The future of journals: where will electronic publishing take us?

Sally Morris

Journals provide much that is of immense value to the researcher and practitioner. Yet the economics of journals are unsustainable; the amount of publishable research is increasing more rapidly than the funds available to buy it. Various alternative models are emerging, none of them without problems. The way forward is not clear, but change is inevitable.

WE CAN'T GO ON LIKE THIS

Researchers and publishers are locked in a vicious spiral which must, logically, end in the collapse of the journals system as we know it. The sheer quantity of research being carried out is increasing steadily; not because the number of papers per researcher has increased (it has in fact remained pretty constant; Tenopir and King, 2000), but simply because more than half of the researchers who have ever lived are alive, researching and writing today.

Publication in (preferably highly cited) peer-reviewed journals is crucial to a researcher's career progression, and indeed to the funding of his or her department. Thus as more research is done, more papers are written and eventually published somewhere (Lock, 1991). More papers being published must mean either the expansion of existing journals — thus increasing their cost — or the creation of new ones.

Either way, this places greater demands on library acquisition budgets. Yet the growth in research is not (and perhaps cannot be) accompanied by a corresponding increase in library funding (Mellon, 1992; National Science Foundation, 1997). Thus the sales per publication decline, which in turn pushes prices up if the publications are to remain financially viable. Higher prices mean even lower sales, and so on until the system finally breaks down.

Sally Morris is Secretary-General, Association of Learned and Professional Society Publishers, Morris Associates, South House, The Street, Clapham, Worthing, West Sussex BN13 3UU

ELECTRONIC PUBLISHING IS NOT THE SOLUTION

The advent of the world wide web in the 1980s was hailed as the solution to this problem. Many of the players anticipated that electronic publication of journals would dramatically reduce costs, thus at least deferring the collapse of the system. Costs of paper, printing and postage would of course disappear, and the incremental cost of each additional sale would be close to zero.

So why have hopes of dramatic price cuts failed to materialize? It isn't as if publishers' profits have suddenly soared. There are a number of reasons why this solution turned out to be illusory:

- The costs which disappear with electronic publication are, for the majority of research journals (which these days have a circulation of under 1000 copies), a very small percentage of the total costs — about 4% for a 500-copy circulation (King and Tenopir, 1999). The proportions are, of course, different for large circulation journals — but many of these are at least partially supported by advertising, and advertisers' enthusiasm for the world wide web has been somewhat muted.
- In addition, publishers have incurred various new costs, not only in getting content into appropriate electronic format, but also in creating and maintaining the systems which both mount it online and control access. What is more, the cost of selling journals, which was very low in the print world, has become a significant factor when complex licences have to be explained and negotiated; this, of course, adds to libraries' overhead costs too.
- The anticipated removal of restrictions on the number of pages which the publisher could afford to print — and thus the removal of publication delays — has not altogether materialized. It does become possible to publish articles as soon as they are available, rather than waiting for the publication date of the next journal issue. However, some of the resources (i.e. people) required to process each article — the available referees to carry out peer review, the editor's time — are finite, while others — copy-editing, typesetting or its electronic equivalent — cannot be increased without increasing costs.
- Even when electronic versions are available, few libraries have had the confidence to drop the print-on-paper version altogether. The main reason is their justifiable concern about long-term accessibility — not just whether their licence will entitle them, without further cost, to continuing access to the material to which they subscribed in the past, but also whether anyone will be able to afford to preserve it so that it will be usable by tomorrow's technology.

COMPETITORS TO HIGH-PRICED JOURNALS

One strategy which has been adopted by the SPARC initiative* (http://www.arl.org/sparc) is to encour-

*SPARC (Scholarly Publishing and Resources Coalition) was set up by the US Association of Research Libraries. It is an alliance of libraries and other organizations which aims to foster more effective and cost-efficient systems of scholarly communication.

age the creation of new journals, whether or not electronic-only, which compete head-on with the most expensive existing journals, but are very significantly cheaper. A number of journals have been launched under its auspices (such as the *Journal of Machine Learning*, *Algebraic and Geometric Toplogy*, *Geochemical Transactions* and *Organic Letters*).

However, it has not been without its critics. Some librarians complain that journals are not substitutable; in an ideal world, they would simply have to buy both the expensive journal and its competitor, thus stretching their available funds even thinner. Others have worked out that the cost per article in these new journals is in fact substantially higher; not surprising, given the difficulty of attracting authors to a new journal which has still to build its reputation (and impact factor). Publishers have found that, even with a certain number of guaranteed library sales, these titles — like all new journals these days — struggle to survive.

ALTERNATIVE BUSINESS MODELS

One way or another, if readers (and authors) want journals more or less as we know them today, then those journals need to produce an adequate financial return for their publishers, whether these are not-for-profit or commercial. Journals which lose money will close, thus reducing the available outlets for publication. Creating more journals which are nevertheless sold on the existing pricing model — subscription or licence — may not be the answer. So what about alternative models?

Site licences

Some publishers have introduced imaginative offers whereby a customer, or a group of customers (such as a consortium of libraries) can obtain electronic access to all the publisher's journals for little more than they previously spent on their print subscriptions to some of them. Libraries sometimes object that this model compels them to buy journals they don't want (although it's rarely the only available option). However, various publishers and other studies report that use of those journals which were previously not available to the library's users is remarkably high; this not only reduces the library's 'inter-library loan' expenditure, but also benefits the authors whose readership increases.

The problem is, however, that the total cost still increases more steeply than do library budgets. If a library accepts such an offer from one publisher, it will probably have to cancel other subscriptions. And small publishers, such as learned societies, which may well have some of the journals of particular interest, cannot individually put together an appropriate 'package' of journals in this way.

Pay per view

An alternative way of buying journals is not by subscription (or licence) but 'by the drink', an article at a time. Publishers have argued that the price per article would have to be prohibitively high in order to keep journals financially viable, although of course without knowing the level of demand this is impossible to judge. Certainly it might be difficult to compete with the prices currently charged, by suppliers such as the British Library Document Supply Centre, for articles which are supplied under 'library privilege' (whereby no copyright fee is payable).

At the same time, librarians have argued that the resultant unpredictability of costs would be impossible to manage (although they seem to cope with electricity, photocopying and telephone bills on this basis). The preferred model (TECUP*, 2000) seems to be for subscription-like licences for 'core' journals, with pay-per-view availability for the rest. Who pays for the individual articles is of course a moot point; the library, the department or the user?

*TECUP (Testbed Implementation of the European Copyright Users Platform) is a EU-funded project which analysed the feasibility of different mechanisms for the distribution, use and archiving of electronic products. Among other issues it examined alternative licensing models.

Author pays

A more radical approach to journal economics (Harnad, 1990, 1995) is to make the journal free to readers, and to cover the costs through submission and/or publication charges to authors. This is in some ways an extension of the 'page charges' model already in existence for a number of American journals (although less popular in other countries). This model has considerable attractions: not only does it make research articles equally available to all, regardless of their resources, it also scales with the increase in researchers and, thus, research articles (which library funds, as noted above, cannot possibly do).

It is difficult to judge how much the publisher would need to charge — some experiments (Haynes, 1999) have charged authors as little as $500, but it is not clear whether this is viable or not. Another difficulty is how the transition from one model to another would in fact be managed. Harnad argues that the savings from library budgets could be redirected towards paying these charges, but it is not obvious that universities and other organizations would actually be willing to do this.

An interesting 'half-way house' towards this approach has been adopted by *Florida Entomologist*, a journal of the Entomological Society of America. For 75% of the price of 100 offprints, the author can pay to make the online version of his or her article freely available to all; otherwise, it is only available to paying subscribers. The growing popularity of this approach with the journal's authors suggests that it may be a practical way forward.

SEIZING CONTROL

Some see copyright ownership as the solution. Universities in the UK (like American universities before them) are flexing their muscles about their legal right to the copyright in their employees' work (Weedon, 2000). Authors, too, are increasingly keen to retain copyright in their own name rather than granting it to publishers. Interestingly, copyright ownership isn't really the point — it's what you do

with it that matters. A growing number of publishers are perfectly happy for authors to reuse their own work in a wide variety of ways, often including mounting it on public websites; this can happen regardless of whether copyright is held by the author or the publisher (Morris, 2000).

In some disciplines, authors have for years placed their work in 'preprint' form in publicly accessible archives, such as the Los Alamos physics preprint server. Stevan Harnad and others would argue that the solution to the 'journals crisis' is for all authors to place not just their preprints, but the final peer-reviewed and published version of their articles, in such databases (Harnad, 1990, 1995).

Standards and software are being developed to make these archives cross-searchable (Open Archives Initiative, http://www.openarchives.org). Similar initiatives are now being developed in medicine, with PubMed Central and its potential European counterpart E-BioSci (PubMed Central, http://www.nih.gov/about/director/pubmedcentral/pubmedcentral.htm; E-BioSci, http://www.embo.org). Perhaps curiously, neither Harnad's proposal nor that of PubMed Central see journals totally disappearing as a result, although their role would diminish to that of enablers and managers of peer review.

WHAT HAPPENS TO PEER REVIEW?

One objection frequently raised to the idea of preprint databases is that the articles would not be subject to the quality control of peer review. This is not necessarily the case. The original PubMed Central proposal envisaged a panel of referees operating rather like the editorial boards of existing journals, although it is not clear whether they would be as motivated as they are when asked persuasively, by an editor whom they respect, to referee for an identifiable journal. E-print archives are expected to contain the final versions of articles after they have been peer-reviewed, edited and published — indeed, some publishers are even willing to provide the electronic files for this purpose.

However, peer review is not of course a single quality filter; articles are selected (or, more commonly, refined) for one journal rather than another on grounds not just of quality, but also of importance, novelty, appropriateness to the journal's topic, level of readership and so on. These distinctions make it possible for a reader to have a good idea what kind of articles to expect within the 'brand' of a particular journal.

This is not to say that the existing approach (or approaches — there is no gold standard of good practice) to peer review could not be improved. It has its critics (Lock, 1991; Jefferson and Godlee, 1999) and there is interesting experimentation with alternative methods, for example soliciting (and in some cases publishing) open commentary (*Electronic Transactions in Artificial Intelligence*, http://www.ida.liu.se/ext/etai) either instead of or as well as traditional peer review. However, the scientific community does seem to set considerable store by some kind of quality control (Frankel et al, 2000).

IS MEDICINE DIFFERENT?

The disciplines in which e-print archives have so far functioned particularly well tend to be highly focused, theoretical research areas within such subjects as physics, mathematics or computing. Research communities may perhaps be small enough for people to know each other's work from conferences, so that an author's name or affiliation tells them whether they will want to read his or her article.

Medicine, in common with a number of other subjects, has a relatively small number of active researchers in proportion to a very large number of practitioners. Practitioners want to know about the research that is most relevant to their work; but their time is precious, and they need this research to be identified, analysed and if possible distilled for them. They value 'systematic reviews' which show the overall conclusions of large numbers of related studies; they value summaries and review articles.

There is another problem which is particular to medicine. Quality control of medical information can be a matter of life and death. Not only unsound research, but simple typographical errors can be life-threatening. And even the best research information could be dangerously misunderstood by the casual reader. So it is necessary to maintain the safeguards of some form of quality control, and of identifying articles as being of a particular type (e.g. specialist and technical rather than for the general reader). Journals as we know them do these things rather well.

WHAT DOES THE FUTURE HOLD?

Will journals as we know them exist at all in 10, 20, 50 years' time? Some think not (Singer, 2000).

There is much that is highly valued in the way journals currently operate, in particular the quality control mechanism of peer review, but also the value added by good editing and presentation, and the convenience of collecting together articles within a journal brand. Whatever the future model, these strengths will need to be preserved in some way.

It seems rationally inevitable that the current business model must collapse — more and more research articles will be published, and there will not be enough additional funds to buy them. A new way of funding publication seems inevitable, and personally I think it makes good sense for the cost of publication to be seen as part of the cost of doing research.

An article might be deemed to be 'published' when it is made freely available on the author's own website in future (although readers would require assurances about its quality, version control, and permanence; Frankel et al, 2000). One can perhaps envisage 'journals' containing only abstracts, and linking directly to not only the full text, but also supporting data, on the author's site.

As the sheer quantity of published research increases, tools for accessing that which is most relevant to the individual reader will become increasingly indispensable. I strongly suspect that

this is not just a matter of 'smart' search engines which can learn what sort of articles you like and find 'more like that'. The role of human intelligence in finding, digesting and summarizing that which is most relevant to a particular readership may become more, not less, important as the potential information overload increases.

Thoughtful publishers have read the writing on the wall, and are already building online communities and information services which will offer tomorrow's readers tools for finding their way around the mass of available information, and making use of it to do their jobs better. **HM**

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KEY POINTS

- The current model of journal publishing is unsustainable.
- Electronic publishing is not the panacea it was expected to be.
- Various alternative models are being explored — one of the most hopeful seems to be 'author (or funding agency) pays'.
- Publishers will need to concentrate on adding value to primary articles.

Medical publishing series

This series, which started in October 2000, will include articles on:

- Finding health information on the internet (health professionals)
- Finding health information on the internet (consumers)
- Writing case reports: an editor's eye view
- How to write a book
- Getting a book published
- Being a journal editor
- Writing for the popular press
- How to write a review article
- How to write a good peer review
- Writing a CD-ROM
- The future of journals
- Publishing on the internet
- How to write a grant application
- How to publish a research paper
- Writing a letter
- Updating your CV