

The AEA's Electronic Publishing Plans: A Progress Report

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One can hardly fail to notice that there is considerable activity in electronic publishing. The widespread availability of Internet access in academic circles has led to significant interest in using it as a distribution medium for scholarly communication. The 1995 edition of the *Directory of Electronic Journals, Newsletters and Academic Discussion Lists* contains over 700 electronic journal and newsletter titles. This is an increase of more than 75 percent over the 1994 listing and an increase of more than six times as large as the 1991 edition. Some of these journals are mainstream supplements to print journals (for example, *Science Magazine On-Line*). Others are publications of professional societies (for example, the *Institute of Electrical and Electronics Engineers* and the *Association for Computing Machinery*). Some are published by university presses (*Chicago Journal of Theoretical Computer Science*), while some are published by commercial publishers (like *Elsevier*).¹

One of the most impressive on-line publications is the *Journal of Biological Chemistry*, published by *Highwire Press*, which is in reality an office in the Stanford University main library. This journal is the core journal for scientists working in biochemistry and molecular biology. The print version consists of about 80 to 100 articles, comprising 1,000 pages *per week*. A yearly subscription to the print version costs institutions \$1,150 per year and individuals about \$165 per year. A subscription to the print and on-line bundle costs institutions \$1,350 and individuals about \$215. Among large professional societies, the *Association for Computing Machinery* has put the most thought into how to organize electronic journals. Their *electronic publication*

¹ Throughout this article, all web sites are listed in italic type in the text, and the full URL web addresses are given in the reference list at the end of the article under the name of the web site.

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plan is well worth reading, and the AEA is watching their experiments with great interest. Recently the AEA appointed an Electronic Publishing Committee to investigate the issues surrounding this medium; currently this committee consists of the editors of the three AEA journals, along with Malcolm Getz, Dan McFadden and me. Although this article expresses my own views, it draws upon my experience as a member of this committee.

The American Economic Association

The AEA publishes three journals, the *American Economic Review*, the *Journal of Economic Literature* and the *Journal of Economic Perspectives*. The subscription rate for all three varies between \$52 and \$73, depending on income, which entitles members to receive four issues of each journal plus the *Papers and Proceedings* from the annual meetings, which is published as a fifth issue of the *AER*. Institutional rates for the package of three journals are \$130 per year.

Some of the AEA journals are available in electronic form now. For example, the contents of the *Journal of Economic Literature* are available in a variety of electronic formats.

EconLit contains all the bibliographic material sent to the *JEL* from about 650 different journals, plus the *Abstracts of Working Papers in Economics*. (The printed version of the *JEL* contains bibliographic information on about 280 journals.) Much of this material goes back to the 1960s. The EconLit CD-ROM is available from Silver Platter for about \$1,600; it is also available via DIALOG and other on-line providers, who generally charge by the minute for access to EconLit. EconLit-AEA consists of a CD-ROM containing everything on EconLit for the last 15 years. It is available to AEA members for \$75 plus shipping. Finally, each issue of the *Journal of Economic Literature* is available in CD-ROM format to members of the AEA as part of the normal membership fee. The CD-ROM version of the *JEL* contains the image of the pages of the journal in PostScript PDF format.

In addition, electronic back issues of the *American Economic Review* are available from at least two different sources. University Microfilms (Ann Arbor, Michigan) provides electronic access to about 5 years of back issues of the *AER* on an institutional basis, and JSTOR is about to make all issues of the *AER* from its inception to 1990 available on-line to both institutions and individuals. OCLC, an organization that provides on-line materials to libraries, has asked for permission to make AEA journals issues available to libraries through their on-line delivery system, and this request is currently under consideration. The JSTOR project is particularly interesting, so I shall describe it in more detail.

JSTOR

JSTOR was conceived by William G. Bowen, President of the Andrew W. Mellon Foundation, former president of Princeton University, and labor economist. His

original idea was to convert back issues of journals to electronic form to save shelf space in libraries. Some back-of-the-envelope calculations suggested that there were significant economies from such conversion.²

It costs about 50 cents a page to digitize material and prepare a reasonably accurate ASCII version of the page for searching. This number only includes the variable costs; there are also significant fixed costs to acquire a complete collection, develop an indexing system, implement quality control and so on. The first 80 volumes of the *AER* consists of 428 issues and 135,449 pages. The variable cost of scanning this was around \$70,000, and the total cost was somewhere between \$125,000 and \$175,000.³ Note that this is only the cost of scanning; it does not include the cost for software development, transferring the contents to new media and administration associated with keeping this material current and making it available to users.

Studies by Cooper (1989) and Getz (1994) suggest that the capital costs associated with the storage space for a single volume of a journal in a library is between \$25 and \$40, which implies that the 80 volumes of the *AER* cost between \$2,000 and \$3,200 to store in perpetuity. It follows that the savings due to freed up shelf space in about 100 libraries would cover the costs of digitization alone.⁴ When one adds in the additional costs of operation of JSTOR, it appears that the break-even point is around 700–800 library subscriptions. This assumes that the libraries remove their collections of back issues of the *AER* from their shelves either by putting the volumes in deep storage, selling them or destroying them.

Space costs are, in fact, only part of the story. There are also huge cost savings in library staff time and user time involved in search, circulation and retrieval. In a speech on “JSTOR and the Economics of Scholarly Communication,” William Bowen (1995) offered some rough calculations about the magnitudes of these costs. Extrapolating from the figures given in this speech, the total annual costs (including the amortized space costs) of storing the entire set of volumes of the *AER* to a typical library is about \$400 per year.

These cost estimates, tentative though they are, suggests that there may be considerable savings to digitization. As a proof of concept, the Mellon Foundation sponsored a pilot project to convert back issues of 10 journals in economics and history to electronic format. This project was carried out by a group of librarians and computer engineers at the University of Michigan. The original economics journals represented in the project were the *American Economic Review*, *Econometrica*, *Journal of Political Economy*, *Quarterly Journal of Economics* and the *Review of Economics*

² Lemberg's (1996) University of California at Berkeley Ph.D. thesis contains a thorough benefit-cost analysis of digitization.

³ As the wording suggests, these are very much back-of-the-envelope calculations; more accurate estimates are being prepared by JSTOR.

⁴ This calculation compares the fixed cost of digitization with the fixed capital costs of providing floor and shelf space. It is based only on library subscriptions. As Tim Taylor reminds me, this is quite conservative since the shelf space in faculty offices has an opportunity cost too!

and Statistics.⁵ All volumes of these journals published prior to 1990, along with five history journals, comprised about 750,000 pages of material. They were scanned into 600 dots per inch bit-images of each page. These bit images were then run through Optical Character Recognition (OCR) software to produce ASCII versions of the text. The ASCII version of the text is not suitable for viewing, but can be used to perform full-text searches of the corpus for words of interest. This combination of linked ASCII and bit-images offers considerable flexibility: the ASCII is searched and the bit image is viewed. The bit images can be viewed on the screen or downloaded and printed out at the desired resolution. The quality is essentially the same as a high-quality photocopy.

The trial users of the *JSTOR* system have been very enthusiastic about it. This enthusiasm prompted the Mellon Foundation to establish an independent not-for-profit organization (also called *JSTOR*) to manage further development of the project. The stated objectives of *JSTOR*, taken from their Web page, are:

1. To improve dramatically access to journal literature for faculty, students and other scholars by linking bitmapped images of journal pages to a powerful search engine;
2. To mitigate some of the vexing economic problems of libraries by easing storage problems (thereby saving prospective capital costs involved in building more shelf space), and also by reducing operating costs associated with retrieving back issues and reshelving them;
3. To address issues of conservation and preservation such as broken runs, mutilated pages and long-term deterioration of paper copy; and
4. To assist scholarly associations and other publishers in making the transition to electronic modes of publication while protecting their traditional values and financial stability.

A limited group of colleges and universities took part in the pilot stage of the process: Bryn Mawr College, Denison University, Haverford College, Swarthmore College, Williams College, University of Michigan and Harvard University. Subsequently, more universities were added: Cornell University, Emory University, Princeton University, Stanford University, University of California at Berkeley, University of Chicago, University of Delaware, University of Texas at Austin, University of Wisconsin and Yale University. Members of these universities are being given free access while the system is being shaken out. The system will be available to subscribing libraries in the near future.

The American Economic Association has granted *JSTOR* access to all back issues (defined as everything five or more years old) on a nonexclusive basis. The reason for this decision was that the AEA makes no money from back issues now and that making these back issues more widely available would be socially valuable. *JSTOR* will make these materials available to libraries and other institutions on a

⁵ The collection now includes many more journals in economics, ecology, population studies, political science, and so on, including the *Journal of Economic Perspectives*. See the *JSTOR* Web Page for a current list.

cost-recovery basis. Of course, there are significant economies of scale and scope in this operation, and *JSTOR* is actively seeking additional journals and will market its collection aggressively in order to exploit these economies. The processing of the *American Political Science Review* has just been completed, and various ecology and demography journals are in the process of being scanned. They intend to have 100 journal titles in 10–15 fields available within three years; the *JSTOR* Web site contains a list of the available journals.

Current Issues

Having back issues of journals available is highly convenient, but it would be even more convenient if current issues were available on-line. This would allow a reader to do very quick and thorough literature reviews. Pulling up references could be done at the click of a mouse rather than the traditional scouring of the library. Having all issues on-line makes the both the back issues and the current issues more valuable.

It is worth emphasizing that on-line access of current journals does not *preclude* paper access. There are many ways in which paper access is more convenient: paper is portable, easier on the eyes, easier to browse, and so on. Since the incremental cost of an issue is about \$2 for printing and mailing, it is likely that many AEA members will want both paper and on-line access to current issues.

Given the strong complementarity between current and past issues, it seemed sensible to try to investigate ways to make current issues available electronically. Technically, this is easy: all of the AEA journals are now produced using PostScript, which can easily be displayed on-line. The difficult issue is the cost recovery problem: how will on-line copies be paid for?

Currently the AEA sells institutional subscriptions to libraries at about \$130 per year and individual subscriptions to members at around \$60 per year. Most individual members can access the library version of the journal at some cost in terms of inconvenience. A subscriber at a university, for example, may have to walk to the university library to retrieve a current issue of the journal. Most subscribers apparently feel that the inconvenience cost of accessing the library copies is more than the \$60 membership fee, so that it is worthwhile to have their own subscription.

If libraries subscribe to on-line versions of the AEA journals, they would like to make these versions accessible via the campus network. This means that individuals could access the AEA journals via their desktops on the same terms that they could access their own copies of the journals. The library subscription would no longer be more inconvenient to use than the individual subscription, which makes one wonder whether individuals would still find it worthwhile to continue to pay the subscription fee for personal access.

It is this fear that worries professional societies. If individuals do not renew their memberships in the societies, the societies lose a significant source of revenue and a significant part of their membership base.

If we take the average membership fee to be about \$60 per year and the variable cost of printing and mailing journals to be about \$25 per year, the AEA would lose about \$35 for each member who opted out. But it is this \$35 per member that is used to fund the *fixed* cost of producing those journals. If that money disappeared, the association would be forced to raise the price of the journals—presumably leading to even more defections.⁶

There are several different ways to address this problem. The first is to go to a boundary solution and have either all library subscriptions or all individual subscriptions. Many for-profit journal providers have essentially priced individual subscriptions out of the market and sold only to libraries for years, so it is certainly viable to sell only to the institutional market. However, many professional societies would be loathe to see their membership roles depleted, even if they were still able to cover the publication costs of their journals.

Another solution is to sell only to individuals—or, in other words, prevent libraries from mounting their electronic subscriptions on a campus-wide network. Presumably, the library subscription would still be available within the physical confines of the library via the local network. This solution makes library usage just as inconvenient as it is now and so would likely lead to members continuing to pay their membership/subscription fees.

The third solution is by far the most interesting one. One way to view the problem is as a self-selection problem: how can we get members to reveal their true willingness to pay for a subscription when the “same” product is available at a lower price via the library? One answer is to differentiate the product—to make the members’ subscriptions more valuable than the library subscription. As we’ve seen, one way to do this is to make the library subscription more *inconvenient* to use by requiring that it only be used on-site. Another way is to make the individual subscriptions more *convenient* to use by providing additional features that would be attractive to members. Examples of such features would be: hypertext links to cited articles in the JSTOR collection so that users could access citations via a mouse click; additional material such as data, theoretical appendices, survey forms, and so on available for download; more powerful search engines; current awareness notification via e-mail based on *JEL* categories and/or keywords; opportunity to view on-line articles prior to release of site license versions (possibly by delaying release of articles to the library version by a few months); higher resolution page images than are available via the site-license version; and so on.

Some items on this list require investment in creating appropriate technology.⁷ Others—like delaying access to the library copy—can be implemented trivially. The key issue is to find aspects of a subscription that the members value highly but are relatively less valuable to library users. Note that several of these possibilities can

⁶ Of course, there may be other benefits to being a member of the AEA. Even economists want to belong *somewhere*.

⁷ For some interesting examples of such technology, see the *University of California at Berkeley Digital Library Project Guided Tour to Documents*, especially the Multivalent Document discussion.

be investigated on a campus-by-campus basis via controlled experiments. Others can be examined on a case-by-case basis.

Current Plans

The AEA Electronic Publishing Committee is currently considering these proposals. We are working with *JSTOR* to offer current issues on-line in a way that both enhances their value for our members and continues to recover the costs of producing the material.

The goal is to differentiate the product so that library users have high-quality access to the journals—but not *so* high a quality that members choose to opt out of membership and access the library subscription. We are also happy to work with other intermediaries who provide on-line services to libraries. However, we intend to make sure that the key features that we choose to differentiate the individual and library subscriptions are not circumvented by third-party suppliers. Suppose, for example, that we decided that the member subscriptions would have hypertext links in the bibliography while the library subscriptions would not have this feature. Third-party suppliers of AEA content might well decide to compete by providing this feature. (Even nonprofit firms compete!) If so, the value of the hypertext links is reduced as a self-selection device.

The trick in maintaining economic viability for the association will be in finding ways to provide high value to both the individual subscribers and the libraries while still maintaining subscribers in both segments of the market.

Evolution of Electronic Journals

Once we figure out an economically sustainable way to offer electronic versions of the AEA journals to members and libraries, it is likely that the form of the journals themselves will change. Here I will offer three forecasts—or maybe I should say guesses—about the form those changes will take.

Filtering

It is obvious to everyone that value of the AEA journals is that they filter information. In the *AER* and *JEL* this is done by peer review; in the *JEP* it is done by editorial discretion. When publishing was expensive, it made sense to filter before publication and distribution. Expert opinion was used to determine whether or not material should undergo the expensive procedures involved in typesetting, printing and mailing.

With the advent of ubiquitous computer networks, distribution has become cheap, while attention is still expensive. In the future everything will be published, in the sense of being readily available, but the need for filtering will be even greater than it is now. Thus, more filtering will be done after the material is published.

New ways to filter will emerge. One can collect citation data instantaneously. One can use ratings systems other than the old 0-1 decision of published or not. One can personalize ratings: I might be interested in the best articles of the year as determined by the Economic History Association. Economic historians probably have a pretty good idea of what these are, but dabblers like myself would like easy access to that information. Groups like the AEA will see their primary value in filtering and certifying economic research. Peer review will likely remain a part of that process, but it will be supplemented by a variety of other mechanisms. See the *University of California at Berkeley School of Information Management and Systems* web page on “Collaborative Filtering” for some provocative examples of recommenders and collaborative filtering systems, and see Resnick and Varian (1997) for discussion and overview of such systems.

Customizable Depth

Journal articles are now typically written in parts: there’s an abstract, an introduction and summary, the body of the article itself and an appendix. With electronic versions of articles, this is just the beginning. One can write articles in a way that they can be read by a variety of audiences for a variety of purposes.

One obvious possibility offered by this “variable depth” of electronic articles is that it allows for the inclusion of material too long for the print media: data sets, computer programs, detailed proofs, and so on could all be included with the electronic version.⁸ But I think that a more important possibility of variable depth articles is that it will allow electronic articles to become *shorter*.

CEOs don’t like to read anything longer than 2 pages, and politicians don’t like to read anything longer than a bumper sticker. But academicians don’t like to write anything shorter than 40 pages. The most common advice from the *AER* editors to authors of accepted papers is probably “Make it shorter!” This is partly due to space limitations, but is also due to limitations on the readers’ attention spans. Authors who are forced to write shorter articles generally write articles that are more accessible, clearer and to-the-point.

With digital documents, you can have the document available in all lengths. You might have the title and the one-paragraph abstract, just as you do now. With one click you can display the executive summary. Another click brings up the 4-page “papers and proceedings” version. A further click brings up the 12-page *AER*-length paper. If you dare, another click will bring forth the article that the author would really like you to read! Finally, if you want access to the data, computer programs, codebooks, and so on that support the research, you can access the electronic appendix.

This sort of flexibility could do a lot to broaden the readership of econom-

⁸ What I am calling variable depth is similar to the “inverted pyramid” used by journalists and is related to “stretch text” used by computer document specialists.

ics articles. There are lots of articles that would be great for undergrads, politicians, or CEOs to read. Unfortunately, the articles that are published are written for only one audience: professional economists. When electronic documents become widely available, we will no longer have to live with this one-size-fits-all model.

Interaction

One of the most popular sections of the *AER* is the shorter papers and comments section. Here, there is something of a dialog between authors and commentators. Errors are found and corrected; additional evidence is brought to bear on a problem; new points of view are offered. This kind of dialog can be very valuable in digging out the truth. At a broader level, the whole enterprise of academic communication is a kind of a dialog. You cite and you are cited as a way of recognizing your contribution to the discussion.

Electronic documents offer much more flexible ways to carry on this sort of dialog. The unit of academic discourse will become a "thread." The citations will become hyperlinks that allow you to follow a discussion quickly and easily. And responding to a discussion will be trivial—although getting someone to read your contribution may well be difficult. Discussions can take place asynchronously, as in comments and replies, or synchronously, as in a chat room.

In a way, academic research will return to its roots: when scholars exchanged letters to report results of their research there was a real dialog going on. When this dialog was replaced with broadcast publication, something was lost. It is true that more people could be exposed to the thoughts of these scientists, but the sense of conversation and dialog was eliminated. Now, with the advent of digital documents, we may be able to have the best of both worlds: broadcast *and* dialog.

Publish or Perish

Everyone recognizes that one of the driving forces behind the academic publishing enterprise is the tenure system. Nontenured faculty publish so that they can become tenured faculty. This is one of the contributing factors to the explosion of academic literature. I'm sure that I am not alone in feeling as though I am drowning in working papers, manuscripts and journals.

If electronic documents make publishing cheaper, this will only get worse. If tenure comes down to weighing six years of manuscripts on a scale, assistant professors will turn out as many manuscripts as they can. Herb Simon once said that "wealth of information creates a poverty of attention," and it has only gotten worse since then. Something must be done.

Let me suggest that universities adopt a policy of putting a limit on the number of papers they will accept for purposes of tenure review. For sake of argument, let's say that tenure committees will only evaluate your five *best* papers, not everything you've ever written. This policy seems like a win all the way around. The authors can focus themselves on doing a few serious pieces rather than lots of shallow ones.

The review committee will have a manageable task. And the readers of articles will have fewer, but higher quality pieces to read.⁹

Summary

Electronic access to back issues of the AEA publications will soon be widely available through *JSTOR* and other vendors. We are exploring ways to make access to current issues available electronically in a way that is revenue neutral. Once electronic versions of journals are available, many new possibilities present themselves for scholarly communication.

⁹ I should note that readers of drafts of this paper have found this by far the most controversial proposal I have made in this article.

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