

The Next Information Revolution - Can Institutional Repositories and Self-archiving Transform Scholarly Communications?

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Abstract

The basic model for scholarly communication in science and technology has remained unchanged for over three hundred years, with the journal playing the central role. However, over the past thirty years there has been growing concern as journal prices have increased faster than library budgets and fewer and fewer readers have had access to the journals, leading to the well-documented 'serials crises'. The widespread introduction of the internet in the 1990s has resulted in some improvements in communication, with readers being able to access papers at their desks rather than having to visit the library. Also, with site licences and consortia deals the downward trend in readers has been reversed. However, the fundamental problem remains. The rate of increase in cost to libraries for electronic access continues to be greater than the increase in library budgets.

This paper will show how by harnessing the power of the internet, authors will be able to distribute their work to all interested readers - not just those lucky enough to have a subscription. It will describe how universities can take responsibility for archiving their intellectual wealth and making it more widely available. Finally, the paper will show how the adoption of institutional repositories and open access journals could bring about a change in the financial model of journal publishing, bringing cost savings to society and improving communications, while still preserving the important functions of peer-review.

Introduction

The basic model for scholarly communication has remained unchanged for over three hundred years. The launch of the modern scientific journal in

1665 provided authors with a means of communicating their new research while laying claim to the intellectual priority of their work. Readers meanwhile have been assured of the quality of what they read (via peer review) and of long-term access (via the archive).

However, over the past thirty years there has been growing concern at the printed journal's ability to fulfill its role as a means of communication of new research. Journal prices have increased faster than library budgets, resulting in cancellations, reduced circulation, and fewer readers with access to the journals. This led to the well-documented 'serials crises'.^[1]

The introduction of the internet in the 1990s has provided some improvements in communication. Papers can often be published more quickly online than in print. More importantly, readers can access papers at their desks rather than having to visit the library. Now, with site licences and consortia deals the downward trend in readers has been reversed for the first time in many years.

However, the fundamental problem remains. The rate of increase in cost to libraries for electronic access continues to be greater than the increase in budgets for many libraries. Therefore, we will see the same pattern as has been observed over the past thirty years - the number of people with electronic access will slowly decline as the price of access increases.

The rise of institutional repositories and the open access model gives libraries and researchers their first chance to change fundamentally the way that scientific information is communicated. By looking closely at the functions performed by scholarly journals we can determine how new technology and models can better serve the international research community.

The Situation Today

It has been well documented that the annual rise in average subscription price for science, technical, and medical (STM) journals has outstripped the increase in library budgets around the world over the past few decades. For example, the Association of Research Libraries (ARL) report that the average cost of STM journals rose by 226% between 1986 and 2000, while the consumer price index rose by 57%. During this period, library spending on journals rose by 192%. To balance budgets libraries had to cancel

journal subscriptions, even after transferring funds from monograph purchasing. This pattern has been repeated worldwide.

This information gap has resulted in widespread dissatisfaction with the current scholarly communication model. Even the wealthiest institutions cannot purchase access to all the information that its researchers require to be effective. In the UK, a recent report accepted that ‘...providing all of the information required by UK researchers is beyond the capability of any single library; and indeed that the aggregated efforts of all UK research libraries are failing to secure a national collection in keeping with the researchers’ current and emerging needs and demands’. [2]

Following the introduction of the internet most leading peer-reviewed journals are now available online. Libraries have over the past few years taken advantage of consortia and bundle deals to access more material than they had subscribed to in print. In online publishing, there are few additional costs in allowing extra libraries to subscribe to online journals (one the initial costs of publishing online have been covered). Therefore, a library can be offered online access to all of a publisher’s titles, rather than print access to a proportion of the titles. Alternatively, libraries can band together in consortia to negotiate a deal whereby all members of the consortia gain access to all journals in the publisher’s portfolio. Invariably, these deals are priced by the publisher at a rate above what the library (or consortia) currently spends with that publisher.

There are undoubted benefits to institutions in taking up these deals as they are able to greatly extend the amount of material they can offer to their researchers. However, to find the extra money for the bundles the library often has to cut back in other areas – this can mean canceling journals that are not part of large bundles (for example, high quality journals from society publishers). Also, there is no guarantee that the bundle price will not increase year-on-year at a rate above the increase in library budget, so once again creating an information gap.

New opportunities

As a result of the problems described above, many have looked at the continued development of the internet and new electronic publishing tools and have asked whether it might be possible to totally reengineer the scholarly communication process. Rather than only producing online

versions of print journals accessed using traditional subscription-based models, might there be new financial models that use new technology to better fulfil the functions of journals and better serve authors, readers, and, ultimately, research?

Traditionally, journals have been seen to perform four functions Registration, Certification, Awareness, and Archiving. [3] That is,

- *Registration* - the author wishes to ensure that he is acknowledged as the person who carried out a specific piece of research and made a specific discovery.
- *Certification* - through the process of peer-review it is determined that the author's claims are reasonable.
- *Awareness* - the research is communicated to the author's peer group.
- *Archiving* - the research is retained for posterity.

The current model integrates these four functions into a single package – 'the journal'. In the new information environment is it sensible to integrate these functions or are there efficiencies and the chance of a better system if we meet the functions in different ways? One option is to investigate the interaction between institutional repositories and open access journals.

Institutional repositories

The term 'institutional repositories' has been used to describe digital collections capturing and preserving the intellectual output of a single or multi-university community.[4] They may contain a wide range of materials that reflect the intellectual wealth of an institution – for example, preprints and working papers, published articles, enduring teaching materials, student theses, data-sets, etc. The repositories would be cumulative and perpetual, ensuring ongoing access to material within them. They should be built to common international technical standards to ensure that the materials can be searched and retrieved [5] and they should be available freely over the internet.

If researchers were to place the results of their research into their local institutional repository, three of the functions of a traditional journal would be immediately met:

1. *Registration* – by depositing in the repository the researcher would make claim to their discovery
2. *Awareness* – by constructing the repository to internationally agree standards the institution would ensure that the researcher's work would be found by search engines and available to their peers
3. *Archive* – the institution would be responsible for maintaining the long term archive of all the work produced by members of that institution.

There are many benefits, at many levels, to institutional repositories:

- For the individual
 - Provide a central archive of their work
 - Increase the dissemination and impact of their research
 - Acts as a full CV
- For the institution
 - Increases visibility and prestige
 - Acts as an advertisement to funding sources, potential new faculty and students, etc.
- For society
 - Provide access to the world's research
 - Ensures long-term preservation of institutes' academic output
 - They can accommodate increased volume of research output (no page limits, can accept large data-sets, 'null-results', etc.)

Peer Review and Open Access Journals

The one function of the traditional journal that institutional repositories do not fulfill is certification or peer-review. Each institution will be able to make its own policies on how material is to be deposited in the repository, and some may insist that papers receive at least an initial review before being made widely available. However, this will not be a substitute for independent peer review. Peer review serves the reader as a mark of quality and it is used by authors to validate their research (which is of particularly importance in their next grant proposal or attempt at promotion).

Peer review journals could sit comfortably with the network of institutional repositories. Authors who wanted their work to be peer reviewed could, after they had deposited it in their local repository, send it to their journal of

choice. At this stage the work would be evaluated as in the current system and, if considered by the editor of the journal to be acceptable, the paper would be published in the journal and so receive the journal's quality stamp.

Obviously, with all the relevant material available for free on a network of institutional repositories it becomes impossible for a journal to charge a subscriber to access a paper in the journal. The peer review journals, therefore, would need to have no access restrictions on them – that is, they would be 'open access'.

Open access journals would give free and unrestricted access through the internet to all primary literature published within the journal. This literature is given to the world by scholars without expectation of payment and in the hope that it is distributed and read as widely as possible. Making it freely available over the internet immediately distributes it to the 650 million people worldwide who have internet access. Giving all interested readers access will accelerate research, enrich education, share learning among rich and poor nations, and, ultimately, enhance return on investment in research (much of which come from the world's taxpayers). From being in a position where institutions cannot supply all the information need of researcher, researchers will be able to access all of the relevant information they need to be effective

Open access also provides major benefits for authors. Rather than their paper being seen by readers at the few hundred institutes at institutions lucky enough to have a subscription to the journal, the paper can now be seen by all interested readers. This increases the profile of the authors, their institutions, and their countries.[6]

Without subscription income publishers will have to look at new financial models to support their journals. There are costs associated with the peer review process and with publication of a paper (even if it is only online), and these costs must be met somehow. A number of possible revenue sources for open access journals have been identified,[7] but one of the most stable may be that where authors pay a publication charge, so ensuring that the publisher would receive sufficient revenue to make the paper available to all with no access restrictions. Ultimately, it would be for the funding body or the institution to cover the publication charge, but basically, this model looks to a move for paying for access to material (through subscriptions) to paying for dissemination.

Practical Developments

The scenario described above – a network of institutional repositories with an over-layer of peer-reviewed journals, all open access and free to all – may sound utopian, but already many positive steps are being taken to realize this future.

Institutional Repositories Three, open source software packages exist for setting up and implementing institutional repositories.[8] Almost 100 institutions worldwide have set up repositories using this software. In addition, there are at least two major national projects investigating how to set up national infrastructures for institutional repositories – SHERPA in the UK, and DARE in The Netherlands.[9,10]

Open Access Journals The number of open access journal publishing high quality, peer reviewed research is growing. SPARC and SPARC Europe are in partnership with a number of these journals,[11] in particular, BioMedCentral who have now published over 2000 papers in 80 open access journals. New open access initiatives are regularly being announced, including the recent decision of the Indian Academy of Sciences to make their 11 journals open access[12] and the Public Library of Science decision to launch two high-quality open access journals in biology and medicine.[13] In addition, a plan has been put forward to transform current subscription-based journals into open access journals and it is expected that a number of publishers will shortly announce their intention to follow this model.[14]

Next Steps

It is my belief that there is growing international momentum in favour of institutional repositories and open access journals. Increasing numbers of libraries are taking on role of hosts for institutional repositories, becoming responsible for maintaining the intellectual heritage of their institution. The success of growing numbers of open access journals is proving the feasibility of the new business models. As success is proved, more authors, university administrators, librarians, and funding bodies are becoming aware of the limitations of the current system and possibilities of the new models.

Over the next few years all players in the communication process can play a part in making change happen. In particular, authors can:

- Support open access journals by submitting papers to them and refereeing, reading, and citing articles in them
- Launch new open access journals if appropriate
- Discuss open access and reasonable prices with the publishers of the journals they use regularly (especially if they are editors or board members)
- Discuss with funding bodies funding and promotion criteria – ensuring that faculty are not penalized for publishing in open access journals (especially those that are online only)
- Deposit their work in institutional repositories.

Librarians can:

- Establish institutional repositories
- Help faculty archive their research papers (new and old) within the repository, digitizing older papers if necessary.
- Help open access journals launched at their institutions become known to other libraries, indexing services, potential funders, and potential readers.
- Make sure scholars at their institutions know how to find open access journals and archives in their fields and set up tools to allow them to access them.
- As open access journals proliferate, and as their usage and impact grow, cancel over-priced journals that do not measure up.
- Familiarize themselves with the issues. [15]
- Support SPARC Europe to multiply their effort.[16]

Conclusion

Obviously, any attempt to change such a well embedded system with large degrees of inertia will be difficult. However, the advantages of the new model are immense. We can create a system that better serves authors (by given them the wide dissemination they require) and readers (by removing access barriers to the information they need). This will enhance research and education worldwide and bring great benefits to society.

References

- [1] A collect of papers on this topic can be found at <http://www.lib.utk.edu/~jon/crisis.html>
- [2] Report of the Research Support Libraries Group, 2003, <http://www.rslg.ac.uk/>
- [3] Roosendaal, Hans E. and Peter A. Th. M. Geurts (1998). “Forces and functions in scientific communication: an analysis of their interplay.” CRISP 97
- [4] Crow, R. (2002). “The Case for Institutional Repositories: A SPARC Position Paper.” <http://www.arl.org/sparc/IR/ir.html>
- [5] For details of institutional repository technical specifications see the Open Archive Initiative, <http://www.openarchives.org>
- [6] An excellent expansion of the benefits of open access is given in Peter Suber’s 2003 paper “Removing the Barriers to Research: An Introduction to Open Access for Librarians”, <http://www.earlham.edu/~peters/writing/acrl.htm>
- [7] See the Crow and Goldstein ‘Guides to business planning for open access journals’ <http://www.soros.org/openaccess/oajguides/index.shtml>
- [8] Details of the various Institutional Repository software can be found at: Eprint - <http://www.eprints.org/>, DSpace - <http://www.dspace.org/>, CDSWare - <http://cdsware.cern.ch/>
- [9] <http://www.sherpa.ac.uk/>
- [10] <http://www.surf.nl/en/themas/index2.php?oid=7>
- [11] <http://www.arl.org/sparc/core/index.asp?page=c0>
- [12] <http://www.ias.ac.in/journals.html>
- [13] <http://www.plos.org/journals.htm>
- [14] Prosser, D.C. (2003). “From Here to There: A Proposed Mechanism for Transforming Journals from Closed to Open Access”. Learned Publishing, In Press. (An earlier version is available at: <http://www.arl.org/sparc/core/index.asp?page=g29>)
- [15] See, for example, *Create Change* (www.createchange.org)
- [16] <http://www.sparceurope.org>