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Introduction

To paraphrase Confucius, if we are to define the future, we must first study the past. So, before we start looking forward, let us briefly look back at the last two centuries or so to the birth of publishing as we know it, in the early 1800s.

Although publishing has been around since the fifteenth century, when Johannes Gutenberg invented the first printing press, publishing technology only changed radically in the early nineteenth century, with the invention of wood pulp based paper and the mechanical press. These innovations led to a dramatic drop in unit cost, which enabled publishers to launch newspapers and magazines, and to produce books much more cheaply.

Then, as now, this drop in unit cost stimulated a search for new pricing models. For example, some newspapers started charging book publishers and theatre managers for favourable reviews – or even for unfavourable reviews of rivals' work! It was only when the market matured, and the reader-pays pricing model was introduced, that the editorial independence of the journalist was established and the new profession of journalism flourished. Two hundred years or so later, as a result of another period of radical changes in publishing technology (this time, the move to online), there are now predictions of the end of professional journalism because, to quote Emily Bell, Editor-in-Chief of *Guardian Unlimited*: 'We're all reporters in the digital democracy.'¹

However, for scholarly journals the situation is different. For one thing, our authors have always been our readers. In addition, unlike the newspaper industry – and the music industry, with which it is also sometimes compared – journal publishing to date has actually become stronger through digitization and the Internet. This is largely

Scholarly journal publishing: where do we go from here?

Robert CAMPBELL and
Alice MEADOWS

John Wiley & Sons

The digitization of journal content and its availability online has revolutionized journal publishing in recent years, resulting in both opportunities and challenges for traditional journal publishers. The explosion of data and the emergence of new players such as Google, new business models like Open Access, and new content consumers and producers, for example, China are significantly changing the face of journal publishing. It is not yet clear what the impact of these changes will be but by continuing to collaborate with our existing stakeholders and building partnerships with these newcomers, as well as by maintaining and promoting the quality of our content, we can ensure our future growth and success.



Bob Campbell

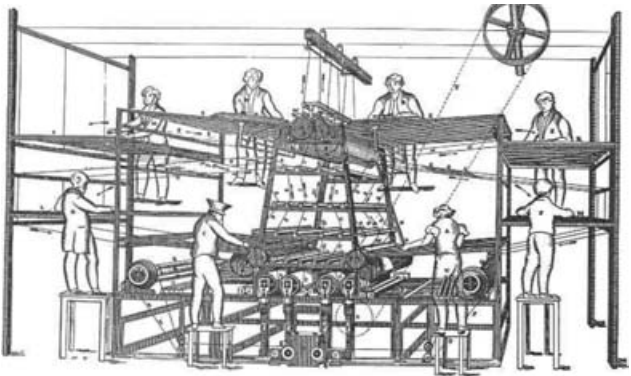


Alice Meadows

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Figure 1. Printing
The Times, steam
press installed in
1814

Reproduced from *The
Design of Books* by
A. Wilson, Peregrine
Smith, Inc., 1974.



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due to the fact that the main market for scholarly and scientific journals is institutional, rather than personal – and that the institutions (faculty, librarians, and researchers) have historically worked in partnership with publishers. So, while publishers have benefited from maintaining market share – and indeed vastly increasing access – by digitizing the whole publishing process, libraries and their customers have, in turn, benefited from the resulting expanded availability and faster publication of journals. Librarians in the United States expect in five years to essentially complete the transition to electronic formats for journals.²

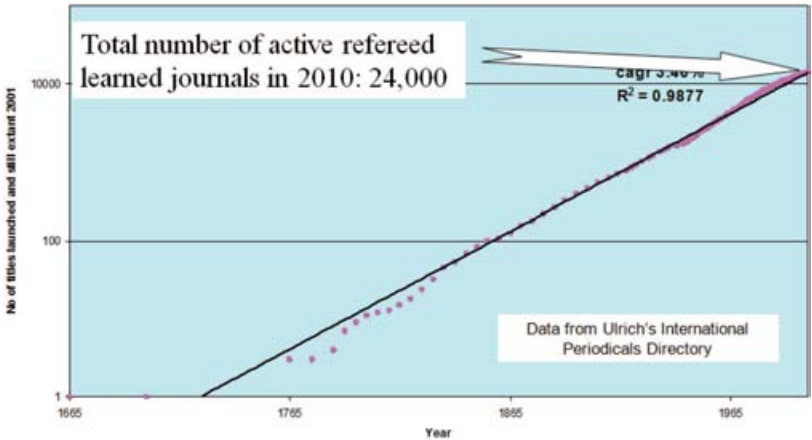
Yet despite the success of journal publishing in the digital world up to now, online availability brings challenges and threats to the industry, as well as opportunities. Some of these are not new, but are taking on different forms online; copyright infringement, for example, has been a problem for most of the last two centuries. Other threats come from new players, such as Google. Perhaps

the single biggest challenge to the established model is the staggering increase in data generated by researchers that is now being powered by new technology and e-science.

Michael Mabe, Chief Executive Officer of the International STM Association and a leading thinker on the future of journals, has shown that journals growth has increased consistently at around 3–4% per annum for centuries and that this directly relates to the growth in the number of researchers and in R&D funding.³ Data generation began to increase in the 1960s, with the start of ‘big science’ and the introduction of the first computers. It has been increasing exponentially since the early twenty-first century and, today, the annual production of data is climbing rapidly off the scale, with the associated growth in analysis and publication of this analysis lagging far behind. Mabe also argues that the basic functions of a research journal – first described by Henry Oldenburg as registration, certification, dissemination,

Figure 2. Number
and growth of
journals.

Source: M.A. Mabe
(originally published in
Serials 16(2) and
updated 2010)



and archiving – plus, perhaps, bibliometrics – will remain much the same, but that the *means* of publishing journals, including pricing and technology, will continue to evolve.

It is certainly true that there seems to be an inherent conservatism in scholarly communication. This has been demonstrated in several recent studies, including one published by the Research Information Network (RIN), which concluded that: '[F]or most researchers the established channels of information exchange work well; and, critically, they are entrenched within the systems for evaluating and rewarding researchers for their work.'⁴ Similarly, a 2010 report from the Center for Studies in Higher Education, UC Berkeley finds: 'These traditions, which rely heavily on various forms of peer review, may override the perceived "opportunities" afforded by new techniques, including those falling into the Web 2.0 category.'⁵ And an Ithaka study by Schonfield and Housewright actually suggests a decline in the enthusiasm for open access (OA) since 2003; Figure 3 shows the percentage of faculty responding 'very important' in answer to the question: 'When it comes to influencing your decisions about journals in which to publish an article of yours, how important is each of the following characteristics?'⁶

So, what does this all mean for the future of scholarly journal publishing? Who are – or will be – the other players in this brave new world of data proliferation? What new business models are emerging? What are the opportunities for collaboration? And how can we maximize the opportunities and minimize the threats to the scholarly communication industry?

Search engines

Search engines are clearly already entrenched in our space, and the elephant in that particular room is, of course, Google. In book publishing, we have already seen the threat of their mass digitization programme. For journals, as Stephanie Taylor⁷ has pointed out, many students already think of library services as 'an add-on to the Google Scholar service'. José van Dyck⁸ argues that

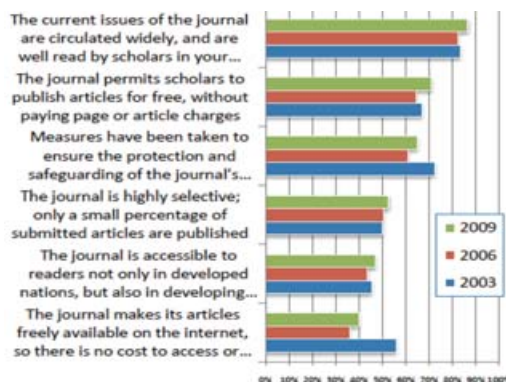


Figure 3. From faculty survey of key strategic insights for libraries, publishers and societies by Schonfeld and Housewright.

search engines have become dominant instruments in the production of knowledge, with the search engine ranking criteria distorting a system which should be benefiting from greater access than ever. He also points out that queries tend to reward sources already cited above sources that are less well connected, i.e. the rich-get-richer – the so-called 'Matthew effect'. And James Evans⁹ suggests that, paradoxically, online search based on the Google Scholar ranking system, for example, actually accelerates consensus and narrows the range of findings and ideas revealed. So are we, as publishers, working to achieve universal access to more content than ever before, only for search engines to put the whole process in reverse by funnelling the researcher to the heavily cited sources?

The dominance of search engines will not stop there; as they become increasingly powerful players in scholarly communication, they are also starting to develop business plans based on their market position. For example, David Lipman, speaking at the Berlin7 meeting in Paris (December 2009), suggested that groups of academics could use Google or other open-source systems to produce a journal, which could be hosted by PubMed Central (PMC) and available free online, with discovery powered by the Google search engine. In such a scenario, the traditional publisher would be bypassed; it is yet to be seen whether there are opportunities for collaboration between such publishers and the search engines.

Repositories and open access

Another concern is the use of repositories

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*a conflation of
'research
results' and
post-peer-
reviewed
articles*

(subject or institutional) that make journal content available without a viable business model. For example, 'green' OA, whereby authors publish in a journal and then self-archive either in their own institutional repository or in another OA website, is unpaid access to publisher or society content and, therefore, unsustainable. 'Gold' OA, in which authors pay to publish in a journal that then provides immediate access to all articles, is considered sustainable by publishers, as is a third option, hybrid OA, where authors pay to have their article made available immediately on publication in an otherwise subscription-based journal.

Policy-makers are likely to be influenced by a major study commissioned by a group of organisations in the UK, led by RIN, and published recently.¹⁰ It concluded that, where an infrastructure of repositories has been built, as is in train in the UK, 'green' OA offers a cost-effective means of increasing access – however, it comes with risks to the current scholarly publishing system, and may not be self-sustaining. So, although 'gold' OA involves higher transition costs, it is preferable in the long run, given its underlying economic stability.

Even so, these conclusions are based on some questionable assumptions. The cost of creating, maintaining and developing a network of repositories run to the standard required to link to publishing and data sets does not appear to be fully understood and the cost of transition to 'Gold' OA is based on what might not be sustainable charges for the value added by publishers.

Although the number of OA journals is still relatively small, it is now increasing – underpinned by political pressure – due to a growing belief that research results should be accessible to everyone, and a conflation of 'research results' and post-peer-reviewed articles. As a result, some funding agencies and universities are beginning to expect that the published results of research which they support should be more widely and readily available.

Lipman's proposed model above is based on the most comprehensive and heavily funded subject repository (SR), PubMed Central (PMC), a US platform, which grew out of the 2008 US National Institutes of

Health mandate requiring that 'all articles arising from NIH funds must be submitted to PubMed Central upon acceptance for publication'. PMC already has international ambitions in the shape of a UK partner site (largely funded by the Wellcome Trust) that is evolving to become a European site. Other SRs and institutional repositories (IRs) are likely to emerge, although, in the current climate of budget cutbacks, their progress may be somewhat curtailed.

Two potential repository models currently exist. First, the 'overlay model', which Houghton makes much of in his contentious JISC-funded report.¹¹ The basic idea here is that repositories take over the journal publishing process by arranging peer review of the articles posted by faculty. At present, this seems extremely unlikely to happen.

Under the second model, as repositories build up significant archives (at this stage only achieved by PMC and its mirror sites), there is a risk that some usage will migrate from publishers' sites to these free access sites, aided by search engines such as Google which favour the free access version. However, much of the content will, of course, be the submitted or accepted versions rather than the Version of Record (VoR) hosted on publishers' sites. It is, therefore, imperative that we continue to invest in making the VoR more attractive to the user, through a combination of enhancing the content (via linking, comments, mining, etc.) and by implementing CrossMark¹² when launched.

Like search engines, repositories are probably here to stay in one form or another. However, there may be more opportunities – and necessity – for librarians and information scientists to work with publishers (e.g. via licensing) in order for IRs to succeed, as Laurent Romary (Director of Scientific Information at CNRS) recently concluded, based on his experience with the PEER Project, which is examining self-archiving and its impact (ALPSP Annual Conference 2010).

The Open Researcher and Contributor ID (ORCID) initiative¹³ could provide both publishers and libraries with a valuable solution to some of the key challenges of repositories. This author disambiguation tool will help universities to track research pub-

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lished by their faculty, while publishers will welcome the fact that users of IRs will be directed to the Version of Record.

Copyright

Repositories are, of course, also of concern to scholarly publishers from a copyright perspective; at Wiley-Blackwell, we have coined the term 'grey OA' as shorthand for articles posted in repositories by authors and institutions in violation of relevant copyright agreements.

In addition, scholarly publishers, along with educational publishers, continue to face occasional threats under what is known as 'exceptions and limitations'. This is the area of copyright law where certain infringements of copyrighted works, such as educational and research uses, are permitted. The challenge for scholarly publishers is that we create products exclusively for the educational and research markets, so these exceptions may directly affect our businesses. A recent example was Bill C-32 in Canada, which sought to create a broad exception under Canadian copyright law for 'Fair Dealing for the Purposes of Education', but failed to make any accommodation for those publishers who directly invest in publications for these markets.¹⁴ While such a law might not withstand a formal challenge under international legal conventions, such challenges are slow and, once lost, these markets are very hard to recover.

Strong copyright laws, along with laws

protecting free speech, are the legal foundation upon which most scholarly publishing financial models are based. The good news is that there are few serious legislative challenges to copyright laws in major markets. Likewise, most courts continue to uphold copyright laws when challenged. However, the challenges of enforcing existing laws in an increasingly disintermediated universe, and of avoiding exceptions and limitations in copyright legislation, are not insignificant.

The Creative Commons (CC) movement is a decade-old attempt to move from copyright's 'All rights reserved' approach to 'Some rights reserved', via the use of six possible licences that vary from the least restrictive (where crediting the original author is sufficient) to the most restrictive (which limits reuse to non-commercial purposes and does not allow derivative works to be made) – but even the most restrictive CC licence still allows full non-commercial redistribution of content. CC licences are likely to continue as a feature of OA business models.¹⁵

Global balance

In an increasingly global economy, a number of new countries are becoming significant players in the world of scholarly communications, both as producers and consumers of content – Brazil, China, India, and South Korea, to name but a few.

In particular, no discussion about the future of scholarly communications – or of

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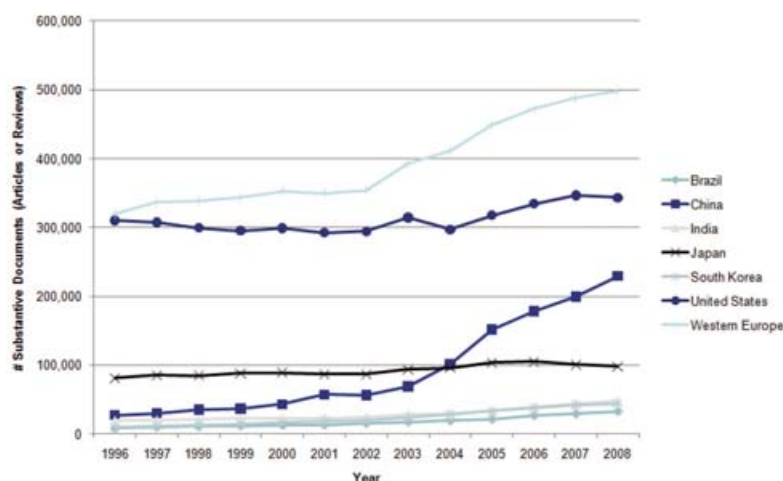


Figure 4. Substantive documents published per year, 1996–2008

Based on data from the Journal Citation Report (Thomson Reuters).

with the high level of state control in China, such changes could be implemented relatively quickly

data proliferation – can exclude China, given the speed at which it is growing as a source of papers. (In 2010, Chinese contributions ranked second only to the US in volume across the Wiley-Blackwell journal list; just 10 years ago, they did not even make the top 20.) And, as China’s economy grows, it will inevitably play an even more important role in determining our future.

Currently the Chinese academic community appears to be fairly cautious about new publishing models, although the Chinese Academy of Sciences (CAS) recently announced its support for OA policies and the promotion of innovation in scholarly communication. ‘The Chinese Academy of Sciences has an ethical responsibility to make the information produced by its researchers available to the public, which is paying for the research’, said LI Jinghai, the CAS Vice-President, at the Berlin8 Open Access Conference Beijing.¹⁶ A platform for OA journals (CAS-OAJ) and the development of an IR grid were both launched at the same conference. There is also likely to be a restructuring of China’s journals publishing (currently around 8,000 titles), with a small number of large organisations emerging that have the potential to become global players. With the high level of state control in China, such changes could be implemented relatively quickly. There is clearly concern about the outflow of papers (incentivized by payments to authors based on the impact factor) which is thought to have hindered the development of Chinese journals.¹⁷

As with repositories, China presents an opportunity for publishers, as well as a threat – both as a consumer and a provider of content. Many publishers are already collaborating with individuals and organizations in

China and this will only increase as the country grows in influence and power.

Social media and peer review

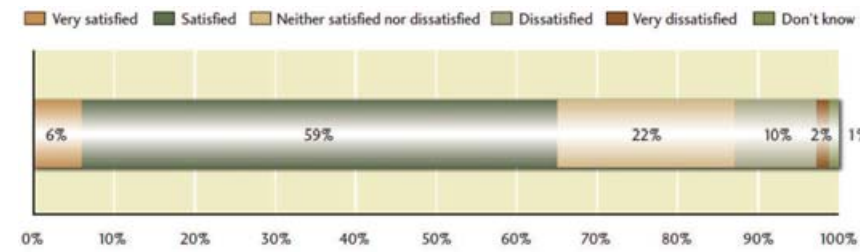
Social networking, which is rapidly becoming an important form of communication for researchers, offers tremendous opportunities for scholarly publishers. Peer review is one area of potential use where social media tools could usefully complement the current system. However, there could also be a possible conflict with the current high standards in peer review; for example, an author might choose to post a paper on a collaborative site, where an entire peer group can get immediate access and review the article, rather than waiting for peer review.

It seems unlikely that this will happen in the near future, not least because, according to two recent studies, researchers still value peer review and the other related services that publishers provide. A PRC survey¹⁸ found that only 12% of respondents were dissatisfied with the current peer-review system, while in 2009 Sense about Science¹⁹ found that 69% were ‘very satisfied’ or ‘satisfied’ with peer review (interestingly, up from 65% in a 2007). Conversely, although respondents to the PRC survey saw post-publication review as a useful supplement (53%), only 19% rated it as a powerful alternative.

Traditional peer review also plays a strong role in making papers better. For example, the PRC survey found that, out of an average 49% of papers accepted, only 8% were accepted without revision – and subsequent improvements were not only to the presentation and readability but also to the science.

The RIN study cited above also found that researchers still place the highest value

Figure 5. Overall satisfaction with the peer review system used by scholarly journals.
Source: M. Ware, Peer Review: Benefits, Perceptions and Alternatives.



on well-established channels of communication, which ensure both recognition and career rewards from that recognition. For example, although about half the respondents share their work with colleagues, only 5% publish their outputs and their 'work in progress' openly. In addition, only 13% of respondents use Web 2.0 tools and file-sharing services frequently, and 39% are not currently using them at all; interestingly, there was slightly higher usage amongst older age groups and those in senior positions. Respondents were also concerned about the lack of formal peer review, and researchers expressed caution about sharing results when no standardized way to formally attribute authorship has emerged.

A recent survey by CIBER²⁰ produced more positive conclusions on the role of social media, finding serious application at all points of the research life cycle. As has been pointed out by Phil Davis and David Crotty in *The Scholarly Kitchen*,²¹ however, such surveys, are subject to sampling bias, basically reporting on the behaviour of a self-identified group of social media enthusiasts.

The three most popular social media tools in a research setting are those for collaborative authoring, conferencing, and scheduling meetings. These all seem to complement, rather than compete with, journal publishing. Researchers are largely using generic tools but perhaps there will be a market for simple bespoke tools.²²

Although traditional peer review is likely to remain as a basic function of primary publication there is no room for complacency. Peer review is truly a massive effort; as

Adrian Mulligan (Elsevier) pointed out at the 2011 Academic Publishing in Europe (APE) conference, 1.4 m. articles were published in peer-reviewed journals in 2009 – that's about one every 22 seconds, and each peer review takes 2–4 hours. But despite some publicly expressed concerns about the so-called 'crisis' in peer review, to date this appears to be speculation rather than fact. For example, although Harley and Krzys recently claimed that a stressed-out peer-review system is allowing over-publication and a decline in standards, they provided no proof that this is actually the case.²³ On the contrary, at Wiley we handled 12% more submissions in 2010 using online peer-review management systems. In addition, Vines *et al.*²⁴ recently analysed data on the number of requests required to obtain a review, the number of submissions, and the number of unique reviewer names; they found that the reviewer pool expanded in proportion to the increased submission rate and that there was no increase in the average number of reviews by individual reviewers. Just as a growing community of researchers generates more articles, so they provide more reviewers; the claimed increase in publications per researcher and the claimed increasing burden on reviewers are both fallacies.

Publishing ethics

Partly as a response to the anarchic nature of social media, publishing ethics are being taken increasingly seriously. The moral agenda will certainly be a feature of future development, as stressed by Richard Horton, Editor of *The Lancet*, who sees it as even more important than technological develop-

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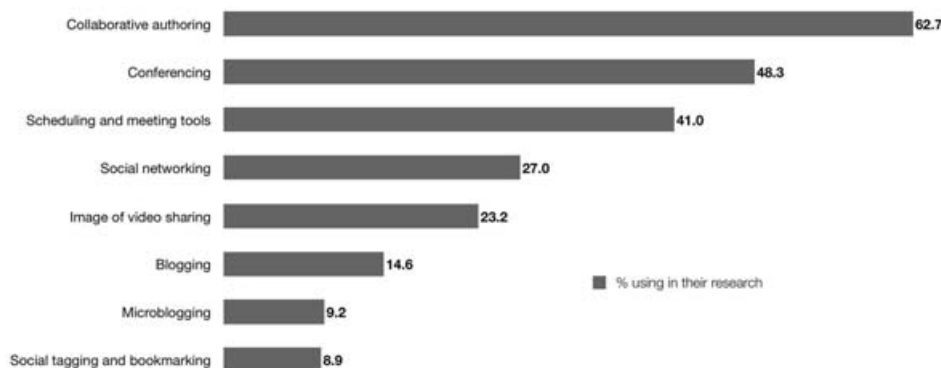


Figure 6. Popularity of various types of social media in research. Active social media users: percentages using each category of tool. Source: Social Media and Research Workflow (CIBER University College London and Emerald Publishing).

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ment (2010 ALPSP annual conference). Publishers are therefore investing more in quality; integrity of data; detecting and dealing with plagiarism; and implementing guidelines on conflicts of interest and the correct acknowledgement of authorship. The role of the Committee on Publication Ethics (COPE)²⁵ has been crucial, with its influence spreading from its base in medicine²⁶ to facilitate good practice across all disciplines. The recent launch of Cross-Check²⁷ by CrossRef as a tool to help combat plagiarism is another important development.

Diane Scott-Lichter²⁸ has drawn an interesting analogy with cancer where identifying and addressing the causes can prevent it in the first place. She suggests that the prevention of, and screening for, ethical matters can similarly reduce the real and intangible costs associated with unethical practices. She calls for all participants in the scholarly enterprise to take preventive measures by educating their communities about the best ethical practices and concepts in research and its communication.

These higher ethical standards will help

set the VoR apart from other forms of communication between researchers which, as we have seen, will be vital in future.

Changing technology

With most journals now available online, and the resulting increase in online subscriptions and decline in print, future technology changes are likely to focus primarily on making digital content even more accessible, especially through handheld devices, including tablets such as the iPad.

As many as 59% of all adults globally are now mobile Internet users and, as this becomes the norm, mobile phones and other handheld devices are increasingly taking on functions once served by desktop and laptop computers. However, although there are clear benefits for users, there are a number of challenges for publishers and other content providers. For example, none of the three main mobile platforms – iPhone, Blackberry, and Android OS – uses the same operating system. With each platform currently accounting for around 30% of mobile usage, it is impossible to predict which, if

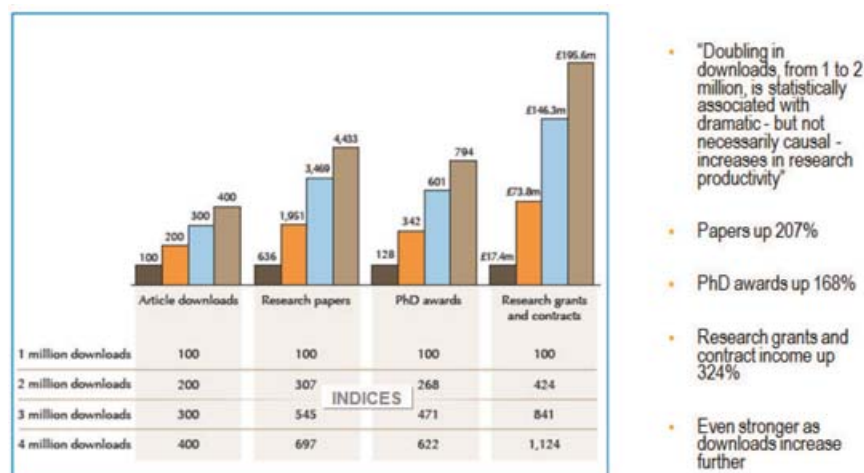


Figure 7. E-journals, their use, value and impact

Source: RIN/Ciber.

any, will dominate the market in future, leaving publishers and developers with the risk of either specializing or over-investing.

Nevertheless, while we cannot know what the handheld devices of the future will look like, nor their functionality, we can be certain that publishers and developers, working together, 'will find ingenious ways of bringing together information from different sources to deliver cost efficiencies and better outcomes'²⁹ in the years to come.

Business models

Just as a drop in unit cost – and the resulting increase in circulation – stimulated ideas for new ways of charging in the early nineteenth century, so we have seen innovations in business models following the digitization and online delivery of journals, which together have made scholarly publications more widely available than ever before.

The 'Big Deal', which powered us through the move to online, emerged in 1996 in the UK, partly as a result of the strong relationship between publishers and libraries. The Higher Education Funding Council's pilot funding scheme aimed to maintain access to high-quality peer-reviewed journals in the face of rising print-on-paper costs and cancellations, and to reduce the unit cost of information. The Big Deal is really the polar opposite of the Deep Dyve/micropayment approach (see below) – it works best with large organizations seeking to provide peer-reviewed content to their members,

apparently free at the point of use, i.e. not restricting their use of the primary literature.

Today, the Big Deal is almost ubiquitous, though it is not without its detractors; it will undoubtedly continue in some form, though it will also continue to evolve. For example, usage data are becoming an increasingly important element in library purchasing decisions, and hence in their negotiations with publishers. As noted above, the free access versions on repositories pose a threat here; PMC is already having an impact on publishers' usage data in biomedicine. The PIRUS2 project,³⁰ which aims to create a common standard for measuring online usage on publisher, aggregator and repository platforms, should be helpful.

The music industry has pioneered micropayments and this may also be part of our way forward. Deep Dyve³¹ has recently emerged as an article-rental option and, although their business model is primarily based on selling to individuals, there may well be scope for this sort of micropayment

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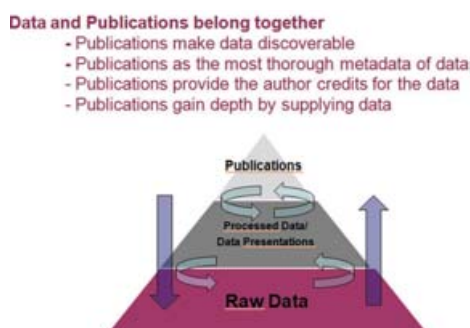


Figure 8. From Eefke Smit's presentation at the 2011 APE conference, reproduced here with her kind permission.

Dylla recently described the current policy for US publicly funded scientific data as muddled, with the muddle continuing

system for small consultancies and for small and medium-sized enterprises. However, we should bear in mind the conclusion from the PRC study by Carol Tenopir and colleagues: '[O]nline access with a direct personal cost to the reader was rated as strongly negative; such a pricing model significantly reduces value to the user and thus likelihood of use.'³²

Publishers, researchers, and libraries – the way ahead

Both publishers and their institutional customers have benefited from the move to online – as noted above, support for the Big Deal from librarians has been critical to our success, and the academic community has benefited from faster publication and wider access. Provided this relationship between publishers and institutions holds – and Richard Horton (2010 ALPSP annual conference) has rightly urged us to see universities as partners, not customers – then universities will continue to invest in providing the optimal research environment. The payback has been shown clearly in a RIN/Ciber Study,³³ which showed that increases in downloads are associated with an increase in research productivity.

Building such partnerships will be important both in maintaining the Big Deal going forward and in meeting the huge challenge of curating data for access and sharing. The Scholarly Publishing Roundtable was set up by the White House Office of Science and Technology (OSTP) on the premise that the academic community, libraries, and publishers are traditionally partners and that they should return to this tradition in order to solve the public access question. Partly as a result of this group's efforts, the America Competes Act now calls for a 'working group' to develop standards for research data and full-text metadata, and to work with international science and technology counterparts to develop tools that maximize interoperability.

But there is certainly more to be done. Fred Dylla of the American Institute of Physics, also speaking at the 2011 APE conference, recently described the current policy for US publicly funded scientific data

as muddled, with the muddle continuing: different rules for each department, policies varying by funder, type of research, university and discipline. Eefke Smit of the International Association of STM Publishers has reported a similar muddle amongst publishers.³⁴ For example, in the Parse Insight 2009 survey,³⁵ 71% of the larger publishers stated that authors can submit their underlying digital research data, yet 69% of the larger publishers said that they have no preservation arrangements for digital research data.

Smit and others at recent meetings have also drawn attention to the four science paradigms proposed by Jim Gray of Microsoft:

1. Thousands of years ago: science was empirical, describing natural phenomena.
2. Last few hundred years: it was theoretical, using models and generalizations.
3. Last few decades: it has been computational, simulating complex phenomena.
4. Today: it is all about data exploration, unifying theory + experiment + simulation.

Our current era of 'data exploration' should be a tremendous opportunity for publishers over the next decade. As Smit has outlined, 'data and publications belong together' because publications: make data discoverable; are the most thorough metadata of data; provide the author/researcher credits for the data; and gain depth by supplying data.

Conclusions

Unlike the music and newspaper industries, which sell primarily to individuals, journal publishing has become stronger through digitization and the Internet.

The basic functions of the journal – including peer review – although enhanced through new technology – have remained in place, and several surveys of the academic community's attitude to change have revealed a reluctance to rely on new models for publication.

Challenges include finding a balance between publishers and repositories (probably more difficult with SRs since they more directly compete with publishers' platforms); developing appropriate pricing models to

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underpin wider access through a variety of devices; creating a system of identifiers for authors (e.g. via the ORCID initiative); achieving a synergistic relationship with search engines and social media; and ensuring that the VoR is the dominant version in scholarly communication, since our future will depend on the value and integrity of our content.

Last, but definitely not least, any vision for the future must be based on a productive partnership with other stakeholders. Together we have to face the challenge of curating data in support of journal content and of making it accessible for sharing.

Acknowledgements

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any vision for the future must be based on a productive partnership with other stakeholders