rushed to adopt this innovation? Why have established paper journals not been abandoned in favor of an alternative that is cheaper, faster, and that can provide all the services traditionally supplied by a communication system whose foundation is paper? The reasons are sociological, and although they have tended to be dismissed or glossed over, they represent the real challenge in diffusing electronic publication within and across disciplines.

The first reason has to do with the sociology of research; there are differences between the disciplines and perhaps their subsidiary fields in research practices and in requirements for systems of scholarly communication that bear upon the relative attractiveness of electronic publication. Some disciplines engage in research that is highly dynamic and interdependent. Knowledge accumulates rapidly, superceding that which was thought previously to be known, and advances in a scholar's research program may be highly dependent on sharing information about advances in other scholars' research programs. Thus, one might expect communication norms to favor rapid dissemination of information and one would not expect the print literature to have much effect on the conduct of ongoing research activities. One might expect individuals in such a discipline to be motivated to adopt technological systems that enable them to overcome problems in rapid transmission of information.

However, other disciplines, particularly in the humanities and social sciences, but even scientific disciplines, may move more slowly. For example, Hailman (1996) describes avian biology as an "inherently slow-moving science," in which the "last important paper on a given topic could be more than a half-century old, and there is little perceived need to rush new results into print" (p. 171).

Such disciplinary characteristics may explain in part why print publication is not a medium that satisfies the communication needs of high energy physics scholars and why an alternative electronic preprint distribution system is working so well. It also explains in part why an electronic preprint distribution system would be of more limited value and thus diffuse more slowly in disciplines with substantially different research practices.

A second set of reasons why paper and print have not been readily relinquished lies in the observation that academic disciplines serve more than just the purpose of generating knowledge. They are also communities in which individuals establish their careers and where they navigate hierarchies of status, prestige and power. Much of this activity is inextricably linked to disciplinary systems of scholarly communication. The scholars who do research now have based their careers on a system of scholarly communication that currently exists and, advantages to research practice notwithstanding, may have little incentive to change. It is interesting to note that the editors of existing print journals have shown little interest in reincarnating their publications electronically and that there has been no apparent pressure by their editorial boards or professional organi-

zations to persuade to them to do so. Electronic journals thus are more likely to be brand new and to involve the creation of new editorial infrastructures, consisting of individuals who are willing to take the risk to staff them, as well as adopting new editorial practices. This also means that electronic journals are likely to be populated by the comparatively young, the technologically sophisticated, and those who have the most to gain by shifting attention away from existing media and focusing it on their activities. In short, the cast of characters in an electronic system of scholarly communication is likely to change and when that happens the social organization of a discipline is up for grabs.

Thus, the real impediments to electronic academic journals are no longer technological and the possibility of economic advantage will not, by itself, overcome them. New electronic publications must bear the burden of all the normal disciplinary challenges to credibility and legitimacy that any new publication faces. But electronic publications must also find ways to justify (and perhaps create a need for) the technological solution that they supply, as well as overcome fears about the changes in disciplinary social organization that their presence will inevitably cause. These are substantial impediments to the success of electronic journals and editors and their editorial staffs must think carefully about how to overcome them.

Such considerations are no doubt behind the conservative look to many electronic publications, many which continue to bundle articles together in packages that look like "issues," even though other approaches to presentation and publication may be more pragmatic and more economical. Some critics have been distressed to find that many electronic journals have so far not taken advantage of some of the technological capabilities afforded by the Internet or World Wide Web (such as the ability to supply manipulable visual images or auditory information). From the more sober perspective of an electronic journal editor attempting to establish the legitimacy of a journal, it may be worthwhile to sacrifice such capabilities initially in favor of making sure that the journal is accessible to most of the scholars in the profession, and more importantly, that it look like a journal and thus satisfy the needs for journal publication of members of the discipline.

All of this is not to say that electronic journal publication does not now carry with it the seeds of more widespread and radical change. While we do not expect print publication to wither away in the foreseeable future, hundreds of individual experiments with electronic publication are taking place discipline by discipline in every academic corner of the Internet and World Wide Web. The phenomenon itself is unquestionably robust: nearly 517 peer-reviewed electronic academic journals existed in 1996, compared to 73 in 1994 (ARL, 1996). But, since some of these new journals do not appear to use peer review in ways that resemble traditional scholarly definitions, it remains to be seen whether and how

long these experiments will take to mature into fully credible and legitimated academic publications in their disciplines. But, to the extent that electronic publication is being introduced on a widespread basis, there is certainly the potential for substantial change in the media mix of disciplinary communication systems.

It remains also to be seen if and how these ventures will change the character of the academic communities they serve and the nature of scholarship undertaken by them. Scholarly communication systems do not simply or only reflect a community's practices; the technological advantages so widely trumpeted can enable a community to undertake new practices, even if this is not a necessary or preordained outcome (Harrison & Stephen, 1996).

If a scholarly community appropriates these new publication forms and begins to incorporate them into the ongoing process of disciplinary work, then we have the basis for radical innovation in scholarly communication processes. Consider, for example, Guedon's (1996) analysis of the early history of print journals in the sciences: Seventeenth century print journals were initially dependent on older, epistolary communication forms with contents that resembled the textual features of letters. But over time, academic journals began to be used by scholars to establish publicly their claims to originality and ownership, which gave rise to certain characteristic features of articles that we now regard as traditional. For example, published articles display a submission date in order to fix the time of first reading; footnotes were invented to credit discoveries, inventions, and advances to particular individuals. Guedon argues further that, as the responsibility for production moved from individual editors to associations of scholars, print journals played a major role in the creation of the social institutions that we now call "academic disciplines." Guedon's analysis suggests that print journals began by reflecting prior scholarly practices and then became the vehicle for the development of new communication practices and forms of social organization. Thus, it is well worth asking, what new scholarly practices and what new institutional formations might be the outcome of widespread acceptance of electronic journal publication?

In the midst of all the speculations and predictions over the future of electronic publication of scholarly periodicals, it is most important to bear in mind that the great experiment with electronic journals is very much underway, that hundreds of scholars are conducting this experiment within their own disciplines, and that ultimately the future of electronic academic journals rests in the hands of the editors, authors, and readers in the academic fields served by each of these journals. We do not believe that there is a necessary relationship between the presence of acceptable technological and economic alternatives to print and resulting changes in the disciplinary communication practices. Instead, such change will be the outcome of editors working strategically to position new

publications within their disciplines, authors who make use of the possibilities for scholarly innovation and personal advancement through electronic publication, and readers who incorporate electronically published research into the ongoing discourse of scholarly communication. Into this experiment, we welcome the new publication "Revista Espanola de Bibliologia" and wish it every success in its growth, development, and efforts to contribute to the transformation of scholarly communication.

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