Evolution or revolution? Publishers' perceptions of future directions in research communications and the publisher role

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Contents

Executive summary

Introduction

1. This report presents a snapshot of the views of a wide range of publishers, covering their perceptions of future directions in research communications, scholarly publishing and the role of publishers. It is important to emphasise that there is not a single "publishers' view" on these matters: the publishers represented here are of differing scale, ownership, (dominant) business model, discipline, and tradition, and their views reflect that diversity of experience.
2. Nearly 20 publishers of different types and scale were interviewed: for-profit and not-for-profit; open access and subscription-based; commercial, society, university presses; and with representation from all scholarly fields. We aimed to synthesise the views thus gathered, while reflecting the diversity of opinion where salient.

Future directions in scholarly publishing

3. The most important factors driving change in scholarly publishing were seen as the continuing digital transition; funder policies; growing pressures for openness (open science, not just open access for articles); and changing researcher attitudes and habits. Also among the more important factors was the growth in R&D outputs, especially in relation to the strains it placed on institutional budgets.
4. Other change factors included lower barriers to entry facilitated by the digital transition; the increasingly important role for research data in the research and publishing ecosystem; the growing importance of authors; budget strains; economies of scale; and globalisation of research.
5. Given that research and research communication make up a complex ecosystem, coupled with the wide range in factors acting on it, and the (poorly understood) interactions among them, it is very hard (if not fundamentally impossible) to predict the future shape of scholarly publishing. Any such forecasts have to take account of changes within both the research system and the publishing market.
6. Accepting that caveat, the large majority of publishers nonetheless anticipate the system evolving (not necessarily slowly), rather than being radically disrupted. Indeed, given the importance of publishing to research, this should be a goal.
7. In particular, the core functions of the journal (registration; certification, i.e. quality assurance; dissemination; and archival record) remain important to researchers and to the research community more widely. Something like the journal will therefore continue, even though the ways these functions are delivered may evolve, and some new functions may be added.
8. Open access (and open science more broadly) is a key nexus for change. There is strong momentum for increased openness, but given the challenges it faces, all agree that there will be a "mixed economy" of open access and subscription journals for the foreseeable future, which has implications for costs and policy.
9. The publishing market has become more competitive, and this will continue. Gold open access is an inherently more competitive model, and lower barriers to entry have encouraged new entrants. New kinds of service will be offered by new entrants (e.g. scholarly communication networks like ResearchGate), and there is global competition from technology and service providers (e.g. Google).
10. Economies of scale have always been important but this factor is increasing in importance, for both subscription and open access publishing. The consequence is likely to be increased consolidation, through publishing mergers or perhaps

through the growth of a few large megajournals displacing smaller journals (though other factors may dominate here).

11. These anticipated trends create a series of challenges for publishers and other stakeholders. Perhaps foremost among these is managing the transition to open research. This will be a multi-dimensional transition, involving business models, funding arrangements, researcher attitudes and habits, and technology innovation, superimposed on new ways of doing research itself. It includes accelerating the shift to open access, but also addresses open data, open source software, open people networks, tools, and new ways of doing and communicating research. Such a complex transition inevitably comes with risks. A key challenge for managing it will be the need for simultaneous and coordinated action on the part of stakeholders.
12. Part of the response to this challenge will be a major and sustained programme of infrastructure development to support this transition, some of it developed by individual publishers, some by publishing industry collaboration, some by the research community, and some by multi-stakeholder collaborations. Clearly this will present its own challenges.
13. Publishers face the challenge of managing increased and more diverse competition, as outlined above. They also see increased competition for usage from Green open access as solutions become more centralised and/or sophisticated in terms of discoverability. They will also face increased competition for skilled staff, particularly in technology areas.
14. Managing growth has been and will continue to be a challenge for the system. For publishers, the challenge is less about the scale of growth itself than about the challenges it creates for other stakeholders, in particular for the challenge it poses to the funding of research communication, and the budgetary strains thus created.
15. A fundamental challenge for all stakeholders is that sustainable ways have to be found to meet these challenges – the transition to open research, infrastructure development, growth, etc. – against a background of constrained budgets.
16. A recurring theme in relation to these challenges and to others later described was the opportunity and need for collaboration among stakeholders, and specifically between publishers and funders.
17. Publishers described a wide range of disciplinary differences, primarily relating to implementation of open access, to peer review, or to the nature or timing of the digital transition within the discipline (or to some combination of these). These differences are important to policy-making, especially for open access: policy should not be determined by precedents from biomedicine, which was referred to as an outlier in terms of practice, compared not just to the humanities and social sciences but also to the physical sciences and other STEM disciplines.
18. Turning to peer review, there was widespread shared belief that it is of central importance to scholarly communication, and that it remains strongly valued by the research community. Peer review is central to the notion of what a journal is, not an optional extra.
19. Peer review clearly faces challenges and pressures, which will be familiar to anyone following this debate, but publishers were divided as to the extent and criticality of the challenge. Many saw the challenges as real issues, but ones that could be managed, but there may be greater frustrations and sense of urgency in the biomedical and life sciences.
20. Peer review thus needs to evolve: there are no "magic bullets", but a mix of improvements and initiatives will be required, and there will be (and should be) a

diverse range of practices and options. Pre-publication editorial review must be retained for journals (this is not to say that there is not a place for preprints), but it seems likely that the "soundness not significance" model will play a greater role (though not in all disciplines). The rigour of peer review also needs to be improved (for instance to help address the issues of reproducibility), which may increase its costs. There is also pressure to make review a more constructive process for authors, limiting the scope of reviewers to make unreasonable requests and the number of rounds of revision allowed, though again these issues seem most pressing in the life sciences. Other approaches with a part to play include internal triage, and cascade and portable review[1].

21. Publishers will also continue to experiment with different approaches to review, testing the merits of single-blind vs double-blind vs open review (see *§Glossary*), for instance. Somewhat paradoxically, there are pressures in the community for increasing both double-blind and open review. There will also be a growing role for post-publication review, or perhaps post-publication quality assurance might be a better term, since it includes a range of approaches (e.g. metrics) as well as review.

Role of publishers

22. Publishers emphasise that their role needs to be seen from a systems viewpoint: a large part of publisher added value derives primarily not from individual activities but from organising, managing, funding and sustaining the whole publication process and infrastructure.
23. Within this framework, managing peer review is pre-eminent among the specific activities. There is a need for a neutral third party. Publishers do not just administer peer review: they create and support the system that makes it possible, including the development and maintenance of journal brands that attract editors and reviewers.
24. There is a long list of further publishing activities (described briefly in the report): editorial, technology and platforms, dissemination and discovery, marketing and promotion, customer services, production services, quality assurance, archiving and long-term preservation, and administrative, overhead and financing. Publishers feel some frustration that they have not better communicated the extent of their role to the research community.
25. Funding and sustaining the system is also part of the publisher role: making a surplus or profit is part of the value that publishers bring to the system, by enabling it to be sustainable. This is as true of not-for-profit open access publishers as for large corporates.

Role of open access, subscriptions and other business models

26. The debate has clearly moved on from *whether to adopt* open access to *how to implement* open access as a publishing business model. There is widespread recognition of the advantages of open access, and the part these have in addressing the challenges posed above, but the challenges of implementation are substantial.
27. The key advantages of Gold open access are that it can *in principle* scale with research outputs, though this is not automatic (it depends on the will and ability of funders and institutions to make funding available to authors); lower barriers to entry, fostering competition and innovation; improved cross-disciplinary discovery and use; and simplified re-use.

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[1] See *§Glossary* for an explanation of these and other possibly unfamiliar terms and acronyms

28. The main challenge for Gold open access is funding the transition to Gold. Related to this is the question of efficiency of the APC model for institutions. There are also issues around disciplinary differences, including licensing choices.
29. Publishers (perhaps excluding the pure open access ones) also see advantages for the subscription model: it spreads costs over a wider base, rather than concentrating on fewer research-intensive institutions; it accesses a range of funding sources; it is better suited (than APCs) to fields with low research funding; it works better for high rejection-rate journals, especially if they contain significant non-research content; and it may be better suited to the outputs of commercial R&D.
30. As with open access, a key challenge for the subscription model is funding the continuing growth in research outputs. The model also has to be reconciled with policy requirements for public and open access; and it needs to demonstrate its ability to deliver on the open science agenda.

Business model improvements and alternatives

31. There was consensus that the APC is still the best available model for open access journals, despite issues that need addressing. There were some reservations expressed, however, as to how sustainable the model would be over the long term, and some sense that it was likely to turn out to be a transitional or perhaps suboptimal approach. The key issue was whether funding could be scaled up to the majority of the literature for the APC model in its current form.
32. All stakeholders acknowledge the need to improve efficiency in the payment mechanisms. A lot of experimentation and work is already under way—including institutional accounts, membership and prepayment schemes; offsetting and bundling; third-party services; and standards and metadata development—but there is scope and willingness to collaborate on further improvements.
33. The particular challenge for open access for high rejection-rate journals was acknowledged but no new solutions offered. Changing reward and career incentives to reduce demand for high Impact Factor publication might help but this is a big issue.
34. The theoretical advantages of submission fees (including for high rejection-rate journals) was acknowledged, but the consensus is that they would not work in practice. This was partly because publishers fear introducing them would simply drive authors to the competitors, and partly because adding complexity to payment systems would be unattractive to institutions and funders. They are also unattractive to some funders because they can be seen as payment for non-publication.
35. So-called offsetting models at the institutional level (as opposed to offsetting open access charges against the global subscription price) are in effect a form of bundling of subscription and open access charges. Such bundling clearly offers both an increase in efficiency and a way for institutional buyers to manage their total costs, but there are concerns from both subscription and open access publishers. It lacks a logical basis in that the charges are for unrelated services; it is not scalable—recent deals will raise expectations that cannot be sustainably met; and it tends to lock in existing market shares with current large publishers. Open access advocates also see it as undesirable as it risks creating new centralised deals that favour larger publishers and reducing transparency.
36. Offsetting open access charges against the subscription price (to avoid double-dipping) is more logical, benefits all subscribers, and is scalable. It has been criticised for lack of transparency, and publishers have responded by clarifying the approach to separate subscription and open access costs and revenues, with

subscription prices based solely on subscription-related costs (e.g. number of articles published).

37. There is interest in exploring non-APC models among publishers working in HSS and other fields where research funding is low. At this point, though, none of the options appears to have much application beyond niche circumstances. The most promising alternative to APCs may be a mix of revenue streams.

Green open access

38. For the main part, publishers do not see current policy and practice as significantly damaging to their subscriptions in its present incarnation, though this is not to say that they they are fully happy with embargo policies, and it does not necessarily reflect confidence in the model for the long term.

39. One view is that Green is now part of the environment: it is the *de facto* mechanism of choice for public access policy, and publishers simply have to find ways to live with it. Some publishers, however, see opportunities to do more than "live with it": with the right embargoes, there was scope to improve the quality and service levels Green offered to authors, readers and institutions.

40. There were four main areas of criticism of Green: embargo lengths; the quality of the service Green open access provides to the research community; some suspicion (from open access publishers) that it will delay rather than accelerate the transition from subscriptions to Gold open access; and the complexity created for institutions, researchers and publishers caused by the proliferation of differing policies. Additional system-wide costs for duplicative services were also mentioned.

41. Most publishers consulted thought embargo periods of 12 months (STM journals) and 24 (HSS journals) were workable, albeit with some provisos. Most were unhappy at the prospect of shorter embargoes.

42. A few were happier with shorter embargoes, citing their own experiences. Some others argued for longer embargoes than 24 months for some HSS disciplines; others that 12 months was realistic for life sciences and biomedicine, but should be extended to 24 months for other STEM disciplines. Disciplinary differences were important and had not been given sufficient weight in much policy-making: the finding of the Crossick report (see *§Bibliography*) was cited to the effect that the division was between biomedicine and other subjects, not between STEM and HSS.

43. Publishers accept that the evidence base for setting embargoes is somewhat limited, but most argue it is not non-existent. Retrospective evidence would be the most convincing but is also too risky ("the breaking point for subscriptions should not be determined empirically"). Usage patterns including half-lives represent the best available data, and were relevant because usage and subscription decisions are correlated. Publishers set embargo policies on the basis of usage studies, their own internal usage analyses, and their experience, knowledge of their markets, and conversations with librarians and researchers. But there is also a view that the process has become essentially funder-led rather than evidence-based, and some frustration with this.

44. Opportunities to make Green work better for all parties were identified: "the Green model could be viable as an intentional part of the subscription model but needs rethinking from both sides … with the right embargoes and with more creative solutions, the subscription model could work effectively with Green". The CHORUS approach could be one starting point for this. Publishers are also experimenting with open preprint services, and the Royal Society of Chemistry has launched a chemistry-specific subject repository.

Quality and integrity of research publications

45. Publishers acknowledge the potential threats to quality and integrity of research communications, but these have always existed and do not become significantly harder to manage under the anticipated future directions for scholarly publishing.

46. Conflicts of interest and threats to quality start in the research process itself, where researchers face huge pressures to keep publishing, inappropriate or misaligned incentives to publish in high impact journals, and other pressures.

47. Gold open access contains a financial incentive to accept substandard work, most notoriously demonstrated by predatory publishers. Such incentives are, however, also present in subscription journals (e.g. sponsored supplements), though the lower barrier to entry in open access publishing may be a factor.

48. The response is that publishers' long-term interests are strongly aligned with quality. Their ability to attract researchers to edit their existing or new journals, and their ability attract authors and reviewers (vital under both open access and subscription models), depended largely on the reputation of the journal in which quality and integrity played a large part. Authors know and trust journal brands; it would not be in publishers' interest to undermine these brands.

49. One approach to maintaining standards and confidence in open access journals would be through the development of agreed minimum criteria and standards. This might be through self-regulation, for instance embodied in membership of a trade association, and hence carry the sanction of expulsion for non-compliance, or through collaborative development of agreed guidelines between publishers, funders and other stakeholders.

50. There is also a role for developing peer review, for instance to help tackle issues around reproducibility. Data sharing clearly has a role, and this has implications for peer review too.

51. From the reader perspective, the issue of determining publication quality is again not new. The traditional quality markers are journal reputation and brand, and these will continue to be important, as well as inclusion in reputable bibliographic databases. New tools and markers may also help, such as CrossMark, PREval, and overlay services like *F1000Prime*.

Publishing costs

52. At a high level, costs are driven by two primary inputs, technology and staff (and their related costs), either inhouse or outsourced.

53. At a granular level, costs are related to the activities described above (paras. 22–25). Editorial costs (primarily staff, but payments to academic editors and editorial systems costs are also important) are the largest single cost for many publishers.

54. Overall, unit costs are relatively stable, with pressures for both increases and decreases in inputs.

55. Some costs scale with growth in output (e.g. production), while others scale with complexity (e.g. platform features). So total system costs are likely to rise, even if unit costs fall. Technology unit costs tend to fall, but are counteracted by pressures for increased functionality. Technology staff costs are likely to increase as a result of competition for scarce skills. There are pressures for editorial costs to increase (it's a manual process, and more is being asked of peer review while reviewers are harder to find), though technology may offer some productivity improvements.

56. Economies of scale are important in determining average costs: consolidation of publishers (and perhaps of journals) will therefore tend to reduce costs.
57. The main reasons for journals to have different cost bases are: editorial model (e.g. use of inhouse editorial staff); rejection rate; society ownership; existence of a print edition; production factors; and marketing and promotion costs.
58. Publishers pointed out that there are external sources of data on publishing costs, including reports by CEPA and John Houghton, and the published accounts of undiversified journal publishers, which we review briefly.

Pricing and value

59. Publishers do not set APC prices solely or even mainly on the basis of cost: value and market competition are more important factors, though cost plays a part.
60. There is no particular trend in APC pricing at present (the market is very immature), with publisher experimentation and market factors creating a diverse picture. On balance, it was thought more likely that APCs would fall than rise, driven by market forces (increased competition arising from author choice). A minority view thought was that there were pressures building for increases: inflation has been ignored so far, with prices staying constant in absolute but falling in real terms; publishers may have priced to marginal rather than full costs; and there was demand for quality that had cost implications.
61. APCs were also likely to remain varied across the market, rather than converge on any particular price point, reflecting different levels of service, editorial model, and prestige/reputation/impact.
62. Fair pricing is tricky to assess, but the best proxy for it is the price willingly paid in the market with relevant information. Taken over time, pricing will reflect quality in a competitive market. This does depend on authors' behaviour; that is, they have to be aware of, respond to, and act on price signals while taking account of the value side of the equation.
63. A number of suggestions for ways in which institutions and funders might control their publishing costs were mentioned by some, though not necessarily shared by all, including bundling/offsetting deals; capping of APCs or maximum reimbursable amounts (the latter preferred); and more speculatively, a move to open access models that did not make a flat-rate incremental charge for each additional paper.
64. Publishers of all stripes defend the need to generate surpluses or profits: to make the organisation properly sustainable (organisations that simply recover costs are "brittle and stagnant"); to allow reinvestment; to attract talent and investment; and to create incentives for greater efficiency and for innovation.
65. Publishers were divided over whether "excessive profit" was meaningful in a market economy, and none was prepared to give a specific level. Long-term return on investment rather than profit margin was a more relevant measure, and in this respect public companies had to compete for shareholder funds. If buyers do feel that profitability is outside acceptable norms, respondents agreed that regulatory-style approaches would be impractical given global markets with differing environments and open access and funding regimes, and given that it would be strongly resisted. Instead funders should look to market solutions, building on the increased market competition that is already being driven by innovation, new entrants, lower barriers to entry, and greater competition in the Gold model.

Introduction

This report presents a snapshot as of early 2015 of the views of a wide range of publishers, covering their perceptions of future directions in research communications, scholarly publishing and the role of publishers. It is important to emphasise that there is not a single "publishers' view" on these matters: the publishers represented here are of differing scale, ownership, (dominant) business model, discipline, and tradition, and their views reflect that diversity of experience. Nonetheless they share very many common interests, not only with each other, but also with other stakeholders in research communications; in many cases this leads to consensus on the key issues, but a range of views on the best ways to address them.

The report was was commissioned by Research Councils UK, in order to inform current thinking and feed into the Global Research Council meeting on Open Access, planned for April 2015. The brief was as follows:

> *In an age of digital scholarship and at a time when the Open Access agenda is affecting the model of publishing, the report will identify the added value that publishers provide, while also providing insight into the potential for change. Informed by in-depth interviews with a range of publishers, the report will synthesise the views of publishers regarding the future of publishing and how a sustainable business model for future academic publishing might look*

Nearly 20 publishers of different types and sizes were interviewed at length (*§Appendix 1*): for-profit and not-for-profit; open access and (at least partly) subscription-based; commercial, society, university presses; and with representation from all scholarly fields (though STEM disciplines were more common).

The report aims to synthesise the views thus gathered, while attempting to reflect the diversity of opinion where salient. Many of the points are illustrated by extracts from the interviews; these are almost always paraphrased for clarity, rather than verbatim quotations.

Future directions in scholarly publishing

We begin by exploring publishers' opinions on the factors influencing change in scholarly communication. Terminology is inevitably imprecise here: these factors may be causal agents of change (for example, funder policies); enablers of change (e.g. the web enabled the emergence of open access); or a bit of both. It is also not always clear whether a factor is a driver/enabler of change, or the result of change: for example, open access can be seen as (largely) the outcome of various top-down mandates, but it's also clearly possible to see open access itself as an important factor in driving change.

Key drivers of change

Digital transition and rapidly evolving technology

The digital transition (from print to online) was seen by many or most respondents as one of the most important factors – or even *the* fundamental issue – remaking scholarly communication. The transition is still very much in progress: there is a wide range of new dissemination options and new technologies that are being (or should be) adopted by publishers. Its impact is felt across the production and publishing (dissemination) functions; business models are evolving but not necessarily keeping up with change elsewhere. Publishers' relationships with authors and readers are directly affected. The implications are not yet fully clear but include the increased role and importance of the publishing platform, of services, tools, and workflow.

The digital transition also of course facilitated open access and is also now supporting the emergence of new communication formats such as scholarly collaboration networks (also called scientific social networks).

Funder policies

The second most popular candidate for the most important factor shaping scientific publishing is the growing role of funders. Research funders have a clear interest in seeing the most effective communication and use of research outputs, which has led to them setting and enforcing policies for Green and Gold open access, data sharing, reproducibility, and more (e.g. launching *eLife*).

Pressures for openness

There is a growing and unstoppable pressure for, and momentum towards greater openness. This overlaps considerably with the funder's role, as the most important of these pressures have been political (e.g. the US OSTP memorandum) or funder-led mandates, but there is a wider desire for openness[2]. The pressures embrace not just access, but sharing, re-use, data, open source software, open educational resources.

Growth in R&D and outputs

Just about all publishers saw growth in outputs as an important factor.

A substantial fraction of publishers saw the continued growth in research outputs (driven by similar long-term growth in R&D investments) as being a major driver of change in scientific publishing. Although annual growth may be relatively small, the cumulative effect is transformative:

[2] though several publishers pointed out that there was little bottom-up demand for (additional) openness from researchers in many disciplines, e.g. chemistry, materials science, humanities.

> *ISI-indexed articles have increased by 56% over 10-year period – equivalent to Wiley's output or to the combined outputs of all the born-open access publishers (PLOS, BMC, Hindawi etc.) [large publisher]*

The impact of growth was felt by readers faced by ever more articles and journals; by editors and reviewers in peer review loads; and by libraries in the strains placed on budgets that did not keep up.

Others had a different perspective on growth: they did not deny the scale or relevance, but saw it more as a challenge, a factor to be managed alongside other issues. It is also an opportunity: from a publisher (especially an open access publisher) or other service provider perspective, this is after all growth in demand.

Changing attitudes and habits

Changing researcher habits, both as reader and as author, are also shaping publishing. Publishers see a need to respond to a new generation of researchers with different approaches to reading and (especially) sharing information. Publishers also face new kinds of competition from services supporting these new behaviours, such as the new scholarly communication (scientific social) networks like ResearchGate or Academia. (This is one reason why major publishers have invested in services like Mendeley (Elsevier), ReadCube (NPG), Papers (Springer), Colwiz (ACS).) Publishing becomes less of a "one-way" process, too: for example, using and modifying code, and feeding back the results.

Researcher workflows are also changing, for instance with respect to the greater role of data and other digital resources.

Other drivers, trends and directions of change

Lower barriers to entry

The combination of the web, falling cost of technology, distributed publishing infrastructure (e.g. CrossRef), and open access business models have significantly reduced the barrier to entry for potential new journal publishers.[3] Many different types of organisation are taking advantage of this, accelerating innovation in services and business models, and increasing competition.

Authors becoming more important to publishers

The need to attract good authors has always been important, but increased competition, the growing role of metrics (usage and citation), and especially their new role as customer (or at any rate, purchasing decision-maker) in open access publishing have all placed the author in an ever-more central role. This is not just about the publisher's marketing/promotion focus, but is also leading to new tools and services designed to support the author's publishing experience from writing onwards, aimed at increasing author/researcher efficiency.

Research data

The move towards data-intensive science may or more may not amount to a "fourth paradigm" but is undeniably changing the way science is done and (increasingly) how it is communicated. There are both substantive changes within the discipline (the greater role for data), and also changes and opportunities in publishing: data sharing and data publishing. Publishers tended to see this more as an opportunity to respond to changing

[3] It was not cited, but one might also add easier access to cheap capital to this list.

researcher/funder needs than as something potentially changing the publishing industry. That's not to say, of course, that it does not present challenges (see below, p.16).

Budget strains

Constrained library budgets are hardly a new factor in discussions of scholarly publishing with the "serials crisis" arguably being one of the roots of the open access advocacy movement. Publishers tend to place the burden of explanation on the combination of exponential growth in research outputs and the underfunding of libraries (i.e. library budgets neither keeping pace with research spending/outputs, nor with university budgets as a whole). Critics acknowledge this but point to the above-inflationary increases in journal prices. In response, publishers argue that this is true but both partial and historical: price rises have moderated significantly since the early 2000s onwards, but more importantly, the new business models (e.g. the Big Deal) have made list prices increasingly irrelevant, and the actual price paid by libraries per journal/article and per article download has fallen substantially during the last decade.[4]

Whatever the causes, there's no dispute that budgets are squeezed at a time when library roles are also potentially expanding (e.g. repositories, data curation, etc.).

Economies of scale

These were mentioned by several publishers as an important driver. Economies of scale (and of scope) have been important in publishing for a long time, but this importance has clearly grown with online/digital publishing. The cost of developing a publishing platform is large, but the marginal cost of publishing one additional article is then very low. This is just as true for open access as for subscription publishing. Business models such as bundling (both subscriptions and APCs) also favour scale.[5]

One consequence of this will be further industry consolidation, as illustrated by the Springer/Macmillan merger. There may also be some cost advantage for megajournals smaller journals, though for publishers with access to existing platforms this may be much less important than other cost factors (e.g. peer review and editing costs).

Globalisation

The globalisation of research, and in particular the rise of China, was mentioned by several. Arguably this might be seen as a subset of overall growth, but there are some important distinctions:

- growth of R&D in emerging markets represents the main current opportunity for growth for subscription journals (as well, of course for open access journals). This opportunity is magnified for publishers to the extent that market shares are not yet locked down in the way they largely are in the West (excluding mergers and acquisitions)
- the increase in outputs from emerging markets, and China especially, has increased strains on peer review because growth in outputs has far outpaced growth in reviewing activity in these regions

[4] See e.g. Gantz, P (2012) *Digital Licenses Replace Print Prices as Accurate Reflection of Real Journal Costs* http://is.gd/efPk7L

[5] A further point not raised by publishers but potentially important is that some web-based business models have an inherent "winner takes all" tendency. This is particular the case for models with a social dimension (e.g. Facebook), which is not currently the case for most scientific publishing, but the growing popularity of scholarly communication networks may change this.

- in the other direction, online usage in China is significantly higher as a share of world usage than its share of global subscription/licence income, even as the size of its economy starts to approach that of the US

Challenges

Managing transition to open research

The challenge of managing an orderly transition to open science (or perhaps open scholarship, though the transition is much further advanced in STEM than in HSS disciplines) was seen by many as fundamental, not just for publishers but for all stakeholders.

> *there has to be a move from a text-based view of publishing to a more data-driven, machine-readable model [open access publisher]*

This was, however, a multi-dimensional transition, involving business models, funding arrangements, researcher attitudes and habits, and technology innovation. It included accelerating the shift to open access articles, but also open data, open source software, open people networks, tools, and new ways of doing and communicating research.

Managing change of this kind presented its own special kind of challenges:

> *a big challenge is that change often requires all stakeholders to act simultaneously but each is waiting for the other to go first [open access publisher]*

> *a key challenge for publishers will be managing both the digital transition in publishing aspects while keeping up with these changes in the discipline, which will change the nature of scholarly outputs [not-for-profit publisher]*

The importance of a relatively orderly transition was stressed, avoiding potential undesirable endpoints but also avoiding unnecessary disruption:

> *These are pressures for evolution, not radical revolution (albeit not necessarily gradual evolution). This is highly desirable because publishing is so important to research – it would be very disturbing therefore if change threatened to be disruptive [society publisher]*

> *Managing the transition to open access is a critical challenge: if mismanaged it could create risks to the system of scholarly publishing [society publisher]*

Infrastructure development

A major and sustained programme of infrastructure development would be required to support the digital transition, the transition to open science and a range of other challenges such as speeding up research communication, improving transparency and reproducibility, improving the user experience (and hence research efficiency), better meeting researchers' evolving needs through new (workflow) tools and services, etc.

Some elements of this programme are visible and well underway, others are well-identified but only just starting to be addressed (e.g. data publishing), while others will no doubt emerge later.

Some infrastructure will be developed by individual publishers or by individual actors in other stakeholder groups, but other infrastructure elements will involve industry and multi-stakeholder collaborations (e.g. CrossRef, FundRef, etc.).

Growth

Managing growth has been and will continue to be a challenge for the system. For publishers, the challenge was less about the scale of growth itself (which is entirely

manageable) than about the challenges it created for other stakeholders, in particular for the challenge it posed to the funding of research communication, and the budgetary strains thus created.

> *These unfunded pressures on growth are at core of many problems in publishing [not-for-profit publisher]*

Regional imbalances (such as that in peer review; see §*Peer review*) were also potentially challenging.

Constrained budgets

Constrained budgets were also seen as a challenge in their own right, albeit clearly exacerbated by growth in outputs. This was as much, if not more, an issue for Gold open access funding as for library budgets.

As well as the the direct challenges posed by constrained budgets, there are also indirect effects:

> *Discussions about value and pricing do get more acrimonious when budgets are tight. There is also a need to overcome distrust sown by some earlier subscription pricing decisions [society publisher]*

Business models and sustainability

A fundamental challenge is that sustainable ways have to be found to meet the foregoing challenges – the transition to open research, infrastructure development, growth, etc. – against a background of constrained budgets. APCs may be the best available model for Gold open access for now but there was plenty of scepticism about the scalability and long-term viability. This is discussed in more detail in a following section (§*Role of open access, subscriptions and other business models*).

Skill sets

Publishers increasingly have to compete for talent with other high value technology-based (and often better paid) industries – current areas include interface and workflow design, data analytics, etc.

Increased competition

Publishers face increasing, and increasingly diverse, competition. This is not necessarily a bad thing, of course – it's a sign of the vitality of the publishing industry, and all else being equal would tend to both improve services and reduce prices – but nonetheless raises the challenge for publishers. The effects of increased competition may also be unevenly felt, with smaller society publishers perhaps less able to compete with larger publishers; an alternative perspective is that small nimbler start-ups can more easily weather changes than publishers with large "legacy" infrastructure to manage.

Some dimensions of this increased competition that were cited include:

- the growth of Gold open access, an inherently more competitive model
- lower barriers to entry have encouraged new journal entrants, from PLOS to PeerJ and eLife
- new kinds of services offered by other new entrants: for example, scholarly collaboration networks (ResearchGate, Academia, etc.)
- global competition from technology and service providers: Google Scholar is a good example

- increased competition for usage from Green open access where solutions become more centralised and/or sophisticated in terms of discoverability

Changing researcher behaviours

Publishers noted two distinct (and to some extent opposed) challenges in relation to researcher attitudes, behaviours and habits, both applicable to their various roles as researcher, reader or authors:

- researchers' behaviours are changing, partly as a new generation of internet-savvy researchers takes the stage – variously described as digital natives or the "Google generation" – with different attitudes and habits towards reading and sharing, for instance. The researcher workflow is also changing, for example, with data playing an increasingly important role alongside articles
- on the other hand, the conservative academic culture tends to resist change. Funder and publisher policies can easily get ahead of the mainstream (e.g. on data sharing or licence preferences) – leadership is desirable, but there can be a mismatch between what is desirable and what authors are able or willing to do

So on the one hand, publishers are challenged to respond to changing behaviours (some of which, like sharing of articles, may present significant challenge to their business model), while at the same time held back by the slow pace of adoption of desirable change:

> *Data sharing is going to take several iterations of funder policies and publishing systems/policies to establish [open access publisher]*

Alignment of incentives and rewards

Researchers face their own challenges: lack of time, constrained budgets, intense competition, amongst others. For example, publishing negative findings may be good for science and society in principle, but in practice researchers' time is limited and they use that time entirely rationally to publish work that is more highly incentivised. Similarly,

> *researchers have good reasons (from their perspective) not to share data [open access publisher]*

The misalignment of incentives and rewards was seen as a major challenge for scholarly communication and for science itself; for example:

> *the "high Impact" culture [is a key driver] – although the drawbacks are actively discussed (e.g. DORA etc.), it's hard to see much actually changing so far [society publisher]*
>
> *the key drivers of most of the problems from over-publication, non-reproducibility, to peer review abuse etc. lie at the door of the funders (or the research system more widely) [large publisher]*
>
> *the role of the Impact Factor is the biggest single problem in scientific publishing and science [open access publisher]*
>
> *research evaluation system doesn't adequately reward cross-disciplinary work or data publication/sharing [large publisher]*

Publishers tended to see the "Impact Factor" culture as created primarily by the community (including research assessment systems, rewards, career processes), rather than by publishers:

> *the clear signal the community sends is that Impact Factor is a key value metric for it [large publisher]*
>
> *publishers respond to the value the community puts on Impact Factor, not vice versa [large publisher]*

Overall, however, this was seen as a complex issue in which all need to play a part (hence DORA (*§Glossary*) has recommendations for all stakeholders). More transparency and other policies aimed at reproducibility will be important. Better post-publication mechanisms to assess reproducibility etc. can help to change behaviour pre-publication. The research evaluation system needs to do more to adequately reward cross-disciplinary work and data publication/sharing.

Discipline-specific challenges

Some of the challenges were specific to, or particularly acute in, particular disciplines. Obvious examples are the lack of funding for APCs in the humanities and many social sciences, or the differences in attitudes towards open access found in biomedical fields compared to most other disciplines. Disciplinary differences are discussed in more detail below (*§Disciplinary differences*).

The issues faced by some smaller society publishers (e.g. sub-scale operations, risk-averse strategic preference, governance structures no longer fit for purpose) may also be compounded by challenges created by their single disciplinary focus:

> *The increasingly collaborative and interdisciplinary research environment creates challenges for single-subject publishers like us, because our brand/reputation and reach don't necessarily extend to other fields [society publisher]*

Outcomes and options

Evolution not revolution

Despite this large range of drivers of change and associated challenges, the large majority of publishers did not foresee a radical disruption or reinvention of scholarly publishing that would displace the *role* of the journal (though the *expression* of journals may change significantly). Indeed it was desirable that this was the case:

> *evolution (not revolution/disruption) is highly desirable because publishing is so important to research [society publisher]*

Instead there would be a process of evolution and development, mostly incremental, not dissimilar to that discussed above in relation to peer review, which remains central. Because of this, it was just as likely that there would be disciplinary divergence (in terms of scholarly communication) as the more frequently discussed convergence.

This did not mean that change might not accelerate. One publisher made the point that open content had not yet found its "killer app"; as multiple interlocking systems and infrastructure are established, and critical masses of content assembled, tipping points may be reached where researcher behaviour and markets change much more rapidly than seen to date. As the following section describes, though, predicting the timing of such changes in complex systems is very hard if not actually impossible.

Complex ecosystem

One publisher made the case that the research/research communication system is fundamentally too complex for reliable predictions to be made. There is a complex ecosystem of at least four main groups of stakeholders (funders, institutions, researchers, publishers) with their own varied interests, combined with some broad forces, trends,

directions whose impact on stakeholders and on each other is not always obvious. There will be new kinds of research outputs. And not only are the outputs and scientific communication channels changing, so are the ways the research itself is done. One plausible prediction from this analysis, however, would be that the science/communication ecosystem will grow increasingly more complex and interconnected.

A similar argument was made about humanities (especially) and social science publishing. The nature of the disciplines themselves were changing in profound ways. For example, humanities is moving from ideographic to nomothetic explanations (i.e. becoming more empirical/science-like, though as yet data-sharing has barely started to be explored), disciplinary boundaries are shifting or blurring, the discipline is becoming more interdisciplinary, with these changes amounting to a shift in the knowledge infrastructure[6] of the discipline.[7] No-one knows where the money to support scholarly communication in the humanities will come from in the medium term, let alone longer term. The existing output formats (monograph, textbook, reference work) are all under challenge. And there would be significant change in the scholarly community around promotion, tenure, and career structures. Against this range of change and uncertainties only the rashest of publishers would attempt to predict the future.

Journal core functions remain

The famous "four functions" of the journal (registration, certification (i.e. quality assurance), dissemination, and archival record) remain important to researchers and to the research community more widely. While the notion of the disaggregated journal has been discussed for some time, the current examples remain fragmentary and publishers thought that some kind of journal or equivalent process will continue to exist.

The nature of the journal will though evolve. Some of the suggested directions of this evolution included:

- expansion of open access – see next section
- fewer, bigger journals
- growing importance of data: this of course is already underway but will not happen overnight – data sharing is going to take several iterations of funder policies and publishing systems/policies before it becomes embedded, and there will be substantial disciplinary differences (see *§Disciplinary differences* below)
- the role of the journal as a quality marker for an individual piece of work will diminish
- less formality, increased flexibility in scholarly communication, and it becomes less of a one-way process (*§Changing attitudes and habits*)

Open access

Open access is clearly here to stay and a growing part of the literature. By and large publishers unsurprisingly did not feel able to make firm predictions about the eventual levels of uptake but the following represent shared ground for many:

- there is a strong momentum towards open access, and this will continue. Open access is a permanent and important part of the ecosystem but not the endpoint

[6] See *Knowledge Infrastructures* report (Sloan) http://knowledgeinfrastructures.org

[7] *Big Data, Little Data, No Data: Scholarship in the Networked World*, by Christine Borgman (MIT Press, 2015)

- uptake to date has been a fairly slow process, only 10–20% available as Gold open access after some 10–15 years. There are some suggestions that the rate of growth may have slowed in 2014. Relatively slow change may not be surprising, however, given that the current system is still dominated by subscriptions and its associated infrastructures, and that many researchers face flat or declining research budgets
- uptake will vary by discipline: Gold open access may displace subscriptions in the life sciences over the next 5–10 years, but uptake is likely to be lower in other disciplines, especially humanities and social sciences
- it follows there will be a "mixed economy" of open access and subscription journals for at least the medium term, which has implications for costs (e.g. running parallel systems at publishers and in institutions) and business models (e.g. bundling of open access and licence charges), and for policy-making

Economics and markets

A move to greater open access journals means that the nature of competition between publishers changes:

> *rather than competing on access, publishers will compete on things like speeding up research communication; improving transparency; user experience (user-friendliness; improving user efficiency); better meeting researcher needs [open access publisher]*

These are of course already on the agenda of most publishers, whether or not their focus is open access or subscription-based journals, since all journals depend on attracting good authors and are increasingly measured on usage.

Increasing economies of scale and scope seem likely to lead to the natural outcome of more consolidation. Most of this will be small-scale and tactical rather than transformative.

Some publishers worried about the potential for increased risk associated with increasingly centralised funding. For example, a large research funder changing its policy (say with respect to hybrid APCs) could have a much larger impact on publishers that decisions at the level of individual institutions.[8]

Disciplinary differences

Publishers cited a host of disciplinary differences, primarily relating to implementation of open access, to peer review, or to the nature or timing of the digital transition within the discipline (or to some combination of these).

Open access

For open access, the main differences were:

- funding levels: the extent to which funding was available to researchers to support APCs, whether from external research funding or from institutional funds
- speed of the research cycle: biomedical fields were seen as the most fast-moving, followed by life and physical sciences, then social sciences and humanities. This is reflected for example in citation and article usage patterns. This is relevant to the setting of embargoes for Green open access. The Wickham report for the

[8] Also true in the subscription world, of course, for instance with respect to large central consortia purchase such as at the national level

British Academy[9] concluded that article usage patterns did not divide between STEM on one hand and HSS on the other (as had sometimes been assumed in embargo setting), but between biomedicine and all other fields

- attitudes to open licences: acceptability of the CCBY licence to researchers varies by discipline. This is partly related to the nature of the research output (e.g. books vs journal articles), and partly related to the nature of scholarly discourse itself. Several publishers cited the Crossick report for HEFCE[10], for example:

  "It is, in my view, highly likely that a significant part of the academic community will, at least in the medium term and perhaps longer, want to see greater restrictions on the licensing terms for open-access monographs than are offered by CCBY"

  "For books in particular where authors feel a much more complex sense of ownership of the published material, it is likely that resistance to the creation of derivative works without specific authorisation, and to the facilitation of commercial redistribution and reuse, will be more keenly articulated than it might be for journal articles"

- the different types of research outputs preferred by different disciplines require different business models for open access and perhaps different publisher roles. It is also the case that the publisher brand (as opposed to journal brand) is much more important in the humanities and other fields where monographs are critical research outputs, with implications for quality signals

Peer review

Peer review is discussed in more detail in the next section, but the following points arose in relation to disciplinary differences:

- although hard data on this wasn't adduced, the sense that "peer review is near breaking point" may be specific to biomedical and life science disciplines, or at least particularly acute there. Publishers in the physical sciences say they do not recognise the researcher frustration with peer review reported elsewhere (e.g. repeated rounds of "reviewer experiments")
- the notion of "objective" peer review, i.e. testing for "correct science" or using a "soundness not significance" criterion, does not translate to the humanities or much of the social sciences (e.g. a lot of sociology)

Digital transition

The digital transition in publishing, and within the underlying fields, was at different stages and moving at different speeds across the disciplines. This was most notable for the humanities, followed by the social sciences. As noted above (*§Complex ecosystem*), there is an ongoing shift in the humanities from ideographic to nomothetic explanations and parallel shifts in its knowledge infrastructure which will have profound consequences for scholarly publishing as well as the fields themselves:

> *no one knows when or if there will be a tipping point when the humanities begin to look more like the social sciences and the social sciences begin to look more like the hard sciences. Everything is pushing in that direction – even if the old guard don't see it [not-for-profit publisher]*

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[9] Wickham, C (2014) *Open access journals in Humanities and Social Science*. British Academy http://www.britac.ac.uk/openaccess/

[10] Crossick, G (2015) *Monographs and Open Access*. HEFCE http://is.gd/XRi4wC

One consequence was that there were different researcher attitudes to the "open science" agenda: for instance, researchers in HSS fields are often more resistant to data sharing than in other fields (and indeed, it was suggested there may be less of a moral imperative for data sharing than compared to say clinical trial data).

Peer review

There was widespread shared belief that peer review is of central importance to scholarly communication (and journals in particular), and its management is the most important (or among the most important) of the roles undertaken by publishers.

> *Peer review is very important and remains strongly valued by the research community [large publisher]*

In addition, all of the publishers consulted believed that pre-publication editorial peer review will continue to retain this central importance: it will not be replaced by alternative systems of quality assurance or filtering such as post-publication review.

Several publishers made the point that peer review was central to the notion of what a journal was; that is, it is not an optional "value added" extra that can be applied as desired, but integral to the journal (and publisher) function.

Challenges for peer review

That's not to say that peer review does not face challenges and pressures. Publishers were divided, however, to the extent of the challenge and the degree to which this was a critical issue. The majority view was that peer review was not in crisis (not "broken", in the social media vernacular) but needed to, and would, evolve and adapt:

> *peer review is not "broken" but there are real issues – but these are fixable [society publisher]*

> *peer review has practical challenges but system will evolve to cope [large publisher]*

A small minority of publishers framed the issue with more urgency:

> *Peer review is increasingly placing an unreasonable burden on the community … it is near breaking point [open access publisher]*

To balance this, a similarly-sized minority was less convinced about the need for urgent reform:

> *see no problems with peer review continuing much in its present form … [our] author surveys show very high levels of satisfaction with peer review [society publisher]*

Nearly all the publishers, however, pointed out that peer review is an area of considerable discussion and active innovation, with lots of experimentation and trials already underway.

The issues cited were familiar:

- the difficulty finding reviewers as the numbers of papers continues to grow, exacerbated by geographical imbalances between research outputs and reviewing activity. Time spent repeatedly seeking available and willing reviewers of course slows down review
- the inefficiency of multiple review cycles as manuscripts are rejected and resubmitted

- speed of review, particular when multiple revisions or multiple review cycles were involved[11]
- researcher frustration at unreasonable requests from reviewers (and at editors who fail to manage this)
- lack of fairness, bias, etc.
- pressures for increased openness
- conversely, pressures for more double-blind review to counter potential for bias. (For example, one publisher cited growing demand for double-blind review from Indian and other Asian researchers, and speculated that this may be due to perceptions of bias on the part of Western editors and reviewers.)

As mentioned above (*§Disciplinary differences*) it does seem that pressures for change may be particularly acute in biomedical and life sciences, though the challenge of finding reviewers seems common (though also not new).

How should peer review be improved?

How should peer review evolve? The consensus view here is that there are no "magic bullets" but a mix of improvements will be required.[12] One publisher framed the issue this way:

> *What needs to be done pre-publication? What can be done post-publication? [open access publisher]*

They pointed out that pre-publication quality assurance is more than just peer review, involving an increasing range of checks and review undertaken by the journal (i.e. by the publisher's editorial staff), including data sharing compliance, ethics compliance, conflict of interest issues, etc.

Perhaps the most radical proposal was for the widespread adoption of the megajournal "soundness not significance" criterion combined with increasing the rigour of the review:

> *An important challenge for all stakeholders is to move to a different definition of "quality": rather than equating quality and impact, scientific quality should be seen in terms of methodological rigour, statistics, experimental design – the outcome itself is less critical. … Peer review has to evolve partly to reflect this idea about scientific quality, and partly to strengthen the quality assurance of scientific publications [society publisher]*

Adopting the "soundness not significance" review criterion will not necessarily speed up review, incidentally; some publishers pointed out that review times for their journals running conventional review were as fast (or not meaningfully slower) – it comes down to how well they are managed. And in the example quoted above, the publisher envisages increasing the rigour of peer review in parallel with the change to the acceptance criterion, which may have implications for time (and perhaps editorial

[11] Several publishers queried where this slow peer review was happening: their own medium-sized lists had average times at least as good as the heralded open access journals, and author satisfaction was high.

[12] One factor not mentioned by respondents but already starting to become important is the role of competition arising from greater availability of open information about journal peer review, including metrics such as time to first decision, time to acceptance, acceptance rate. Journals are increasingly showing this data on their homepages, and third-party services are harvesting it to power various comparison sites.

costs). What seems more important is limiting the scope of reviewers to make unreasonable requests and the number of rounds of revision allowed.

Publishers and research communities differ on the merits of different approaches to peer review, including open review (which covers a wide range of options – see *§Glossary*) and double- vs single-blind review. The consensus seems to be that these and other approaches are all worth exploring, but it is unlikely that there will be a single solution that applies for all journals and research communities.

Although a lot has been done already, there is substantial opportunity for improving the efficiency of the peer review process for authors, editors and reviewers. This includes comprehensive rethinking of the submission/review systems with a view to improving the user experience and efficiency of the workflows; using technology to improve article-reviewer topic matching while automating the avoidance of conflicts of interest etc.; other technological or service enhancements to make the job easier for editors and reviewers (e.g. access to bibliographic databases); and others.

Most journals employ editorial triage, filtering submissions for those to send out for peer review. In some cases this is done by external academic editors, in other cases by publishers' inhouse editorial staff. Some publishers mentioned an opportunity to reduce the burden on their reviewer communities by increasing the role of internal triage.

Cascade review (see *§Glossary)* was seen as potentially having a role to play, though it is probably a modest one. The multi-publisher experiments to date have not seen much uptake from authors, but may yet deliver as the concept becomes more widely known. Internal cascade gets much higher take-up, and it is becoming standard publisher strategy to build or assemble hierarchical portfolios of journals to take advantage of this. Publisher and reviewer community interests are of course aligned in this case.

Portable review (where the review is commissioned by the author from an independent service provider such as Rubriq or Peerage of Science) may also have some part to play, though it is unlikely to become anything like the norm.

Publishers generally see post-publication review (see *§Glossary*) as a potentially useful complement, though its value to date has been limited.

> *post-publication review without editorial review is not viable, though has a clear complementary role [large publisher]*
>
> *an open mind on post-publication review: it may be a useful supplement to pre-publication review, but experiments and pilots to date have not been very convenient [society publisher]*

One open access publisher did see post-publication review as "the way forward"; despite the lack of traction to date, they believed it would happen because of dissatisfaction with current systems, widespread pressures for greater openness, and some "technology pull" (i.e. creation of new services to support it).

Role of publishers

Publisher value added

There were two main ways that publishers responded to the question: "how do you summarise the value publishers add to the research process and communication of its outcomes?"

The first approach takes a systems viewpoint: while you can list the various activities publishers undertake or manage, the key value that publishers bring is the creation and maintenance of systems for delivering the relevant platforms and services for publishing scholarly outputs in a scalable, efficient and long-term sustainable way. For example:

> *A large part of publisher added value derives primarily not from individual activities but from organising, managing, funding and sustaining the whole publication process and infrastructure [large publisher]*

Innovation and developments of this system, both at individual publisher and collective levels, also add value by improving the efficiency of scientific research.

The second approach is to identify the wide range of activities and functions that publishers are responsible for; pre-eminent among these is peer review, all publishers were agreed.

Peer review

Peer review has already been discussed at some length (*§Future directions in scholarly publishing*) so we will not repeat unnecessarily.

In the context of the publisher's role, the following key points were made:

- there is a need for a neutral third party to validate and filter submissions, i.e. manage the peer review process[13]
- as previously noted, peer review was central to the notion of what a journal was; that is, it is not an optional "value added" extra that can be applied as desired, but integral to the journal (and publisher) function
- As with publishing overall, this is not just about doing the administration, it is about developing and supporting the *system* that makes this possible. It includes, for example, the creation and maintenance of journal brands: without good reputations, journals cannot attract submissions to review, nor reviewers and editors to conduct the peer review

Detailed roles

After peer review, there is a very long list of activities[14] that are collectively necessary to build the system of scholarly publishing:[15]

- creation, "care and feeding" of journal brands

[13] Derk Haank, CEO of Springer, made the same point in a recent presentation to the Association of Subscription Agents conference, when he said publishers offer two things to scholarly publishing that academia can't easily do for itself: neutrality and scale

[14] A post on the Scholarly Kitchen blog lists and describes 82 activities undertaken by publishers, with a rough estimate of their difficulty and cost http://is.gd/ETKjhj

[15] IOPP referred to a document on its website, *Scientific publishing: adding value, delivering impact* that also lists a wide range of functions undertaken by publishers: http://is.gd/rHYKwC

- editorial services
- technology and platform(s): submission and production systems, publishing platforms, semantic indexing, integration with external services, etc.
- dissemination and discovery, including indexing and other discovery tools
- marketing and promotion: to authors, readers, international media
- customer services: this turns out to be at least as important in open access publishing, if not more so
- production services (copy-editing, formatting, tagging, presentation)
- quality assurance: not just peer review, e.g. plagiarism checking, image manipulation checks, ethics checks, etc.
- archiving and long-term preservation
- administrative, overhead and financing costs: may not obviously add value in themselves but required to enable other services to be performed
- data curation services (maybe in the future)
- funding and sustaining: making a surplus/profit is part of the value that publishers bring to the system, by enabling it to be sustainable

Role of open access, subscriptions and other business models

Advantages of Gold open access

The main advantages for Gold open access cited by publishers were:

- scales better with growth of research outputs. This point, though widely cited elsewhere, and mentioned by some respondents, was however challenged by many other publishers. First, while it may be true in principle, few funders were unambiguously backing Gold with full funding, and the policy direction outside the UK and a few European countries was moving more towards Green. There's no more guarantee that funders will increase Gold publication funding proportionately than that library funding would be scaled. Research-intensive institutions similarly faced pressures of scaling up Gold. Secondly, it was argued that subscriptions were just as scalable given adequate funding, as had been illustrated by the long history of the journal
- lower barriers to entry, fostering competition and innovation
- a more efficient market, because of price transparency and increased competition
- improved cross-disciplinary discovery and use, compared to subscription model
- simplified re-use

Challenges for Gold open access

The most common unprompted issue for open access raised by publishers was the challenge of funding the transition to Gold open access:

> *the key problem with open access is that as yet there is no coherent explanation of how the costs of the publishing system will be sustainably met [large publisher]*
>
> *transition to open access has been cart before the horse: open access mandated without proper funding streams in place [society publisher]*

Related to this is the question of efficiency of the APC model, and in particular the efficiency of institutions administrative systems for processing APCs.

Other issues mentioned, which are touched on elsewhere in this report, included:

- issues around licensing, including the acceptability of CCBY compared to NC/ND variants
- disciplinary differences

Advantages of subscriptions

Publishers with subscription journals see that this also has some advantages:

- well-read journals spread the publishing costs over a wide base, rather than concentrating them on a smaller number of research-intensive institutions
- similarly, subscription journals access a range of funding sources and budget lines
- they work better than the APC model in fields with low research funding (e.g. humanities and social social sciences), and for researchers from less well developed economies
- subscriptions are better for high rejection-rate journals
- it may be better suited to the outputs of commercial R&D

Challenges for subscriptions

The challenges for the subscription model were seen to be:

- as for open access, the key challenge for the system is ensuring adequate funding is in place to support growth of outputs
- reconciling the business model with legitimate policy requirements for public access and open access. This is partly about Green (see *§Green open access* below) and partly about hybrid, though there is also an issue for both models in that running two systems in parallel is more expensive than a single system[16]
- demonstrating its ability to deliver on the open science agenda

Overall, the debate has clearly moved on from *whether* open access to *how to implement* open access. There is widespread recognition of the advantages, but the challenges of implementation are substantial.

> *open access is clearly part of the mix and here to stay, but they [the publisher] are pragmatic. They do not see open access as a uniquely critical role in tackling the big challenges for scholarly communications – it has advantages in some areas, disadvantages in others, and lots of its own challenges to be worked out [large publisher]*
>
> *doubts Gold open access will become a majority of journals/articles over the next 5-10 years; maybe 25% within 5 years? [open access publisher]*

[16] though there has never been a system that relied exclusively on subscriptions; publication charges are a long-standing part of the subscription journal universe, for example

Business model improvements and alternatives

APC-based Gold open access

Sustainability of the APC model

Publishers were clear that the APC model was the best currently available, despite some issues that needed addressing. There were some reservations expressed, however, as to how sustainable the model would be over the long term, and some sense that it was likely to turn out to be a transitional or perhaps suboptimal approach. Concerns included the following:

- APCs are not set at realistic sustainable levels: they have been largely set at market rates rather than based on costs and are below cost in many cases. Some publishers with subscription portfolios appear to be pricing nearer to marginal than to full recovery costs
- APCs are not sustainable in the long run, because there is no realistic way to scale up funding to the majority of the literature
- the model involves a shift of costs from the broader spread of subscribers to the research-intensive institutions with higher numbers of research outputs; it is unclear that there is political or funder will at a global level to fund this change

High rejection-rate journals

The issue of pricing APCs for high rejection-rate journals is well known. This was confirmed by the publishers consulted; while no new solutions were offered, the following points were made:

- none was willing to give a specific threshold for what constituted a high rejection rate in this context, though it was probably higher than 80%. There was a continuous spectrum, and the threshold would depend not just on the rejection rate but the editorial model (e.g. whether inhouse editorial staff were employed). One publisher noted that with rejection rates above 80%, their editorial costs already made it difficult to price to the levels expected by the market
- publications like *Science* and *Nature* were really not high rejection-rate *journals* as such, but *magazines* that included a high rejection-rate journal section. In other words, their high editorial costs were not just driven by peer review but by journalism and other reader-focussed editorial activities

A further point about the leading prestige journals was this:

> *The demand to publish in Nature, Science etc. was originally about visibility (as well as prestige): in a print world their very broad reach was a key advantage (and scientifically meaningful, e.g. reaching cross-disciplinary audiences). Prestige derived from being accepted because print and distribution costs meant space was finite. To some extent online publishing levels the playing field in reach, but the author motivation [and hence demand] has switched to prestige and Impact Factor [society publisher]*

Submission fees

The theoretical advantages of submission fees were acknowledged, but they were not seen as a solution for high rejection-rate journals, or for wider use:

> *Submission fees are a good idea in principle, but it is simply the wrong time to think about introducing now [society publisher]*

> *Sees why submission fees have been proposed, but would never work in practice – it's a non-starter for our field [society publisher]*

The main reasons why submission fees were impractical were (a) publishers would not risk "going first", because they fear losing authors to competing journals without submission fees; and (b) introducing additional complexity into the open access payment systems would be unattractive to institutions and funders while institutions are still struggling to implement efficient payment handling systems for APCs. Some funders have also indicated to publishers that they see submission fees as unattractive for high rejection-rate journals because by definition the majority of fees funded do not result in publication.

APC structure ("menus")

A number of publishers reported having examined the idea of breaking down the flat-rate APC into a number of discrete elements. The general view was that there was no *a priori* reason why such pricing models should not be explored, and it was likely that the market would indeed experiment in this way in the future. The time for such experimentation was not right, however, while institutions are still struggling to implement efficient processes to handle simple APC structures.

Improving efficiency

All stakeholders acknowledge the need to improve efficiency in the payment mechanisms.[17] A lot of experimentation and work is already under way, including:

- institutional memberships and prepayment schemes fell out of favour somewhat (e.g. due to difficulties in price setting, or to low take-up of prepayments), but there appears to be interest (at institutions as well as publishers) in revisiting them
- offsetting and bundling models – see below
- third party services like CCC's RightsLink and OAK. There may be a limit to the scope for such systems: while publishers are willing to collaborate with each other on the development of standards, for example, a central clearing house-type system for APCs seems unlikely because many publishers will want to retain a direct relationship with their customers rather than entrust this relationship to an intermediary
- standards and metadata development – see below

An additional point relates to infrequently-publishing authors:

> *A long tail of authors publish only once in their careers, or once every couple of years of so, so given this infrequent interaction with the system, educating authors can't be the whole answer – though it is clearly important, and we put a lot of effort into this – the system itself needs to involve minimal friction. There is clear scope for publishers to collaborate with funders on improving this area [large publisher]*

[17] As a recent report by Rob Johnson of Research Consulting put it: "The current approach to APC management is highly fragmented and undermined by differences of approach among nations and academic disciplines, by inefficiencies in process, and by scarcity of resources. . . . Many of these issues could be alleviated through improvements in data sharing and development of common identifiers and vocabularies, but these must be placed in the context of broader trends and continuing uncertainties over the future of academic publishing." http://is.gd/WlQFq8

Standards for open access

It's clear that publishers see plenty of scope to develop standards and metadata to make open access handling and payments more efficient; indeed this is seen as the kind of thing where the industry has a good track record. Publishers are clearly willing to engage with other stakeholders in this area.

One example is ESAC[18] (Efficiency and Standards for Article Charges), an informal working group (predominantly operating in Germany at present) with representatives from open access publishers, funders and libraries. It aims to address the challenges associated with the management of open access article charges; to start the discussion on efficient workflows involving all parties such as funders, libraries, authors, standardisation initiatives, and publishers; and to propose good practices and proven workflows.

Table 1 in *The Role of Standards in the Management of Open Access Research Publications: A Research Library Perspective*[19] sets out a useful list of relevant open access standards and processes, with the requirement and current status for each: researcher, funder, HEI and digital object identification; bibliographic and administrative metadata exchange; journal submission; APC processing; publisher rights policies; journal compliance with funder open access policies; licensing; repository download statistics; and compliance monitoring and reporting.

Offsetting, subscription price

The first method adopted by publishers to offset hybrid open access charges was to reduce the subscription price to reflect APC income earned. The disadvantage of this approach is that the calculations were not transparent to third parties, and with low hybrid uptake the reductions on prices were either very small or more often swamped by rises due to other factors.

Publishers are now modifying (or clarifying) this approach by separating the income and cost streams for subscriptions and open access. Subscription prices are based purely on the subscribed content and its associated costs.

The advantages of subscription price offsetting is that it is logical; that all subscribers benefit; and it is scalable. (In practice if hybrid levels exceeded some threshold, it is more likely the journal would flip to open access.)

Offsetting, institutional

The more recent approach has been to offset subscription and open access charges at the institution (or consortium) level. This was pioneered by the RSC with its *Gold for Gold* initiative and is exemplified by the Jisc "Total cost of ownership" approach.

It is easy to understand why the model is attractive to buyers, particularly those representing research-intensive universities. The following extract from an article by Lorraine Estelle of Jisc Collections illustrates the point well:

> *An example: one institution we spoke to spent more than £28,000 in subscriptions with just one publisher, and also published 12 journal articles with*

[18] http://esac-initiative.org/about/

[19] by Martin Moyle, Catherine Sharp, and Alan Bracey. Information Standards Quarterly, Summer 2014, 26(2), 15–21 doi: 10.3789/isqv26no2.2014.03

> *the same company. Those 12 APCs amounted to an extra £21,000 paid by the university – a 71 per cent increase in charges from that publisher*[20]

While publishers are clearly willing to explore this model (e.g. Jisc has agreements with IOPP, SAGE, Taylor & Francis, and Wiley, and similar deals have been struck in Austria and the Netherlands), serious concerns were aired in the consultation:

- it lacks a coherent logic: while there is a normal commercial practice of discounting for volume, offsetting all or most of the APC charges against subscriptions (or vice versa) has no natural logical basis[21] in that the charges are for two unrelated services. In effect subscription costs are being redistributed to other subscribers
- it is not scalable or sustainable: it may have a place in some territories, but institutions' expectations can't be sustainably met by the publishing industry
- it tends to lock in existing market shares (undesirable to large publishers, as well as smaller open access publishers, who don't have subscription portfolios to offset)
- from the open access advocate's perspective, it is undesirable because it risks creating new "Big Deal" style packages that favour larger publishers

Hybrid open access

The key issues for the community for hybrid open access have been low take-up, double-dipping, and the degree to which a competitive market exists.

- we did not systematically collect data, but publisher-wide hybrid uptakes that were mentioned by publishers varied from 0.2% (RSC, pre-RCUK policy[22]) to 18% (Royal Society). At the low end this is likely due to the well-known antipathy to open access within chemistry; the Royal Society attributes its high take up to proactive author education and encouragement, and the subject coverage of their journals
- many publishers reported very substantial proportionate increases in hybrid following the introduction of the RCUK policy in the UK (albeit from low bases)
- all publishers insist they have robust systems fully embedded in place to prevent double-dipping, e.g. with separate open access and subscription price-setting mechanisms. Two offsetting mechanisms are in use (as discussed above)
- publishers also suggest that the double-dipping issue is inherent in the hybrid model; if you want a system that allows authors to publish with immediate open access in their preferred journals, you have to work with this
- it is also inherent in the Gold model that its adoption would involve a shift of costs to research-intensive institutions
- there has been some criticism that the hybrid market lacks transparency (because of opaque way in which subscription price adjustments were seen to be made)

[20] Lorraine Estelle, Still a long way to go for OA? *Research Information* Feb/Mar 2015

[21] other than being a deal freely entered by both parties – MW

[22] *RCUK Policy on open access* http://www.rcuk.ac.uk/research/openaccess/policy/

and is not competitive[23]. Evidence for the latter point is said to be the lack of price variation, with a "norm" established at $3000; the lack of correlation between APC and journal quality, unlike for full open access journals; and the lack of evidence of use of price as a competitive tool (again, unlike for full open access journals where for instance new entrants price low to attract authors). Publishers responding to these points in this consultation say that these criticisms are out of date: not only is there now a range of hybrid pricing at list price, the actual amounts paid for hybrid APCs (e.g. based on Jisc data) vary considerably and have also fluctuated over time

The solution to these issues was suggested to be:

> *a combination of journal policies, greater transparency and ultimately flipping [large publisher]*

Transparency

One of the benefits of the APC business model is its transparency. There are some concerns from open access publishers about centralisation deals (whether offsetting or membership-style, or other):

> *[we have] significant concerns about centralisation deals, unless it's really transparent what the real costs are [open access publisher]*

There are also institutional concerns about the transparency of hybrid, as discussed above. The point made by one publishers seems pertinent:

> *most of the problems to do with transparency are primarily a consequence of being in a transition [society publisher]*

In other words, while publishers and institutions run dual systems for subscription and open access journals there will be difficulties in transparently separating their cost and revenue streams. Indeed publishers themselves may not yet have an accurate idea of the true costs.[24]

Scalability of the APC model

The challenges of funding a scale-up of APC-based open access has already been mentioned, and is evident in the pressure from buyers for offsetting deals.

A related point was made by a couple of publishers, that the flat-rate APC does not represent the true economics of online publishing, in that there were large fixed costs (platform and staff) but low marginal costs of publishing an additional article. Models that reflected this cost structure better might be more scalable and affordable for research-intensive institutions.

Non-APC models

While a number of alternatives to APCs for funding open access journals were mentioned – sponsorship, institutional subsidy, SCOAP3 – none of these was regarded as promising much beyond niche options, and all lacked the scope to be scaled up. The issue is one that humanities and social sciences publishers have been actively exploring; they say APCs remain the best generally applicable model at present.

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[23] e.g. Björk, B-C & Solomon, D (2014). *Developing an effective market for open access article processing charges*. Wellcome Trust. http://www.wellcome.ac.uk/stellent/groups/corporatesite/@policy_communications/documents/web_document/wtp055910.pdf

[24] One of the reasons Taylor & Francis established Cogent OA as a separate division was to allow it better to understand the true costs of open access publishing

- SCOAP3 was generally seen by non-participants as an interesting case, but the special circumstances of high-energy physics seemed unlikely to be replicated elsewhere. One participant in the scheme was much more damning, describing a huge administrative burden (e.g. reconciling library rebates to CERN payments) and being very expensive to run
- publishers do not see lots of organisations coming forward to sponsor journals. This model also has inherent risks in that it relies on the continuing willingness of the sponsor:

  [we publish] two "platinum" open access journals; one is supported by the South Korean government … there are simply no guarantees as to what Korea will do at the end of 5-year contract [not-for-profit publisher]

Knowledge Unlatched pilot

The "library partnership model" explored by Knowledge Unlatched has been successful in its view:

> *in the first 9 months, over 23,000 fulltext downloads from 150 countries of the 28 books, or an average of ~820 downloads per title (all specialised monographs). The unlatching fee paid by the 297 participating libraries for the collection was $1195, averaging $43 per title, compared to typical list price of $95. So it had delivered wider access at lower cost*

This is a book model, however, and other publishers did not see its widespread applicability to journals.[25]

For fields where APCs are not viable alone, a publisher with social sciences experience suggested that:

> *the most promising alternative looks like a mix of revenue streams, for example combining very low APCs, or perhaps a PeerJ-type membership model, with sponsorship and subsidies [large publisher]*

[25] The Open Library of the Humanities is, however, exploring how the model could be adapted

Green open access

Publisher perceptions and attitudes towards Green open access

How do publishers perceive the current implementation of Green open access?

For the main part, publishers do not see current policy and practice as significantly damaging to their subscriptions in its current incarnation, though that is not to say that they they are fully happy with embargo policies, and it does not necessarily reflect confidence in the model for the long term:

> *reasonably happy with how Green is playing out at present: it's increasing access, which is presumably the goal, and has not so far much impacted subscriptions [large publisher]*

> *Green open access in most of [our] disciplines is not a significant disruptor at present because it is still at a lower level and because repositories are inefficient and poorly designed (e.g. for discoverability). However poor execution or low take-up can't be assumed to prevail indefinitely, and there is a strong concern that there could be a "tipping point" effect when an unknown threshold is reached [large publisher]*

One common pragmatic view was that, given that Green is the *de facto* mechanism of choice for public access policy, publishers simply have find ways to live with it.

But subscription publishers also seem willing to do more than just "live with it", with potential to collaborate to improve the system for both parties:

> *the Green model could be viable as an intentional part of the subscription model but needs rethinking from both sides … with the right embargoes and with more creative solutions, the subscription model could work effectively with Green [large publisher]*

We discuss this in a little more detail below (*§Opportunities to improve Green*).

At least some of the open access publishers seemed if anything more critical of Green open access at a fundamental level:

> *sceptical of Green model because it depends on subscriptions [open access publisher]*

> *Green is OK as a transitional arrangement but fears that it – and hence subscriptions – are being normalised as part of the open access landscape [open access publisher]*

> *"Delayed open access" is an oxymoron [open access publisher]*

though others were happy with it as a transitional arrangement pending widespread Gold (and as an incentive to switch to Gold)[26].

Issues and problems

There were four main areas of criticism: embargo lengths (see next section); the quality of the service Green open access provides to the research community; some suspicion (from open access publishers, as above) that it will delay rather than accelerate the transition from subscriptions to Gold open access; and the complexity created for

[26] One publisher criticised this approach, arguing that negotiations over improving access via Green should be done in good faith, i.e. accepting that Green is dependent on subscription journals remaining viable, rather than pushing it as a way to make them unviable over the long term in the hope that publishers will see this as an incentive to switch faster to Gold

institutions, researchers and publishers caused by the proliferation of differing policies. Additional system-wide costs for duplicative services were also mentioned.

The quality of service issues relate to discoverability, delays, inferior and/or multiple versions, lack of visibility of retractions and errata, etc.

> *Green is fundamentally the wrong solution in that it requires the continued existence of subscription journals, and it delivers an inferior open access product (delayed author's manuscript rather than immediate version of record) [society publisher]*
>
> *Doesn't think Green open access is a good solution for the research community because of poor discoverability and because the system is a mess [society publisher]*

Embargoes

Most publishers consulted thought embargo periods of 12 months (STM journals) and 24 (HSS journals) were workable, albeit with some provisos. Most were unhappy at the prospect of shorter embargoes:

> *six month embargoes are the outlier and not acceptable to most publishers (outside biomedicine) [society publisher]*
>
> *very short embargoes would be damaging – i.e. in STM 12 months is OK, but 6 months is generally too short [large publisher]*
>
> *would be very worried about 6 month embargoes being imposed on physical sciences [society publisher]*

A few were happier with shorter embargoes: NPG's high-impact, fast-moving life sciences portfolio has set 6 month embargoes for some years; SAGE allows immediate deposit of the author's accepted manuscript in an institutional repository (but not in subject repositories); Chicago allows posting of the version of record on author homepages, but only in institutional or subject repositories after embargo.

Some others argued for longer embargoes than 24 months for some HSS disciplines; others that 12 months was realistic for life sciences and biomedicine, but should be extended to 24 months for other STEM disciplines.

Publishers accept the evidence base for setting embargoes is relatively limited. The most convincing test would be retrospective: to reduce embargoes to the point where damage to subscriptions was clear, or otherwise, but publishers are not keen on this kind of destructive testing ("the breaking point for subscriptions should not be determined empirically").[27]

Failing that, the best available evidence is thought to be article usage patterns including (but not exclusively) halflife data. Usage patterns were relevant because usage and subscription decisions are correlated; citation patterns over time may have some relevance but it is much less direct and hard to interpret.

[27] Some pointed out that there are some limited case studies of journals having to reverse decisions to implement too-short embargoes

Usage data evidence cited included the Phil Davis 2013 study[28] and the Wickham report for the British Academy.[29] Several indicated they would welcome more collaborative studies involving funders.

Publishers also say they form judgements about appropriate embargoes taking into account usage studies and also more subjective evidence based on their experience, knowledge of their markets, and conversations with librarians and researchers.

This is not to say there is not scepticism about the quality of the available evidence, or whether usage halflives are a relevant measure at all.

But there is also a view that embargo-setting is in reality less about evidence, and more of a negotiated compromise:

> *[their] embargo periods were originally set in the mid-2000s, so not now sure of the exact process used, but they see the process now as essentially funder-led, i.e. publishers want to meet funder requirements [large publisher]*

There is some frustration about this. One publisher argued that:

> *pushing for shorter embargoes (or arguing that the way to test embargo limits is to push embargoes down until damage to subscriptions becomes obvious) is counter-productive: it makes publishers more resistant to the idea of Green open access and closes off constructive engagement over new creative solutions around Green [large publisher]*

Disciplinary differences are important to publishers

Recognition of disciplinary differences is important to publishers (see above, *§Disciplinary differences*). Policy should be set on the basis of practice and available evidence for each discipline, rather than being led by experience from a relatively "small number of major journals".[30]

> *the problem is that the precedents are primarily in biomedicine, and the rest of science (let alone HSS) doesn't work like biomedicine*

Opportunities to improve Green

Some publishers see opportunities to make Green work better for all parties:

> *the Green model could be viable as an intentional part of the subscription model but needs rethinking from both sides … publishers' mindsets would need to change: there has been far too little discussion on how to make it work effectively, but instead a focus on it as a threat to subscriptions. But with the right embargoes and with more creative solutions, the subscription model could work effectively with Green. Hence they are very encouraged by CHORUS – this is the first (collective) proactive publisher response to Green [large publisher]*

Details of what such solutions might look like were not given, but one possibility is greater access to the version of record for Green:

> *we do see some tendency for the version of record to be used more for Green, e.g. CHORUS seems to be having this effect [large publisher]*

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[28] Davis, P (2013) *Journal Usage Half-Life* http://is.gd/PjUbB5

[29] Wickham, op. cit.

[30] Wickham, op. cit., as cited by the respondent

Other possibilities (by reference to the CHORUS example) might be institutional discovery services and dashboards, or automatic populating of institutional repositories with metadata, etc.

Publishers are also experimenting with open preprint services (PeerJ, BioRxiv, F1000, Copernicus). The Royal Society of Chemistry has launched a chemistry-specific subject repository *Chemical Sciences Article Repository*[31]. At present deposits are limited to articles published by RSC but they hope to set up arrangements for automated deposit with other chemistry publishers.

[31] http://www.rsc.org/chemical-sciences-repository/articles/

Quality and integrity of research publications

Challenges and threats to quality/integrity

The objective of this section of the consultation was to explore issues around the quality and integrity of research communications: would these be threatened by the anticipated direction of change in scholarly publishing? Are there conflicts for publishers between quality and a viable business model? What can publishers do to ensure quality and integrity, and how can readers be assured of the quality of a publication?

To start with, publishers acknowledge there are of course potential threats and conflicts of interest around quality. These are not new, and are not confined to the publisher's part of the process: for instance, researchers face multiple potential conflicts:

- the growth in retractions, misconduct etc. (partly attributable to improved methods of detection introduced by publishers)
- the pressures on authors to keep publishing creates incentives to publish work before it is ready, or to overhype the findings
- inappropriate researcher incentives creating hyper-competition for publication in high-impact journals

One open access publisher put this most strongly:

> *the key drivers of most of the problems from over-publication, non-reproducibility, to peer review abuse etc. lie at the door of the funders or the research system more widely [i.e. in fostering inappropriate or misaligned incentives) [large publisher]*

Turning to the publishers' role, though, potential threats could include:

- a built-in incentive in the Gold open access model to accept sub-standard work in order to get the APC
- this is not unique to open access, though: similar tensions or temptations exist in subscription based publishing, e.g. to accept sufficient work to justify (or increase) the subscription price, or to accept substandard work for a sponsored supplement
- this is most visible in (open access) predatory journals, though of course the issues there go beyond simply shading the acceptance criterion, and amount to outright fraud in many cases
- the misperception that open access journals were of lower quality (a misperception that predatory publishers have likely fostered) creates a challenge for open access publishers
- some publishers saw a risk that Gold open access focussed too much on meeting author needs, such that there could be a temptation to cut reader-facing costs (such as copy-editing)
- there are potential tradeoffs between speed of publication and quality

Ensuring quality and integrity of research publications

Publishers argued that such threats or conflicts of interest were nothing new, and it would be unrealistic or naïve to expect there to be none.

> *there are "tensions" between quality and business model rather than "conflicts", that need to be managed [society publisher]*

The answer is that publishers' long-term interests are strongly aligned with quality. Their ability to attract researchers to edit or review for their existing or new journals, and similarly their ability to attract authors (vital under both open access and subscription models), depended largely on the reputation of the journal in which quality and integrity played a large part.

So there is no necessary link between editorial quality and the business model – these can and must be kept separate.

Whitelists or agreed criteria

One way of tackling predatory journals could be through strengthening industry associations' codes of conduct, for example OASPA. For instance:

> *funders could have a policy that did not reimburse APCs unless the journal was member of an organisation like OASPA with clear criteria and sanctions (including expulsion) for non-compliance [large publisher]*

Indeed many institutions and libraries already use OASPA membership or listing in DOAJ as indicating lists of journals that meet minimum criteria. This may be a little premature, especially with respect to DOAJ (which has identified the need to recertify journals but has yet to complete this work (currently scheduled for the end of 2015), and may be underfunded to do this and maintain active quality control), and OASPA probably lacks the authority with all publishers at this stage to perform a regulatory function, and is not seen as even-handed by some publishers in its treatment of open access articles in hybrid journals.

An alternative approach is to develop agreed guidelines representing good practice. This could be done collaboratively between publishers and funders (and other interested parties).

One note of caution was sounded: approaches should be wary of increasing barriers to legitimate new entrants.

Peer review developments

Moving forward to tackling the issues around lack of reproducibility, growing retractions, etc., while these are complex issues with roots deep in the research community, publishers see a clear supporting role for themselves:

> *Publishers' contribution to this is just to do their job well! If peer review is to move in the direction outlined [i.e. more like the PLOS ONE model] then it's essential that it's done properly: statistics, experimental design, references all must be checked properly by reviewers. Data sharing clearly has a role to play here, and publishers need to think about their policies, how to support this, etc. [society publisher]*

Strengthening peer review in these kinds of ways was seen as important by publishers, and many reported either introducing changes or planning to do so.

Other developments around peer review may also be helpful here; one possibly useful tool is PREval[32] (Peer Review Evaluation), a new third-party service that verifies for the end user that content has gone through the peer review process and provides information that is vital to assessing the quality of that process.

There was also a sense that the system was self-correcting through community vigilance and feedback mechanisms ("that's how we know about these recent abuses"). Journal

[32] http://pre-val.org

quality and reputation are always top of the criteria used by authors to choose journals to submit to, so publishers have strong incentives to police.

These self-correcting feedback mechanisms can be strengthened, of course, and publishers pointed to increased transparency (open data, open review), open science, and post-publication review/metrics, as well as the raft of measures being explored around the "reproducibility" agenda (e.g. tackling publication bias).

Reader quality markers

Turning to readers, again the response is that the issue is not new. The traditional quality markers have been journal reputation and brand (and publisher brand in some fields), but this can be bolstered by some new tools:

> *reader quality markers include CrossMark, PREval, and publisher/journal brand [large publisher]*
>
> *readers assess quality partly though brand factors [open access publisher]*
>
> *other markers may emerge – e.g. overlays like F1000Prime [large publisher]*
>
> *for readers, inclusion or otherwise in the reputable indexes [open access publisher]*

Publishing costs

Categories of cost

At a high level, publishers' costs were described as falling into two broad categories: technology (hardware and software) and staff (and related costs like accommodation, insurance, payroll taxes, etc.). These costs may be incurred internally or outsourced. (There are also print-related costs (paper, printing, distribution) but these are falling fast and dwarfed by platform costs.)

At a more granular or functional level, the categories listed in the section (*§Role of Publishers*) describing the publisher's role are the same things that drive costs. Apart from print, publishers did not expect the cost mix to change dramatically.

Many publishers said their single largest cost was editorial (primarily staff, but also associated peer review costs such as submission systems and payments to academic editors).

Cost trends

Overall, the feedback was that publishing costs are relatively stable, but there were a number of pressures that could increase or decrease costs, with no clear consensus on which would win out.

- some costs scale with growth in output (e.g. production), while others scale with complexity (e.g. platform features). So total system costs are likely to rise, even if unit/average costs fall
- editorial/peer review costs would increase, partly because it was an essential manual process dependent on skilled people, and partly because more was being asked of it and it is harder to find reviewers. On the other hand, technology provides opportunities for improving productivity
- the costs of technology staff would increase, because of competition with other (higher-paid) industries
- the unit cost of technology will continue to fall (Moore's Law etc.) but there are pressures for increased functionality and new features that push costs up[33]
- economies of scale are very important in determining average costs: consolidation will therefore tend to reduce costs (either through publisher merger, or perhaps through reduction of journal numbers in favour of fewer, larger megajournals, though other cost factors will tend to dominate here)

Cost differences between journals

The main factors creating different costs for different journals were:

- editorial model: whether or not inhouse editorial staff were employed; the existence and level of fees paid to external academic editors; the extent of non-research content, especially journalistic content
- rejection rate: higher rejection rates increase the cost of peer review

[33] one publisher speculated that it may prove unsustainable for lots of publishers to continue to make parallel competitive investments in proprietary platforms. A possible counter-trend would be increased use of open source or commodity infrastructure; for example CoAction and Ubiquity use (modified versions of) OJS (Open Journal Systems). Another example is the use of services like figshare or Dryad rather than publishers hosting data themselves; it's unclear how the costs of these services as charged to publishers will evolve

- society ownership: for commercial publishers, their society-owned journals are often more costly to publish because of the high royalty payments extracted by societies (via competitive tenders)
- existence of a print edition versus online-only
- production factors: submission formats supported (allowing a wide range of formats increases author convenience but also increases journal costs); production standards (article length; copy-editing, language editing, proofing; functionality of published article)
- marketing and promotion costs: for instance, newer journals may need higher author promotion costs; authors at high-impact journals expect promotion of their work to the wider media

On the other hand, within large publishers historic differences between journals have been evened out through the introduction of standard workflows.

Other sources

Several publishers pointed out that there were external sources of data on publishing costs, including published studies and the reported financial results of some publishers.

A 2008 RIN report conducted by Cambridge Economic Policy Associates looked in detail at the system-wide costs involved in the journals publishing process.[34] CEPA subsequently updated their estimates for a later report,[35] giving the average 2010 journal article cost of production (for print + electronic) at £3095, made up as follows:

- first copy costs (the costs incurred regardless of the number of copies distributed, e.g. peer review management, copy-editing, typesetting and origination): £1261
- variable costs (printing, paper, distribution): £581
- indirect costs (staff and overheads): £666
- surplus: £586

The 2009 Houghton report[36] also identified the costs of scholarly publishing with broadly similar findings, with an average total cost of £3247.

Both these reports are in need of updating in respect of the cost analyses; CEPA has now been commissioned by the Publishing Research Consortium to update its estimates, and is expected to report back later this year.

The PEER project[37] reported the average cost of managing peer review at $250 per submitted manuscript (hence if the rejection rate was 80%, average peer review administration costs would be $1250 per accepted manuscript).

Reviewing the public financial accounts and journal outputs of undiversified journal publishers allows estimates of their total average costs per published article. This data is of limited value for a variety of reasons (e.g. there are very few such publishers, timing

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[34] RIN (2008) *Activities, costs and funding flows in the scholarly communications system in the UK*. Research Information Network http://is.gd/x7ViSH

[35] RIN (2011) *Heading for the open road: Costs and benefits of transitions in scholarly communications* Research Information Network http://is.gd/ELeKHS

[36] Houghton, J, et al. (2009) *Economic implications of alternative scholarly publishing models*. JISC http://is.gd/7ggvDb

[37] Wallace, J (2012) *PEER project: Final report*. PEER http://www.peerproject.eu/reports/

effects with respect to investments and the development stage of the journals, or spending on non-journal-publishing activities), but the following are available:

- PLOS's annual report for 2013/14[38] shows total costs (including overheads) of $29.6 million for about 34,000 articles published, giving an average of $1088 per article. This combines the low-cost *PLOS ONE* with the higher-cost selective journals, suggesting that the average for *PLOS ONE* would have been lower
- eLife's financial statement for its first full year of operation is publicly available, and showed total costs of £2644k, equating to an average cost per peer-reviewed research article of £12.2k. This figure is clearly weighted by start-up costs and lower outputs in its early stages. The (as yet unpublished) figures for 2014 are total expenses of £3386k and 536 articles published, giving a 2014 average cost per article of £6.3k[39]

To put the eLife figures in context, costs for the highly selective journals have been much discussed, though unlike for eLife, the major established journals have not released detailed financial statements (they are consolidated into their parent organisations' accounts). However, *Nature*'s Editor-in-Chief was cited[40] as estimating "his journal's internal costs at £20,000–30,000 ($30,000–40,000) per paper". Alan Leshner (the AAAS's Chief Executive) was quoted in *The Atlantic*[41] as saying it costs $50 million a run to publish *Science*, which would equate to about $38k per article for the 1330 articles published in 2014. Another reasonably high-impact journal (albeit a different kind of publication from *Nature* or *Science*), *PNAS*, was quoted in the same *Nature* article, giving average costs per article at $3700.

[38] *PLOS progress update 2013/2014* http://www.plos.org/about/plos/progress-update/

[39] Source: eLife (private communication)

[40] *Nature* 495, 426–429 (28 March 2013) doi:10.1038/495426a

[41] Eveleth, R. Free access to science research doesn't benefit everyone. *The Atlantic*, 14 December 2014

Pricing and value

APC price-setting

Given the factors that affect differences in the cost bases of different journals, how are these reflected in APCs?

In fact, publishers do not set prices primarily on the basis of cost; the three factors driving APC pricing are:

- value (to researchers/the research community, as perceived by the publisher): for example, journal quality and impact; level of service
- market pressures and competition: for example, new entrants have clearly used cost as a market entry tool or differentiator; several publishers reported setting APCs for new open access journals below their estimated costs because of the need to be competitive
- cost: this accounts for instance for much of the difference in APCs between *PLOS ONE* and the smaller *PLOS Medicine* and *PLOS Biology*

The relative importance of these factors will vary between journals and publishers, and they are not necessarily uncorrelated (e.g. high-value journals may have high cost bases), but most publishers consulted thought the first two factors would play the larger part. This should not be surprising: value-based pricing was the norm in information markets.

APC price trends

The general view was that there was no particular trend easily visible in APC pricing at present (one publisher made the point that it was too early, and the market too immature, for prices to have settled), but that it was more likely that APCs would fall than rise, driven by market forces (competition arising from author choice). Not all share this view, however:

> *it's more likely that average APCs will rise than be driven down [despite acknowledging the downward pressures]. There's a demand for quality and recognition that this costs money; inflation has so far been ignored by many journals (i.e. APCs have not risen for 5 years in many cases), but over time this will create pressure for increases [large publisher]*

APCs were likely to remain very varied across the market, as you would expect in a competitive market:

> *[we] don't see any reason why APCs should converge to a single price point: pricing will reflect level of service, the editorial model, and prestige/reputation/ impact [large publisher]*

Fair prices and value

There was some sympathy for the position of institutions in determining what represented fair pricing or good value. The best available measure of value for institutions and funders may be some kind of combination of journal quality and impact, which could be partly assessed using a range metrics.

There was a commonly expressed view, however, that the best proxy for "fair pricing" was the price people were willing to pay in the market. Taken over time, pricing will reflect quality in a competitive market. This does depend on authors' behaviour, though; that is, they have to be aware of, respond to, and act on price signals while taking account of the value side of the equation. One publisher (not NPG!) pointed out that

> *Nature Communications has no trouble attracting submissions at $5000, far more than PeerJ at a much lower price point [not-for-profit publisher]*

Caveat emptor thus applies to some degree: buyers who take the trouble fully to understand what they are buying will be at an advantage. One of the conclusions of the Wickham report[42] may be relevant here:

> *"A key to improving the cost situation is to remove the current information asymmetry, and require more transparency on the part of publishers to match the public availability of library budget information"*

Controlling institutional/funder costs

A number of suggestions for ways in which institutions and funders might control their publishing costs were given, several of which have already been discussed:

- bundling deals have potential to bring discounts as they do in the subscription world. Some open access publishers are uneasy about these models, though, for the reasons already given
- individual APC payments might be capped, though this is not something most publishers would support. There are two possible approaches: funders might (i) specify a maximum allowable APC, or (ii) specify a maximum reimbursable amount (i.e. authors could make up difference with other funds). The majority of publishers asked thought price-capping was undesirable because the market should find its own level – it would be premature now to start locking down prices. Of the two options, however, publishers thought the second approach was less damaging, because APCs might still be able to find a sustainable level in market, though the additional administration involved in finding multiple sources of funding for an APC would deter many authors and increase friction
- more speculatively, business models that did not make a flat-rate incremental charge for each additional paper, which could be based at the level of the individual researcher or the institution, might help manage costs while also better reflecting the economics of online publishing (see *§Scalability of the APC model*). These might be *PeerJ*-type membership models, or perhaps a combination of annual fee plus sliding-scale APCs

Publisher profitability

Arguments in favour of profits

There was a clear consensus among publishers, with perhaps one exception, of the importance of the role of surpluses and profits in scientific publishing:

- generating a surplus is fundamental for the enterprise – whether commercial or not-for-profit – to be sustainable over the long term. Collectively, the scientific publishing enterprise collectively likewise needs to generate surpluses over its operating income for the same reason
- specifically, surpluses allow reinvestment in the publishing platform, new technologies, and allows funding of R&D and innovation
- profits provide incentives that attract talent and investment: this is perhaps more specific to the commercial sector (though presumably few people want to work for unsustainable organisations). At one end of the size scale, public companies need to compete for shareholder capital on the open market; they have to provide

[42] Wickham, C. op. cit.

> competitive rates of return to do this. At the other end, innovative start-ups like PeerJ, Mendeley, figshare or the new scientific social networks are able to attract venture capital or corporate investment to fund their launch and development

A few comments illustrate the range of support for this perspective:

> *[we] make no apologies for being profitable: this allows us to reinvest to improve research communications, efficiency, etc. [open access publisher]*
>
> *profits support reinvestment and innovation (either directly or by attracting new entrants) – this is one reason why scholarly publishing is seeing such an explosion in innovation and experimentation [large corporate]*
>
> *there is a strong case for for-profit companies in scientific publishing, in that they have strong incentives to find truly sustainable models [open access publisher]*

A similar case for the role of surpluses in providing sustainability was made in a recent draft paper *Principles for Open Scholarly Infrastructure*:[43]

> *"Financial sustainability is a key element of creating trust … [hence the need for a] Goal to generate surplus – organisations which define sustainability based merely on recovering costs are brittle and stagnant. It is not enough to merely survive it has to be able to adapt and change. To weather economic, social and technological volatility, they need financial resources beyond immediate operating costs."*

Excessive profitability

If the role of profits *per se* is uncontroversial, clearly the same cannot be said about the wider perceptions of the level of profits earned by some larger corporates. None of the publishers consulted, however, was either willing or perhaps able to give a definition of "excessive" profit, or even in many cases to concede that the notion was meaningful in a market economy. This was not just self-interest on the part of large corporates:

> *it's not possible to give a specific figure for "excessive" profits [open access publisher]*
>
> *not possible to give specific figure for what represents "excessive" profit but thinks the answer would be different for plcs vs societies [society publisher]*
>
> *levels of profitability are not a fundamental problem: who's to say in a market economy what the "right" profit should be? [medium-sized corporate]*

If some profits are thought to be outside reasonable norms, what remedies are available? None of the publishers thought regulatory approaches would be viable, given global markets with widely differing regulatory environments, open access policies and funding regimes, and given that it would be strongly resisted by publishers.

Instead it was suggested funders should look to the market for solutions. It was suggested that the current and likely changes to scholarly publishing already described all tended to increase competition:

> *innovation, new entrants, lower barriers to entry, and greater competition in open access, all of which tend to lower profitability over the long term [large corporate]*

Funders could in addition adopt and encourage policies and practices that support competition. The most frequently made suggestion was to accelerate the move to Gold

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[43] Bilder G, Lin J, Neylon C (2015) *Principles for Open Scholarly Infrastructure-v1*, retrieved 25 February 2015, http://dx.doi.org/10.6084/m9.figshare.1314859

open access to create a market in which publishers increasingly competed on service and price.

> *the solution is to accelerate the move to Gold open access, because this will tend to reduce profitability and hence total costs [society publisher]*

A somewhat different slant was put on market dynamics by one publisher:

> *additional profits generated by thus reducing costs [from the efficiencies created by publishers in response to incentives generated by the profit motive] will be retained by publishers rather than shared with purchasers (e.g. by reducing prices) unless the latter use their buying power, either through negotiations or by switching their business elsewhere (which authors can do under open access) [large corporate publisher]*

Not every publisher agreed that overall profitability in a Gold open access world would necessarily be lower in every case – there are clear returns to scale, and a large megajournal publisher may be able to generate levels of profit comparable to or perhaps higher than in subscription publishing – but the large majority of respondents held to the view that Gold open access would increase competition and hence lower profits over the longer term.[44]

[44] And this view is widely shared by the open access community, and is supported by academic studies. For example, see SPARC's evidence to the House of Lords in 2013 (http://is.gd/pPztKN) or Björk's study for Wellcome Trust (Björk, B-C. & Solomon, D (2014). *Developing an effective market for open access article processing charges*. Wellcome Trust. http://is.gd/a3phL4

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Glossary

APC: Article Publication (or Processing) Charge, the fee paid by the author, or their institution or funder for open access publication

Cascade (peer) review: a variant of peer review in which a paper rejected by one journal is transferred along with the review reports to another journal, thus avoiding the need for (some) re-reviewing. It has been more successful within a publisher's list than between journals at different publishers

CHORUS: the Clearinghouse for the Open Research of the United States was formed by a group of publishers and service providers, as a not-for-profit public-private partnership to develop a service that would enable funding agencies to meet the OSTP requirements. See http://www.chorusaccess.org/

CrossMark: a service provided by CrossRef that allows scholars to easily identify instances of documents that are being actively maintained by their publishers. The appearance of a CrossMark logo on a HTML, PDF or ePub document indicates that the publisher is taking care of or stewarding it through any updates, corrections, retractions, or other changes. See http://www.crossref.org/crossmark/About.htm

DORA: San Francisco Declaration on Research Assessment, a statement issued by a group of editors and publishers of scholarly journals in December 2012. It makes a range of recommendations for improving research assessment, but is particularly concerned with the misuse of the Journal Impact Factor as a quality measure for research articles. See http://www.ascb.org/dora-old/files/SFDeclarationFINAL.pdf

Double-blind peer review: editorial review in journals where the authors' and reviewers' names are blinded from each other. (The journal and/or authors may need to redact or edit potentially identifying material from the text to achieve this.)

HSS: humanities and social sciences

Megajournal: this journal model consists of three key parts: full open access with a relatively low APC; rapid "non-selective" peer review based on "soundness not significance" (i.e. selecting papers on the basis that science is soundly conducted rather than more subjective criteria of impact, significance or relevance to a particularly community); and a very broad subject scope. The category was created by *PLOS ONE* in 2006; it is still the largest by some way but there are now over 50 other megajournals

Offsetting: either the policy of making equivalent reductions in subscription price of a hybrid journal to reflect the open access charges received, or an agreement between a publisher and an institution (or consortium) to bundle subscription and open access charges in various possible ways

Open (peer) review: editorial review in journals where the reviewer's name is disclosed to the author and/or the reviewer's name is published, and/or the review report is published alongside the article. At present more reviewers appear more comfortable with the open treatment of their review than with having their identify disclosed

OSTP memorandum: issued by the US White House's Office of Science and Technology Policy, this specified that all US federal agencies with research budgets greater than $100 million were required to make research outputs – specifically, "any results published in peer-reviewed scholarly publications that are based on research that directly arises from Federal funds" – freely available with a maximum delay of 12 months following publication. See http://www.whitehouse.gov/administration/eop/ostp/library/publicaccess

PREval: a new third-party service that verifies for the end user that content has gone through the peer review process and provides information that is vital to assessing the quality of that process (though note, not the quality of the review). See http://pre-val.org

Post-publication review: strictly speaking, this should refer to review of published articles by the community, for instance via comments or ratings (which could be done directly on the journal site or on a third-party platform such as PubMed Commons). The term is also more loosely used to refer to these reviews in combination with other post-publication signals that may indicate quality and help filter articles, also referred to as altmetrics: for example, article downloads; citations in blogs, Twitter or other social media; sharing activity on scholarly collaboration platforms like ResearchGate or Mendeley; etc.

Scholarly collaboration platform: (also called scientific social networks). Online platforms that allow researchers to create profiles, share articles (via links, bibliographic references, or full-text version), hold discussions, etc. Examples in Academia, Colwiz, ResearchGate, Mendeley, and others

Single-blind peer review: editorial review in journals where the authors' names are known to reviewers, but not *vice versa*

STEM: Scientific, Technological, Engineering and Mathematical (usually applied to academic disciplines)

STM: Scientific, Technical & Medical (usually applied to journals or publishers)

Submission fee: non-refundable fee payable on submission of an article to journal (open access or subscription-based), intending to defray (part of) the peer review administration costs

Appendix 1: Publishers interviewed

With grateful thanks to the following publishers who kindly agreed to be interviewed for this report:

Society publishers

Fred Dylla, American Institute of Physics

Rita Scheman, American Physiological Society

Steven Hall, IOP Publishing

Stuart Taylor, The Royal Society

Emma Wilson, Royal Society of Chemistry

Not-for-profit publishers

Michael Magoulias, University of Chicago Press

Frances Pinter, Manchester University Press and Knowledge Unlatched

David Crotty, Oxford University Press

Open access publishers

Xenia van Edig, Copernicus Publications

Mark Patterson, eLife

Rebecca Lawrence, Faculty of 1000

Elizabeth Marincola, PLOS

Brian Hole, Ubiquity Press

Large publishers

Alicia Wise, Elsevier

Steven Inchcoombe, Nature Publishing Group / Palgrave

David Ross, SAGE Publications

Wim van der Stelt, Springer Science+Business Media

Ian Bannerman, Taylor & Francis

Philip Carpenter and Rachel Burley, Wiley-Blackwell

Appendix 2: Mapping the future of scholarly publishing

The Open Science Initiative Working Group published a report in early 2015 entitled *Mapping the Future of Scholarly Publishing*.[45] The reports findings were based on email/online consultations among 112 thought leaders, drawn mostly from the academic, research, and library communities[46] (though apparently not so much from the publisher or funder communities). The report begins by setting out the challenges faced by scholarly publishing, and it may be interesting (if perhaps unsurprising) to see the close overlap between their analysis and the current exercise:

> *for the past 20 years or so—roughly coinciding with the growth of the Internet—the scholarly publishing system has been under a tremendous and increasing amount of stress due to rapidly increasing subscription prices, rapid proliferation in the number of journals being published, distorted publishing incentives in academia, lax editorial oversight, massive escalation in the global rate of knowledge production, changing communication patterns and expectations in our society, the emergence of open access as a compelling model of free and open information access, and a wide array of other important factors*

(Annex 2 of the report expands on each of these challenges in turn, as well as some additional issues facing journals such as fraud, costs, tenure, information literacy, readability, and peer review.)

The OSI group had more questions than answers, but made three main recommendations: (1) Convene an annual series of high-level conferences between all key stakeholders over the next 10 years; (2) Find answers to key questions related to reform, as detailed in the summary document; (3) Investigate the possibility of constructing the world's first all-scholarship repository.

The report set out 24 "questions that need answering", including for example the following:

> *What goals should scholarly publishing have?*
>
> *Do researchers and scientists participate in the current system of scholarly publishing because they believe in it, or do they participate because it's the only game in town?*
>
> *What is the most appropriate role for publishers?*
>
> *Is there a way for publishers to be paid, reasonably, for the work that they do that won't constitute the inappropriate commodification of knowledge?*
>
> *What do we mean by "publishing?" Do we mean archiving? Or the value-added services provided by publishers (such as editing and managing peer review)? When we talk about publishing reform, are we talking about reforming the polished end products, the process, the profits, the mechanisms, the archives, or something else?*
>
> *Is the currently slow growth of OA due to a lack of supply, sub-par solutions, a lack of demand, a lack of clarity about what OA means, or all of the above?*
>
> *Is there actually evidence that journals have experienced subscription cancellations in response to manuscripts being made available in open access repositories?*

[45] http://is.gd/6em9x3

[46] In practice the majority of the 112 did not participate actively in the discussions