science editing

The big picture: scholarly publishing trends 2014

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Abstract

It is important for journal editors to keep up to date with the changes happening in the international journal environment to ensure that their own publications remain current and meet international expectations. Dramatic changes have taken place in the journals environment during the last two decades, frequently driven by technology but also by increased global participation in scholarly and scientific research and concern about the commercial influence on dissemination of knowledge. Technical solutions have attempted to address the growth in research but have sometimes added to the tsunami of information and increased the need to manage quality. To this end experiments with the traditional quality control and dissemination systems have been attempted, but news of improvements are frequently overshadowed by alarms about ethical problems. There is particular concern about some of the new publishers who are not adhering to established quality control and ethical practices. Within a potentially fragmenting system, however, there are also emerging collaborative projects helping to knit together the different elements of the publishing landscape to improve quality, linkages and access.

Introduction

This article considers the changes that have happened recently to the scholarly journal environment, starting with the changes in research and development and the influence of the emerging economies. It then considers the financial models and the serials crisis that led to the movement for more open access to research and greater involvement of the academic community. It looks at the ethical issues that have beset the recent years, and the new technologies that promise more efficient and ethical publishing.

The Growth of Research and Journals

Until the mid 1960s, the majority of scholarly communication took place through journals published by Universities, Societies or Associations on behalf of their members, and containing content mostly written by their members. There then came the rapid growth of commercial publishers, who launched their own journals, realising that there was a market for inter-disciplinary and inter-country research. The rapid growth in the numbers of journals in developed countries was echoed by a rapid growth in developing countries as they gained independence and developed their tertiary education and research institutions. It has been estimated that the growth of investment in research and development worldwide has been approximately 3% year-on-year for the past 30 years, and that the number of articles increases accordingly [1]. The latest report from the STM Association estimates that there are over 28,000 journals publishing over 1.8 million articles each year [2]—and it should be noted that this report only considers publications appearing in the main international indexes. This excludes most of those journals published in non-English languages and those in the periphery of the main research areas.

The Serials Crisis

In the 1990s journals were one of the early adopters of the Internet and eagerly encouraged digital dissemination. However this was also accompanied by substantial increases in journal subscription charges, partly due to the additional cost of processing more content and compounded by the costs of implementing new technologies, plus commercial opportunism. Meanwhile, the budgets available to libraries to purchase these journals did not increase similarly, and this led in the late 1990s to what was termed "the serials crisis" [1]. This, combined with the apparent ease of digital delivery, led to a call for government-funded information to be made freely available, and the start of the open access movement.

International Collaboration and Emerging Countries

Whilst these commercial tensions were growing in the western world, another influence was starting to be felt: increasing international collaboration and input. A report from the UK Royal Society in 2011 reported changes in global research outputs and found a large increase in participation from around the world. As an example, it cited an article published in *Physics Letters B* in 2010, which was authored by 3,222 researchers from 32 different countries [3].

Although this number of authors remains unusual, the situation it presents raises several issues which publishers, editors and even governments need to consider. Firstly, there is a need for these researchers to have access to the most recent and relevant research, regardless of where it is published. Second, all the authors need to agree to a common standard for ethical research and publication. Third, they all need to be able to communicate in a common language (English in this case). And lastly, that each of these authors needs to agree on the journal in which they wish to publish—which implies a common awareness and respect for the same publications.

One particular country of note, China, has recently emerged as a major exporter of articles [4,5]—many co-authored with researchers from different countries, but many more authored exclusively by Chinese authors. These authors have chosen to be published in what are considered international journals—usually those published in Europe or the USA. This highlights a trend towards the same value criteria being used by authors in China as those used by western researchers—in this case the decisions are greatly influenced by the Impact Factor calculated by the US-based commercial company Thomson Reuters.

Any consideration of the journal environment must take global influences into account, whilst at the same time acknowledging that most of the changes and trends are being driven from Europe and North America. The reasons for this are partly due to the research and development strengths of these regions as well as the strengths of their existing publishing industry. However many publishing developments in these regions are happening in response to the increasingly global environment.

Commercial Business Models

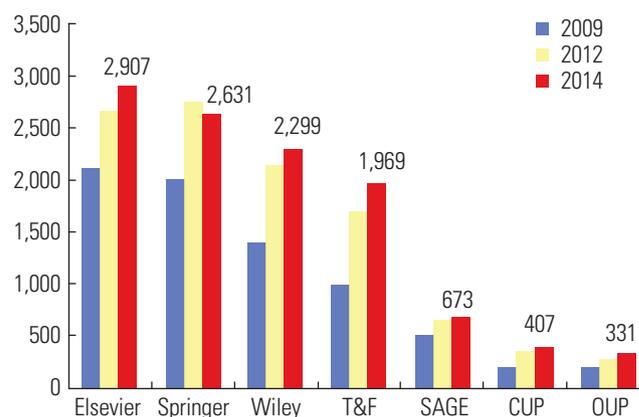One of the main business trends during the past decade has

Fig. 1. The number of journals published by the largest publishers (Numbers taken from the publisher websites and are subject to change.). T&F, Taylor & Francis; CUP, Cambridge University Press; OUP, Oxford University Press.

been the merger of publishers and the growth of the largest publishers. Elsevier remains the largest publisher of journals, closely followed by Springer, then Wiley and then Taylor & Francis. It is notable that each of these publishers has increased the number of journals that it publishes each year (Fig. 1) and they now dominate the journal market. Part of their growth has been from new journal launches, but the majority has either been from acquisition of other, smaller, publishers or from becoming the contract publisher for a learned society or association. As the technical issues associated with publishing are increasing, many institutional journal publishers are tuning to professional publishers to produce their journals and advise them on the best way to develop them. This has led to a delegation of skills and knowledge to the commercial publishers, and—it is arguable—a loss of publishing control within these scholarly and academic institutions.

Whilst the move to commercial publishers has been a pragmatic decision by these institutional publishers, it has raised concerns in the librarian and academic world about the commercialisation of research. Some efforts have therefore been made to develop new models that would revert control to academia. The most recent of these is a proposal from an American academic consultant for a collaborative publishing model for humanities and social science journals from nonprofit society publishers. The proposal would require learned societies to manage the editorial and quality control processes, libraries to manage the dissemination and archiving processes, and higher education institutions to fund the journals through a centralised platform [6].

The Growth of Institutional Repositories

In an attempt to counteract the control of the commercial companies on the dissemination of research, several repositories have emerged, managed and controlled by institutions. The best known of these is ArXiv.org managed out of Cornell University and containing items of interest to the physics and mathematical community. This emerged in 1992 as a place to deposit early article versions for public view and comment prior to submission to a journal. At the time of writing it contains almost 1 million items and the model has just been copied for the life sciences in the repository, bioRxiv.org. Interestingly, there has not been any problems with physics or maths journals considering the appearance of an article in this repository to be prior publication. However, in other disciplines such posting would constitute prior publication and cause the articles to be rejected.

Many institutions have also launched their own repositories, in an effort to capture the creative output of the institution—theses, working papers, data sets, book chapters and articles.

The Registry of Open Access Repositories (http://roar.eprints. org/) currently lists over 3,500 repositories from around the world, with 94 in Africa, 604 in Asia, 1,315 in Europe, 685 in North America, 98 in Oceania and 290 in South America. These are generally managed within the institution library, and many institutions have a mandate whereby all faculty and students are required to deposit their works in the institutional repository. Most of these are made free for anyone, anywhere, to view and are seen as a window to the output of the institution, promoting its research.

There are, of course, tensions with the deposit of materials into these open repositories. In the first place these come from publishers who are not happy to find an article they wish to sell available for free in a repository. However, the institution itself (or the authors) may also wish to withhold some items due to patents pending or for other commercial or legal reasons.

Version Control

One unexpected consequence of the growth of repositories is the multiple version of artices that are now available. There are questions about what version of an article is available from the repository and how much it differs from what is published in a journal. This leads to questions about citation—how should repository versions be cited (and should they be cited at all if they are not the Version of Record?).

Recognising the problem over "early" versions being available, a project in 2008 identified 7 different article versions and provided a nomenclature to ensure correct citation [7]. The versions ranged from Author's original to Enhanced Version of Record. Although this nomenclature has not been widely adopted in the citation environment, the most important two versions (and those being most used) are Accepted Manuscript and Version of Record. The former is the version after peer review and the latter is the version published by the publisher. Most commonly it is the Accepted Manuscript that is found in repositories, and many publishers allow this to appear at the time of publishing with others allowing it to appear after a specified embargo period (commonly 6 or 12 months).

The question for readers, however, is which version to cite? Some readers will not be able to access the Version of Record, and so will read the Accepted Manuscript. However when they cite the work in their own publication, it is likely that they will cite the Version of Record as this has grants greater credibility on their work (even though they have not read this). It is quite possible that a change made to the Version of Record may result in it not supporting the argument of the citing author, and this uncertainty may be increased by early and later versions being made available in different places on the Internet. CrossMark is an initiative to alert readers of any

changes to the published version (the Version of Record), including later versions and errata, and is starting to be used on journal sites, but not yet in repositories and so is not yet addressing the potential versioning problems that they pose.

One journal working with multiple versions is *Faculty 1000Research* (http://f1000research.com/). This journal is making an attempt to promote the concept of multiple versions as something to be embraced within research—the justification being that research is not static and that iterative changes should be recorded and visible. The journal publishes each article as soon as it has undertaken what is called a "sanity check" (to confirm that it is not a totally unsuitable article). It is then published for open peer review. When reviews have been received, the authors can comment and update their articles, including updating and uploading new versions. At all stages the articles are identified with their status—"awaiting peer review", "approved with reservations", "published", etc., as well as the version number. All the comments and reviews can also be read next to the article.

Transparency of Reviews

Transparency of reviews is growing in popularity and many journals are not only using an open system (where the authors' and reviewers' identities are known to each other during the traditional, confidential, reviewing process), but also publishing the reviews alongside the accepted, published, articles. Examples of this include most of the BioMed Central journals, *EMBO*, and *PeerJ* [8].

Within this environment, quality control and the importance of peer review remain paramount, and editors throughout the world increasingly find problems in obtaining suitable reviews. There are some new initiatives that offer a reward to reviewers to provide an incentive. Some publishers offer benefits such as temporary free access, for example reviewers of Elsevier journals can access ScienceDirect for a month. Some journals pay reviewers, but until recently information about what incentivises reviewers has not been properly researched. Recently, however, one journal, *The Journal of Public Economics*, has undertaken research to find out what it could do to improve submission of reviews. It found that offering a shorter timescale did speed up the return of reviews, as did offering 100 US dollars as an incentive to return the review within the stipulated time period [9].

There are several peer review experiments outside the journals themselves. Publons (https://publons.com/), for example, is an initiative that asks researchers to upload post-publication reviews onto its site. These are given a Digital Object Identifier (DOI) and are therefore citable. The initiative is being promoted as a way for researchers to gain publication credit for

their reviews. Another research networking site, ResearchGate, is also experimenting with a similar system. However, an article in *Nature* voiced concern that the emergence of these sites is potentially leading to a fragmented environment for posting and finding such reviews [10].

Apart from the problems associated with managing a peer review system, reviewing itself does not manage to guarantee the validity of all articles, and there is suspicion that misconduct is growing. The number of articles being retracted for errors and fraud is increasing [11] and the blog site, Retraction Watch, posts regularly on problem articles. There is some debate about the reason for this increase: whether malicious misconduct is to blame or if honest error accounts for the majority of the problems. Some researchers are under such pressure to publish that it inevitably leads to misconduct. In China, for example, not only are cash incentives offered to successful authors, but sometimes even housing benefits, and this must inevitably entice some researchers to fabricate data, plagiarise other works and generally behave unethically [12].

Predatory Publishers

Of course, authors are not alone in behaving unethically and several publishers and journals have also been criticised for potentially fraudulent behaviour. A Canadian librarian, Jeffrey Beall, maintains a list of what he calls "predatory publishers" who publish with little or no peer review and lure unsuspecting authors who need to publish their work. These journals promise a high quality (and therefore value) journal, but actually just provide a "vanity" publication which may harm the reputation of the author. The increasing numbers of these journals (from 23 in 2011 to over 225 in 2013) is a worrying side effect of online open access in which it becomes normal for the author to pay for publication, and a global environment where naïve authors are under pressure to publish without a support structure to help them identify suitable outlets for their research.

New Publishing Technologies

Addressing such ethical problems, publishing technologies have become increasingly sophisticated and can help to identify publication fraud in addition to providing extra reader and researcher benefits. On the negative side, however, they also provide worrying examples of how publisher systems are not foolproof. For example early in 2014, a French computer scientist, Cyril Labbé of Joseph Fourier University in Grenoble, discovered that IEEE had published 100 articles created by computer software, SCIgen—not by human authors. The articles had, apparently, been peer reviewed, but had not been

spotted as fraudulent. Such ethical issues are becoming a widely-reported part of the journal landscape.

A suite of softwares from the non-profit organisation, Cross-Ref, include systems that use the underlying bibliographic data within each article to provide services to editors, readers, publishers and funding agencies. These include CrossCheck, a plagiarism-checking software (now used by over 600 publishers worldwide), FundRef that enables grant funders identify the outputs of their research investment, CrossMark (mentioned above) that helps readers to identify updates and new versions of articles, and other systems that assist data and text mining. These have added to the now-established DOI system that provides direct article linking.

Data and Text Mining

Data and text mining is the most recent trend to gain traction—particularly within Governments. Not only is there interest in what can be done with large data sets, but there are concerns about the loss of data because it is not being systematically captured and stored. Data repositories such as Dryad and DataCite have started to emerge, following the model of content repositories discussed above. Several journals now require authors to make their supporting data available, either by depositing it in one of these public repositories, or by providing it as a supporting file to the article. For example all PLoS journals require authors to provide a Data Availability Statement guaranteeing that they will make all data publicly available, without restriction, immediately upon publication of their article.

Conclusion

Innovation in research communication is emerging from different areas and from institutions and people with different objectives. While this is resulting in a dynamic and innovative environment, it is also providing some tensions and examples of malpractice and unethical behaviours. The increased globalisation caused by widespread use of the Internet has brought a wealth of different perspectives and opportunities for improvements in the sharing of knowledge—but is also revealing some very different viewpoints and conflicts about what are considered acceptable behaviours. This article has considered some of the recently-emerging trends, but cannot claim to provide a complete overview of a landscape that is under pressures from governments, institutions, companies and individuals to increase access and usability of research findings within existing financial constraints. A comprehensive consideration of the changes, technologies, mandates, concerns and problems emerging within the scholarly publishing communi-

ty would require a large book (and be out of date at the moment of publication).

For ongoing information about changes to the industry, readers are directed to relevant blogs, such as Scholarly Kitchen (http://scholarlykitchen.sspnet.org) run by the US Society of Scholarly Publishers, and to the updates and *ALERT* newsletter provided to members of the Association of Learned and Professional Society Publishers (ALPSP, http://www.alpsp.org) (Please note that the author of this article is also the author/editor of the *ALERT* newsletter.).

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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