Electronic Journals and Legitimate Media in the Systems of Scholarly Communication

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Introduction

Scholarly publishing in books and journals, like lecture series, workshops and conferences, are forums for scholarly communications whose character can be influenced by the media of communication. With each electronic invention, many scholars hope that new media can expand authors' or speakers' abilities to reach new audiences. They hope that listeners or readers will hear new voices, or hear old voices faster or more conveniently.

This paper offers a way to conceptualize scholarly publications that can help understand some key issues in the debates about the appropriate roles of paper and electronic public-ation. It also examines some key beliefs that appear in the debates about electronic publication. On one hand, advocates of electronic publication often hold that paper-based journals (and books) will become obsolete within a few decades, that materials will remain in electronic form once they are in electronic form, that electronic publication offers an excep-tional opportunity to speed and expand the range of scholarly communication, and that the shift to scholarly electronic publication is inevitable (Lanham 1993, 1994; Okerson 1991; Odlyzko 1995). Few critics of electronic publication express their misgivings in writing, and dismiss these publications through indifference. But many scholars who are wary of elect-ronic publication seem to think that the intellectual quality of electronic publications must be deficient in some key ways (in contrast with paper-based alternatives).

For simplicity, we will define an electronic journal (e-journal) as one which is distributed to some or all of its primary subscribers in electronic form. In contrast, a paper journal (p-journal) is one that is distributed exclusively in paper form. It does not take much work to find that the number of e-journals is growing annually and includes fields from theoretical computer science to medieval literature, or to find numerous instances where scholars have learned of new results or studies more rapidly by using electronic media.

The more difficult questions are how to conceptualize the changing scholarly communications systems and their social roles. We are especially concerned about the next few decades — a period of experimentation, excitement, confusion, and anxiety — for the publication forms that thrive in this period may become institutionalized as the most valid forms of scholarly journals for the following century. We will examine what we believe are the range of plausible forms of viable scholarly publishing, rather than emphasizing the most exciting but more socially fragile possibilities of electronic publication.

1. Scholarly communication systems are socio-technical systems

While few scholars have diverse experiences with electronic publishing, academics are familiar with oral forms of scholarly communication, and its alteration by electronic communication. Amplifiers in lecture halls, video conferencing, and videotape alter the nature of audiences that scholars can reach, and also shift the relationships between those audiences and lecturers/speakers. These electronically enhanced forums do not simply provide "more communication," but also alter the ways that people speak and interact. As the audience scales up in size, or moves out in space and time with real-time video or othertime videotape, the informal give and take between speakers and listeners becomes more difficult (in contrast with the smaller face-to-face seminar). On the other hand, people watching a videotape may privately replay sections to enhance their comprehension, while in a face-to-face meeting they may have to ask questions (that might also embarrass the speaker or questioner).

Voice-based face-to-face conference, video conferencing, and videotape are not simply technologies; they shape scholarly communications as socio-technical systems in which social characteristics such as controls over access (via pricing and distribution channels), and social protocols for regulating discussions between speakers and audience also influence the character of scholarly communications. The nature of videotape pricing and the distribution channels can lead to minor or huge expansions beyond the original conferees. Despite scholars' potentially broader access to conference talks via videotape distribution, a face-to-face conference is different from a videotape collection of its talks because of the diverse informal discussions and important social networking that conferences support. The face-to-face conference and the videotape collection are different scholarly communication systems with overlapping capabilities, but which also support very different forms of scholarly communication. These observations discourage us from conceiving of electronic media in exclusively celebratory, cornucopic, technologically utopian terms (see Kling and Lamb 1995).

In a similar way, a scholarly journal can also be usefully understood as the product of a socio-technical production and communications system. The publishing communication system includes both full-text materials (articles and books), and indexes/pointers to these materials (including book reviews, abstract sets, specialized bibliographies, and diverse catalogs).

Most readers of p-journals see few of the social and technical alternatives that differentiate one journal's production and distribution systems from another's. Scholars are aware of different reviewing practices of journals in which they publish, and also aware of the time periods between the date that they send a final manscript to a publisher and the date that it appears in print.

But other differences in the production systems that create a journal's issues can also be substantial, and have been changing over time. Some scientific journals print color plates of a kind that were implausible twenty years ago, while many mathematics and humanistic journals still print exclusively black and white text and diagrams. Most p-journals are now willing to accept the final form of manuscripts in electronic form, and a few require it. Further, some p-journals are willing to review articles that are submitted in electronic form.

The production of scholarly journals has become much more computer intensive in the last decade, and there have been no significant scholarly controversies over these shifts. However, the possibility of electronic distribution — the distinguishing characteristic of e-journals — is the one that is most subject to debate by both publishers and scholars. E-journal editors and publishers have been experimenting with different ways to charge for an e-journal (now often free), have articles reviewed, lay out each issue, and distribute it. We will discuss some of the differences in the socio-technical design of e-journals below.

2. Connecting authors and readers

Scholarly publishing should be viewed as one part of the scholarly communications systems that connect authors and readers. In the extremes, world-class scholars (and national class scholars) are eager to have their works be read (and appreciated) by their peers, and also by some larger disciplinary or cross-disciplinary audiences that usually number in the range of hundreds to thousands. In contrast, there are other scholars who are simply happy to publish periodically, or at least publish before receiving tenure or other professorial promotions. Scholars are very sensitive to the legitimacy and status of the journals (or publishing houses) that publish their work, but they vary in their insistence in publishing in the journals that their peers regard most highly.

Every major traditional field has a few high status journals whose content is controlled by a small set of gatekeepers and is widely read within its scholarly community. Other journals that are believed to be of lesser quality and at the bottom tier are "write only journals" that few scholars read regularly.

Within the United States alone there are over 2,000 four year colleges and universities, of which fewer than 200 have vigorous campus-wide research programs. A relatively small fraction of 500,000 professors in the U.S. publish routinely in the highest-status journals in their fields. The majority of professors publish relatively few scholarly works, and in the lesser-quality journals, especially after receiving tenure. But even in many of the 1,800 colleges and universities with minimal research programs, faculty are often required to publish some work as a criterion for tenure. Some analysts would draw the boundary between these two classes more narrowly, and refer to perhaps 100 research intensive universities and 1900 other colleges and universities. Regardless of where one draws such boundaries, there is tremendous heterogeneity within these classes and a huge cultural divide in the meanings of scholarly publishing between them.

While communication systems link people (or groups), not every scholar writes to be widely read. They may publish so as to be seen as "being in the scholarly system" by their colleagues and academic administrators who review them for promotions and pay raises. In contrast, scholarly readers are usually seeking highly trustworthy or "interesting" materials within what they see as a huge corpus of publications (books and articles with plausibly relevant titles). Scholars who work within well-defined article-based disciplines report that they routinely read a few "high-quality" journals or (conference proceedings). They find other works through diverse socially filtered processes that emphasize the credibility or "quality" of the work such as asking expert colleagues for references to related studies, tracing references in the bibliographies and footnotes of "high quality studies," or seeking the relevant publications of respected scholars.

Scholars often use electronic indices and abstracts to facilitate parts of these searches, especially when they are searching for a specific document or its location, based on clues about the author or title. These electronic indices and abstract services have expanded greatly in the last decade, and there is a good chance that they will continue to expand. For example,

journal publishers may post their own journals abstracts on the WWW (or other services), although field-wide abstracts (i.e., *Chemical Abstracts*) will probably remain viable independent services. Conference organizers may also post paper abstracts and author contact information on the WWW, and thus enable many potential readers to track parts of a field or to contact authors for specific papers (which they might send electronically or in paper).

But social networks also play a key role in informal scholarly communication. Scholars usually track the work of 10-50 colleagues (or labs). They often learn about new studies and results in their immediate areas well before they are published — through collegial conversation, conference presentations, attending invited seminars, acting as journal editors and reviewers, and receiving manuscript drafts or preprints from close colleagues. Active scholars are usually well positioned in these (primarily) verbal networks.

We have heard active scientists dismiss the value of journal publishing because they print "old news" in fast moving fields when the publishing delays are one to three years between the time that an article is accepted and it appears in print. High energy physicists have taken a lead in developing a preprint server (http://xxx.lanl.gov) where physicists can post articles that have been submitted for publication (articles are removed after they have been published). According to Stevan Harnad (in press) 25,000 physicists worldwide are accessing the archive 45,000 times a day, with 350 new papers deposited per week. Computer scientists have at least two networks of technical report search systems that can help eager readers locate papers when they are issued in the technical report series of the computer science departments at the major research universities. (URL ...)

Journals continue to play many key roles in scholarly communication, in helping insure that published work is of higher quality than under a self-publishing system, resolving "priority of discovery" disputes, and in making work available to those who are outside of the tiny subcommunities that produce the leading work on narrowly defined topics. The journal system of scholarly publishing also seems to work as an efficient system of packaging materials and signalling the likely quality of the edited articles (as with brand names).

3. Economic conditions and the shift from paper to electronic publication

To the extent that journals reflect the world views of their editorial boards, they also serve as relatively closed communication systems which innovate slowly. The most common conception behind new journals is the rise of new topics and new fields. But another key incentive for starting a new journal comes when a scholarly subcommunity has trouble getting its form of research published in highly legitimate or trustworthy journals.

The emergence of e-journals is driven by a few large scale social forces, above and beyond the technical capabilities and allure of low cost electronic distribution. Some of these include the continuing downsizing of US university budgets (relative to inflation), with a consequent flattening of growth in academic library budgets. At the same time, the costs of subscribing to scholarly journals has been generally rising much higher than inflation, with the largest price increases coming from for-profit European scientific publishing houses. These increases have been partly driven by the declining value of the US dollar against Western European currencies, and partly by increases in the cost structure of the publishing houses.

These economic conditions influence the nature of academic journals, as well as their circulation. The price of journals is highly correlated with their page counts, and both scholarly societies and trade publishers have been reluctant to increase page counts and prices, independently of the scholarly dynamism in the fields covered by a journal. Academic libraries have been cancelling journal subscriptions (but generally shifting their materials acquisitions budgets from acquiring monographs to maintaining journal subscriptions).

These economic conditions make it harder for scholars who want to initiate new journals to develop a workable circulation. Academic (and sometimes industrial laboratory) libraries are a major subscription base for scholarly journals. But when libraries are cancelling subscriptions, scholars face an uphill battle in having their library add new journals. Some university libraries are marked by the balance in their collections between old and new journals: they have respectable collections of established journals, but relatively few subscriptions to newer journals. This balance can undermine their abilities to support scholarship and teaching in new or emerging fields.

These conditions could also foster the development of e-journals, but e-journals have not yet become legitimate publication outlets. As with paper publications, articles that are submitted to e-journals may be lightly edited or tightly reviewed by an editorial board with strong academic standards. Today, many scholars are confused about the formats and intellectual quality of e-journals. In extreme cases, they feel that e-journals must be of lower intellectual quality than p-journals, because they sense something insubstantial and potentially transient — ghostly, superficial, unreal, and thus untrustworthy — in electronic media. In practice, some refereed e-journals publish high-quality articles, but they are not well known by their existential critics.

4. E-journal formats

E-journals are not all alike. Like p-journals, they differ in the care with which their editor (and editorial boards) review papers. But they also differ in the way that they format articles for distribution and their actual distribution channels. We believe that the ways that e-journal editors design these aspects of their journals influence their likely acceptability by productive scholars, and thus their overall legitimacy.

In numerous conversations and interviews with diverse academics and librarians, We have heard some significant and common (but not universal) confusions about the nature and meanings of electronic publication. Scholars who do not work routinely with electronic texts often assume that they are deficient in some ways. For example, when the editorial board of the ACM's Transactions on Information Systems (TOIS) discussed various formats for an electronic alternative, e-TOIS, in 1994, a mathematician colleague of one editorial board member sent a note which stated that "an electronic journal must be deficient in every way when compared with a paper journal". It is ironic that some of the editorial board's discussion was how and whether to make the e-TOIS superior in some ways to p-TOIS (for example by including more artwork, sets of data, and electronic pointers to related research).

One of the remarkable features of today's e-journals is that few of them use special features of the electronic media to scholarly intellectual advantage. Most of the e-journals publish papers that could appear in p-journals. In contrast, the *Journal of Current Clinical Trials* creates hypertext links between related articles and also letters to the editor related to specific articles. Computer scientists have speculated about including executable algorithms and data sets with e-journal articles. And it might happen in the (electronic) *Chicago Journal of Theoretical Computer Science*. But, today, the articles that appear in e-journals, such as *PostModern Culture*, *Electronic Journal* of Sociology, *Electronic Journal of Virtual Culture*, and *Public Access Computer Systems Review* (and so on) do not make special use of their electronic formats, except for distribution.

With a few exceptions, e-journals exist in a kind of ghostly netherworld of academic publishing. As we mentioned earlier, university librarians seem puzzled about how to integrate them into their collections and how to provide them to their clients. They are not

(yet) indexed in the *Science Citation Index* (with the exception of the *Journal of Current Clinical Trials*) or *Social Science Citation indices*, or in abstracting services such as MLA Abstracts or Sociological Abstracts.

One e-journal is worth singling out for attention because of its sociologically clever formats. The *Journal of Artificial Intelligence Research* is a relatively new e-journal that publishes its articles in electronic form, in Postscript, on WWW, gopher, and ftp servers when they are accepted for publication. The title and abstract are also posted on a Usenet newsgroup, *comp.ai.jair.announce*, and also available on the Usenet newsgroup *comp.ai.jair.papers*. JAIR's editors offer authors the promise of rapid international access to their articles. Each article is formatted and paginated as it would appear in a printed journal. Someone who prints the Postscript file has an article which looks like the photocopy of an article from a traditional p-journal. A publishing house, Morgan-Kaufman, also sells a printed version of the journal in an annual issue to libraries and others, so that librarians can readily integrate *Journal of Artificial Intelligence Research* into their catalogs and collections.

We think of JAIR as the Stealth E-journal of Artificial Intelligence Research. Its editors cleverly exploit the broad rapid international distribution afforded by Internet services such as WWW, while simultaneously calming authors' fears of publishing in a stigmatized electronic medium because it always looks like a p-journal and can be purchased in paper form. In fact, JAIR's editors encourage readers to cite articles published in JAIR in the same format that they would cite a p-journal article (and they do not encourage citations to include URLs).

The case of the *Journal of Artificial Intelligence Research* illustrates many key social features of electronic scholarly publishing. By publishing polymorphously in paper and electronic media, this journal can offer an electronic edge to authors while appearing traditional to those who do not know its workings. Its authors and readers are part of a scholarly community where there is strong consensus on a computerized typesetting format (in this case Postscript), and in which every research lab has free (or subsidized) electronic access to Internet services. And JAIR is allied with a (commercial) publisher that routinely markets and sells books to libraries, scholars and professionals. One other key feature of JAIR's stealth approach is that it doesn't broadcast its e-journal status in its name. It is a fascinating model.

A few e-journals are affiliated with publishing houses that sell paper versions of the journal in annual bound volumes. We suspect that these e-journals which distribute both e-journal and p-journal versions have a greater chance of being seen as legitimate publication outlets than those e-journals that distribute only in electronic form. However many of these e-journals, such as the *Public Access Computer Systems Review*, distribute their electronic articles as ASCII text. When they are printed for extended reading, annotation or distribution to colleagues, they do not appear to be bona fide journal articles.

In contrast JAIR takes an important step beyond that of most e-journals that also distribute and sell paper annual volumes by insuring that every printed copy of a JAIR article appears as a visually well-crafted facsimile of a photocopied journal page — complete with headers, footers and the specific page numbers for each article as they will appear in the paper volume that Morgan-Kaufman sells to libraries. JAIR leaves no traces of its e-journal status for academic administrators such as department chairs and deans to sneer at. If they see a JAIR article during an academic career review, it appears as a bona fide p-journal publication, and can be assessed on the basis of its content.

Some of these serendipitous enabling conditions that help link authors and readers may be found in some other fields, such as mathematics, where LaTex is a typesetting standard and

where the active researchers also have Internet access. In many fields, posting articles in multiple print formats — WordPerfect, RTF, and MS-Word — would probably make them accessible to most readers.

JAIR was able to become a legitimate computer science journal through a clever set of conventions that hides its e-journal status. However, it can attract good authors by offering the advantages of rapid publication and a strategy of avoiding any stigma of e-publishing. JAIR also allows authors to include elaborate appendices that can contain executable computer programs and data that are not published in the paper version. But aside from these optional appendices, JAIR's articles appear like traditional p-journal articles. The disadvantage of the JAIR format is that it doesn't allow articles to utilize key features of electronic publishing, such as hypertext within articles.

5. Once an electron, always an electron?: How do media matter?

University libraries have not yet developed ways to effectively archive e-journals and integrate them into their catalogs and collections, unless they can buy paper versions (as with JAIR, *Public Access Computer Systems Review*, etc.). There are serious questions about what a library should deliver when a client requests an article from an e-journal — a printout, a file, or a URL, for example. In a seminar in 1993, one of us (Kling) suggested that libraries print e-journals and integrate them into their paper collections. A librarian sternly replied that a paper version of an e-journal "undermined the concept" of an e-journal.

In principle, paper and electronic media need not influence the scholarly quality of a book or journal. But paper and electronic media do have significantly different material properties, and that influences some of their social properties. It is usually easier to transform an electronic document into a paper form, than vice versa. In practice, paper and electronic formats have complementary virtues and vices. A key point is that most scholarly documents that start in electronic form will end up in paper form sooner or later. When publishers or readers (and their assistants) transform electronic documents into paper is part of the story of electronic publishing.

Fifty years ago, most scholars worked from longhand notes and manuscripts. In the 1940s to 1970s, many scholars developed typing skills and transformed rough notes and verbatim manuscripts from long hand to typescript. Some scholars composed on a keyboard. In the 1980s, many scholars began using word processors in lieu of typewriters. Scholars vary in the extent to which they start a manuscript by composing on keyboards or develop notes, outline or even a first full draft in longhand. Today, virtually all scholarly manuscripts exist, in part, in electronic form in a scholar's office. Pictures and diagrams are least often in electronic form, and the frequency of pictures and diagrams in a book or article varies a lot by discipline and subfield.

Even when scholars prepare papers and books in electronic form, they commonly print intermediate drafts for their own review and revision. Most scholars find it much easier to annotate paper manuscripts than electronic drafts. Paper manuscripts offer different affordances than electronic formats: ease of getting a sense of the whole, ease of short marginal comments and arbitrary markings, and portability. In contrast, electronic documents can be more rapidly searched for keywords and radically restructured. These complementary properties of paper and electronic documents also influence readers as well as authors. When academics obtain documents in electronic form — drafts, preprints, technical reports, and whole articles, they may preview them on screen. But in our research, they universally report preferring print manuscripts for serious reading and annotation.

Collaborating co-authors may prefer paper formats for reading and electronic documents to facilitate revision. But other than authors, few scholars have a deep interest in revising the works that they receive! (One kind of exception is our own preference of reformatting electronic documents in a large easy-to-read font for subsequent printing and reading).

We suspect that scholars in diverse fields will continue to write and revise their manuscripts while shifting back and forth between paper notes, electronic documents, and printed drafts read and marked for revisions. The existence of electronic documents heightens the possibility that they could be readily published (and distributed) in electronic form at lower costs to wider international audiences.

Scholarly book and journal publishers vary in the extent to which they will accept electronic submissions of original manuscripts, although the publishers are drifting towards accepting (or even preferring) electronic final copies in addition to a printed version.

Electronic documents do not remain in electronic form, and discussions of electronic publishing should be cognizant that exclusively electronic representations will be relatively rare in serious scholarly publications. Even so, there is a continuing slow shift from exclusively paper to a mixture of paper and electronic publishing, distribution, archiving, searching and previewing scholarly journals.

6. Field shifts

Some key technological demographics will change considerably in the next two decades. More colleges and universities will wire many more of their faculties' offices and labs, although some campuses face daunting costs and complexities in cabling older stone buildings or cabling scattered buildings in dense urban districts.

Despite a cornucopia of new information that might be rapidly accessible, scholars will still work and live within a 168-hour week that does not expand. Active scholars often work sixty- to seventy-hour weeks, and are mindful of their time. Their attention is a precious resource. And publications in which editors or indexers help them focus on what they believe are the highest-quality articles and reports are now and will remain at a premium.

We suspect that there will be many more electronic indexing systems that help point scholars to paper-based journals and conferences (see above). We did not cover the sharing of datasets and software, but it is likely that there will be more specialties in which scholars share these costly intellectual resources via computer networks (much in the way that molecular biologists within very specialized communities use flybase, genbank, and the protein database). Doubtless, more scholars will post preprints and reprints of articles on services like the World Wide Web (WWW). But will scholarly electronic publishing become legitimate and routine in this same time frame?

Andrew Odlyzko (1995) argues that the demise of p-journals is inevitable, and Harnad (in press) argues that academics should immediately abandon p-journals and publish in e-journals. These arguments focus on the technical process and economic costs of distributing e-journals (in contrast with paper). We have tried to locate journal publication within a larger social system of scholarly communication. And, within this frame, the rapid demise of p-journals seems less likely. We are specially impressed by the way that molecular biologists who routinely share DNA sequences via genbank circulate paper preprints rather than electronic preprints. This might be a technological peculiarity which will shift as soon as 1200-dpi printers cost as little as a Laserjet (or Laserwriter). But there are deeper social relationships in scientific communities that influence these patterns.

Most academics now view electronic publishing as experimental, at best. The segregation of e-journals into an electronic space that isn't (yet) integrated into the scholarly document systems of libraries, indices, abstracting services, and so on is a formula for continued marginality. In addition, commercial publishers are only cautiously experimenting with allowing the full text of p-journals to be licensed for electronic access (as in Elsevier's TULIP project). All paper-based publishers are wary that unlimited on-line access to journal articles will erode their subscription base, and they have not yet developed good electronic subscription models to supplement paper publication. Scholars are used to unlimited access to journals that they subscribe to, and have relatively little enthusiasm for pay-per-use models for electronic access. There is little empirical guidance at this time for publishers to learn how different forms of e-journal dissemination will amplify, synergize with, or erode their revenues.

The scholarly societies are possible loci of change in the systems of scholarly communication. *The American Mathematical Society* and the *Association for Computing Machinery* are both exploring electronic publication. These societies could experiment with posting electronic preprints of articles accepted for their p-journals as a form of member service. Since the membership fees in scholarly associations cover diverse "memberships services" as well as some journal subscriptions, the associations have some flexibility in shifting their investments, services and pricing. In contrast, the commercial publishers only offer a set of journals and draw their revenues exclusively from direct subscriptions and related post-publishing income (such as permissions fees). Even so, we would predict more rapid rates of change in the overall scholarly communications systems if many associations and publishers were actively experimenting with electronic formats, rather than just a few.

Part of the dilemma is in encouraging prestigious scholars to take the risk of publishing in e-journals, or in electronic extensions of traditional p-journals to help enhance their legitimacy. The polymorphous model of the *Journal of Artificial Intelligence Research* offers some promise in the technologically savvy scientific associations, since they already publish their own p-journals. The other main shifts in the next two decades — perhaps more likely in many fields — is that scholars will share some of their preprints with colleagues via field-specific or departmental WWW servers (or whatever technologies follow after WWW).

These changes in scholarly communication could be accelerated if a critical mass of the highest-status scientists in a given field were willing to publish their best work in electronic media. However, the highest-status scientists have the least to gain in terms of personal visibility and prestige in such moves. And scholars whose status is just a bit lower are likely to publish in the same journals as the highest-status scientists. And so on down the prestige hierarchies, until one reaches scientists who have trouble publishing in 1st- and 2nd-tier journals, and who have "less to lose." To the extent that scholarly communication takes place within a system of prestige that extends well beyond the immediate sub-disciplinary groupings, social change will be slower than if technical and economic conditions alone drove the scientific world.

Hess, Sproull, Kiesler and Walsh (1993) argue that networked discussion lists help improve the visibility and influence of scholars who are outside an inner circle within a field — i.e. those who are in lower-status institutions, institutions with weaker programs in a particular specialty, and those who are lower-ranked. Electronic publication might also give these people greater visibility, if their e-journal articles were read by scholars in more prestigious positions or more central locations. Today, e-journals can be read worldwide by scholars and students with modest access to the Internet. But e-journals' isolation in a kind of ghostly

netherworld of academic publishing doesn't help those who publish in them to be seen by prestigious and established scholars whose intellectual blood circulates in oral and paper networks.

Conclusions

Stevan Harnad (in press) offers a "subversive proposal" for ushering in an era in which e-journals replace p-journals:

> If from this day forward, everyone were to make available on the Net, in publicly accessible archives on the World Wide Web, the texts of all their current papers (and whichever past ones are still sitting on their word processors' disks) then the transition to the PostGutenberg Galaxy would happen virtually overnight.

Harnad's proposal to move scholars from one set of communication systems to another has much in common with many utopian proposals: there is no effective analysis of how to encourage diverse scholars make a workable transition. In practice, scholars will become interested in e-journals at varying rates. Today, a scholar who is facing a choice between publishing in a p-journal and publishing in an e-journal (other than JAIR) faces a choice between legitimate (but perhaps slow) publication, and more rapid publication in e-journals that are viewed as of lesser quality (or even not serious journals). The e-journal may promise worldwide accessibility. But the scholar who wants to be read by his or her colleagues is more concerned that the article be seen by valued peers than that it be seen by a possibly larger but much less influential group of readers. Today, p-journals are better able to promise appropriate readership than are e-journals, with a few exceptions.

The scholar who selects a journal to submit an article to for possible publication cannot wave a joystick and enact Harnad's subversive proposal. If the scholar is in a field where paper journals reign supreme and electronic journals are fledgling operations, there is little incentive to try the e-journal unless the scholar has serious problems being published in higher-quality p-journals.

We have examined some of the key features of the scholarly communication system that e-journal enthusiasts must face if they wish to accelerate the pace at which e-journals become legitimate. These include finding ways to synergize with the paper world, because readers will often print out articles for subsequent careful reading even if they receive them electronically. In practical terms, it can entail using stealth strategies such as those pioneered by JAIR.

The e-journals that thrive are most likely to be those whose editorial boards can design formats that are compatible with the p-journal world, while adding e-journal virtues, such as rapid dissemination of accepted articles and the possibility of elaborate and computationally rich appendices. In our view, this is a more subversive proposal because it aims to alter the scholarly communication systems while seeming to be a routine part of the dominant paper systems.

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