

Challenges to academic publishing from the demand for instant open access to research

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Academic publishing is facing major challenges on two fronts. One of these relates to the relative ease of publishing ‘on line’ compared with the historic barriers to establishing print-based journals in the pre-internet age. The other front concerns a shift towards ‘open-access’ publishing, driven both by user expectations and funding body preferences. Neither of these issues should be considered as inherently bad developments and both are underpinned by the information revolution that allows a substantial and growing proportion of the world’s population to draw upon a vast resource base connected through the internet, and indeed to share their own ideas with the world in a way that might have seemed fantastic a few decades ago. The present article assumes that these developments - ready access to information and open access to publishing opportunities - are (subject to a few provisos) to be welcomed. However, even positive changes may have unforeseen complications, and academic publishers are having to reconsider traditional models of publication in the ‘internet’ age.

The information revolution

The speed of developments in information and communications technology has been impressive. Computers progressively become faster and more powerful, and indeed more affordable. Moreover computers are no longer specialised tools for experts, but have user-friendly ‘intuitive’ interfaces, so the user soon almost fails to notice the tool itself. Many children at school today use computers almost as effortlessly as they use pencil and paper. Whereas early computers occupied whole rooms (and could only be afforded by major institutions and companies), we now have hand-held devices at a price that is within the reach of most people in many countries.

Alongside the improvements in hardware and usability, there has been the development of the world wide web (www) and the internet. We can all be connected: billions of us, all over the world. We can contact each other using email protocols that make sending a message to someone thousands of kilometres away in a fraction of a second an everyday and unremarkable event. Of course there are always ‘down’ sides to such developments, and many of us now regularly receive vast amounts of nuisance email.

The www allows information to be presented on webpages, or downloaded from web addresses. Increasingly this includes the journal articles that are the life-blood of academic scholarship. This has changed the way many of us in academia work. The pleasures of browsing dusty journals on

library stacks are now little more than fond memories because we know it is usually much more convenient and effective to browse remotely from our desk. Indeed, for many of us, much of the work can be done from our home computer, sometimes avoiding the need to spend valuable time commuting to the University. The virtual paper chase can be undertaken from the comfort of our study (or even, weather permitting, garden) chair - each journal accessible at a few clicks. Then downloaded papers can be rapidly searched electronically for key words or terms, and quickly evaluated for their relevance to our current needs. Those papers we decide were not useful have not cost us much time and effort. I know of some academic libraries where many journals have to be ordered from store, and only appear some hours later. Now I can identify a potentially useful paper, access it, browse it, and move on if it is not as relevant as I had hoped, within a few minutes. Electronic library access can certainly facilitate more effective working.

The promiscuous nature of the information explosion

The information revolution offers affordances in education and academia, but also brings its own challenges. As an educator I am aware of the amazing possibilities for supporting learning at all levels through the use of the internet. However I am also aware that the sheer amount of material available can present difficulties to learners, as can the lack of quality control. Anyone can put up a webpage that can be accessed by anyone else connected to the internet. The information may be incorrect, biased, obscene, defamatory or may even incite violence or other criminal acts. The cost of allowing anyone to publish on the web is that users need to be very aware of what they might find surfing the net - 'caveat emptor'. Governments can police the internet, but at the cost of being accused of censorship of what is commonly seen as intended to be an open and free medium. This is an area where it is very difficult to know where the balance should be: especially when children can so readily access web-based materials.

The promiscuity of the web also has consequences for academic publishers. The well-established research journals are increasingly facing competition from new, web-only, journals, and there are now so many fledging research journals appearing that it is very difficult for academics and students to judge the quality standards of these new journals.

The challenge of new academic journals

Many well-established journals have a print edition that goes back decades or even centuries. Most now also have electronic editions as well. Setting up a print-based journal is a major endeavor. In particular, print-based journals face considerable costs relating to the printing, storage and distribution of issues. Short print runs which underestimate demand are a missed opportunity, whereas unsold material due to overoptimistic predictions of sales represent wasted resources and a storage problem.

Of course the higher purpose of an academic journal is not to make profits for publishers but to support the development of a field of scholarship and research. These activities depend upon those working in a field having access to the work of others, and research journals allow publication of work so that it becomes available for critique and to inform further studies. Many of the most well-established journals have strong links with academic institutions and learned societies. This is so in my own field of science education, where a number of the main journals have current or historical links to science education associations. I edit one of the two major international journals in chemistry education, both of which are published by learned societies: *The Journal of Chemical Education* by the American Chemical Society and *Chemistry Education Research and Practice* by the (UK based) Royal Society of Chemistry.

Even when journals are published by such not-for-profit organisations their costs need to be met, and, more widely, international publishers see journal publishing as a commercial proposition. The difficulties and risks involved in setting up a new journal, getting it established in an academic field, and selling sufficient copies (usually largely through library subscriptions) to cover costs mean that proposals for new print-edition journals require a very strong case. This probably explains why the major international publishers have in recent years tended to prefer to acquire journals that are already established and have an existing subscriber base.

Electronic-only journals however are a less risky venture. There are editorial and production costs similar to paper-based journals, but these are mostly fixed costs which remain the same regardless of 'sales' (i.e. library subscriptions or downloads of articles) and so there is no major investment in paper and print nor troublesome decisions regarding the print run. Once a paper is published on line it can be downloaded any number of times without additional cost to the publisher.

Electronic journals also avoid problems associated with the physical size of issues. The cost of production and postage of a hard copy journal depends upon how many pages an issue includes. Magazines have similar considerations but are able to manage the problem by having a fixed number of pages and then commissioning material to fit the space available. Academic journals usually have guidelines on article length, but have limited control over the number of submissions received, the quality of those submissions, and the time from first submission to acceptance for publication.

Peer review and article revision

Quality journals will reject most submissions as not meeting their high quality standards. In the case of the journal I edit, *Chemistry Education Research and Practice*, only about a quarter of submissions are eventually published. Even when submissions arrive fairly regularly, there will be statistical fluctuations in when material of publishable quality is received. Moreover, the peer review process that is central to quality in academic publishing introduces considerable further uncertainties. Editors have to identify suitable referees, who have to accept assignments and return evaluations in a timely manner. Often there is a fair agreement between the views of different referees, allowing editors to proceed to a decision - but this is by no means always the case, so decisions on some submissions await the invitation and opinion of additional or adjudicating referees.

Research papers are seldom accepted as submitted - at least not in fields like education - and it is more common for there to be one or more cycles of revisions based upon reviewer comments. So some papers are only accepted many months after first being submitted. For print journals this creates a difficulty: how does one control costs by maintaining an approximately constant issue size, when the flow of accepted articles is uncertain and uneven. The traditional solution to this problem in some fields was a production queue that might mean an article was only published in a journal issue many months, or sometimes even several years, after being accepted. That was frustrating for authors, and counterproductive for the research field.

Immediate publication in electronic journals

This later problem can be avoided in electronic journals. *Chemistry Education Research and Practice*, for example, is a web-based journal which has four issues per year, and (because it does not have a paper copy) articles that have been accepted, copy-edited and proof-read by their authors can be included in the next issue: there is no need to defer articles because there are too many for a single issue. This may mean that some issues have more articles, and more pages than others, but

this is not a problem for an electronic journal. Indeed, although peer reviewers will tend to ask authors to cut papers that seem over-long or have unfocused sections, there is no pressure for articles to fit within a strict word limit, as each article is a self-contained pdf which may be of whatever length seems necessary to do justice to its subject matter. By contrast, a paper-based journal can only accept longer articles by including fewer articles in an issue.

Moreover, once an article has been copy-edited and the proofs approved it can be published on the web in advance of being allocated to a volume and issue. A DOI (digital object identifier) can be assigned which will remain with the article once it is later provided with volume, issue and page numbers. Given the competitive nature of academic publishing, most journals with a print edition now also publish articles electronically many months before they appear in print, and seminal papers may already be widely recognised as potentially significant before hard copy of the paper reaches print subscribers.

Authors usually much appreciate having their article published quickly after acceptance, and indeed publishers such as the Royal Society of Chemistry are now publishing on line within a few days of acceptance, using author-provided pdfs of accepted papers as an interim version whilst copy-editing and proof checking proceeds. Many of us still like to receive journal issues in a physical form, but when electronic articles can be accessed readily, and so far in advance of the print copy, print versions of journals are increasingly looking redundant.

Risks to quality control

The best electronic-only journals have the same expectations and standards as high quality traditional print journals: editorial boards and advisors who are leaders in the field, stringent peer review, and editor freedom to reject any submissions that do not demonstrate the originality and quality needed to contribute to a field. There are many new journals appearing that aspire to publish high quality material. This is challenging as authors will sensibly prefer to have their work published in the highest status journals in their field, and will often only consider a relatively unknown journal for articles not accepted by their preferred outlets. New journals therefore have to face a balance between compromising on quality and potentially not finding sufficient material to attract readers.

In some cases I have seen too much compromise on quality in the quest to attract and publish research in new journals. I found one academic publisher setting up an electronic journal where much of the administration of the peer review process was being undertaken by people with little knowledge of the field, resulting in referee reports that were not fit for purpose. Referees who had agreed to review submissions for the journal were clearly not experienced enough to recognise problems in submissions, or even to recognise when an article fell well outside the remit of the journal. The uninformed reader looking at the professional journal website would find what appeared to be a respectable peer reviewed research journal, but the academic norms of peer review were not being met. Referees are essential to journal quality, and journals need to be careful that their peer reviewers are themselves recognised scholars in the field. Yet established scholars are less likely to work (for free) for unproven new journals as these do not offer the kudos associated with high ranking journals.

Who pays for publication?

The other major challenge to academic publishing in many parts of the world is the rise of open-access publishing. Traditionally publishers charged readers for their journals. Membership subscriptions to a learned society sometimes included the costs of the journal, but otherwise

libraries and personal subscribers paid for each volume. To some extent this is an act of faith - subscribing to a journal because it is expected to continue publishing important work. Most respected journals did not charge authors for publication, because costs were covered by subscriptions.

In starting a new electronic journal the traditional model is problematic. Academic libraries, already subject to serious budgetary constraints, are unlikely to wish to subscribe to an unknown journal which has no track record and offers no print issue. Making articles available for pay-to-view is possible for new journals, just as well-established journals usually allow non-subscribers to buy single articles as downloads, but is unlikely to produce much income as most academics (the major users of the journals) access journals through institutional subscriptions and so largely rely upon the journals their library provides access to.

However, if authors are prepared to pay for publication of their papers (after proper peer review) then the material can be made available free-to-view, with the likelihood that articles will be accessed, read, and cited by readers who would not be prepared to buy the download. If an author has to choose between sending their work to two journals of similar standing, then open-access to all readers is more attractive than access limited to those who pay. Once this trend became common for new journals, well-established journals began offering open-access options, allowing authors (or more likely their institutions) to pay for any reader to be able to download a paper. It is worth noting that this development would have been impossible in relation to printed articles - the costs of printing an article and distributing it so that it could be freely accessed by any interested author would clearly be prohibitive.

There are now many new journals charging authors for publication and then offering papers 'open-access' for free download. This is a perfectly reasonable model, but universities will not commit to paying publication fees whilst also spending vast sum on library subscriptions for other journals. There is also a suspicion that authors will only pay for publication if they fail to get their work accepted in preferred (free to authors) journals. Some funding agencies and governments are now confusing the issue further by requiring that research that is publicly funded be published open-access - either in open-access journals or through free access to versions of published work in institutional repositories (which can undermine subscriptions and pay-for-view downloads for publishers).

The future of academic journal publishing

It is not yet clear how this messy situation will develop. Potentially there will be a major shift towards open-access publishing, with payment made by authors for editing/production costs, but then free access for any interested readers. Such a development makes the continuation of paper copies of journals, bought at great expense by university libraries, increasingly non-viable.

Electronic journals are certainly here to stay as they are more cost effective, more flexible, and allow very quick publication. Indeed, the relatively modest costs of web-only journals allows a third model of funding besides the free to authors/subscriber payment or publication fees/open-access alternatives. *Chemistry Education Research and Practice*, for example, does not charge authors anything for publication of articles, and yet makes all published articles available free to any reader via the internet. The journal has a sponsored mode of funding where the editorial and production costs are met by the Education Division of the Royal Society of Chemistry as part of its educational and charitable mission. This shows that a journal that is web-based with no print edition can with modest sponsorship from a learned society or educational institution maintain high editorial standards, offer free and very rapid publication to authors, and make research and scholarship freely

available to anyone with an internet connection. This model frees editorial processes from risk of taint by financial and commercial considerations, supports academics in developing countries with limited library budgets, and gives teachers at all levels access to the latest research. The sponsored mode of journal publication is very much in the spirit of the internet revolution, allowing free access, but without compromising academic standards.

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传统学术出版与电子期刊融合发展

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不过,对于电子学术期刊来说,风险就不会那么大了。电子学术期刊在编辑审核过程中的花费和纸质学术期刊相差无几,但因为无需考虑实际销售量和发行量,也没有纸张和印刷的费用,因此节约了很多成本。一旦电子版上传至网络,出版机构开放下载后,无论被下载多少次,出版机构都不需要再花钱重印,几乎可以说是“只进不出”。此外,纸质期刊每次印刷完之后,在寄存仓库、运输、邮寄等环节上无一不要花费一定的资金,但电子期刊就不存在这些问题。

除了成本上的差异之外,篇幅也是电子学术期刊和纸质学术期刊的不同之处。纸质学术期刊每期的版面有限,编辑们不得不严格控制论文的篇数和字数——这导致有些论文要等待几个月甚至一两年才能刊发,这显然会影响作者的积极性,也不利于学术研究的及时交流。

相对来说,电子学术期刊就能避

免这一问题。例如,《化学教育研究与实践》(*Chemistry Education Research and Practice*)这本完全电子化的季刊(没有纸质版本),编辑和同行评审们也常常会要求作者对论文进行删减,但却对字数没有特定的要求;这本期刊每一期的分量都不相同。而纸质学术期刊如果想要刊登长篇文章的话,必须减少当期的论文数量,或是将长篇文章分成几期连载。

现在,一些纸质学术期刊开始借鉴电子学术期刊,把定于在未来发表的论文提前传上网,同时注明将在何时刊发。这一创新一方面鼓励了作者,弥补其论文不能在纸质期刊上及时刊发的遗憾,另一方面也使得作者的研究成果能够得到及时传播。

开放获取 学术期刊发展的一种新形式

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不过,如果有两份质量相当的学术期刊摆在作者面前,一份不向他收取任何费用,但是读者需要花钱购买才能进行阅读;另一份向他收取一些费用,但读者不用花钱就能读到,并且能够引用其观点。以上要二选一的话,后者,也就是开放获取,对许多学者来说更有吸引力;因为这意味着他的观点能够被更多的人读到,并有可能被更多的论文引

用,影响力可能更大。

现在,有很多创刊历史不久的新期刊正在采取这一方式。虽然人们对开放获取期刊的论文质量仍然存在一些质疑,比如有人认为,只有那些被传统期刊拒稿的作者才会将论文再投给这些开放获取的期刊。但是,开放获取的推广也是大势所趋,在这一背景之下,订阅数有限的纸质学术期刊的未来会受到更大冲击。而电子学术期刊受到的冲击则并不大,因为它们的编排方式和出版周期更为灵活,而成本只有那些传统纸质学术期刊的三分之一。

对于期刊来说,在坚持读者付费的传统和作者付费的开放获取之间,其实还有第三条路可供选择。以《化学教育研究与实践》为例,这份电子学术期刊不向作者收费,也不向读者收费,所有人都能在网上免费阅读——编辑出版的所有费用都由英国皇家化学学会教育组赞助。这为很多学术期刊的发展提供了借鉴;学术期刊电子化之后,成本大大降低,从而使得向所在学科的学会组织或是教育科研部门请求资金支持成为可能,一旦采取这样的运营模式,一方面使得学者们能够免费、快速地刊登最新研究成果,另一方面读者们也能够享受免费的学术资源,这无疑会大大促进研究成果的有效传播和学术的进步。这种接受赞助的开放获取模式很好地体现了互联网的共享精神,同时也能够保证学术期刊的水准。此外,这一模式还能降低出版机构的资金风险,科研预算资金短缺的贫困国家和地区也能共享最新的科研进展。

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