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Article

Types of Open Access Publishers in Scopus

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Abstract: This study assessed characteristics of publishers who published 2010 open access (OA) journals indexed in Scopus. Publishers were categorized into six types; professional, society, university, scholar/researcher, government, and other organizations. Type of publisher was broken down by number of journals/articles published in 2010, funding model, location, discipline and whether the journal was born or converted to OA. Universities and societies accounted for 50% of the journals and 43% of the articles published. Professional publisher accounted for a third of the journals and 42% of the articles. With the exception of professional and scholar/researcher publishers, most journals were originally subscription journals that made at least their digital version freely available. Arts, humanities and social science journals are largely published by societies and universities outside the major publishing countries. Professional OA publishing is most common in biomedicine, mathematics, the sciences and engineering. Approximately a quarter of the journals are hosted on national/international platforms, in Latin America, Eastern Europe and Asia largely published by universities and societies without the need for publishing fees. This type of collaboration between governments, universities and/or societies may be an effective means of expanding open access publications.

Keywords: open access; publisher; Scopus; funding model; discipline

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1. Introduction

Open access (OA) to scholarly literature has progressed along two lines, commonly called green open archiving and gold open access journals [1]. With green OA, authors or publishers place versions of articles published in subscription journals in freely accessible archives. Gold OA consists of either

creating new digital journals that make their content freely available or making at least the digital versions of existing subscription journals freely available. While still making up only a small fraction of scholarly publishing, the growth of gold OA journals and the articles they publish has been exponential [2]. A variety of means have been used to fund OA publishing. These include volunteer effort as well as subsidies from universities, societies, governments and various other organizations. Beginning around 2002 a new class of professional publisher arose based on funding publication through article processing charges (APCs) paid by the author, their institution or funder. The growth of APC funded OA particularly when measured by articles published has been very rapid and has reached the point where it is equal to the OA articles funded by other means [2].

There has been quite a bit of debate concerning the use of APCs as a means of funding OA publication. Most troublesome has been a growing proliferation of clearly substandard journals using the APC model [3]. There is also a common misperception that OA publishing is synonymous with charging APCs [4,5]. In fact the majority of OA journals and approximately half the articles published in OA journals are funded by means other than APCs [2]. These journals are published by individuals, small groups of scholars and a rich variety of organizations that in many cases have converted the digital versions of previously subscription journals to OA [6].

This study explores the types of organizations and their characteristics that are publishing roughly 2000 OA journals in the Scopus citation and abstract database (Scopus). Scopus is the world's largest citation database including over 18,500 journals. The selection process for inclusion in Scopus is based on a clearly defined set of criteria and uses an external peer-reviewed selection process [7]. As such, Scopus provides an excellent sampling frame for assessing the nature of high quality OA publishing. Gaining a better understanding of the types of organizations that are publishing OA journals, particularly those able to fund publication by means other than charging APCs, can help in making sense of the sources of support for OA publishing and the various options for publishing high quality OA journals.

2. Experimental Methods

SCIMago Journal and Country Rank website [8] provides free access to a broad set of information on the journals contained in Scopus including article counts and citation statistics. Information is available in downloadable spreadsheet that can be found on the SCImago website. Individual journal statistics are available on the website for the years 1999 through 2011 and searchable based on a variety of criteria. The author developed software that used the International Standard Serial Number (ISSN) obtained from the downloadable spreadsheet to automate the process of capturing longitudinal information on article counts and citation statistics for each journal in the Scopus database. The capture process was run on July 26 and 27, 2012. A review of the data suggested the statistics obtained for 2011 were not complete and these data were not used in this study.

Elsevier, the publisher of Scopus, provides access to a spreadsheet on its website containing information on each journal in Scopus including a coding system for discipline [9]. The Directory of Open Access Journals (DOAJ) maintains a database of over 8000 OA journals. The inclusion criteria for the DOAJ are specified on their website [10] and include being freely accessible upon publication

and implementing some form of quality control. The metadata include whether or not a journal charges APCs. The metadata for the journals in the DOAJ are available in a downloadable spreadsheet [11].

The three data sets described above were merged using each journal's ISSN. Status as an OA journal was determined by presence in the DOAJ. The analyses described in this paper were limited to the journals found in Scopus that were also identified in the DOAJ. These data along with the coding described in the paragraph below were used in a related study focusing on the growth and citation rates of OA journals and articles in the Scopus database [6]. For the current study, only article and journal count data from 2010 were used.

The author and another researcher (Mikael Laakso) reviewed the websites of the journals in the sample in order to see if the journal converted from subscription to OA. In many cases it was not immediately clear if a journal was born OA or converted. In such cases the investigators used a set of assumptions in assigning a journal as born or converted. These are given in the Appendix. The consistency of the coding was assessed by both investigators coding 30 randomly selected journals. In 28 cases the determination as to whether a journal was born OA *versus* converted from a subscription journal was consistent.

I coded each journal into six publisher categories. They include professional, society, university, scholar publisher, government, and other organization. A more detailed description of each category is contained in the Appendix. A significant number of societies are associated with journals published by professional publishers with the society often subsidizing at least in part the cost of publication. Since it was not possible to determine the nature of the relationship between the society and the publisher, it was decided to code these journals as professionally published when a professional publisher was listed in Scopus and the DOAJ as the publisher of record.

Both the DOAJ and Scopus metadata include fields listing the publisher for each journal. About 60% of the time, the type of publisher was clear from the name. When that was not the case, I went to the journal website and/or the publisher's website to attempt to determine the most appropriate publisher category. In a few cases, it was not possible to determine the appropriate category by any of these means. To assess the consistency of the coding a random set of 30 journals was coded by another investigator. (A separate random sample of 30 journals was used for this coding check. Mikael Laakso performed the coding check.) In 28 cases, the coding was consistent.

In reviewing the journal websites to code the type of publisher it became clear a significant number of the OA journals where hosted on nationally or internationally funded web platforms. Eight platforms were identified in this process. Since it appeared a single domain name was used for each of the platforms, it was relatively easy to identify other journals hosted on the platform. The platform was coded for each journal that could be identified as being hosted on one of the platforms.

3. Results and Discussion

There were a total of 2010 journals in the Scopus data downloaded from SCIMago website that were identified in the DOAJ metadata and assumed to be OA. Sixty-two of these journals did not publish any articles in 2010. This may have been because they were added to Scopus in 2011.

Table 1 presents a breakdown of the number of journals and articles published in 2010 by type of publisher. Professional, society and university publishers in combination account for approximately

85% of the journals and articles published in 2010. As a whole, professional publishers and societies publish considerably more articles per journal than universities. Universities account for nearly 24% of the journals yet only account for about 14% of the articles. Scholar publishers, government agencies and other organizations such as museums, foundations and trade associations account for a combined 13% of the journals and 12% of the articles published.

Table 1. Journals and Articles Counts of open access (OA) Journals in Scopus by Type of Publisher [1].

Publisher Type	Journals	Percent of Journals	Articles Published in 2010	Percent of Articles Published in 2010
Professional Publisher	656	33.7%	66,051	42.0%
Society Publisher	515	26.4%	46,816	29.8%
University Publisher	460	23.6%	21,279	13.6%
Scholar Publisher	36	1.8%	2048	1.3%
Government Agency	92	4.7%	5563	3.5%
Other Organization [2]	132	6.8%	11,094	7.1%
Unknown	57	2.9%	4169	2.7%
Total Sample	1948	100.0%	157,020	100.0%

[1] There were 62 journals excluded because they did not publish any articles in 2010; [2] Non-profit organization, industry association, institute not affiliated with a university, museum *etc.*

Table 2 contains the percentage of journals charging an APC, published in the four largest publishing countries, USA, Great Britain, Netherlands and Germany, as well as those journals that were determined to have converted from subscription to OA by each type of publisher. Over 80% of the journals were published by professional publishers charge APCs. A significant but much lower number of society and university journals also charge APCs. Sixty percent of the journals published by professional publishers are based in the four largest publishing countries while well over 80% of the society and university publishers are outside these countries. With the exception of journals published by professional publishers and scholar/researchers, most OA journals were originally subscription journals that have chosen to make at least their digital versions freely available. A good example is the Brazilian Journal of Physics that was launched in 1971 and now published electronically in partnership with the Springer Group with a freely accessible version available through the SciELO platform.

Table 2. Characteristics of OA Journals in Scopus by Type of Publisher [1].

Publisher Type	% of Journals Charging APC [1]	% of Journals in Large Publishing Countries [3]	% of Journals that Converted from Subscription
Professional Publisher	80.7%	60.0%	21.8%
Society Publisher	19.5%	15.9%	74.9%
University Publisher	14.5%	12.4%	64.6%
Scholar Publisher	17.6%	39.5%	18.4%
Government Agency	2.4%	15.1%	88.2%
Other Organization [2]	21.4%	23.1%	58.2%

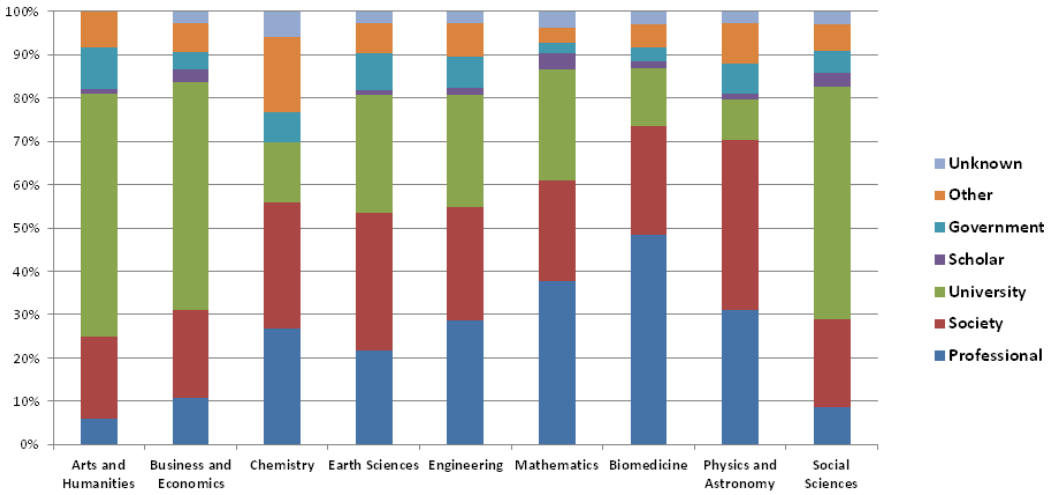
Table 2. *Cont.*

Unknown	12.5%	5.1%	74.6%
Total Sample	38.9%	30.5%	52.9%

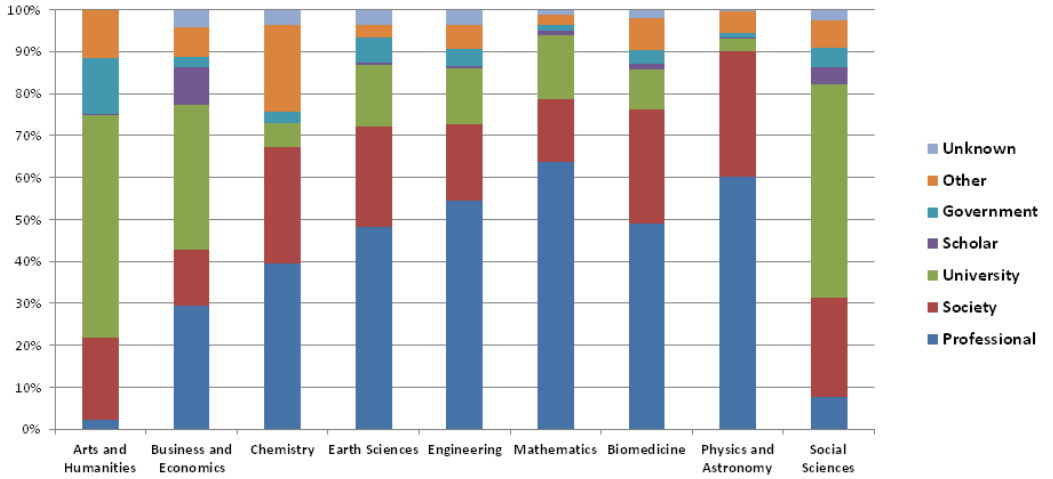
[1] There were 62 journals excluded because they did not publish any articles in 2010; [2] Non-profit organization, industry association, institute not affiliated with a university, museum *etc.*; [3] United States, Great Britain, The Netherlands and Germany.

Figure 1a presents the percentage of OA journals in each publisher type for each of nine discipline categories. Figure 1b provides the same breakdown as Figure 1a for articles. Table 3 presents the number of journals and articles published in 2010 in each discipline category as well as the percentage of journals and articles located in the four largest publishing countries. It should be noted that approximately 25% of the journals span multiple disciplines, and in a few cases, as many as four or five disciplines. These journals are included in each discipline category they were coded in Table 3 and Figure 1(a,b). There were also 111 journals without a discipline coding. These were not included in the figures or Table 3.

Figure 1. (**a**) The Percentage of Open Access Journals within Publisher Type by Discipline; (**b**) The Percentage of Open Access Articles within Publisher Type by Discipline.



(a)



(b)

Table 3. Journals and Articles Counts and Percent in Large Publishing Countries of OA Journals in Scopus by Discipline [1].

Discipline	Journals	% in Large Publishing Countries	Articles Published in 2010	% in Large Publishing Countries
Arts and Humanities	79	15.2%	2143	21.1%
Business and Economics	72	31.9%	3199	56.1%
Chemistry	86	23.3%	12,886	37.7%
Earth Sciences	390	21.5%	35,313	46.7%
Engineering	478	26.4%	45,628	48.2%
Mathematics	81	48.1%	5243	57.1%
Biomedicine	1009	36.2%	88,517	43.7%
Physics and Astronomy	73	38.6%	19,007	80.0%
Social Sciences	293	26.6%	9316	30.4%

[1] Some journals are listed in multiple disciples resulting in counts not adding to total number of journal or articles in the study.

The types of organizations publishing OA journals differed significantly across disciplines. Universities are publishing the most journals and articles in the arts and humanities as well as the social sciences. Societies play a significant though secondary publishing role across all disciplines, publishing between 15% and 30% of both the OA journals and articles in each discipline. Interestingly while it appears professional publishers account for a significantly higher proportion of OA articles as compared with journals in most disciplines, this is not the case in biomedicine where they publish both half the journals and half the articles.

As shown in Table 3, the majority of OA journals across all disciplines are published outside the four major publishing countries. This is not the case for the number of articles published in some disciplines. In mathematics, engineering, physics and astronomy the majority of articles published in 2010 were published in the large publishing countries.

Table 4 presents the breakdown of journals, articles published in 2010 and the percentage of journals charging APCs on each of the eight national or international online hosting platforms identified by the study. I was able to locate a total of 447 journals publishing 30,653 articles in 2010 that were hosted on these platforms. There may be other platforms as well as other journals on these platforms that were missed in the identification process. For example there are currently 1049 journals in the Scientific Electronic Library Online (SciELO) [12]. I was only able to locate 281. It is not clear to what extent the discrepancy is due to the journals not being indexed in Scopus *versus* ones missed in the review process.

Table 4. Journal, Article Counts and Percent Charging APC in National/International OA Journal Platforms.

Platform	Journals	% of Journals Charging APC [1]	Articles (2010)
SciELO	281	6.8%	20,385
Redalyc	40	64.4%	1400
J-Stage	56	55.3%	4951
Hcak Portal of Scientific Journals of Croatia	23	0.0%	617
Bioline	7	12.5%	412
Tubitak, The Scientific and Technological Research Council of Turkey	12	0.0%	755
CSIR National Institute of Science Communication and Information Resources (India)	12	0.0%	1194
doiSerbia National Library of Serbia	16	0.0%	939
Total	447	16.4%	30,653

[1] Percent of journals charging an APC is based on the total number of journals in the sample. Journals that did not publish articles in 2010 are not included in the journal counts in the first column.

4. Conclusions

It has been approximately 20 years since it became practical to disseminate scholarly journals over the Internet. Electronic distribution brought about the possibility of funding journals by means other than subscription fees and the formation of open access journals. Over the last 10 years there has been a dramatic growth of OA through journals making their content freely available and through open archiving [2,13]. To my knowledge there has not been a systematic study of what types of organizations are publishing OA journals or the nature of publishing done by these organizations.

The Study of Open Access Publishing (SOAP) addressed a number of similar issues in their very comprehensive study of OA publishing [14]. SOAP reviewed 1809 journals identified in the DOAJ as of July 2009 using data from the directory supplemented by manually reviewing the websites and other databases for some data fields. Though they studied discipline, start date and income sources, the methodology and category schemes used made it impossible to made meaningful comparisons between the two studies.

Universities and societies published half the OA journals and about 40% of the OA articles indexed in Scopus during 2010. Unlike professional publishers that accounted for just over a third of the journals and 42% of the articles, university and society publishers tend to be located outside the four largest publishing countries, the USA, Great Britain, the Netherlands and Germany. Many of these journals, particularly those located in Latin America, Japan and Eastern Europe are being hosted on national or internationally funded software platforms that appear to provide a variety of services and in at least some cases are selective in the journals they will host. Since these journals tend not charge APCs, it appears universities and professional societies collaborating with national or international consortia that provide web hosting and variety of technical services are able to create and maintain high quality scholarly journals without the need or the problems associated with charging APCs. A growing number of foundations and governments that fund research, particularly in Europe and North America, are requiring the results of the research they fund be made freely available while

grappling on how best to achieve this goal. Perhaps this model can be part of a comprehensive solution for funders seeking to ensure their research results are freely disseminated.

Although charging APCs has been closely linked to professional publishing, nearly a fifth of professionally published journals do not charge APCs. It appears these journals are funded by a variety of sources including subsidies from societies, governments and other organizations. While a much smaller percentage, a significant number of societal, university and even a few journals operated by governmental agencies charge APCs. There appears to be no clear delineation between funding model and type of publisher.

Universities and to a lesser extent societies publish the bulk of OA journals in the arts and sciences as well as the social sciences, business and economics. As one might expect, professional publishers account for the largest share, about 50%, of biomedical publishing. When looked at from the perspective of the articles published rather than the number of journals, the picture is somewhat different with professional publishers playing a significantly larger role in fields like mathematics and most of the sciences. The disciplines also differ significantly in where their OA journals are published. Only about 15% of the journals in the arts and letters are published in the four large publishing countries while nearly half the journals in mathematics are published in these countries.

The types of publishers as well as how OA publishing is funded varied greatly based on discipline, and the location of the journal. Interestingly, with the exception of professional publishers and scholar publisher, the majority of OA journals consist of former subscription journals that have chosen to make their digital versions freely available. An example is DNA Research which was launched in 1994 by Kazusa DNA Research Institute [15]. The journal began publishing an open access online version in 2000. While our earlier study [6] suggested that conversions peaked around 2005 and has tailed off significantly, these journals continue to make up a significant portion of gold OA publishing.

What emerges from this study is that open access publishing is being conducted by a whole variety of means. APC funded professional publishing is a significant and growing segment but only one of a wide variety of publishing models whose prominence varies substantially across disciplines and geography. In the developing world, societies and universities often with technical support from national and internationally funded hosting platforms appear to be the most common model that potentially could be used more broadly. Over time new experimental economic models for sustainable gold OA publishing such exhibited by PeerJ, SCOAP3, and eLife could provide new approaches for funding scholarly research dissemination. What seems clear is that digital distribution has provided a great deal of flexibility for high quality scholarly publishing and no single model appears to be dominating at this point in time.

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Conflict of Interest

The authors declare no conflict of interest.

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Appendix

Publisher Coding Scheme

1. **Professionally published Journals**—Journals published by what appear to be professional publishers, and organization with dedicated employees focused on publishing scholarly journals. In most cases they had multiple journals and indicated they were a publishing company and were not affiliated with a university of government agency.
2. **Society Journals**—Journals that were affiliated or owned and published by a professional society or a national academy.
3. **University published journals**—Journals that were published by a university, university department, scholarly publishing office, university press or institute that appeared to be operated from within a university.
4. **Independent scholar publisher**—Journals that appeared to be published by researcher(s) or scholar(s) without any clear affiliation to a larger organization. In some cases these journals had a university domain (URL) but there was no indication on the website that there was a connection to the university and the university was not listed in Scopus as the publisher.
5. **Government agency**—Journals published by a government agency such as a health service or research institute.
6. **Other organization**—Organizations other than professional publishers, societies, universities or government agencies. Examples include foundations, museums, institutes (not affiliated with a university) hospitals or private company other than a publisher.
7. **Unknown**—It was not possible to determine what type of entity published the journal.

Assumptions for Determining "Born" *Versus* "Converted" and Date of Conversion

When there is information on the website that allows determination of the conversion date or that the journal is born OA that date is used. Otherwise:

1. When a start date cannot be determined any other way, the entry date in the DOAJ is used and the journal is assumed converted. When a journal was launched after 2000 and all volumes are available OA, it is assumed to have been born OA.
2. Journals with Ulrichweb start dates or article archives before 1993 are assumed to be converted.
3. When start dates are in the in the mid-1990s and all back issues are available the journal is assumed to be born OA particularly when the websites looks to be mid-1990 vintage.
4. When journals are converted OA from before 1993 and digital articles are available OA after mid-1990s it is assumed the journal became OA with the first available OA available volume.
5. When articles are available OA before mid-1990s, it is assumed it is assumed back issues were made OA at the point of conversion and if no other information is available, the DOAJ entry date is used.
6. SciELO journals are assumed converted OA and the date of entry into SciELO or if not available, the first SciELO volume is used for the date the journal became OA.

7. Redalyc journals are assumed to be converted OA and the earliest volume available on the website is assumed to be the conversion date or 2002 if there are articles available before 2002.