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Does discipline affect academics' behaviour and attitudes towards open access publishing?

Abstract

Open access publishing can be viewed as a paradigmatic shift in scholarly communication practices. Whilst there is significant progress with policy and a lively debate regarding the potential impact of open access publishing, few studies have examined academics' behaviour and attitudes to open access publishing (OAP). This article, then seeks to contribute to knowledge in relation to open access publishing by surveying an international and interdisciplinary sample of academics, with regard to issues such as: use of and intentions regarding OAP, and perceptions regarding advantages and disadvantages of OAP, journal article publication services, peer review, and re-use. Despite reporting engagement in OAP, academics were unsure about their future intentions regarding OAP. Broadly, academics identified the potential for wider circulation as the key advantage of open access publishing, and were generally more positive about the benefits of OAP, than they were negative about its disadvantages. As regards services, rigorous peer review, followed by rapid publication were most valued, with rapid peer review and promotion of papers post-publication also regarded as valuable. Strong views on re-use of their work were indicated; academics were relatively happy regarding non-commercial re-use, but were very negative regarding commercial re-use, adaptations, and inclusion in anthologies. Comparing the two major disciplinary groups, science, technology and medicine and arts, humanities and social sciences, showed a significant difference in attitude on a number of questions, but, in general, the effect size was small, suggesting that attitudes are more consistent across the academic community than might be assumed from some of the current debates. Additional analyses on the basis of gender, publication rates, years of experience produced similar results.

Introduction

Philosophically, policy makers and research funders are persuaded of the merits of open access publishing (OAP) as a model for providing wider access to research outcomes, and, in particular, propose that research that is funded by public funds should be publicly available, and its access not restricted to subscription based academic journals. There is also the pragmatic stance that proposes OAP as a panacea for what can be viewed as extortionate increases academic journal subscription prices, which are typically borne by universities through their academic library budgets. OAP proponents point to the contradictory cycle of universities creating research outputs, in the form of journal articles, and then paying publishers to have access to these outputs. Others have discussed the relative merits of OAP as an inevitable evolution of scholarly communication in a digital age. Lewis (2012) describes open access as a disruptive innovation and on this basis proposes that it will become the dominant model for the distribution of scholarly content in the next decade. Jubb (2013) agrees suggesting that open access has the potential to upset the business model of scholarly publishing, but is optimistic that the consequent shifts in the ecology of scientific communication, including the dynamics of its production and the dynamics of its use, will

render content more amenable to the needs of scholar and readers. Certainly, we can look forward to a future that will depend on dynamic and interactive relationships between publishers, researchers, users, and information professionals (Bennett, 2013); the challenge is to achieve co-creation and not conflict and competition.

In recent years, a wide range of different open access models have been proposed and there has been considerable debate regarding the role of research funding bodies, universities and their libraries, and academic publishers within the context of these models. Amongst these models are: open access repositories (managed by universities and subject communities); pure open access journals (traditionally published by enthusiasts or organisations in a subject community, but more recently being launched by academic journal publishers (e.g. Cogent from Taylor & Francis); and, green and gold open access publication routes into traditional subscription-based scholarly journals published by academic publishers (e.g. Elsevier).

However, whilst some academics have been proactive advocates of OAP (Jubb, 2013; Eve, 2013), and others have expressed their concerns regarding the disruptive nature of OAP (Lewis, 2012; Osborne, 2013), in general little attention has been focussed the academic community's views on and response to OAP (Nariani & Fernandez, 2012). Academics, as researchers, authors, editors, and reviewers, are largely responsible for the intellectual content of scholarly communication in all of its forms. The success of the 'OAP Project' depends heavily on them, and hence it is important to design a model of scholarly communication for the digital age that they will embrace, or even better, to engage them in the co-creation of that model. Yet, research on institutional repositories reveals low engagement from academics. Some argue that this is due to a lack of alignment between the espoused objectives of institutional repositories and those of academics (Cullen & Chawner, 2011; Creaser, 2010; Xia, 2011), and suggest that other open access models may meet with greater success. In addition, differences in research funding regimes, research impacts and formats of academic publishing between disciplines (Solomon & Bjork, 2012a; Dallmeier-Tiessen et al., 2011), together with disciplinary cultures, norms and traditions (Coonin & Younce, 2009; Spezi, Fry, Creaser, Proberts & White, 2013) may mean that attitudes are to some extent disciplinary dependent. Certainly, *'changes to the scholarly information business model will only be successful if they continue to satisfy the underlying motivations and needs of researchers'* (Mulligan & Mabe, 2011a, p. 290).

This research, then, aims to contribute to knowledge regarding academics' attitudes to OAP, and further to investigate whether there are any disciplinary differences in attitudes. More specifically, the objectives of this research are to:

1. Profile academics' OAP behaviour, in terms of:
 - a. recent publication activities
 - b. future intentions
2. Profile academics' views on OAP, in terms of:
 - a. the advantages and disadvantages of OAP
 - b. the importance of services associated with paid OA publication

- c. their preferences regarding peer review
- d. the dissemination and re-use of their research

Next, a literature review summarises prior literature on disciplinary differences with regard to OAP, and on academics' attitudes towards OAP. Then, the survey-based method, drawing on the international and inter-disciplinary community of scholars who are authors, editors and peer reviewers for Taylor & Francis journals, is outlined and evaluated. Next, findings are reported and discussed. Finally, conclusions and recommendations for future research, and practice and policy are offered.

Literature Review

Factors disposing towards disciplinary differences in academics' attitudes towards OAP

There are two main mechanisms to achieve open access - gold route OA or the 'author pays' route, and the green, or 'self-archiving' route. The gold route is funded through the payment of article processing charges (APC) to the publishers such that there are no subscription or charge barriers to access. In practice, where, as is often the case in STM subjects, the publication merges from a funded research project, the research funder or the researchers' university pay the APC. Two major studies have shown significant differences in access to grant funding for APC's, with a divide between the bio and physical sciences and the social sciences and humanities (Solomon & Bjork, 2012a; Dallmeier-Tiessen et al., 2011). APC's also have the potential to reinforce existing hierarchies, with the highest prices being charged by journals with high impact factors from major international publishers, particularly those in biomedicine, and lowest prices being charged by journals in developing countries (Solomon & Bjork, 2012b). Not surprisingly, those publishers in a position to do so are using APC's to generate high levels of revenue, as a substitute for the high levels of subscription fees that they previously garnered. Publishers argue that such charges are justifiable given services that they offer.

The green route has two branches. The first, self-archiving in personal, institutional or other repositories or submission to a green open access journal, involves authors in archiving either otherwise unpublished articles, or under certain conditions, versions of articles published in traditional journals. As Laakso (2014, p.476) suggests '*Green in this context comes from the notion of publishers giving a "green light" for uploading openly available copies of the article contents*'. Normally the terms under which an author can undertake this deposit are specified by the publisher, and may include the versions that can be uploaded (pre-print, accepted manuscript, publisher version), where it may be uploaded to (personal website, institutional repository, subject repository, elsewhere), and the embargo (after 6, 12, 18 or 24 months) (based on Laasko, 2014). The embargo is another area of disciplinary divergence, with embargos in the STM disciplines typically shorter than in HSS (e.g. 12 as opposed to 24 months).

In addition to these practical differences between disciplines, the open access movement has its foundation in STM subjects, leaving humanities and social science scholars wrestling with

the relevance of OAP. For example, Dallmeier-Tiessen et al. (2011) found that STM accounts for 66% of pure and hybrid open access journals, and contributes 77% of articles. Humanities scholars have been found to have a low awareness of repositories and make significantly less use of e-publications and open access services (Cullen & Chawner, 2011; Heath, Jubb & Robey, 2008) and penetration of open access has been much slower in the social sciences (Coonin & Younce, 2009, 2010). In a recent study focussing on arts, humanities and social science disciplines, Rodriguez (2014) found that although self-reported knowledge of OA was growing, publishing activity remained relatively limited. More generally, the culture of a discipline and its norms (or traditions) impact strongly on researchers communication practices, including their relative reliance on journals, books and conference proceedings (Coonin & Younce, 2009; Fry et al., 2009; Harley et al., 2010) and there is evidence that discipline culture influences the adoption and adaptations of digital scholarship (Kling & McKim, 1999, 2000).

Previous research into academics attitudes towards OAP

Research into academics' attitudes and behaviours regarding OAP encompasses two groups: that associated with the use of open access repositories, and that associated with publishing in open access journals. Studies in both of these areas provide insights into the factors that are important to academics in their decision to deposit in open access repositories or publish in open access journals. There is strong evidence that these factors are consistent across both OAP and traditional publishing, such that recent studies on scholarly communication, also offer valuable insights into academics' attitudes to open access.

Early research on engagement with open access repositories, especially those established by university libraries, revealed low levels of deposits (Kim, 2007; Hendler, 2007), Creaser (2010) suggested that only around 30% of eligible scholars and researchers self-archive their work in institutional repositories. Creaser (2010) also found that: academic staff had little knowledge of institutional repositories; were unaware of their institutions' policy; and the most important consideration in publication decisions was achieving high readership and impact in their own discipline. Fry et al. (2009) suggest that their respondents showed evidence of confusion between access to OA resources and seamless desktop access to subscription-based journal resources through a university's access system. There are two important differences between OAI and open access journals - reviewing and community. Cullen and Chawner (2011), on the basis of findings from a national study of academics in New Zealand' universities, conclude that the vision of capturing the intellectual capital of the organisation is unlikely to be realised, because as Xia (2011) also acknowledges, scholarly communication needs to be owned by the scholars. Cullen and Chawner (2011) suggest that with the advent of electronic journals and improved agreements regarding intellectual property the four key functions of the scholarly communication system, registration, certification, awareness and archiving (Roosendaal & Geurts, 1997) are being fulfilled more effectively. Nevertheless, in a more recent study, following on from Creaser (2010) and involving a survey and focus groups with a significant population of European academics, Spezi, Fry, Creaser, Proberts and White (2013) report that 59% of respondents had self-

archived a version of their journal article in either an institutional or subject based OAR. In explaining this increase, they refer policy developments, and mandatory deposit, as outlined in ROARMAP (<http://roarmap.eprints.org>) and OpenDOAR (www.opendoar.org/). Spezi, Fry, Creaser, Proberts and White (2013) offer a thorough review of green open access practices, including an interesting picture of inter-disciplinary differences as they relate to areas such as self-archiving behaviours, readers' use of OAR's, and, satisfaction with OAR journal articles.

Studies on OAP offer more specific insights into the factors that influence engagement in OAP. Most focus on publication choice and are restricted to specific disciplinary or journal communities. Schroter, Tite and Smith (2005) conducted a study of the OAP perceptions of authors published in *British Medical Journal*; they were willing to consider publishing in open access journals (OAJs), but the quality and reputation of the journal, including impact factor were key considerations, with charging policy being less important. Warlick and Vaughan (2007) interviewed biomedical faculty members who were early OAP adopters at two major US research universities. Incentives to publish in OAJs included audience accessibility and the potential for broad exposure; disincentives included cost, and lack of regard for OAJ's. Coonin and Younce (2009), in a survey-based study of publishing in open access journals in the social sciences and humanities, concluded that peer review and peer acceptance are at the heart of scholarly and research endeavours. They also commented on the impact of disciplinary cultural differences comparing psychology ('*a concise discipline*', p.91) with women's studies ('*interdisciplinary and still relatively young*', p.91). Mathematics is an interesting case, due the longstanding use of arXiv; Fowler (2011) found that a third of respondents had published in OAJ's, with speed of publication being viewed as a main advantage. Nevertheless, tenure and promotion criteria were a major influencer of publishing decisions and there was substantial philosophical opposition to author fees. Two other studies (Coonin & Younce, 2010; Coonin, 2011), in education and business, respectively, confirmed the importance of peer review in publication choice, irrespective of the business model used for publishing. Russell and Kent (2010) conducted a case study involving University of Birmingham authors who had received institutional support for green and gold open access publication, and again confirmed that authors are not concerned about the business model, and are much more interested in the impact and reputation of the journal. Bird (2010), in a study of authors contributing to *Nucleic Acids Research*, found impact factor, journal profile and reputation and quality and speed of the reviewing process to be key in journal choice. The Study of Open Access Publishing (SOAP) project, conducted by a consortium of publishers, funding agencies and libraries, a cross-disciplinary worldwide survey confirmed funding and perceived quality as the main barriers to publishing in open access journals (Dallmeier-Tiessen et al., 2011).

An important large-scale study of scholarly communication, led by CIBER, has spawned a number of publications, each focussing on different aspects of scholarly communication, but all generally exploring how scholars judge and implement trust and authority in reading, citing and publishing. Relevant to this study are findings regarding attitudes to open access

and the role of peer review. For example, Nicholas et al. (2014) suggest that researchers are confused and suspicious about open access, but less so if produced by a traditional publisher, whilst Jamali et al. (2014) uncovered negativity towards the use of repositories for publishing and some scepticism regarding their potential for increasing usage or reaching a wider audience. Interestingly, Jamali et al. (2014) suggest that researchers from less developed countries, such as India and China, are more reliant than those in the US and the UK on external factors that are related to authority, brand and reputation, including authors' names, affiliations, country, and journal names. Accordingly, open access models that do not embed these indicators may present researchers in developing countries with greater challenge in making authority judgements.

However, taking a different tack, Nicholas et al. (2015), in an article that focuses on peer review, argues the case for the continuing and growing importance of peer review. He suggests that *'the implicit trust that comes with peer review is very effective for reducing the complexity of today's disintermediated, overly abundant scholarly information environment because it enables scholars to come to decisions without first considering every possible eventuality'* (p.15). Other merits of traditional peer review are its contribution to improvement in the quality of the article, and that the publishers (with the aid of their editors) organise it. Peer review is typically associated with traditional academic publishing, but Nicholas et al. (2015) suggest that it may be possible to disaggregate the two. As regards usage, academics were concerned about the peer review status of OA publications, and, in general, there was a perception that OA journals are not peer reviewed. On the other hand, when making choices for publishing their research, peer review was ranked above 'being published by a traditional publisher' or 'being in a highly cited journal'. In addition, PLOS ONE, has demonstrated the potential for an OA journal that publishes speedily, undertakes peer reviewing, and has a good impact factor (Curry, 2013; Nicholas et al., 2015). This emphasis on peer review is consistent with Solomon and Bjork (2012a)'s finding that quality/impact, and speed of review/publication, were the most important factors, after 'fit with the scope' determining journal choice for submission. Similarly, Mulligan and Mabe (2011a, b), in an analysis of Elsevier's author feedback programme, found that refereeing quality and refereeing speed were the most important factors influencing journal choice.

Methodology

In early 2014, Taylor & Francis carried out a worldwide online survey to gather authors' views on OAP. The survey was sent via email to 89,181 authors during March 2014. By the end of the exercise, 7,936 filled questionnaires were returned, a response rate of 9%. The survey was designed to gain insights on a number of aspects of OAP. Large scale and interdisciplinary nature of the survey has generated a significant dataset that generates evidence that not only has value for policy development for Taylor & Francis, but also offers some indicators of more general interest. One limitation of the survey derives from the contact details available on the T&F database, such that only corresponding authors were asked to complete the questionnaire. This might skew the results towards the views of more experienced researchers and lead to under-representation of research students and younger

academics. The nature of the contact database also affects the geographical spread of respondents. Nevertheless, 41% of the respondents are from the United States and the UK, 19% are from the rest of Europe and the remaining 40% is represented by the rest of the world (including Australasia, Africa and South America). This implies that the views collected are largely those of the western research world.

The 2014 Taylor & Francis Open Access Survey was composed of eight sections (“Your Attitudes and Values”, “Licences”, “Article Submission Practices”, “Repositories”, “Regional Questions”, “Open Access Services”, “The Future of Open Access Publishing” and “Demographics”), with 91 statements/closed questions and two open questions, divided into 26 main questions. For the present study, seven main questions were considered, giving a total of 35 statements; full details of the survey can be found online at www.tandfonline.com/page/openaccess/opensurvey.

Data were entered into IBM SPSS Statistics 22. The dataset was initially inspected for errors and out-of-range values in each variable. The maximum confidence interval (at a 95% confidence level) for any one question is 1.16. For the purposes of this study, the 24 subject areas covered by the survey were collapsed into two main categories (Table 1).

Table 1. Distribution of the scientific (STM) and social (HSS) subject areas.

| | <i>Disciplines</i> | <i>%</i> |
|-----|---|----------|
| STM | Behavioural Sciences, Engineering & Technology, Biological Science, Environmental Science, Mathematics, Medicine (Dentistry, Nursing, Pharmacy, Allied Health), Geography, Chemistry, Agriculture & Food Science, Physics, Materials Science, Computer Science | 47.8 |
| HSS | Humanities, Education, Business & Economics, Sociology (Ethnicity, Race, Gender, Development), Politics & International Relations, Cultural Studies, Media & Communication, Public Health & Social Care, Arts, Library & Information Science, Tourism, Leisure & Sport Studies, Law & Criminology, Area Studies | 52.5 |

According to this classification, all scientific, technical and medical sciences (STM) accounted for 47.8% of the responses, while the humanity and social sciences (HSS) accounted for the remaining 52.2%. Descriptive statistics were calculated and means and standard deviations were calculated for each of the statements. Subsequently, independent samples t-tests were carried out to compare mean scores on gender and subject area and one-way between-groups ANOVA with post-hoc tests were performed to compare mean scores according to the years of experience of the respondent. This study reports the results from t-tests with respect to subject discipline. The analyses performed on gender, and years of experience did not show any differences between groups other variables, have shown similar results and hence have not been reported here.

Findings

Key insights

This section reports and discusses the findings relating to the two key objectives of this research, *viz*, to profile academics' OAP behaviour, and to profile academics' views on OAP. Most of the tables report responses for the whole sample, as well as providing a comparison of the differences between respondents in STM and those in HSS.

This paragraph first identifies some of the headline findings, and the sections that follow provide a more in-depth analysis. First on behaviour, there are two interesting findings. The ratio of total articles published to those published as gold OA, is relatively consistent between STM and HSS (Table 2a). Whilst HSS scholars output is lower, this ratio suggests similar level of adoption of gold OAP, which is inconsistent with findings from other studies that suggest that HSS scholars are slower to adopt OAP (Croonin & Younce, 2009, 2011; Cullen & Chawner, 2011). It also poses questions regarding the effect of differing levels of funding for APC's (Solomon & Bjork, 2012a; Dallmeier-Tiessen et al., 2011). Also, in terms of behaviour, when asked about future intentions regarding OA and their research, the responses to most questions revealed a high level of uncertainty regarding future intentions, with typically around 50% indicating that they were '*unsure*', irrespective of discipline group (Table 2b). This is an important finding, which is arguably consistent with assertions that scholarly communication is undergoing a paradigm change that academics are finding difficult to interpret (Jubb, 2013; Lewis, 2012), and concurs with Nicholas et al. (2015)'s observation that researchers are confused and suspicious about open access.

When it comes to attitudes towards OAP, responses to four statements stand out. Respondents identify wider circulation than publication in a subscription journal, as a possible advantage of open access (Table 3), agreeing with the findings from Warlick and Vaughan (2007)'s interview-based study. In terms of the service expected when they pay for OAP, key are rigorous peer review, and rapid publication (Table 5), and consistent with this there is a preference for the peer review style most aligned with the traditional peer reviewing process (Table 6). These findings echo those of many other studies that identify the increasing importance of peer review (Coonin & Younce, 2009a; Nicholas et al., 2015) and its importance, alongside impact factors and reputation, to the success of OAJ's (Bird, 2010; Coonin, 2011; Curry, 2013; Nicholas et al., 2015). Speed of reviewing has also been identified as important in other studies (Bird, 2010; Solomon & Bjork, 2012 a). Finally, one result stands out for its negativity. Academics are strongly against the use of their work for commercial gain without their prior knowledge or permission, even when they receive credit as the original author (Table 7); the issue of re-use has previously been relatively unexplored. In addition, there are differences between the two disciplinary groups, and whilst for many statements there is a statistically significant difference, in almost all cases the effect size is small suggesting that the two groups are more similar than has been found or asserted by previous researchers and commentators (Cullen & Chawner, 2011; Harley et al., 2010; Rodriguez, 2014).

Academics' OAP Behaviour

Table 2a and 2b summarise the responses to questions on academics' current OAP behaviour, and their intentions for the future. Overall, academics report publishing an average of 4.0 articles in the twelve months prior to the survey, with roughly one quarter of these being published as gold open access (Table 2a). Further, the ratio of gold open access to publication in subscriptions based journals is similar for both of the disciplinary groups. Altogether this suggests either that there is considerable scope for further development of gold open access publishing, or that APC's act as a barrier to gold OAP, such that the co-existence of gold and green OAP is likely to persist for a considerable time. As regards academics' future intentions regarding engagement with gold and green OA, there are no marked disciplinary differences, here, either, and the largest group of responses to all questions except one is in the '*Unsure*' category. The exception is the response to the statement '*I will choose to publish more articles as green OA*', with 46% expecting to choose to publish more green OA articles in the future.

[Insert Table 2a here]

[Insert Table 2b here]

Academics' OAP Attitudes

Tables 3 to 7 summarise the responses to questions on various aspects of academics' attitudes towards OAP. Tables 3 and 4, respectively, offer insights into their views on the advantages and disadvantages of OAP. Responses to the first three questions in Table 3 deal variously with perceptions relating to circulation, visibility, and readership. Academics seem convinced that OA offers wider circulation, but less convinced that it offers higher visibility than publication in a subscription journal. They are more ambivalent as to whether '*OA journals have a larger readership of researchers than subscription journals*'. Other researchers have suggested that academics are less concerned about circulation, and more about having their work read by a community of scholars (Cullen & Chawner, 2011; Warlick & Vaughan, 2007). Respondents were also ambivalent regarding whether '*OAJ's were cited more heavily than subscription journals*', with HSS respondents showing slightly less agreement with this than STM respondents. OAJ's were to some extent perceived to '*have faster publication times than subscriptions journals*', but there was no overall agreement as to whether OA drives innovation in research. Differences between the two discipline groups were significant for statements V3,V5,V6 and V8, but effect sizes were small in all instances.

Table 4 asks about potential disadvantages of OAP. The first two statements relate to the quality and production standards of OAJ's, respectively. Overall, there was a great deal of ambivalence regarding these issues, with both having means close to 3. OA proponents may view this as a step in the right direction since earlier studies have typically reported that OAJ's are typically perceived to be of lower quality than traditional journals, due to the absence of peer review (Coonin & Younce, 2009; Coonin, 2011; Dallmeier-Tiessen et al., 2011; Schroter et al., 2005), but there is still a way to go. Positive progress is also weakly

evident in the relatively negative responses to the statement: *‘There are no fundamental benefits to OA publication’*. Differences between the two discipline groups were significant for statements V11 and V12 but effect sizes were small in both instances.

[Insert Table 3 here]

[Insert Table 4 here]

Table 5 offers important insights into what academic authors want from publishers, especially when they are required to pay for those services. We have already identified the importance of rigorous peer review and rapid publication, above. Other strongly ranked items are rapid peer review, and promotion of their paper, post-publication. In all of these areas, publishers, whether they be OA or traditional, rely heavily upon input from editors and reviewers. In other words, success is highly dependent on the labour and the reputation of the academics associated with a journal, much of which has, until now, only been remunerated through the honour accorded to reviewers and editors by their scholarly community. Of these four statements, V65 and V67 show statistically significant differences between disciplines, but both have small effect sizes. Other statements relate to: guidance on increasing the visibility of a paper, automatic deposit of a paper, provision of usage and citation figures, provision of alt-metrics, and pre-peer review services, such as language checking and paper formatting. Responses suggested that all of these services would be appreciated, but were not pivotal. This may, in part, be because they are not part of the standard package offered to authors, such that respondents do not have sufficient experience to be able to judge how useful they might be.

Given the importance of peer review, the study sought to identify which approaches to peer review were most favoured by respondents. Strongest support was evident for *‘a rigorous assessment of the merit and novelty of my articles with constructive comments for its improvement, even if this takes a long time’*. This suggests that academics do not only want peer review, they want a specific model of peer review. Some support was also lent to *‘accelerated peer review with fewer rounds of revision’*, but alternative models, such as those based on assessment of technical soundness, with no judgement on novelty, or post-publication peer review did not attract much support. Of these four statements, V40, V41 and V43 show statistically significant differences between disciplines, but have small effect sizes. However, there is evidence here that it may be worth investigating further whether STM researchers may be more tolerant of alternative models of peer review than HSS researchers.

[Insert Table 5 here]

[Insert Table 6 here]

Finally, Table 7 summarises attitudes on dissemination and re-use of research. All statements in this table had the proviso: *‘without my prior knowledge or permission, provided I receive credit as the original author’*. As already indicated, the lowest ranking in the survey was associated with re-use of their work for commercial gain. However, in contrast, a relatively

positive response was offered on the issue of re-use for non-commercial gain. Respondents also indicated concern regarding the inclusion of their work in an anthology, and its adaptation. They were ambivalent regarding translation and data and text mining, suggesting that they were cautious in expressing general support, and that the specific circumstances may influence their opinions. The issue of re-use has received very little attention beyond the publisher's controls over deposit of versions of articles in repositories (Bjork, 2004), so the insights from this study are important. This is also the only topic where there are statistically significant differences with effect sizes that are worthy of consideration. V24, V25, V26, V27 and V28 all have statistically significant differences. For V24 and V25, relating respectively to use for commercial gain and translation, the effect size is small (.02), with in both instances, HSS scholars being more resistant to the re-use of their work. For V27 and V28, relating respectively to inclusion in anthologies and adaptation, the effect size is large (.07, .06), with HSS researchers being considerably more resistant to the re-use of their work.

[Insert Table 7 here]

Conclusion and recommendations

This article draws on data from a major international survey, based on the database of authors and reviewers of a major publisher, Taylor & Francis. It offers insights into various aspects of academics behaviour and attitudes towards OAP in OAJ's. As well as providing a general profile, analyses have been performed to explore any differences on the basis of the two major disciplinary groups, STM and HSS. In terms of behaviour, this study suggests that HSS and STM authors are equally engaged in publication in OAJ's, but that there is considerable progress to be made regarding the adoption of gold open access routes. Indeed, respondents reported a high level of uncertainty regarding their future intentions regarding OAP.

Overall, then, whilst there is some evidence of adoption of OAP, especially in the arena of OAJ's, gold open access only accounts for around a quarter of open access publications, and coupled with this academics are unsure as to their future intentions regarding OAP. Academics are uncertain as to the future of scholarly communication, and this presents them with dilemmas in their choice of publication, yet this study suggests that there is an agreement that there may be some value on OA publication. On one hand, some authors are being mandated and funded to choose gold open access, but on the other, there are financial and ideological drivers inclining them to participation in various green open access models. Taking this into account, it is likely that for the short term at the very least, green and gold open access models will continue to complement each other. Publishers, researchers and policy makers need to take an omnichannel perspective to scholarly communication, and to develop further understanding of the models and contributions of green and gold open access to effective and sustainable scholarly communication.

Responses on attitudes to various aspects of OAP provide insights into the characteristics of OAP in OAJ's that are important to academics, and therefore need to be incorporated into any successful model. These are: rigorous peer review, and rapid publication. More specifically, there is considerable support for peer review models that are aligned with the traditional

model that involves pre-publication review of all aspects of the article, including techniques contribution and novelty. This study provides some tentative indication that STM researchers may be more amenable to alternative methods of review than HSS researchers, and there might be scope for further research in this area. The peer review process is pivotal to any model of scholarly communication. However, with the advent of electronic manuscript submission systems, greater internationalisation of reviewing and editorial communities, and increased interdisciplinary, it is in transition. Many studies have identified the importance of peer review to the success of OAP, but there is considerable scope for further research into this 'hidden' world. Other authors have also identified the importance of journal impact factors and reputation. There are grounds for believing that academics will migrate to and embrace any model of scholarly communication or specific publication outlet that is perceived as high impact, rigorously refereed, and of good reputation, and by so doing will re-enforce its status. Accordingly, those OA initiatives that will succeed are those that work with scholarly communities to co-create the scholarly communication models of the future.

Finally, there is the matter of intellectual property. Whilst academics may traditionally have accepted the copyright and licence agreements that publishers put before them in the interests of being published, open access brings into the limelight the issues associated with re-use. Academics are strongly against the re-use of their work for commercial gain without their prior knowledge or permission, even if they receive credit as the original author. They also have concerns regarding adaption of their work, and its inclusion in an anthology, without their permission, with HSS academics expressing much stronger views on this than STM academics. Publishers and policy makers need to focus further attention on the intellectual property rights of authors, especially in a world where there are serious concerns regarding plagiarism and copyright infringement. Maintaining appropriate controls are likely to be all the more difficult where the author deposits more than one version of an article in different OA 'repositories'.

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Table 2a. Academics' behaviours and intentions on OAP – Number of articles published.

| <i>Code</i> | <i>In the last 12 months, how many scholarly articles have you published:</i> | <i>Total articles per author (mean)</i> | <i>STM articles per author (mean)</i> | <i>STM Ratio</i> | <i>HSS articles per author (mean)</i> | <i>HSS Ratio</i> |
|-------------|---|---|---------------------------------------|------------------|---------------------------------------|------------------|
| V37 | Where a subscription is required by the reader to access the article | 3.1 | 4.05 | 3.52 | 2.59 | 3.55 |
| V38 | As Gold OA, where the article is freely available to everyone | 0.9 | 1.15 | | 0.73 | |

Table 2b. Academics' behaviours and intentions on OAP – Future intentions.

| <i>Code</i> | <i>What are your future intentions regarding OA and your own research?</i> | <i>Total</i> | | | <i>STM</i> | | | <i>HSS</i> | | |
|-------------|--|----------------|---------------|-------------------|----------------|---------------|-------------------|----------------|---------------|-------------------|
| | | <i>Yes (%)</i> | <i>No (%)</i> | <i>Unsure (%)</i> | <i>Yes (%)</i> | <i>No (%)</i> | <i>Unsure (%)</i> | <i>Yes (%)</i> | <i>No (%)</i> | <i>Unsure (%)</i> |
| V75 | I will choose to publish more articles as Gold OA | 31 | 21 | 47 | 33 | 20 | 47 | 30 | 23 | 48 |
| V76 | I will be mandated to publish more articles as Gold OA | 14 | 33 | 54 | 15 | 34 | 52 | 13 | 33 | 55 |
| V77 | I will choose to publish more articles as Green OA | 46 | 13 | 41 | 46 | 14 | 40 | 46 | 13 | 41 |
| V78 | I will be mandated to publish more articles as Green OA | 21 | 27 | 52 | 22 | 27 | 51 | 20 | 27 | 53 |

Table 3. Possible advantages of OAP.

| Code | Statement | Total | | STM | | HSS | | Means diff. | Sig. | Effect size |
|------|--|-------|-------|------|-------|------|-------|-------------|------|-------------|
| | | Mean | s.d. | Mean | s.d. | Mean | s.d. | | | |
| V3 | OA offers wider circulation than publication in a subscription journal | 4.21 | 0.952 | 4.17 | 0.978 | 4.26 | 0.920 | -0.09 | .000 | .002 |
| V4 | OA offers higher visibility than publication in a subscription journal | 3.83 | 1.095 | 3.85 | 1.098 | 3.82 | 1.079 | 0.03 | .317 | n/a |
| V5 | OA journals have larger readership of researchers than subscription journals | 3.52 | 1.123 | 3.58 | 1.148 | 3.47 | 1.102 | 0.11 | .000 | .002 |
| V6 | OA journals are cited more heavily than subscription journals | 3.02 | 1.110 | 3.11 | 1.144 | 2.94 | 1.078 | 0.17 | .000 | .005 |
| V7 | OA journals have faster publication times than subscription journals | 3.63 | 0.989 | 3.60 | 1.021 | 3.66 | 0.955 | -0.06 | .023 | .001 |
| V8 | OA drives innovation in research | 3.19 | 1.137 | 3.13 | 1.141 | 3.23 | 1.117 | -0.10 | .001 | .002 |

Table 4. Possible disadvantages of OAP.

| Code | Statement | Total | | STM | | HSS | | Means diff. | Sig. | Effect Size |
|------|--|-------|-------|------|-------|------|-------|-------------|------|-------------|
| | | Mean | s.d. | Mean | s.d. | Mean | s.d. | | | |
| V10 | OA journals are lower quality than subscription journals | 3.01 | 1.109 | 2.98 | 1.134 | 3.04 | 1.089 | -0.06 | .036 | .001 |
| V11 | OA journals have lower production standards than subscription journals | 2.92 | 1.077 | 2.86 | 1.093 | 2.98 | 1.061 | -0.12 | .000 | .003 |
| V12 | There are no fundamental benefits to OA publication | 2.05 | 1.086 | 2.17 | 1.120 | 1.95 | 1.035 | 0.22 | .000 | .01 |

Table 5. Importance of services when paying for publication in OAJs.

| Code | Statement | Total | | STM | | HSS | | Means diff. | Sig. | Effect size |
|------|--|-------|-------|------|-------|------|-------|-------------|------|-------------|
| | | Mean | s.d. | Mean | s.d. | Mean | s.d. | | | |
| V65 | Rapid peer review | 3.81 | 1.013 | 4.06 | 1.000 | 3.85 | 1.038 | 0.21 | .000 | .01 |
| V66 | Rigorous peer review | 4.04 | 0.953 | 4.16 | 0.933 | 4.21 | 0.915 | -0.05 | .046 | .001 |
| V67 | Rapid publication of my paper | 3.90 | 0.988 | 4.15 | 0.942 | 3.97 | 1.011 | 0.18 | .000 | .008 |
| V68 | Promotion of my paper post-publication | 3.75 | 1.034 | 3.81 | 1.052 | 3.88 | 1.059 | -0.07 | .009 | .001 |
| V69 | Detailed guidance on how I can increase the visibility of my paper | 3.52 | 1.089 | 3.61 | 1.135 | 3.58 | 1.142 | 0.03 | .432 | n/a |
| V70 | Automated deposit of my paper (Author Accepted Version) into a repository of my choice | 3.62 | 1.037 | 3.67 | 1.072 | 3.72 | 1.076 | -0.05 | .076 | n/a |
| V71 | Provision of usage and citation figures at the article level | 3.60 | 1.025 | 3.66 | 1.063 | 3.69 | 1.066 | -0.03 | .225 | n/a |
| V72 | Provision of alt-metrics (such as Altmetric or ImpactStory) | 3.13 | 1.103 | 3.19 | 1.133 | 3.12 | 1.199 | 0.07 | .021 | .001 |
| V73 | Pre-peer review services such as language polishing, matching my paper to a journal, and/or formatting my paper to journal style | 3.43 | 1.168 | 3.51 | 1.224 | 3.48 | 1.240 | 0.03 | .397 | n/a |

Table 6. Views on peer review styles in OAJs.

| Code | Statement | Total | | STM | | HSS | | Means diff. | Sig. | Effect size |
|------|--|-------|-------|------|-------|------|-------|-------------|------|-------------|
| | | Mean | s.d. | Mean | s.d. | Mean | s.d. | | | |
| V40 | A rigorous assessment of the merit and novelty of my article with constructive comments for its improvement, even if this takes a long time | 3.86 | 1.005 | 3.84 | 1.043 | 3.98 | 0.965 | -0.14 | .000 | .005 |
| V41 | Accelerated peer review that reviews the technical soundness of my research without any judgement on its novelty or interest | 2.90 | 1.145 | 2.97 | 1.201 | 2.84 | 1.161 | 0.13 | .000 | .004 |
| V42 | Accelerated peer review with fewer rounds of revision | 3.15 | 1.077 | 3.18 | 1.141 | 3.16 | 1.082 | 0.02 | .517 | n/a |
| V43 | Post-publication peer review after a basic formal check by invited reviewers that my work is scientifically sound (in the style of F1000 Research) | 2.58 | 1.172 | 2.70 | 1.228 | 2.44 | 1.167 | 0.26 | .000 | .01 |

Table 7. Attitudes towards the dissemination and re-use of their research.

| Code | Statement | Total | | STM | | HSS | | Means diff. | Sig. | Effect size |
|------|--|-------|-------|------|-------|------|-------|-------------|------|-------------|
| | | Mean | s.d. | Mean | s.d. | Mean | s.d. | | | |
| V22 | It is acceptable for my work to be reused provided the new author applies the same reuse conditions as I applied when I published the work | 3.64 | 1.272 | 3.69 | 1.241 | 3.58 | 1.290 | 0.11 | .364 | n/a |
| V23 | It is acceptable for my work to be re-used for non-commercial gain | 3.84 | 1.190 | 3.89 | 1.136 | 3.80 | 1.208 | 0.09 | .506 | n/a |
| V24 | It is acceptable for others to use my work for commercial gain | 2.23 | 1.287 | 2.49 | 1.343 | 2.07 | 1.239 | 0.42 | .000 | .02 |
| V25 | It is acceptable for others to translate my work | 3.06 | 1.399 | 3.30 | 1.346 | 2.95 | 1.422 | 0.35 | .000 | .02 |
| V26 | It is acceptable for others to use my work in text- or data-mining | 3.41 | 1.238 | 3.53 | 1.209 | 3.39 | 1.251 | 0.14 | .000 | .003 |
| V27 | It is acceptable for others to include my work in an anthology | 2.88 | 1.401 | 3.38 | 1.263 | 2.62 | 1.416 | 0.76 | .000 | .07 |
| V28 | It is acceptable for others to adapt my work | 2.64 | 1.404 | 3.12 | 1.339 | 2.39 | 1.390 | 0.73 | .000 | .06 |