Open Access Issues and Engineering Faculty Attitudes and Practices

WILLIAM H. MISCHO and MARY C. SCHLEMBACH

University of Illinois at Urbana-Champaign, Urbana, IL, USA

ABSTRACT. The two primary means for accomplishing Open Access (OA) goals are the "author pays" or Gold model and the "self- archiving" or Green model, both of which can have variations or hybrids. There is a growing schism between proponents of the Gold and Green models. Scholar uptake on self-archiving has been very limited. At the same time, a great deal of concern has been expressed regarding the Gold model, particularly with regard to cost and the role of peer-review lite journals. With the evolving OA environment as a backdrop, the authors conducted a survey of university engineering faculty in order to better understand their OA practices and attitudes. The scholarly communication needs and activities of engineering faculty are more diverse than other scholars in that they have a broader and more varied literature, which includes journal articles, conference papers, technical reports, standards, handbook information, patents, and grey literature. The survey was comprised of 12 Likert scale questions and 3 open comment questions. The results of the survey of engineering faculty were consistent with other studies that have revealed concerns over the author pays model and a reluctance to self-archive in the university institutional repository (IR). Survey results showed that engineering faculty do not extensively publish in author pays Gold journals and had limited plans to do so in the future. In line with other studies, the survey revealed that there was a lack of familiarity with campus IRs and a very small uptake rate for depositing research output in institutional repositories.

INTRODUCTION

The operating principle of open access (OA) is that intellectual content be made available free to users without usage restrictions. Harnad defines the goal of the OA movement as providing a scholarly publishing environment that will "maximize research uptake, usage, and impact by making research articles accessible to all the potential users" (Harnad, 2010). The two primary means for accomplishing OA goals were identified in the Budapest Open Access Initiative in 2001. They are:

> 1. The "author pays" or Gold model where journal publishers charge authors a fee—above and beyond the usual page and graphics charges—typically on the order of $1,500 to $3,500 per article to make the article OA.
> 2. The "self-archiving" or Green model in which authors deposit their works (including journal articles) in open repositories such as campus institutional repositories (IRs) or national subject domain repositories.

There are variations within both the Gold and Green models. There are pure Gold journals such as the Public Library of Science (PLoS) and Hindawi journals and also "hybrid" Gold journals comprised of a mixture of optional OA author pays and subscription-access or toll access content. Approximately 30% of scholarly publishers (including Elsevier, Springer, and the American Physical Society) offer optional author pays hybrid journals, but the uptake on the author pays portion of these journals has been very small, less than 10% on the average (Bird, 2010). A survey of the Biosciences Federation member societies showed that 65% offer the hybrid option, but that the author pays option has been taken up for only 1.35% of the articles published (Thorn, Morris, & Fraser, 2009). An analysis of the Gold hybrid journal market undertaken by the SOAP (Study of OA Publishing) project showed that the OA component share in hybrid journals was only about 2% in 2009 (Dallmeier-Tiessen et al., 2010).

The Green model has been pushed forward by federal mandates for the archiving of research sponsored by government funds. This is a requirement of the National Institutes of Health (NIH) and, within the Federal Research Public Access Act (FRPAA), is being considered for all granting agencies (Courant, O'Donnell, Okerson, & Taylor, 2010). In addition, campus mandates for self-archiving or repository deposit have passed the faculty senates at MIT, Boston University, and several Harvard faculties, including the Faculty of Arts and Sciences. In these situations, depending on publisher copyright permissions and stipulated embargo periods, faculty are required or encouraged to provide either a publisher-ready copy or a publisher-submitted copy of their articles for deposit into an OA repository, usually the campus IR.

It has been generally assumed that the two approaches (the Gold and the Green) can operate in a complementary manner and are not mutually exclusive. Indeed, parallel developments in both approaches have long been discussed (Guedon, 2004; Johnson, 2005; Brown, 2010). Guedon (2004) has argued that treating the Gold and Green approaches as separate or as competitive is "not useful" and, moreover is "potentially divisive" and "could ultimately weaken the open access movement."

However, Harnad (2010) and others contend that the only viable road to OA is for universities and funders to first mandate universal self-archiving or Green OA of the final peer-reviewed articles with no embargo period. In a 2010 interview, Harnad laments that "instead of pursuing Green OA mandates, nearly everyone keeps succumbing to golden fantasies" (Poynder, 2010). The failure of a 2009 OA faculty senate mandate at the University of Maryland was at least partially attributed to the faculty's inability to disentangle the Gold and Green models and fairly widespread faculty concerns over author fees (Hackman, 2009). However, self-archiving via institutional repositories has been slow in gaining acceptance and uptake. It is estimated that only about 15% of the peer-reviewed literature is presently being self-archived in IRs (Poynder, 2010).

In examining and analyzing the literature, it appears that the OA movement is at a crossroads. There is contention between the two camps. Twenty years of discussion, debate, and user surveys on OA have generated a critical mass of OA knowledge and activities. But, some long-held beliefs are being challenged and uncertainty exists surrounding the role of OA in the evolving scholarly communication landscape. Given that a variety of OA mechanisms have been introduced and are moving forward, this is both an opportune time and an important time to engage faculty in discussions on OA questions.

This article summarizes the key issues faced by OA with an eye to providing a framework for discussing these issues with research faculty. From this framework, the authors compiled and administered a survey to faculty in the College of Engineering (COE) at the University of Illinois at Urbana-Champaign to determine current OA attitudes and practices of a prestigious and prolific research faculty.

OA ISSUES

It is important to look at the cross-section of OA issues, as reported and commented on in the literature, which includes articles, blogs, and editorials. There are clear advantages to OA's free dissemination of the scholarly literature. They include: potentially speeding up the knowledge transfer process, providing both individuals and industry with broader access to information, enabling scientists in poor and developing countries to access more information, and empowering the general public (Davis, 2009).

In addition, libraries around the world are facing a "serials crisis" of rising costs of journals in an environment of shrinking library budgets. This has forced libraries to cancel an increasing number of subscriptions, curtailing researcher access to the literature and threatening scientific and medical breakthroughs. Arguments have been advanced that OA decreases the costs of the scientific publishing system in general (Houghton, et al., 2009; Swan, 2010a). Brown provides a comprehensive analysis of the often contradictory studies, policy papers, financial analyses, Web sites, and blog entries that address the overarching controversies connected with OA. He specifically focuses on the business of journal publishing and the financial relationships between repositories and journal subscriptions. He concludes that there is a large emotional component to both the arguments in support of OA and those against OA and that little hard evidence currently exists to make informed decisions in this time of rapid change (Brown, 2010).

Citation Advantage

It is often reported that OA articles are cited more often than subscription access (toll access) or print format articles. Several early studies have suggested this; see Swan (2010b) for a summary of this work. The Sherpa Web site states that OA articles are cited up to 300% more than subscription articles (Sherpa, 2011). A recent article by Gargouri et al. in PLoS ONE claims that authors who have self-archived the final draft of an article find that these articles are cited significantly more often than articles in the same journal that have not been made OA (Gargouri et al., 2010). This article has engendered a detailed statistical argument around the question of cause and effect relationships (Davis, 2010).

Several factors have been put forth to explain the citation advantage for OA articles, including the role of author self-selection of their most important, and hence, most cited articles for OA access (selection bias) and the "early view" explanation based on the early time of deposit in relation to time of publication (Craig, Plume, McVeigh, & Amin, 2007).

Several studies have failed to show an OA citation advantage (Davis & Fromerth, 2007; Kurtz & Henneken, 2007; Moed, 2007). In a well-designed controlled trial involving the random selection of articles for OA status from a publisher's corpus, no evidence was found for an OA citation advantage (Davis et al., 2008). A later study showed that only 2 out of 11

journals studied showed positive OA citation effects (Davis, 2009). A more extensive 3 year study over 36 journals and randomly selected OA articles in the sciences, social sciences, and humanities showed that, while the OA articles were downloaded more frequently, they were cited no more frequently, nor earlier, than the subscription-access control articles (Davis, 2011).

In an extensive study of citation data generated from the ISI Web of Knowledge database, Evans and Reimer (2009) showed that the OA effect on citations is modest, at approximately 8% for recently published research. In contrast, the impact of commercial and professional society online availability was on the average 40% larger than the OA effect. A more recent working paper expanding on Evans' work and employing the same type of econometric models claims that the dramatic citation effects attributed to online access and OA are both spurious (McCabe & Snyder, 2011). This working paper offers that citation advantages due to online access, including OA access, are a statistical artifact of the failure to account for several types of uncontrolled variables. The McCabe and Snyder article has also brought extended comment and is an example of an important OA battle being waged not only in the open literature but in specialized blogs and author columns. Expect more on the citation advantage question in the future.

Gold OA

Eckman and Weil (2010) advocate for the establishment of an OA publishing fund within either the library or the institution to subsidize or pay the Gold charges. By the end of 2010, 14 institutions had joined the COPE (Compact for OA Publishing Equity), committing institution funds to assist in paying author fees for OA journals (COPE, 2011). However, the potential total cost of supporting Gold publishing within an institution could be quite high. Walters notes that changing to a publishing pricing model based on author pays rather than subscriptions will "reduce the proportion of the total cost paid by most institutions and increase the proportion of the total cost paid by the largest research universities" (Walters, 2007). Clearly, the Carnegie Doctoral universities will pay the lion's share of the costs in an author pays environment. At a number of institutions, depending on the subject scope of Gold OA coverage, these author costs would exceed the current library outlays for scientific journals or, indeed, all serial purchases (Okerson, 2005; Walters, 2007; Davis, 2004; University of California Berkeley, 2010).

However, the case continues to be made for the author pays model. Bird offers several case studies of what she considers successful and viable Gold OA journals. In addition, several recent articles have offered implementation paths for the Gold route that involve funding mechanisms outside the author pays/institutional subscription scholarly models (Shieber, 2009; King, 2010). Shieber proposes that federal government funding agencies and universities form a joint compact to fund a Gold OA model that would require publication only in "pure" OA journals, not including hybrid journals (Shieber, 2009). Shieber notes that there are questions involving implementation, including whose articles and which journals would be eligible, what constitutes a reasonable processing fee, what limitations would be imposed on funds, and the danger of authors abusing the system. King proposes a Gold OA model built around complete federal government funding of all author payments for peer-reviewed articles written by U.S. authors (King, 2010). At $2,500 per article, the total annual cost in the King model to fund all U.S. scientific articles could be approximately $712.5 million. King also notes that, with full government funding of publication costs, there might be a temptation for authors to increase

their output and publish more articles.

An alternative model for Gold OA has been advanced within SCOAP3 (Sponsoring Consortium for OA Publishing in Particle Physics). In this model, physics funding agencies and libraries will contribute annual funds to enable the Consortium to make six high energy physics journals, from four publishers, full OA journals. The Consortium will tender an offer to the four publishers to support the costs of the six journals, including retaining the current peer review services, in exchange for making the journals free to readers. Authors are not directly charged in this model. At this point in time, the fundraising phase is well underway with SCOAP3 establishing partnerships with 25 countries.

Concerns have also been expressed about the possibility of publishers increasing the base author fee to unacceptable levels over time. PLoS has increased the author fees in its two main journals from $1,500 in 2004 to $2,850 in 2009. Mellman estimates that the real online publishing cost for the *Journal of Cell Biology* is $10,000 per article and other major journals have estimated costs as much as three times as high (Harnad, 2010; King and Tenopir, 1998). A 2008 analysis of the author pays business model showed that "publishing houses would have to raise publishing fees well beyond the level that scientists are willing to pay" to sustain financial stability (Hagenhoff, Blumenstiel, & Ortelbach, 2008). In two of Bird's successful Gold hybrid cases, subscription revenues and institutional memberships still account for between 33% and 47% of revenue (Bird, 2010). Moving to an all author-fee model will require additional income for these journals to break even.

Also expressed has been a fear that publishers could increase acceptance rates in order to increase revenues, thereby lowering the quality of the literature (Walters, 2007). This is indeed an issue with the introduction of "peer-review lite" journals such as *PLoS ONE* , *BMC Open*, *BMC Case Reports*, *Nature Communications*, and the newly announced American Institute of Physics *AIP Advances*. For acceptance in *PLoS One,* articles must be "technically sound" but they need not report novel results. *PLoS ONE* , with an acceptance rate of 70%, has published some 15,000 articles since 2007 at an author charge of $1,250 per article, growing from 1,366 articles in 2007 to almost 6,000 in 2010. This journal accounts for a significant and growing percentage of PLoS's income (Butler, 2008). The peer-review lite approach represents an elastic expansion and perhaps a sea change in scholarly publishing. Some critics have likened this to vanity publishing, with those authors or institutions with the ability to pay dominating this high-acceptance rate publishing medium and smaller or less well-funded research institutions being possibly discriminated against. Anderson claims that, with this approach, "we are stretching the genre of scientific communications to the point of absurdity" (Anderson, 2010). It will be interesting to see whether faculty can be promoted and tenured with a publication record dominated by publications in peer-review lite journals.

Green OA

For the reasons given above and the general economic arguments, the Green road has gained some momentum as a more viable (and quicker) path to OA. Harnad offers a scenario in which universal author self-archiving in IRs – with no embargo period – will start a chain reaction where the wide availability of the research literature in IRs will allow institutions to cancel journal subscriptions and, as a result, journal publishers will be induced to convert to the Gold OA model (Harnad, 2010). The immediate focus on the universal self-archiving phase in the short-term is the critical component in his plan. In his scenario, the resulting Gold charge would

be levied by the journals to pay for peer review only (not for publication) and institutions would have saved enough from their cancelled journal subscriptions to pay these author refereeing fees (Harnad, 2009; Harnad, 2010).

Researchers have been slow to embrace self-archiving via institutional repositories. Several of the user studies described below provide evidence for the estimate that about 15% of the peer-reviewed literature is presently being self-archived in IRs (Poynder, 2010). Davis and Connolly looked at the reasons why self-archiving in IRs has gained so little uptake. They identified the use of alternatives such as departmental pages and disciplinary repositories, the concern with redundancy and multiple copies being deposited, the learning curve and effort involved in depositing in IRs, confusion about copyright, fear of being "scooped" by their peers, concern with plagiarism, and a failure to identify truly compelling values in self-archiving as precipitating factors (Davis & Connolly, 2007).

It is important to note that the download rates for IRs are significant and growing. The Davis et al. (2008) controlled study which found no citation advantage did show that OA articles had more downloads and were accessed more often than the control group. This in itself is very valuable.

Several studies discuss the practice of researchers self-archiving full-text articles on personal Web pages or departmental Web pages. This is sometimes referred to as the "grey" road (Brown, 2010). While there are clear concerns with this in terms of archiving/preservation and scalability, it is, nevertheless, a popular and often useful access approach, particularly given that these pages are spidered and indexed by Web search engines. A 2008 study of self-archiving by faculty within personal and departmental Web pages found that 34% of the faculty at Carnegie-Mellon University have self-archived at least one journal article. However, the gap between the articles cited on faculty pages and those that were actually capable (based on publisher policy) of being self-archived was 64% across the University and 73% within the College of Engineering (Covey, 2009). Other self-archiving studies are discussed below.

It is also important to note that self-archiving, as currently proposed and practiced, does not replace the commercial and professional society journal, but rather supplements the current journal-based scholarly communication system.

LITERATURE REVIEW OF OA SURVEYS

A number of faculty and end-user surveys regarding OA have been conducted over a 20 year period. Xia (2010) compiled a comprehensive bibliography and listing of these user surveys and conducted a longitudinal analysis and synthesis of survey results using time-series methods. In this work, Xia normalized the data and produced a summary set of core survey questions over key areas of interest. We used these core questions in the design of our survey. Xia found that as scholars have become more aware of and knowledgeable of OA journal publishing, "no concrete evidence has been discovered to illustrate that their willingness has been translated into actions." Indeed, while researcher lack of awareness of OA has dropped below 15% as of 2007, there remains a hesitation among scholars in making contributions to OA journals (Xia, 2010). The primary reasons cited for this include concerns about the perceived low prestige of OA journals and concerns over the peer review process of OA journals. Both of these concerns are connected with requirements of the promotion and tenure process.

Several surveys similar to the one reported in this article have been carried out in the last few years. Two complementary surveys of academic librarians and researchers connected to the Research Councils UK to measure OA research outputs were carried out in 2008 by Loughborough University, UK (Creaser, 2010). This survey generated 2,122 responses from the UK research community. The study found that only 16% of the respondents had paid to publish in OA venues. And, a reluctance to pay for publication costs was expressed. Fifty percent of the authors did not know how to obtain funds to meet author's fees for Gold pay-to-publish journals. Likewise, the study showed that 43% of the researchers did not know whether their institution had its own repository and only 23% of the researchers had self-archived in their institutional repository. Interestingly, 42% of respondents had placed research journal content on their own or on a departmental Web site. Among the reasons given for eschewing OA journals was a tendency to equate OA with vanity publishing and perceived poor quality outputs (Creaser, 2010).

Thorn, Morris, and Fraser (2009) conducted a survey of Bioscience Federation (UK) societies and researchers to determine OA policies and practices. Responses were received from 17 learned societies and 1,368 scientists. The study revealed a distinct lack of understanding of OA in both its Green and Gold forms. In particular, they found that 33% of the journal titles that scientists had published in that they listed as OA were, in fact, not OA. The assumption was that authors were confusing page charges with larger author pays charges. In addition, the study found that over half of the respondents who used grant or institution funding for author pays journals found it "fairly difficult" or "very difficult" to access the funds. They also found a "lack of clear understanding of self-archiving and repositories" among the bioscientists responding to the survey. Only 29% of respondents said that they ever self-archived and of this 29% only 35% said they placed their content in their institutional repository while 50% deposited in personal or departmental Web sites. Survey support for self-archiving only (36% thought it was a good idea) was much weaker than support for OA Gold journals (although, again, there was confusion over what was an OA journal). Concern was expressed that self-archiving led to multiple versions, lacked peer review, could damage the journal literature, and suffered from a lack of copy-editing.

The SOAP (Study of OA Publishing) project conducted a large-scale online survey in 2010 of scientists and researchers from around the world (Dallmeier-Tiessen et al., 2011). The survey mailings were generated from author lists supplied by various publishers and A&I services. There were a total of 53,890 respondents, including 38,858 active researchers who had published at least one peer-reviewed research article in the last five years. Among the subset of these 39K active researchers, 89% thought that their "research field benefits, or would benefit from journals that publish open access articles." In addition, 52% out of a sample of 46,006 designated active researchers indicated that they had published at least one OA article, although 50% of the positive responders indicated they had not paid a fee to publish. These numbers again suggest some confusion regarding what is and is not an OA journal. Of those who had paid fees, 54% of the respondents noted that it was "difficult" to find funds for author pays journals.

Another important barometer of the effects technologies have on faculty behaviors and attitudes are the ITHAKA S+R reports. The ITHAKA 2009 Faculty Survey of scholarly communications opinions continued a longitudinal study of previous surveys done in 2003 and 2006. In the 2009 survey, 70% of respondents – up from 2003 and 2006 – felt that it was "very important" that journals permit scholars to publish articles for free and 40% of faculty

thought it "very important" that journals make their articles freely available on the Internet – down from 65% in 2003. In light of these responses, the report suggests that "the 'author pays' model favored by many OA journals may not match the preferences of many faculty" (Schonfeld, 2009).

Kim (2010) investigated the factors that motivated or deterred faculty to engage in self-archiving. From a sample of 684 faculty respondents, 70.2% had made their research materials available on the Web. Of these 66.7% had placed articles on personal Web pages, 51.5% on research group Web pages, 41.7% on departmental Web sites, 28.3% in disciplinary repositories, and 22.7% in institutional repositories. Importantly, this was in an environment where IRs had been introduced in all the universities represented by the faculty sample. Respondents generally viewed self-archiving as positive or neutral, but concerns were expressed regarding copyright, the time and effort involved, and the technical skills needed to deposit.

As a trend, it is clear from the Thorn, Morris, and Fraser (2009) survey, the Creaser (2010) survey, and the Kim (2010) synthesis that many authors consider departmental and personal Web pages as an appropriate and popular venue for self-archiving.

ILLINOIS ENGINEERING FACULTY USER SURVEY

With this evolving OA environment as a backdrop, the authors conducted a survey of engineering faculty at the University of Illinois at Urbana- Champaign in order to better understand this faculty's OA practices and attitudes.

The University of Illinois at Urbana-Champaign is a Carnegie Doctorate institution. The College of Engineering at Illinois is comprised of 10 departments and 7 major affiliated laboratories with a total of 6,900 undergraduate students, 2,700 graduate students, and 351 tenured or tenure-track faculty. The university's departments of Computer Science and Physics are part of the College of Engineering.

While many researchers in engineering are not as culturally accustomed as life science researchers to paying large author publication charges, they often have significant grant resources at their disposal. They also publish a large number of technical reports and working papers that lend themselves to deposition in repositories.

The scholarly communication needs and activities of engineering faculty are perhaps more diverse than other scholars in that they have a broader and more varied literature, which includes journal articles, conference papers, technical reports, standards, handbook information, patents, and grey literature.

Methodology

In late spring 2010, the authors sent an e-mail directing College of Engineering faculty to a Web site survey on OA publication. The survey was comprised of 12 Likert scale questions and 3 open comment questions. See Appendix A for a copy of the survey. Users were authenticated through the campus security system to determine their affiliation and to prevent multiple responses. The initial survey was prepared after the literature search identified similar surveys and in conjunction with discussions with the College of Engineering administration and department heads. A follow-on e-mail was sent to select engineering faculty

who frequently communicate with librarians about scholarly communication matters. The goal of the questionnaire was to collect information on faculty practices and attitudes regarding several aspects of OA, including author pays models, self-archiving in institutional repositories and on individual/departmental Web sites, preprint and dataset deposit in repositories, and knowledge of and general thoughts on OA. This included querying faculty about their awareness of and current practices of depositing into the University of Illinois at Urbana-Champaign institutional repository, Illinois Digital Environment for Access to Learning and Scholarship (IDEALS).

Summary Results

The authors received 54 usable responses to the survey representing a re- sponse rate of 15.4%. Follow-up interviews were held with eight survey respondents. Responses were received from faculty in the departments of:

Aerospace Engineering: 4

Bioengineering: 3

Civil and Environmental Engineering: 3

Computer Science: 6

Electrical and Computer Engineering: 12

Industrial and Enterprise Engineering: 1

Materials Science: 8

Mechanical Engineering: 5

Physics: 12

     The academic rank of the respondents:

Professor: 35

Emeritus: 3

Associate professor: 8

Assistant professor: 8

This academic rank breakdown is very much in line with the percentages across the entire College, which are: professor: 60%; associate professor: 19%; assistant professor: 21%.

A summary of the Likert scale questions and responses is shown in Table 1.

TABLE 1 Summary of Survey Results

Survey question #	Almost exclusively/ all papers	Primarily/ many	Occasionally/ Some	Never/ none	Don't know
1A. I currently publish my research through commercial publishers or professional societies	43	9	2	0	n/a
1B. I access and read the electronic version of commercial publisher or professional society papers and articles	33	14	5	2	n/a
2. I publish in "author pays" open access journals that charge a set fee above page charges	2	2	14	36	n/a
3. I expect to publish in "author pays" journals in the future	1	3	19	17	13
4. I am in favor of professional societies moving to an "author pays" model	1	3	10	31	9
5. I am in favor of commercial publishers moving to an "author pays" model	1	2	15	26	10
6. I presently deposit articles, reports or papers in the University of Illinois institutional repository (IDEALS)	0	0	6	48	n/a
8. I expect to deposit in the IDEALS institutional repository in the future	0	6	16	32	n/a
10. I make my preprints available in open repository systems (i.e., ArXiv, etc.)	8	8	9	29	n/a
11. I place completed articles on a personal or department Web site	16	11	14	13	n/a
12. I make datasets available via an open repository *before* publication	0	2	11	41	n/a
13. I make datasets available via an open repository *after* publication	1	6	23	23	n/a

Publication and Reading

Two questions were asked (Questions 1A and 1B) regarding faculty publication and reading habits. Ninety-six percent of respondents primarily or exclusively publish their research in commercial publisher or professional society publications, including 80% who exclusively publish in these venues. This reflects the typical scholarly dissemination habits of engineering faculty, in particular given that there is still a fairly strong tradition of publishing engineering research in the grey literature of technical reports and position papers.

In addition, 87% of faculty respondents said that they primarily or exclusively read these publications in electronic format. This is consistent with the almost universal embrace of e-journals that has been widely reported in the literature (Mischo et al., 2007). Interestingly, two respondents claimed they never read electronic versions of publisher content. Both of these are emeritus faculty.

Gold Model

Four questions designed to gauge faculty practices and attitudes toward the author pays Gold model of OA were asked in the survey. A link to an explanation page containing the definition of an author pays journal and emphasizing its distinction from a toll access journal with page charges was provided. Seven and four-tenths percent (4 of 54) of the survey respondents answered that they exclusively or primarily publish in Gold journals. However, checking in A&I services and follow-up interviews indicated that all four of these individuals confused page charges with OA Gold or hybrid Gold journal payments. This type of confusion over real OA journals was also found by Thorn, Morris, and Fraser (2009) and Kim (2010).

As reported in earlier studies, the true rate of Gold publishing is hard to calculate. Sixty-seven percent of the survey respondents indicated that they never published in author pays journals. The real percentage may be higher given the confusion by some faculty over Gold vs. page charges. However, Illinois engineering faculty do in fact publish in OA journals. Illinois engineering faculty published a total of 78 articles in the OA journal *Optics Express* from 1998 to 2011, including one prolific Electrical and Computer Engineering faculty member who has published 22 articles in the journal. These 22 articles would have cost over $23,000 in total.

The responses to the question of whether they expected to publish in Gold journals in the future were just as tentative, with only 7% of respondents saying they will publish all or many of their articles in Gold journals. An additional 35% said they would occasionally publish in author pays journals. There was an overwhelming consensus that commercial publishers should not pursue the Gold route although 18.5% of respondents didn't know if this was a good idea or not. The survey clearly indicates some confusion about the Gold model. Clearly, there is no overwhelming mandate or support for the Gold model. A number of faculty supplied survey comments on the author pays model. Among the comments:

> In a system with "author pays," the authors would end up paying twice, once in the form of payment to the journal, then again in the form of overhead costs to the university, since university overhead never decreases.

> Being editor of a "commercial" journal I don't see how they can make enough from author fees to pay for the publication cost; most authors can't even pay to have figures

printed in color on paper copies.

"Author-pays" has always been part of the model, in that page charges have always been requested (and lately required).

In my view, the author pays model of scientific publishing is ill-conceived and not in the best interests of the research community.

I am concerned with the conflict of interest inherent in the "author pays" model, in terms of having papers peer reviewed and accepted.

I do not think that faculty and research scientists would advocate any type of "the author pays model." Research funding is becoming increasingly difficult to get and I do not think funding agencies will grant money between $1,500 to $3,000 per article.

The prices quoted are exceedingly too high. Individuals cannot afford it and if paid from grants takes $$$ away from RA salaries. I believe that this is not the way to go in the future. Furthermore, I suspect quality control of these journals will suffer because they will be driven to publish as much as possible to make money at almost zero cost to them per paper. A bad idea!

I'm struggling to keep up on all the developments. A cost of $3,000 per article for an author pays model seems just too large.

Author pays has a danger of "institutionalizing" all research; e.g., students cannot publish their own papers easily; it can hamper moves into new fields other than the ones the authors already have grants.

I am in favor of free, open-source publication. It would be great if some- one could found an open-source, "high impact" journal on the level of *Science* or *Nature* that was free to read.

There were also two favorable comments:

I expect to go to an author pays model, and I would build the costs into budgets for my research grants. The fee should be waived or reduced for articles that are not supported by research grants, but I don't know how publishers can enforce the rule.

I think "author pays" is appropriate for funded research, with the payment being made from funds budgeted in the grant/contract, rather than by the institution. People have historically budgeted for "page charge" in professional-society journals, and this is essentially the same idea.

Self-Archiving into the IR and Discipline Repositories

Only 11% of survey respondents had deposited content into the IDEALS institutional repository. Those who had deposited indicated they did so because "(it) might increase readership," "more people will be able to access my work," and "to enable wide dissemination." The IR deposit rate in our survey was smaller but generally consistent with the rates reported in other studies already discussed.

Those who had not deposited were asked what would make it easier for them to deposit materials into IDEALS. Faculty commented that they needed a "faster process with better indexing so that I know what I have already deposited" and "a better understanding of the deposition process." Nine respondents indicated that they had no prior knowledge of the existence of IDEALS. One commented: "I am a bit embarrassed to admit that until this survey I was completely unaware of IDEALS."

Forty-one percent of the respondents indicated that they expected to deposit in IDEALS in the future, although most of the faculty (16 of the 22 indicating they would deposit in the future) planned to deposit occasionally/some content.

There were also four respondents who commented that the copyright laws and/or the journals they published in did not allow deposit into IDEALS. In retrospect, it would have been useful if the survey had mentioned and provided a link to the Sherpa site for informational purposes.

In contrast, 46% of the respondents indicated that they deposited preprint content into disciplinary repositories, including 30% of respondents who deposited all or many of their papers. This result is somewhat skewed by the high numbers of physicists in the sample (22% of the sample).

Similar to the results reported in several of the earlier studies, some questioned the value of depositing in an IR. Among the comments:

> I'm not sure about ease, but I don't see the benefit, as scholars are unlikely to search IDEALS for my work.

> But it's another task to complete, and ArXiV and the journals already reach my most important audiences.

> For someone to explain WHY this is a good thing. How does peer review function in OA? What is advantage to author? What is advantage to reader (i.e. potential of reading low quality material?)

> I don't think a piecemeal approach by each university is that useful. I already put all my papers on my website and also try to post most of them to ArXiV.

> As for the open repository, I am concerned about article quality. If the peer review process is by-passed, then we risk being flooded with articles of diminished scientific value. I have already seen such articles which would have never been published had they been sent to a knowledgeable journal editor who knows the relevant scientific community. I think the peer-review process has worked over the years, despite its shortcomings, and we should not abolish it. In fact, we should focus our attention on improving it.

There were also some positive comments provided:

> In general, papers available over the WWW are much more likely to be read and cited. It is to the advantage of researchers to make their papers easily read.

> All scholarship should be open.

> I am strongly in favor of the "green" system, though I would need instruction on how to

implement it myself.

Personal and Departmental Web Sites

The survey results show that the responding engineering faculty are consistently and comfortably placing full-text research content into personal and departmental Web sites. Seventy-six percent of the survey respondents are placing completed articles on a personal or departmental Web site. Forty-six percent of the respondents are putting many or all of their articles on these sites. These rates are quite consistent with the results reported above by Creaser (2010), Thorn, Morris, and Fraser (2009), and Kim (2010).

Data Set Deposit

The survey also asked about faculty practices regarding dataset deposit in open repositories. Libraries are increasingly involved in data curation and stewardship activities, often in conjunction with other units on campus. Interest in data curation has been fueled by the new National Science Foundation requirement that all proposals must include a data management plan. In this survey, 24% of the responding Illinois engineering faculty said they deposited research datasets prior to publication. Almost all (11 of 13 or 20% of these respondents) deposited only some of their datasets in open repositories before publication. A higher percentage – 56% – deposited datasets in open repositories after publication, although even here only 13% deposited all or many of their datasets.

DISCUSSION AND CONCLUSION

This survey of engineering faculty at the University of Illinois was designed to serve as a jumping-off point for further discussion and as a tool for educating faculty on the OA issues. Several survey respondents noted that their particular professional society was in the midst of discussing the establishment of OA mechanisms within their society publications and they felt this survey and supporting information was useful to them as background information. The survey also served as a prelude to the establishment of a College of Engineering scholarly communication advisory committee for the Grainger Engineering Library.

Survey respondents expressed concerns with both the Gold and Green OA models. These are detailed. In particular, concern was registered over the author pays model in terms of cost to authors, the economics of the system, possible conflicts of interest, and journals expanding article acceptances to make money. The Green model was criticized on the grounds of lack of peer review, the lack of need due to the existence of robust subject repositories, copyright concerns, and the piecemeal nature of local IRs.

One of the most interesting comments made by a respondent was directed to the library's role in the OA movement. This faculty member commented: "Librarians should not be telling us where to publish. They can better help us by addressing the growing number of low-quality journals and helping to eliminate them." This perspective represents what we have heard as an oft-expressed conviction that the present scholarly communication system, with all its flaws, has served the Academy reasonably well for hundreds of years. In their comments to us, engineering faculty admit that the system needs some adjustment and tweaking in order to embrace new technologies, and to more effectively support scholarship and the always important promotion

and tenure process.

In summary, the results of the survey of University of Illinois engineering faculty were consistent with other studies that have revealed concerns over the author pays model and a reluctance to self-archive in the university institutional repository. Survey results showed that Illinois engineering faculty do not extensively publish in author pays Gold journals and had limited plans to do so in the future. One could argue that the limited number of pure Gold journals in engineering fields plays a role here but the survey revealed widespread philosophical concerns about author pays models. The survey respondents also did not favor either commercial publishers or professional societies adopting a Gold model.

In line with other studies, the survey revealed that there was a lack of familiarity with the campus IR and a very small uptake rate for depositing research output in the IR. There is confusion regarding copyright and journal permissions to self-archive and the deposition process needs to be made easier. While concerns were expressed about the efficacy of self-archiving in IRs, in general there appears to be less philosophical opposition to self- archiving than there is to author pays. Several respondents indicated that, now that they had learned about the existence of IDEALS, they would begin to deposit content there. The survey indicated that 41% of the respondents planned to deposit at least some content into IDEALS. In contrast, the survey documented the well-established practice of making article content available from personal and departmental Web sites – notwithstanding the implications for preservation, sustainability, and scalability.

Rapid developments in Web-based information technologies and a strong push by OA adherents toward innovations in scholarly communication have moved OA forward on a number of fronts. This has led to the introduction of hybrid journals, peer-review lite journals, IRs, and alternative approaches like SCOAP3. At the same time, the dichotomy between the Green and Gold approaches has become a point of contention. The questions surrounding the economics of Gold OA also serve to exacerbate the issues. Research faculty are aware of OA issues but have invested heavily in the current reader pays commercial publisher and professional society based scholarly dissemination system. Clearly OA initiatives and practices will continue to advance. The overarching effects of OA on the scholarly communications landscape remain an open question.

REFERENCES

Anderson, K. (2010). Where trust is built and how it can be destroyed: A publisher's perspective. *Scholarly Kitchen*, *11*(09). Available at http://scholarlykitchen. sspnet.org/2010/11/09/

Bird, C. (2010). Continued adventures in open access: 2009 perspective. *Learned Publishing*, *23*(2), 107–116. doi:10.1087/20100205

Brown, D. J. (2010). Repositories and journals: Are they in conflict? A literature review of relevant literature. *ASLIB Proceedings*, *62*(2), 112.

Budapest open access initiative in 2001. (2011). Retrieved November 3, 2011 from http://www.soros.org/openaccess

Butler, D. (2008). PLoS stays afloat with bulk publishing. *Nature*, *454*(3), 71.

COPE: Compact for open access publishing equity. (2011). Retrieved November 2, 2010, from http://www.oacompact.org/

Courant, P. N., O'Donnell, J. J., Okerson, A., & Taylor, C. B. (2010). Improving access to research. *Science*, *327*(5964), 393.

Covey, D. T. (2009). Self-archiving journal articles: A case study of faculty practice and missed opportunity. *Portal: Libraries and the Academy*, *9*(2), 223, 224–251.

Craig, I. D., Plume, A. M., McVeigh, J. P., & Amin, M. (2007). *Do open access articles have greater citation impact? A critical review of the literature*. United Kingdom: Publishing Research Consortium. Retrieved from http://www. publishingresearch.net/Citations-SummaryPaper3_000.pdf.pdf

Creaser, C. (2010). Open access to research outputs -institutional policies and re- searchers' views: Results from two complementary surveys. *New Review of Academic Librarianship*, *16*(1), 4, 5–25.

Dallmeier-Tiessen, S., Darby, R., Goerner, B., Hyppoelae, J., Igo-Kemenes, P., Lambert, S., Lengenfelder, A., ... van der Stelt, W. (2010). *First results of the SOAP project. Open access publishing in 2010*. Retrieved from http://arxiv.org/ftp/arxiv/papers/1010/1010.0506.pdf

Dallmeier-Tiessen, S., Darby, R., Goerner, B., Hyppoelea, J., Igo-Kemenes, P., Kahn, D., Lambert, S., ... van der Stelt, W. (2011). Highlights from the SOAP project survey. What scientists think about open access publishing. *ArXiv:1101.5260v2*. Retrieved from http://arxiv.org/abs/1101.5260

Davis, P. M. (2004). Calculating the cost per article in the current subscription. *Cornell University Library Task Force on Open Access Publishing*. Retrieved from http://hdl.handle.net/3181/632

Davis, P. M. (2008). Open access publishing, article downloads, and citations: Randomised controlled trial. *BMJ, 337*: a568.

Davis, P. M. (2009). Author-choice open-access publishing in the biological and medical literature: A citation analysis. *Journal of the American Society for Information Science and Technology*, *60*(1), 3, 4–8.

Davis, P. (2010). *Can open access journals guarantee sound methods?* Retrieved November 8, 2010, from http://scholarlykitchen.sspnet.org/2010/10/19/oa- sound-methodology/

Davis, P. M. (2011). Open access, readership, citations: A randomized controlled trial of scientific journal publishing. *FASEB Journal, 25*(July), 2129–2134. doi:10.1096/fj.11-183988

Davis, P. M., & Connolly, M. J. L. (2007, March/April). Institutional repositories: Evaluating the reasons for non-use of Cornell University's installation of DSpace. *D-Lib Magazine*, *13*(3/4). Retrieved from http://www.dlib.org/ dlib/march07/davis/03davis.html

Davis, P. M., & Fromerth, M. J. (2007). Does the arXiv lead to higher citations and reduced publisher downloads for mathematics articles? *Scientometrics*, *71*, 203-204-215.

Eckman, C. D., & Weil, B. T. (2010). Institutional open access funds: Now is the time. *PLoS Biology*, *8*(5), 1000375.

Evans, J. A., & Reimer, J. (2009). Open access and global participation in science. *Science*, *323*, 1025.

Gargouri, Y., Hajjem, C., Lariviere, V., Gingras, Y., Caarr, L., & Brody, S. T. (2010). Self-selected or mandated, open access increases citation impact for higher quality research. *PLoS ONE*, *5*(10), e13636.

Guedon, J. (2004). The "green" and "gold" roads to open access: The case for mixing and matching. *Serials Review*, *30*(4), 315-316-328. doi:10.1016/ j.serrev.2004.09.005

Hackman, T. (2009). What's the opposite of a pyrrhic victory? *College and Research Libraries News*, *70*(9), 518-519-521.

Hagenhoff, S., Blumenstiel, M., & Ortelbach, B. (2008). An empirical analysis of the amount of publication fees. *Serials Review*, *34*(4), 257-258-266.

Harnad, S. (2009). The PostGutenberg open access journal. In B. Cope, & A. Phillips (Eds.), *The future of the academic journal* Oxford, UK: Chandos Information Professional.

Harnad, S. (2010, July/August). No-fault peer review charges: The price of selectivity need not be access denied or delayed. *D-Lib Magazine*, *16*(7-8). Retrieved from http://www.dlib.org/dlib/july10/harnad/07harnad.html

Houghton, J., Rasmussen, B., Sheehan, P., Oppenheim, C., Morris, A., ...Creaser, C. (2009). *Economic implications of alternative scholarly publishing models: Exploring the costs and benefits*. United Kingdom: Joint Information Systems Committee (JISC). Retrieved from http://www.jisc.ac.uk/media/ documents/publications/rpteconomicoapublishing.pdf

Johnson, R. K. (2005). Open access: Unlocking the value of scientific research. *Journal of Library Administration*, *42*(2), 107–124.

Kim, J. (2010). Faculty self-archiving: Motivations and barriers. *Journal of the American Society for Information Science and Technology*, *61*(9), 1909-1910-1922.

King, D. W. (2010, March/April). An approach to open access author payment. *D-Lib Magazine*, *16*(3/4). Retrieved from http://www.dlib.org/ dlib/march10/king/03king.html

King, D. W., & Tenopir, C. (1998). Economic cost models of scientific scholarly journals: Economic, read costs and benefits of electronic publishing in science. A technical study. *Proceedings of the ICSU Press Workshop*, Keble College, Oxford.

Kurtz, M. J., & Henneken, E. A. (2007). Open access does not increase citations for research articles from the astrophysical journal. *ArXiv:0709.089v1*

McCabe, M. J., & Snyder, C. M. (2011). Did online access to journals change the economics literature? *Social Science Research Network*. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1746243

Mischo, W. H., Norman, M. A., & Shelburne, W. A. (2006). The growth of electronic journals in libraries: Access and management issues and solutions. *Science & Technology Libraries*, *26*(3/4), 29–59.

Moed, H. F. (2007). The effect of "open access" on citation impact: An analysis of arXiv's condensed matter section. *Journal of the American Society for Informa- tion Science and Technology*, *58*(13), 2047-2048-2054.

Okerson, A. (2005). Open access: Reflections from the United States. *Serials, 18*(1), 20-21-25.

Poynder, R. (2010). A prophet whose time has come. *Information Today*, *27*(2), 1.

Savage, C. J., & Vickers, A. J. (2009). Emperical study of data sharing by authors publishing in PLoS journals. *PLoS ONE*, *4*(9), e7078.

Schonfeld, R. C., & Housewright, R. (2010). Chapter 3: Scholarly communications of the faculty study 2009: Key strategic insights for libraries, publishers, and societies. http://www.ithaka.org/ithaka-s-r/research/faculty-surveys-2000-2009/Faculty%20Study%202009.pdf

SCOAP3: Sponsoring consortium for open access publishing in particle physics. (2011). Retrieved January 25, 2011, from www.scoap3.org

SHERPA: University of Nottingham. (2006). *Authors and open access*. Retrieved 8/3, 2010, from www.sherpa.ac.uk/guidance/authors.html

Shieber, S. (2009). Equity for open-access journal publishing. *PLoS Biology*, *7*(8), e1000165. doi:10.1371/journal.pbio.1000165

SOAP: Study of open access publishing. (2011). Retrieved Nov. 3, 2010, from http://project-soap.eu/

Swan, A. (2010a). *The open access citation advantage: Studies and results to date*. United Kingdom: School of Electronics & Computer Science, University of Southampton. http://eprints.ecs.soton.ac.uk/18516/

Swan, A. (2010b). *Modelling scholarly communication options: Costs and benefits for universities. A report for JISC*. United Kingdom: JISC. http://eprints. ecs.soton.ac.uk/18584

Thorn, S., Morris, S., & Fraser, R. (2009). Learned societies and open access: Key results from surveys of bioscience societies and researchers. *Serials*, *22*(1), 39-40-46.

University of California Berkeley. (2011). *Selective list of open access and paid access fees*. Retrieved October 26, 2010, from http://www.lib.berkeley.edu/ scholarlycommunication/oa_fees.html

Walters, W. H. (2007). Institutional journal costs in an open access environment. *Journal of the American Society for Information Science and Technology*, *58*(1), 108, 109–120.

Xia, J. (2010). A longitudinal study of scholars' attitudes and behaviors toward open- access journal publishing. *Journal of the American Society for Information Science and Technology*, *61*(3), 615, 616–624.

APPENDIX A

Open Access Publication Survey

The Grainger Library needs your help in planning for changes in scholarly communication, particularly the move to open access.
We want to establish a COE scholarly communications advisory group.

Background Information on Open Access

Please provide us your contact information (* required).

The data you provide for this survey is for internal use by the Library and the COE Open Access Advisory Committee.

* Name: **E-mail:**

Rank

Select a rank: -- select one -- ▾

Primary Department:

Select a department: -- select one -- ▾

1a) I currently publish my research through commercial publishers (e.g. Springer) or professional societies (ACM):

☐ Almost Exclusively   ☐ Primarily   ☐ Occasionally   ☐ Never

1b) I access and read the electronic version of commercial publisher (e.g Springer) and professional society (e.g. IEEE) publications:

☐ Almost Exclusively   ☐ Primarily   ☐ Occasionally   ☐ Never

---

2) I presently publish in "author pays" open access journals (Explanation) that charge author fees above page/graphics charges:

☐ Almost Exclusively   ☐ Primarily   ☐ Occasionally   ☐ Never

---

3) In the future, I expect to publish in "author pays" journals:

☐ Almost Exclusively   ☐ Primarily   ☐ Occasionally   ☐ Never   ☐ Don't Know

---

4) I am in favor of professional societies moving to an "author pays" model:

☐ Exclusively   ☐ Primarily   ☐ For Some Articles   ☐ Not for any Articles   ☐ Don't Know

---

5) I am in favor of commercial publishers moving to an "author pays" model:

☐ Exclusively   ☐ Primarily   ☐ For some articles   ☐ Not for Any Articles   ☐ Don't Know

---

Information about Depositing Articles in Open Repositories

6) I presently deposit articles, reports, or papers in the IDEALS Illinois scholarship repository:

☐ All papers   ☐ Many   ☐ Some   ☐ None

---

7) If you answered Yes to #6, I deposit in IDEALS because:

8) **In the future, I expect to deposit articles/papers/etc. in the IDEALS repository:**

☐ All papers ☐ Many ☐ Some ☐ None

9) **What would make it easier for you to deposit materials in IDEALS?**

[text area]

10) **I currently make my preprints available in an open repository preprint server like ArXiv or a web site:**

☐ All papers ☐ Many ☐ Some ☐ None

11) **I currently put my completed articles on a personal or departmental web site:**

☐ All papers ☐ Many ☐ Some ☐ None

12) **I make my datasets available in an open repository or web site BEFORE publication:**

☐ All of the time ☐ Much of the time ☐ Some of the time ☐ Never

13) **I make my datasets available in an open repository or web site AFTER publication:**

☐ All of the time ☐ Much of the time ☐ Some of the time ☐ Never

14) **Please provide any comments on open access, repository deposit, or other issues connected with scholarly communication:**

[text area]

[Submit Survey]

yes