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Economics

When I first began to speak publicly about the prospects of open access during the late 1990s, I found myself running into difficulties over the most obvious of questions. I was asking faculty members to consider two things, doing an electronic edition of the journals with which they worked as editors, board members, and reviewers, then exploring whether they could make those online journals free to read in some way. Even as I asked people to give the advantages of these two ideas some serious thought, I had no real idea of what moving a journal online would cost, as more than one of them politely pointed out to me. The solution to this embarrassing moment in my presentations seemed easy enough. I simply had to pin down what it cost to put a journal online, and to do so I hired Larry Wolfson, as a research assistant with an economics background, to scour the emerging literature on online publishing for costs, as well as conduct a small survey among editors of online journals on this matter. It was not hard to find an answer to the question, although that gave rise to a new problem. There were far too many answers to the question, with huge differences among the answers.

Our inquiry certainly got off to a good start. Larry sent off e-mails to editors of electronic journals asking about their costs, while he started to scour the literature in search of published figures on online journal costs. However, before he had sent more than a handful of e-mail queries, he had an answer back from Gene Glass, who had founded *Education Policy Analysis Archives* (EPAA) in 1993 as a "born digital" peer-reviewed journal. Glass was blunt and multilingual about his business model: "Zero, *nada*, no budget, no grad assistant, no secretary" (personal communication, October 21, 2001). I described earlier the success of Glass's

online journal, which receives some 2,500 unique visitors a day (Glass 2003).

As you might imagine, we were greatly encouraged by how easy Glass made it all seem, both to gather figures and then to convince others what a sensible, viable idea open access is. We were still in the early stages of our search, and of course, we did not see anything even close to that figure for publishing costs again. Even the most successful of the automated repository models, the arXiv.org E-Print Archive, in which authors file their own papers, and there is no reviewing or editing, has costs that, according to its founder Paul Ginsparg, run to nine dollars per paper (Glanz 2001).[1]

We went on to identify a small group of electronic journals that were spending in the area of $20,000 a year. For example, the *Electronic Journal of Comparative Law* had had its books reviewed by the accounting firm PricewaterhouseCoopers, which calculated that the Dutch open access quarterly was costing $20,084 annually (Bot, Burgemeester, and Roes 1998; also see Fisher 1999; "Integration" 2002). Adding up the author fees of $525 per published article (for most of its 100 or so open access journals, although a few charge more) yields a similar figure for the journals published by BioMed Central, a corporate venture in an entirely online and open access approach to journal publishing. Some journals contract out their e-journal edition, and HighWire Press, at Stanford University Library, was charging $35,000 to $125,000 in the late 1990s to set up an electronic journal, with ongoing operating fees of several thousand dollars a month (Young 1997). Additional figures are to be found in the report on e-journals from Donald W. King and Carolyn Tenopir (1998), who put the cost of an electronic edition of a journal at $368 per page or about $175,000 per year for a typical journal. Then, there was the Electronic Publishing Steering Committee at Cornell University (1998), which estimated that it would take $2,700,000 to establish an electronic publishing program at the university, serving a number of journals, although a member of the team at Cornell later told me that

1. The National Science Foundation, the Department of Energy, and Los Alamos National Laboratory provided $300,000 annually in support of arXiv.org E-Print Archive prior to its move to Cornell University in 2001 (Kling, Spector, and McKim 2002).

what had been spent was more like $600,000. Finally, Reed Elsevier estimates that it has spent $360 million developing ScienceDirect, which hosts electronic editions of its 1,800 journals (Davis 2004).

All told, the breathtaking range in the cost of mounting journals online bespoke nothing but risk, risk, risk. How could we advise editors to consider open access as a viable option when we could not provide a reliable picture of what it cost to run an online journal? Well, we could tell those skeptical editors that it might cost them nothing, or more likely $20,000 a year, although it might run to more than $100,000, especially if there were a number of journals involved. It seemed to leave the entire open access journal-publishing movement with a less than credible case to make with editors, scholarly associations, and funding agencies. The open question of what it costs to move a journal online would seem to discourage all but die-hard risk takers and do-it-yourself adventurers from considering the move from print to online publishing, unless one had a very sound business plan to cover the unpredictable costs.[2]

It is true that there are a number of economic models for open access publishing, as I review in appendix A, but in all of the models I discuss, there is this initial hurdle of setting up shop online. It appeared that if we wanted to speak with some authority on what it cost to put a journal online, the Public Knowledge Project, with which I work at the University of British Columbia, would have to build, test, and cost out a system of our own for putting a journal online. This would seem to require having a journal to put online, which we did not. Alternatively, we could build a device for others to use to put their journals online. After all, our survey of journal costs had revealed a myriad of approaches to publishing online, many of which entailed creating an ad hoc publishing system for each journal, which is bound to keep expenses high. Tenopir and King (2001), for example, use this software development point to argue that

2. A similar picture emerges for the cost of "institutional repositories" such as e-print archives: "Practically speaking, both development and operating costs can range from virtually no incremental costs (for institutions that reallocate resources) to hundreds of thousands of dollars (for institutions recognizing incremental systems and staff resources)" (Crow 2000, 28). For open source solutions to repositories and archives, see the Massachusetts Institute of Technology's DSpace Federation Web site ⟨http://www.dspace.org⟩ and that for EPrints.org ⟨http://www.eprints.org⟩.

electronic publishing does not lead to great savings: "Electronic access avoids these costs [of printing and distribution], but has a substantial additional fixed cost—putting up full text on the web, staffing, software and other technology issues including design, functionality, searchability and speed" (673).

What if, we wondered, we could control one part of publishing's financial model by reducing the journal's software design and development costs to zero? We could do this by creating open source software that was specifically developed to manage and publish journals online. The software could be designed so that it required no more technical skills of journal editors than word processing, e-mailing, and Web browsing. It could also keep costs down by utilizing the technical infrastructure already in place in most university libraries to place the journal online.

This was, after all, the model that had proven itself with the self-archiving EPrints.org software developed at the University of Southampton, which enables libraries and other organizations to set up sites for authors to self-archive their preprints and postprints. It was to follow the well-established path of such open source systems as Linux, otherwise known as "the impossible public good" (Smith and Kollock 1999, 230).[3] Just as Linus Torvald began working on Linux as a graduate class project in Finland, the academic community continues to play a vital role in open source software development, most recently with the Sakai coop-

3. Josh Lerner and Jean Tirole (2000) identify "career concern" and "ego gratification" as the central incentives for those contributing to the development of Linux; then these two economists pause to wonder if such an open source phenomenon could happen in any other industry. Why has it not occurred to them, I wonder in turn, that their own academic "industry" of scholarly publishing should be the next logical site for such a phenomenon? Many of Linux's 90,000 registered users have contributed, if only in a small way, to its development, largely by following their own interests and "itches," as Steven Weber (2000, 15) puts it. Eric Raymond also plays on Linux's impossibility: "Many people (especially those who politically distrust free markets) would expect a culture of self-directed egoists to be fragmented, territorial, wasteful, secretive, and hostile. But this expectation is clearly falsified by (to give just one example) the stunning variety, quality and depth of Linux documentation" (2003). On the inappropriateness of drawing analogies between open access and open source, see Harnad 2003e.

erative, which has formed among forty-four institutions and is devoted to developing, with the support of the Mellon Foundation and Hewlett Foundation, open source course management software (Young 2004).[4]

Now, I realize that it would be easy to confuse *open access* and *open source*. Just to review, *open access* principally refers to research literature which has been made free to read online. *Open source* is a term used exclusively in referring to software the code for which can be used, modified, and distributed by anyone.[5] So what the Public Knowledge Project has done, in response to this economic question, is build a piece of *open source* software that would make *open access* journal publishing not only economically viable, but well-indexed, through its compliance with the protocols set by (to add one more *open* term to the mix) the *Open Archives Initiative*. The Open Archives Initiative has established an open, nonproprietary protocol for "harvesting" and then searching a prescribed set of metadata or indexing items from research databases and documents, such as journals, which I discuss in chapter 12.

Drawing inspiration, then, from the open source movement, as well as from efforts afoot with open access e-print archives and journals, the Public Knowledge Project team set to work in 2001 on what has become Open Journal Systems (OJS). It has cost roughly $100,000 in hard-won research grants to develop thus far, even as upgrades of the software continue to be released. Launched in November of 2002, two years later it was being used by some 250 journals, based on those that have contacted us, including 210 African journals that are using a version of OJS adapted by the African Journals Online program to give these journals an online presence (Smart 2003). A community of users and developers has grown up around the software (typical of open source projects)

4. See the Web site for the Sakai Project at ⟨http://sakaiproject.org/⟩. See also Gleason 2003 on the use of open source systems in universities: "Open-source initiatives stand the best chance of success in higher education because of the traditions of sharing and cooperation among institutions and software developers. Open systems and open standards all lead in the same direction: promotion of interoperability among applications, a lessening reliance and dependency on the proprietary technology of a single application-software vendor, and reduction in costs to higher-education institutions of all sizes."

5. On the contentious issue of "open source" versus "free software," see Stallman 2001.

pushing it in new directions—with delayed open access for example—as well as translating it for international use. It has worked with the LOCKSS (Lots of Copies Keep Stuff Safe) team at Stanford University Library to ensure that it can take advantage of the team's open source archiving and preservation strategy.[6]

As part of the open source economic model, OJS is designed to be downloaded and installed on a local Web server, enabling local control within a distributed system for journal content indexing and system development. A number of university libraries are hosting OJS on their servers, which makes a great deal of sense given the libraries' expertise, technical infrastructure, and interest in improving access to such resources. Once OJS is installed, the editor can readily configure it by filling in templates (for example, "Title of the journal:") that reflect the journal's editorial structure, policies, sections, review process, and publishing schedule. Through this process, OJS creates a customized Web site for managing and publishing the journal. Authors can submit their work directly to the Web site; editors can work on the journal from computers in hotels or airports; reviewers can similarly pick up assigned papers and post their reviews; accepted papers are edited, laid out, published, and indexed all on the site. OJS is designed to reduce the clerical, management, and publishing costs of journals (see appendix C). Such cost reduction was necessary, of course, if there was to be any hope of journals' being able to make their contents free for readers in some form of open access.

In one sense, Open Journal Systems is no more than a proof of concept. It is testing the degree to which an open source (freely distributed) and easily configurable piece of software can reduce the cost of running a journal by moving the process online, not only in the publishing and distribution of the journal, but in its actual day-to-day management. It may indeed seem something of a heartless approach to place experienced and

6. The LOCKSS initiative is producing open source software that will enable journals to synchronize the archiving of their content across a handful of institutions to ensure its long-term preservation. The expense for libraries hosting this service (which can be used for the preservation of more than journals) has been projected by the LOCKSS team to be down to $0.07 for a year of a journal by 2007 (Reich and Rosenthal 2003).

knowledgeable editorial assistants' jobs on the line through the use of automated systems to, in effect, file, record, date, notify, look up, assemble, calculate, and on and on. Yet where cost reductions are used to support open access, at least, a trade-off is being made that brings to the fore the very purpose of the journal, which is to extend the circulation of knowledge. I have laid out the advantages and savings that a journal management system such as OJS can provide, as it would support journals moving to open access forms of publishing. However, this obviously raises a question about the rest of the publishing industry's use of these tools. Sarah Milstein (2002), in a column for the *New York Times*, identified journal management systems as belonging to that coveted class of "killer app," and she estimated that some 30 percent of journal publishers were using these management tools in 2002. She predicted that the rest of the industry would soon follow. While the publishing industry may not be using open source versions of these management systems, one still has to wonder where the savings these systems produce might figure in the ongoing transfer to this digital publishing medium.[7]

An online management system does more than simply reduce costs. It allows energy and money to be reallocated from clerical tasks to editorial quality, including copyediting and proofreading, which can be an issue for small and struggling journals. The ease with which the editor can take care of business means more time and attention for working on manuscripts and otherwise helping authors improve their research (see appendix C). The system's meticulous record keeping and reminders improve the journal's accountability to authors and readers, which should reduce some of the career-imperiling delays and confusion that are too often experienced with journal publishing. The ideal justification for the use of this technology was summed up by Steinway Pianos Vice President Werner Husmann, commenting on the use of new technologies in the building of his company's pianos: "What is your relation to machines?

7. Milstein (2002) quotes a typical setup charge of $5,000 to $20,000 for commercial journal management systems, and a processing cost of $12 to $50 a manuscript, with editors repeatedly citing advantages of speed and efficiency, which is thought to attract better papers, and savings that run to $60,000 in mailing costs, at least for *Journal of the American College of Cardiology*.

It's simple. A machine has to provide an increase in quality" (quoted in Barron 2003).

Exactly how much going online with a system such as OJS can reduce a journal's publishing costs depends on how the journal is currently being run, whether it will continue with a print edition, and how important it is for it to reduce costs. I present figures from a survey of sixty-one journals in appendix D (in association with chapter 6, on publishing cooperatives) that demonstrate how, with the elimination of print editions and the use of an open source management system such as OJS, the savings can be in the area of 50 percent over current figures. Among current users of OJS, a number are managing and publishing their open access journals entirely online, using university hosting services and volunteer editors, reviewers, copyeditors, and proofreaders, resulting in a zero-revenue and zero-expense budget. The goal here, however, has not been to simply package a version of the Gene Glass nada-expense journal publishing model. (Would that we all had Gene's resourcefulness and dedication.) It is about using open source and open access principles and technologies to extend the quality and circulation of this knowledge. One way of doing that is by reducing publishing costs to enable journal editors and publishers to consider alternatives to the dominant publishing models. One can think of it as increasing competition within the oddly shaped marketplace of scholarly publishing.

While the publishing industry may have been the principal means of achieving journal quality and circulation during the age of print, its business model has been taken to the point at which, according to the leading research libraries, the scholarly community has no choice but to begin "declaring independence" (from corporate journal publishers) by seeking ways of "returning science to scientists."[8] The considerable difference in journal prices is bound to raise questions about the value of the services that publishers provide, an issue that arose in chapter 1 as well.

As Janet Boulin of Oxford University Press, which publishes 184 journals, recently pointed out, a publisher's staff is highly knowledgeable about the review process, skilled at staffing editorial boards, and adept

8. The quotations are from materials for recent campaigns of the Scholarly Publishing and Academic Resources Coalition (2001) in association with the Association of Research Libraries.

at using software to mange the flow of manuscripts in an efficient manner (ALPSP 2003). Boulin also held up the extensive marketing campaigns that publishers mount on behalf of the scholarly materials they handle, and she emphasized how responsive publishers can be to market changes. Publishers are there, she concluded, to support the authority, quality, accessibility, longevity, and recognition of scholarship. And publishers have done this indisputedly well for a good long time, and a great many scholars have benefited by it. But what is perhaps most striking about the skills that Boulin identifies is that they are (with the exception, perhaps, of the marketing campaigns) possessed by scholars and their associations as well. However, marketing campaigns cannot help seeming something of an extravagance when librarians are deciding on which journals to cancel, rather than on which to purchase. Otherwise, it would seem fair to surmise that the qualities held up by publishers as representing their contribution regarding the state of the journal are rooted in the countless editors, authors, and reviewers involved in the production of these periodicals.

Whatever publisher or journal they are working with, these scholars are at the heart of the *authority*, *quality*, and *recognition* that Boulin identifies as distinguishing this body of literature. By the same token, improving *accessibility* (the very point of open access) and *longevity* (with the LOCKSS software) is very much a part of the economic alternatives that are now available under a broadly construed open access. The services of a good copyeditor, on the other hand, cannot be matched by faculty or system. As we saw in chapter 3, the major publishers do not always provide copyeditors for their journals, but fortunately, copyeditors are available on a freelance basis and offer a quality investment for journals that are saving money by automating other aspects of the editorial process.

Still, the current economics of scholarly publishing no longer allows one to pit the big publisher against the open access rebel with a cause, at least not in any simple sense. Boulin's Oxford University Press, after all, is moving its flagship journal, *Nucleic Acids Research*, to open access in 2005 by shifting from subscriptions to author fees. Such moves, with other journals presumably to follow suit at Oxford with time, point to how open access is becoming part of the peculiar economics of

scholarly publishing. Open access's corporate champion, BioMed Central, is certainly part of that picture, as are publishers rethinking what the low costs of access mean for their responsibilities to research access in developing countries, as reflected in the Health InterNetwork Access to Research Initiative (HINARI) and International Network for the Availability of Scientific Publications (INASP) projects.[9] And Elsevier chairman Derk Haank is right. Elsevier Science is "making scientific information more accessible to the community at large than ever before" ("Integration" 2002; see also Haank 2001). Not only does Elsevier's ScienceDirect provide an open index to that portion of the literature that it controls, but its endorsement of Elsevier authors' self-archiving their work makes the company party to the most expedient, as Stevan Harnad (2003a) rightly notes, and most easily achieved form of complete open access.[10]

Where does that leave the economics of access, if not with blurred lines between the heroes and villains of access? The blurring speaks, however, to the remarkable range of opportunities that journals have for increasing access to research and scholarship. This greater realization of the access principle through this digital medium offers tenable options to large corporate publishers and small society journals. And the development of these options is bound to continue, given that the American Association for the Advancement of Science, among others, is encouraging the U.S. National Science Foundation to "fund experiments intended to bolster alternative models of licensing and publication" with a goal of promoting "wide access to and the preservation of scientific information in a cost-effective way" (Frankel 2002, 25).

Yet while open access is making gains in almost every sector of scholarly publishing, journal prices go on increasing well ahead of infla-

9. The Association of Learned and Professional Society Publishers (2004) reports that 60 percent of publishers participate in some form of assistance program for getting their wares to developing countries.

10. Parent company Reed Elsevier, fifth-largest media company in the world, had revenues of $8 billion in 2002, of which $1.5 billion came from online delivery of information to both scholars and professionals (physicians, lawyers, etc.) through services such as ScienceDirect, with an operating margin that Forbes .com called "fabulous" at 22 percent (Morais 2002).

tion rates. Restrictive licensing agreements and near monopolies persist among journal publishers bent on mergers and acquisitions (McCabe 2002; Susman and Carter 2003). That is, there is little reason to let up in pursuit of the access principle. The need for new forms and alternative journal-publishing models continues, even as the case for opening access must be carefully worked out to ensure that this idea continues to play its part in what is most exciting and promising about scholarly publishing today.