ARTICLE

STATUS AND PERFORMANCE OF OPEN ACCESS JOURNALS IN AFRICA

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ABSTRACT

This article reports on an examination of the uptake and status of open access journals (OAJs) in Africa based on the listing of the Directory of Open Access Journals (DOAJ). The article addresses the questions of the pattern of distribution of OAJs in Africa and examines the distribution of the oldest closed access journals that have migrated to the open access (OA) platform; the distribution of the publishers; and the licensing regime and publication languages. We first downloaded all the content of the DOAJ into a Microsoft Excel spreadsheet and then into Statistical Package for the Social Sciences, after editing. For data on publishers, the list of publishers was pasted into the MS Excel spreadsheet and physically sorted. As at November 2014, the total volume of OAJs globally registered in the DOAJ was 10 152, including those born closed which have now migrated to the OA platform. Globally, Europe produced the largest number of journals, followed by Asia, North America, South America and Africa. South America produced the highest number of journals per country. Egypt had the highest number of journals through the activities of one organisation, Hindawi. A journal of African origin is the oldest closed access journal in the DOAJ database; while corporations dominate OAJ publishing. Generally, OA uptake in Africa is considerably low. We suggest that the DOAJ should be proactive in sensitising publishers and other stakeholders in Africa about their services and the benefits, and how to include their journals in the database.

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INTRODUCTION

Since the expansion of information technologies in the 1990s, many scholars have been advocating for the use of the World Wide Web (WWW or the Web) to distribute scholarly publications free of charge to the public, with authors owning the copyrights of their works. This is the crux of the open access (OA) movement (Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities 2003; Bethesda Declaration on Open Access 2002; Budapest Open Access Initiative 2002; Suber 2012a; 2012b). The cost of processing and publishing a research paper in a journal could be borne by the author, the author's institutions or funders; this approach is known as the Gold route of OA. The content could also be made available to the public free of charge through institutional or the author's own repositories; this approach is known as the Green route of OA. Besides these two major routes, scholars have identified many other alternatives through which OA publishing could be funded, including: advertising, crowdsourcing, auction, endowments, fundraising and hybrid approach, among others (Chang 2006). Hybrid is the approach in which the publisher publishes OA articles alongside non-open access articles, at the discretion of the authors.

There are many organisations and projects that are playing critical roles to promote the OA movement. For example, the Electronic Information for Libraries (EiFL) based in Italy promotes OA in libraries; the Directory of Open Access Repositories (DOAR) and Registry of Open Access Repositories (ROAR) are concerned with maintaining statistics of repositories globally; while the Directory of Open Access Journals (DOAJ), based at the University of Lund in Sweden, maintains a database of OAJs at the global level.

THE DIRECTORY OF OPEN ACCESS JOURNALS

The DOAJ is a free librarian-vetted list of peer-reviewed scholarly OAJs globally. The DOAJ was initiated in 2003 at the University of Lund in Sweden. The DOAJ provides individuals and libraries with serial support services that help them to identify reputable scholarly OAJs and also to connect people with the journals. The DOAJ is the most authoritative list of scholarly, peer-reviewed and fully OAJs. The list is designed to contain the journal's title, alternative title and URL identifier. It also contains the name of the journal's publisher, the language in which the journal is published and the licensing type subscribed to by the journal. From the list, it is also possible to extract information about the journal's starting year and ending year; the date on which the journal was added to the list; the subject focus; and the journal's country of origin. The DOAJ has a set of criteria for admitting journals, including that the journal must be OA,

peer reviewed, report primary results, and the publisher must be active in publishing. Also the journals admitted by the DOAJ must have no embargoes on publications and must make all contents available in full text as well as having an ISSN.

It is expected that there will be constraints in the indexing services of the DOAJ. For instance, the DOAJ requires that OAJs adopt the Budapest Open Access Initiative, which includes permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles; crawl them for indexing; pass them as data to software; or use them for any other lawful purpose, without financial, legal or technical barriers other than those inseparable from gaining access to the internet itself (Bethesda Open Access Initiative 2003; Budapest Open Access Initiative 2002). OAJs that are not so liberal may not apply to be listed in the DOAJ. The DOAJ is a voluntary membership list and only proprietors of OAJs that wish to have their journals listed in the DOAJ would apply to do so. It must also be pointed out that although the DOAJ aims to be a comprehensive list of global journals, there may be many genuine journals that are not listed in the database – for instance those that are listed as predatory. Also, like many indexes, the DOAJ content is not stable – journals are added and removed periodically.

Open Access in Africa

OA is occurring everywhere in the world, but there are disparities between how different communities are participating in the movement and appropriating the advantages. Many scholars have emphasised the significant role that OA is expected to play in Africa (Lor and Britz 2004), while identifying the challenges that may obstruct these advantages (Nwagwu 2007). Generally, there is some appreciable level of awareness about OA publishing in the Africa region (Nwagwu and Ahmed 2006), but the consciousness appears to focus mainly on the use of information resources made available on the internet by scholars from elsewhere. Nwagwu and Ahmed (2006) identified several international initiatives and collaborations that are providing access to scholarly information to people in Africa, underpinning the foregoing observations.

OA to literature has been eulogised as holding the possibility of providing an alternative strategy for increasing the contribution of academics in Africa to global scholarly literature and thus raising the capabilities of researchers to conduct research that could facilitate the development process in Africa (Lor and Britz 2004). In their study about OA in Africa, Lor and Britz (2004, 17) found that:

> Open access can help Africa to address its developmental challenges by moving the continent from the periphery of knowledge production to the centre. And the growth of open access on the continent signifies that Africa is ready to lead itself and its sciences deeper into the 21st century.

There is a strong belief that OA can help Africa to address its developmental challenges by moving the continent from the periphery of knowledge production to the centre

thereof and that growth of OA on the continent signifies Africa's readiness to make progress and lead itself into and beyond the twenty-first century (Botman 2012).

Except for activities at country and institutional levels, and mainly in South Africa, the activities initiated by the Council for the Development of Social Science Research in Africa are the only regional level OA activities in Africa. In its analysis of OA in Africa, the United Nations Educational, Scientific and Cultural Organisation (UNESCO 2010) presented a country-by-country analysis of the situation, but it would appear that much of its observations were driven by observed increases in access and use of information technologies, particularly the Web, except in South Africa, Egypt, and Kenya among others. Although Egypt was the first to initiate OA projects (Nwagwu 2012) and has the highest number of OAJs in the region, South Africa is ahead of all other countries in terms of OA policies, initiatives and mandates. South Africa as a country migrated to the OA platform in 2006 and many journals and research projects published in most universities and associated institutions are made available on an OA basis.

A major challenge of OA in Africa is related to the poor and unprofessional manner in which OA publishers are conducting scholarly publishing, a major reason why many OA publishers in the region have been rated by Beall (2009; 2010; 2011; 2013; 2014) as "potential, possible or probable predatory scholarly open-access journals". The products of OA publishers have actually penetrated the world, and their publications are widely read and used, but the journals are dodgy (Truth 2012) as a result of their bad peer review practices and failure in other expected journal management practices, thus the validity of their content is doubtful. Nwagwu (2015) and Nwagwu and Ojemeni (2015) have addressed the social and technological circumstances under which predatory publishers operate, with the hope that some of them may be genuine apprentices in publishing whose products might get better with time. Significantly, predatory publishing is taking place in regions of the world where modern scholarly publishing has not flourished and modern high educational performance has been generally low. Although fake and substandard articles have increasingly appeared in the biggest closed access journals in the era of OA (Sheckman 2013), the banding of OAJs in the Africa region as predatory will damage the expected benefits of OA to Africa. For instance, a personal interaction with many scholars from Nigeria, where there is a relative presence of the predatory publishers, shows that many scholars are already reluctant to publish in OAJs for fear of being regarded as fake scholars.

Xia et al. (2015) have also shown that scholars from the developing countries dominate the authorship of predatory OAJ, and thus support the above observation. Xia et al. (2015) also observed that this evidence reflects the economic and social conditions of different countries. In a recent study, Nwagwu (2015) elaborated factors that could further account for the embracing of the predatory OAJs by scholars from Africa and other developing regions.

THE PURPOSE OF THE STUDY

It is necessary to undertake a periodic study of the distribution of OAJs in order to understand the growth patterns and other characteristics of OA in different regions and countries. Therefore, the article is designed to provide information on the status and uptake of OAJs in the Africa region based on the listing of the DOAJ. The study addressed the questions:

1. What is the pattern of the distribution of open access journals in Africa?
2. What are the top 20 open access publishing countries?
3. What is the pattern of the uptake of open access in Africa?
4. What is the distribution of the oldest closed access journals that have migrated to the open access platform?
5. Who and what are the geographical origin of open access publishers?
6. What licensing regime and what languages are mostly used by open access journals in the region?

This descriptive snapshot information is sufficient to provide a basis for assessing the progress of OA in Africa. To the best of the knowledge of these authors, there is no report describing the characteristics of Africa's presence in the DOAJ.

METHODOLOGY

The study covered journals listed in the DOAJ as at November 2014 when the data was collected. The study was descriptive, providing face value information about OAJs based on the variables used by the DOAJ in its index. We downloaded all the content of the DOAJ into a Microsoft Excel spreadsheet on 26 November 2015 and then, into Statistical Package for the Social Science, after editing. For data on publishers, the list of publishers was pasted into the MS Excel spreadsheet and physically classed into the following: commercial, university, unknown, .com, .org, not-for-profit, university/society university/commercial, government, government/society and .org/university. This way of classing has been used earlier by Morrison, Salhab, Calvé-Genest and Horava (2015).

In presenting the results, we considered it necessary to reflect the global pattern of the distributions of the phenomena under study in order to highlight the position of Africa. We also recognise that Africa is a diverse continent, thus we opted for a pan-African picture in our reflection. We examined the distribution of OAJs globally and in Africa specifically, and then the distribution of the journals by continents in order to identify and insert the contribution of Africa. It was also necessary to understand the position of Africa in respect of the top 20 OAJ producing countries, and for stronger reflection, to inform about how Africa stands among other countries in respect of

migration of old journals to OA. Licensing regimes globally and in Africa were then examined. Global distribution of OA publishers by types was examined with attention to the African publishers in the top 20 publishers in the world. Finally, the global picture of languages used in OAJs was presented with particular emphasis on Africa. In the discussion, the study drew from previous publications in OAJs in Africa (Nwagwu 2015; Nwagwu and Ahmed 2006; Nwagwu and Ojemeni 2015) to interpret and make sense of the data collected.

RESULTS

As at November 2014, the total volume of OAJs globally registered in the DOAJ was 10 152. The content of all the journals indexed in the DOAJ was also available in the DOAJ. At the time of the study, publication fees status of the OAJs was not indicated in the DOAJ databases, and 2 491 (24.5%) of the journals did not supply alternate names. All the journals supplied their URL identifiers as well as the names of their publishers. The articles were written in 590 single and combined languages.

Global Distribution of OAJs

The distribution of the 10 152 journals listed in DOAJ by the year in which they were established is shown in Figure 1. The records from 2002 onwards include the journals that were born open as well as those that were born closed. The records during the period 1874 to 2001 show the pattern of migration of "born closed" journals to the OA platform. Figure 1 further shows that the year 2002, when OA publishing was formally flagged off, also marks a significant year in the number of closed access journals that migrated to the OA regime.

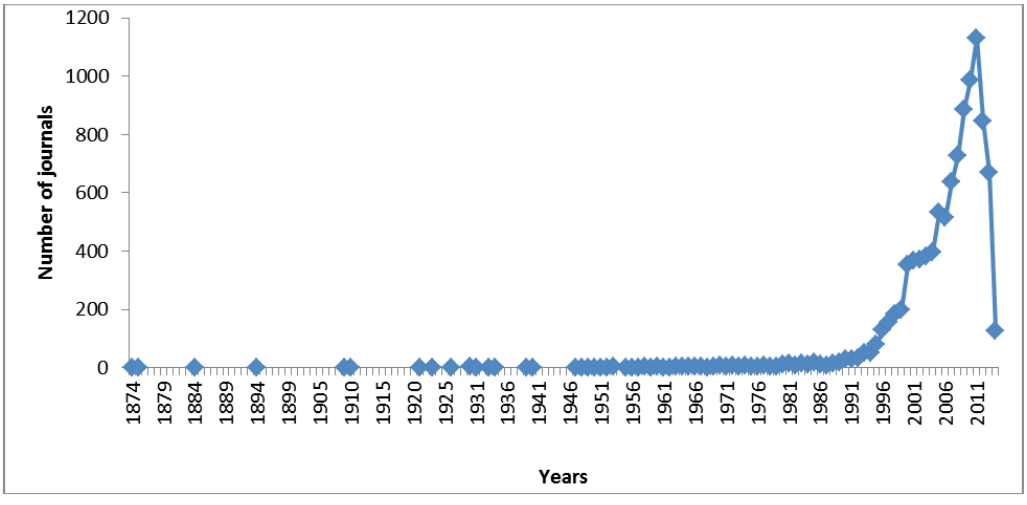

Figure 1: Global distribution of OAJs

Considering all the journals in the DOAJ, the peak of the birth of OAJs was in 2011 (1 132 journals), before a sharp drop began in 2012 (848 journals), throughout 2013 (667 journals) to end at a low of 127 journals in 2014 (October). If we consider only those journals born during or those that migrated to OA after the initiation of OA in 2002, then the peak of birth or migration of OAJs was in 2013. A total of 8 212 journals have become OA since 2002 – this number includes those born OA and those born closed. A total of 1 940 journals that were established before 2002 and most probably born closed access, and that represent 19.19 per cent of all the OAJs in the DOAJ, have migrated to OA. The number of journals born between 1963 and 1994 that joined OA increased relatively rapidly (from 5 to 53). Journals born in the period 1994 to 2001 recorded a rapid migration to OA. The number of journals born during 2002 to 2014 increased rapidly, although a drop of 25 per cent and 40.1 per cent in 2012 and 2013, respectively, is very remarkable.

Distribution of OAJs in Africa

Figure 2 shows the pattern of the distribution of OAJs in Africa from 1874 to 2013 (November).

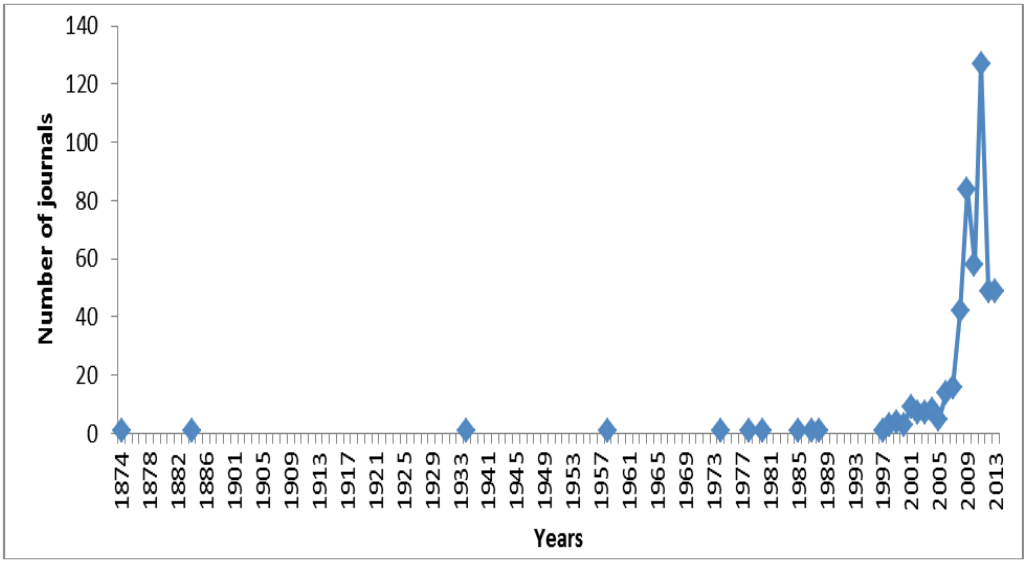

Figure 2: Distribution of OAJs in Africa

Besides Africa producing the oldest journal (*Psyche: A Journal of Entomology,* born in 1874) that migrated to OA, no journal born during 1875 and 1883; 1885 and 1933; 1935 and 1957; and 1959 and 1973 in the region was listed in the DOAJ. Rising from three journals in 1998, the number of African journals in the DOAJ came to a peak of 147 in 2013. Considering the period from 1874 (when the oldest closed access journal

that joined OA was born) to 2002 (when OA publishing began), it can be noted that the uptake of migration of closed access journals born before 2005 was very low.

Distribution of Journals in the DOAJ by Continent

All the entries in the DOAJ were also examined with respect to the continents they originated from as shown in Table 3. Europe produced the largest number of journals in the DOAJ, accounting for 39.1 per cent of the total, followed by Asia which produced 1 909 (18.8%), North America which had 1 733 (17.1%), and South America and Africa which accounted for 1 628 (16%) and 648 (6.3%), respectively. Oceania and Central America produced 236 (2.3%) and 33 (0.3%) journals, respectively. The continents of origin of four journals, namely, *ETRI Journal*, *Tijdschrift voor Skandinavistiek*, *Drug Design* and *Development and Therapy*, were not indicated in the DOAJ database.

Distribution of OAJs by Continent Adjusted by Countries

We adjusted the average number of journals per continent by the number of countries in each continent to gauge the spread of OAJs. South America (144.2) produced the highest average number of journals per country (see Table 1), while Europe produced an average of 79.34 journals per country and North America (including the Caribbean) 70.78.

Table 1: Continental/country distribution of number of OAJs

Continent	No. of countries	No. of journals	Average no. of journals/no. of countries
Europe	50	3 967	79.34
Asia	49 (5 disputed)	1 909	38.95
South America	12	1 733	144.42
North America	23	1 628	70.78
Africa	56	646	11.48 (2.71 without Egypt, South Africa and Nigeria)
Central America	7	236	33.71
Oceania	14	33	2.36
Others	Unspecified	3	Unspecified

Africa's statistics in this regard were skewed with Egypt accounting for the highest number of journals, and South Africa and Nigeria causing a further skew in the result.

If we remove these three big journal producers, the number of journals per country in Africa is reduced to as low as three journals per country.

First/Top 20 Countries in Terms of OAJs in the DOAJ

We also examined the number of OAJs per country, limiting the data in Table 2 to the first 20 countries.

Table 2: Top 20 OAJ producing countries

Country	Frequency	Per cent/Overall
United States	1 235	12.2
Brazil	942	9.3
United Kingdom	659	6.5
India	595	5.9
Spain	550	5.4
Egypt	490	4.8
Germany	343	3.4
Romania	307	3.0
Italy	300	3.0
Iran	278	2.7
Canada	267	2.6
Turkey	265	2.6
Colombia	255	2.5
Switzerland	219	2.2
Poland	192	1.9
France	181	1.8
Argentina	157	1.5
Mexico	157	1.5
Chile	144	1.4
Australia	120	1.2
Total	**7 656/10 152**	**75.6**

From Table 2, the top 20 countries accounted for 75.6 per cent of the 10 152 journals in the world. Accounting for 12.2 per cent of the total number of journals (10 152), the US led in terms of the number of OAJs that were registered in the DOAJ. The South

American country Brazil came before the United Kingdom, India and Spain, which accounted for 9.3 per cent, 6.5 per cent, 5.9 per cent and 5.4 per cent, respectively.

Leading the other African countries was Egypt, which ranked sixth out of 20 globally and accounted for only 4.8 per cent of all the journals. Germany, Romania and Italy accounted for about 3 per cent each, while Iran, Canada, Turkey, Colombia and Switzerland were responsible for between 3 per cent and 2 per cent each. Poland, France, Argentina, Mexico, Chile and Australia accounted for less 2 per cent each.

Distribution of OAJs by Continent During 25-year Periods since 1874

We examined the number of OAJs distributed by continent during 25-year periods since 1974 (see Table 3).

Table 3: Distribution of OAJs by continent (per cent)

Journals born	Asia	Africa	Europe	South America	North America	Central America	Oceania	Other	Total
1874 to 1899	Nil	0.0	0.0	Nil	0.0	Nil	Nil	Nil	0.0
1900 to 1925	0.0	Nil	0.0	0.0	0.0	Nil	Nil	nil	0.0
1926 to 1951	0.0	0.0	0.1	0.0	0.0	Nil	Nil	nil	0.2
1952 to 1977	0.2	0.0	0.4	0.2	0.1	0.0	0.0	nil	1.0
1978 to 2003	3.2	0.5	10.0	5.8	5.2	0.2	0.5	0.0	25.3
> 2003	15.4	5.8	28.6	10.0	11.7	0.1	1.8	0.0	73.5
Total	**18.8**	**6.3**	**39.1**	**16.0**	**17.1**	**0.3**	**2.3**	**0.0**	**100.0**

Note: *Nil = no journals found during the period.*

Table 3 shows that apart from unveiling the pattern of migration to OA by closed access journals that were established in different continents before 2002, it also gives a fuller picture of the distribution of OAJs in the continents across the periods. Asian and South American closed access journals established during the first 25 years (from 1874) have not migrated to OA, but African, European and North American journals established during the period have migrated to OA. For Central America and Oceania, the situation is different; none of the journals produced 75 years after 1874 (when the oldest journal migrated to OA) has migrated to OA. For the other periods (not shown in Table 3), only four journals born in the period 1900 to1925 have joined OA. They are *Memrias do Instituto Oswaldo Cruz*, *Journal of Genetics*, *American Museum Novitates* and *Annales Societatis Geologorum Poloniae* with focus on Microbiology, Medicine, Biology, Geology, and they originated from Brazil, the US and Poland, respectively.

OAJs in Africa by country

Table 4 shows the 20 of Africa's 56 countries that accounted for 646 OAJs that are listed in the DOAJ.

Table 4: OAJs in Africa by Country

Country	Frequency	Per cent
Egypt	490	75.9
South Africa	72	11.1
Nigeria	38	5.9
Morocco	8	1.2
Kenya	7	1.1
Algeria	5	0.8
Ethiopia	5	0.8
Uganda	3	0.5
Zambia	3	0.5
Libya	2	0.3
Mauritius	2	0.3
Tanzania, United Republic of	2	0.3
Tunisia	2	0.3
Burundi	1	0.2
Cameroon	1	0.2
Cote d'Ivoire	1	0.2
Democratic Republic of the Congo	1	0.2
Ghana	1	0.2
Madagascar	1	0.2
Rwanda	1	0.2
Total	**646**	**100.0**

Seven of these 20 countries had only one OAJ each (0.2%) listed in the DOAJ. Egypt had the highest number of OAJs in Africa (75.9%), followed by South Africa (11.1%) and Nigeria (5.9%). This result implies that 64.29 per cent of African countries did not have OAJs listed in the DOAJ; even relatively large (in terms of population) countries, such Sudan and Angola, had no OAJs listed in the DOAJ.

The Oldest African Closed Access Journals that Migrated to OA

Table 5 shows the oldest African closed access journals that migrated to OA.

Table 5: The first five closed access journals to migrate to OA

Journal	Publisher	Language	Started	Became OA	Country
Psyche: A Journal of Entomology	Hindawi Publishing Corporation	English	1874	2008	Egypt
Bulletin of the American Museum of Natural History	American Museum of Natural History	English	1881	2002	United States
Fishery Bulletin	US National Marine Fisheries Service	English	1881	2003	United States
South African Medical Journal	Health and Medical Publishing Group	English	1884	2010	South Africa
Bulletin of the Geological Society of Denmark	Geological Society of Denmark	Danish, English	1894	2008	Denmark

Table 5 shows that two of the five oldest journals that migrated to OA were African journals. Two of the oldest journals on the list, namely, *Bulletin of the American Museum of Natural History* published by the American Museum of Natural History, and *The Fisher Bulletin* published by the US National Marine and Fisheries Services, started in 1881 but became OA in 2002 and 2003, respectively.

There are two African journals on the list: firstly, *Psyche: A Journal of Entomology*, which started in 1874 in Egypt was published by Hindawi Publishing Cooperation and migrated to OA in 2008; and secondly, an 1884 medical journal originating from South Africa which migrated to OA in 2010.

Licensing

At global level, 5 975 (58.8%) of the journals in the DOAJ reported no information about their licensing regimes (see Figure 3).

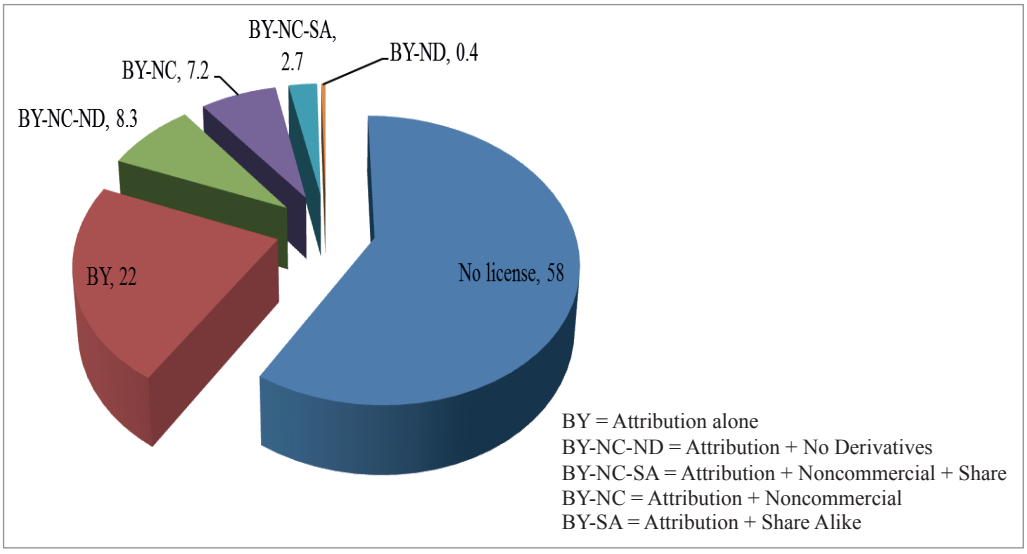

Figure 3: Licensing regimes used by OAJs

About one-fifth (2 233 = 22%) and (834 = 8.2%) indicated that they use the BY and BY-NC-ND licences, respectively, while 729 (7.2%), 279 (2.7%) and 41 (0.4%) reported using the BY-NC, BY-NC-SA and BY-ND type of licences, respectively.

At regional level in Africa, the situation was almost the same. Table 6 shows that as many as 135 (21%) of the journals had no licences.

Table 6: OA licensing regimes in Africa

Licensing regime	Frequency	Per cent
BY (Attribution alone)	488	75.5
None	135	20.9
BY-NC-ND (Attribution + No Derivatives)	12	1.9
BY-NC-SA (Attribution + Noncommercial + ShareAlike)	6	0.9
BY-NC (Attribution + Noncommercial)	4	0.6
BY-SA (Attribution + ShareAlike)	1	0.2
Total	**646**	**100.0**

Table 6 shows that BY was the most preferred licence, while BY-SA was the least preferred. At country level, 26 (4%) of Egypt's 490 contributions, 33 (5%) of Nigeria's 38 journals and 37 (5.7%) of South Africa's 72 journals, had no licences.

OA Publishers

The 10 152 journals were published by 5 616 publishers, giving an average of 1.8 journals per publisher.

Global OA Publishers by Type

We examined the websites of the publishers of the OAJs in order to classify the publishers by type. Some of the publishers indicated their status, that is, whether they are commercial, non-governmental, corporation/company, university, government or professional or academic society. Some publisher types suggested that they belong to two or more categories or are in partnerships; for instance, some of the publishers indicated that they were government/society. We respected this structure which some publishers adopted in describing themselves because a society affiliated to a university might claim dual a type of publisher identity. Crucially, although .com and .org are generally taken to mean commercial and non-governmental organisation respectively, we agree with Morrinson (2015) who used this classification and suggested that this categorisation is increasingly becoming difficult to establish.

The publishers by type are shown in Table 7, which shows a wide array of types of stakeholders who are taking part in disseminating scientific information to readers through OA publishing.

Table 7: Global OA publishers by type

Type	Frequency	Per cent (All)	Per cent (considering skew)
Commercial	6 042	59.52	
University	1 124	11.07	
Unknown	799	7.87	
.com	730	7.19	33.31
Society	445	4.38	31.29
.org	418	4.12	15.79
Not-for-profit	211	2.08	11.00
University/society	147	1.45	4.72
University/commercial	63	0.62	3.89
Government	52	0.51	33.31
Government/society	42	0.41	1.92
.org/university	79	0.78	3.61
	10 152	**100**	**100**

Note: Table 7 presents the results taking into consideration the skewed nature of the distribution.

They include a large number of commercial outfits (59.52%), universities (11.7%), governmental organisations (0.52%) and non-governmental organisations and societies. The twins of university/society, .org/university and university/commercial have implications for the types of collaborations taking place to publish OAJs. In the event that .com publishers category (or some of them) also refer to commercial publishers, it would mean that about 71 per cent of OA publishers are still commercial publishers.

African OA Publishers by Type

Table 8 shows that more universities (33.33%) are getting involved in publishing OAJs than other categories of publishers; but the universities published fewer journals (9.29%) than the corporations (30.08%). Stellenbosch University in South Africa published 10 (of the 60) of the journals published by universities. Academies and societies (19.51%) published 3.72 per cent of the journals, while two NGOs were responsible for only 0.31 per cent. Ten stand-alone journals (8.13%) accounted for 1.55 per cent of the journals, while others (7.32%) accounted for 7.43 per cent.

Table 8: African OA publishers by type

Type of publisher	N	%	Number of journals published	%
Universities/institutes	41	33.33	60	9.29
Corporations/publishing outfits	37	30.08	502	77.71
Academies/societies	24	19.51	24	3.72
Individuals/individual journals	10	8.13	10	1.55
Others	9	7.32	48	7.43
NGO	2	1.63	2	0.31
Total	**123**	**100**	**646**	**100**

Top 20 OA Publishers in the World by Number of Journals Published

We isolated the top 20 publishers. As shown in Table 9, the Egyptian publisher, Hindawi Publishing Cooperation, led other countries, accounting for 4.8 per cent of all the journals and 26.06 per cent of the top 20. Four publishers from the US were in the top 20, accounting for 443 (23.46%) of the 1 888 journals.

Table 9: Top 20 OA publishers in the world by number of journals published

Publisher	Country of origin	No. of journals published	% (of the total)	% (of top 20)
Hindawi Publishing Corporation	Egypt	490	4.8	26.06
BioMed Central	United States	261	2.6	13.82
Scientific Research Publishing	China	125	1.2	6.62
MDPI AG	Switzerland	112	1.1	5.93
Dove Medical Press	United Kingdom	103	1	5.46
Springer	Germany	101	1	5.35
Bentham Open	UAE	99	1	5.24
Medknow Publications	India	88	0.9	4.66
De Gruyter Open	Germany	83	0.8	4.39
Libertas Academica	New Zealand	54	0.5	2.86
PAGEPress Publications	Italy	48	0.5	2.54
Internet Scientific Publications	United States	46	0.5	2.43
Frontiers Media	Switzerland	42	0.4	2.22
Copernicus Publications	Germany	39	0.4	2.07
Canadian Center of Science and Education	Canada	37	0.4	1.96
Universidad Nacional de Colombia	Colombia	36	0.4	1.91
Universidade de Sao Paulo	Brazil	34	0.3	1.80
Co-Action Publishing	Sweden	31	0.3	1.64
Tehran University of Medical Sciences	Iran	31	0.3	1.64
Hans Publishers	United States	26	0.3	1.38
Total		**1 888**	**19**	**100**

The top 20 publishers accounted for 1 888 (19%) of all the journals, an average of 94.4 per publisher. The rest of the 10 132 journals were published by 3 729 publishers, giving an average of 2.72 journals per publisher.

OA Publishers in Africa

We identified a total of 123 publishers that were responsible for publishing the 646 OAJs in the Africa region. Figure 4 shows that the Hindawi Publishing Cooperation in Egypt accounted for the highest number of OAJs (75.5%), while AOSIS Open Journal, Stellenbosch University, Academic Journals and Ain Shams University published 19 (2.9%), 10 (1.5%), 7 (1.1%) and 7 (1.1%), respectively. Academia Publishing, and Health and Medical Publishing Group published 6 (0.9%) each.

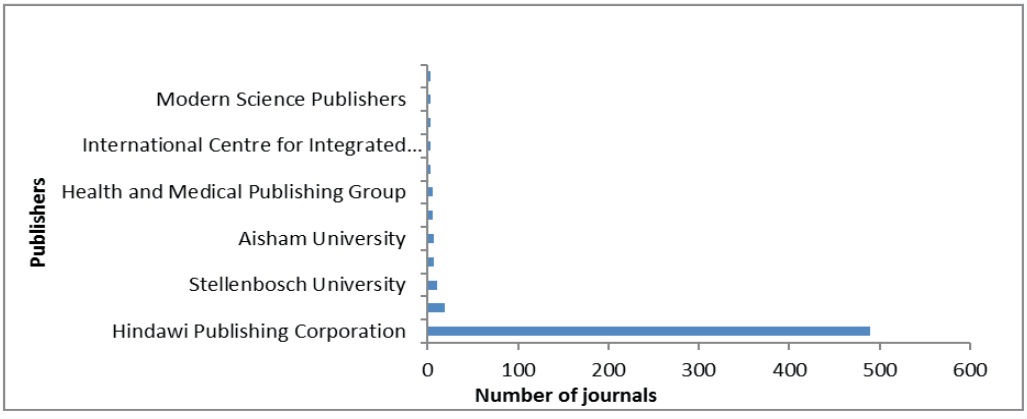

Figure 4: Publishers of at least three journals

Most of the African OA publishers (95.7%) come from Africa, except Elsevier and BiomedCentral, and they published only one journal each.

Languages of OAJs in the World

As many as 589 journals did not indicate their language of publication, but more than half of the journals (54.5%) were published in English, 12.12 per cent were published in Spanish and 7.9 per cent in Portuguese. French and German were used to publish 4.9 per cent and 2.2 per cent, respectively, while Italian, Turkish and Russian were used to publish 1.9 per cent, 1.2 per cent and 1.2 per cent, respectively. The rest of the languages each accounted for less than 1 per cent of the publications. The wide array of languages used in publishing OAJs is very remarkable, although many of the languages were rendered in abbreviations. Another observation is the pairing of languages in the publishing of OAJ, with English paring with most other languages.

Languages of OAJs in Africa

The languages (and their combinations) used in publishing OAJs in the region are intriguing, as shown in Table 10.

Table 10: Languages of OAJs in Africa

Language/s	Frequency	Per cent
English	568	87.92
Not indicated	33	5.11
English, French	18	2.79
English, Afrikaans	7	1.08
French	5	0.77
Arabic, English	2	0.31
Afrikaans	1	0.155
Afrikaans, Dutch	1	0.156
Afrikaans, English, Dutch, German, French	1	0.155
Arabic	1	0.155
English, Afrikaans, Dutch	1	0.155
English, Afrikaans, Dutch, German	1	0.155
English, Afrikaans, German	1	0.155
English, Afrikaans, German, Dutch, Isipedi	1	0.155
English, Afrikaans, Xhosa	1	0.155
English, Chinese	1	0.155
English, French, Spanish	1	0.155
English, German, Italian, French, Spanish, Chinese	1	0.155
English, Swahili	1	0.155
Total	**646**	**100**

As expected, most of the journals (87.92%) were published only in English. English was also used in combination with other languages such as Afrikaans, Dutch, Arabic, Swahili, French and Spanish. Afrikaans, French, Afrikaans and Dutch, and Arabic are the only languages that were used to publish journals without a combination with English. Afrikaans, a more recent language in South Africa than other South African languages, is used solely to publish one journal but also pairs in the publication of six other journals. Arabic alone was used in the publishing of one journal, while Swahili, a very widely spoken language only pairs with English in one journal.

DISCUSSION

The study examined the status of OAJs listed in the DOAJ, with the aim of highlighting Africa's contributions. Figures 1 and 2 show that although the oldest born closed journal that has migrated to OA is an African journal, born closed access journals of African origin are less consistent in their migration to OA compared with the global picture. It might be necessary to engage in another study on the pattern and factors explaining this migration pattern. The earliest journals were born in France and England in 1675, but the oldest closed access journals that have migrated to OA were those dated 1874 and later. The oldest journal that migrated to OA was an African journal established in 1874 and published by Egypt's Hindawi Publishing Cooperation. This journal migrated to OA in 2008, later than a younger journal, the *Bulletin of the American Museum of Natural History* established in 1881, which migrated in 2002. It is informative to note that Hindawi was listed in Beall's list of predatory publishers until 2013.

The uptake of OAJs in Africa has shown gentle growth in the migration of journals born closed to OA until 2005, and a sharper rise until 2009 followed by very sharp drops in 2010 and 2012. These drops coincided with the period when Beall (2009; 2010; 2011; 2013; 2014) observed and raised his voice about a certain category of OAJs he described as predatory. Beall maintains a list of possible, potential and probable predatory publishers and journals which is growing both in popularity (Harzing 2012) and controversy (Bohanon 2013; Nwagwu 2015). A major feature of Beall's list is that African countries constitute major sources of the journals and publishers although Europe accounted for 33 per cent of the 117 journals in Beall's list (Nwagwu and Ojemeni 2015).

Asia and Africa, which accounted for over 53 per cent of predatory medical journals in Beall's list (Nwagwu and Ojemeni 2015), have very low numbers of journals per country in the DOAJ as compared with Europe and the United States (US). As has been inferred, the reason for this might be associated with the classification of many of OAJs and OA publishers emanating from these regions as predatory. This observation, however, raises some contradictions in view of a recent study that revealed that the spread of readers of the predatory journals of Nigeria origin, for instance, is wider than the sources of the articles published in the journals. By implication, scholars from various parts of the world are reading and using the predatory journals, but fewer people are accounting for the articles (Nwagwu and Ojemeni 2015).

In Africa, Egypt accounts for about 76 per cent of the journals from the region. Without Egypt, the remaining 53 countries in Africa would be responsible for only 24.6 per cent of the 646 (or 153) journals from the region, that is, an average of three journals per country. This unfavourable result suggests that although Africa might have fared well in increasing its share of research papers in the world (Wold Bank 2014) by using OAJs from elsewhere, it has not really done well in exploiting the possibilities of using the Web to create credible OA sources through which local research could be disseminated. In respect of the dominance of Egypt in OAJs in Africa, however,

the question to be asked is: How widely spread in the Africa region are the journals published in Egypt? This a question that deserves to be addressed in a different study.

We suggest that the absence of more than 60 per cent of African countries from the list of countries with journals in the DOAJ means that OAJs from the majority of the countries in the region are probably considered substandard, or the publishers have not sought enlistment in, or are not conscious of, the need for their journals to be listed in the DOAJ, or other. Generally, however, this result shows that the uptake of OAJs in the region is low. The work of Abrahams, Burke, Gray and Rens (2008) clearly illustrates that there are more OAJs in the Southern African sub-region than are captured in the DOAJ; only one country in the sub-region namely South Africa has a presence in the DOAJ. Nigeria and Egypt stand out in West and North African sub-regions respectively in respect of journals listed in the DOAJ, but the east and central African sub-regional countries in the DOAJ produced only two or fewer journals each.

In respect of licences, there is a contrast between global authors' opinions in Wiley's (2013) survey and our report that only 22 per cent of the journals have a preference for BY licence, followed by BY-NC. Although the explanation for this contrast is not clear, it may signify the preference patterns between authors and journal publishers because Wiley's survey was focussed on authors while the present study was focussed on journals. The license preference by African journals shows that as much as 75 per cent of the licence choices is the very permissive CC-BY type, while only 1.9 per cent would prefer the non-permissive license of CC-BY-NC. It could therefore be suggested that the few African OAJs in the DOAJ demonstrate a more liberal attitude towards sharing and allowing reuse of the information they produce than journals from elsewhere. Fewer (20.1%) journals from Africa which did not indicate their licensing choices suggest that African publishers are probably most likely to disclose their licensing regimes than the global pattern (58%) would suggest. A major influencing factor in the choice of license is the funders' mandate (Morrinson et al. 2015); it is not clear, however, to what extent the papers published in the African OAJs are funded by agencies. This picture might be different and even clearer if Hindawi is taken out of the distribution of African publishers and their journals because of its skew in the distribution.

In respect of type of publishers at the global stage, the majority of OAJs are still being published by commercial organisations (59.52%). A high proportion of the over 40 per cent of these publishers indicates a wide array of non-commercial and non-profit oriented interests in the distribution of scholarly publications. This result support that publishing is increasingly not just a business of the commercial publishers, but that any organisation that has any information to share could deploy the OA technology platforms to disseminate the information they produce. When the top 20 publishers were examined, the most outstanding OA publishers are the new open-access-only publishing houses, with the big and hybrid publishers constituting just a very small proportion of the top OA publishers. Apart from Hindawi, an OA-only publisher that was once a closed access publisher, all the closed access publishers in the list are at

best hybrid in terms of publishing model. Given adequate planning and mission, the pattern of leadership in scholarly publishing could be changing, with new and upcoming publishers as well as old and relatively unknown publishers, such as Hindawi, rating high in their volume of publications. The countries of origin of the publishing houses also show that there is no one country that is dominating, despite the US accounting for four different publishers in the list. Open access is creating opportunities for socialising and democratising human rights to the collective production, circulation and use of knowledge (Quijano 2000). People are sharing the knowledge they produce freely, with an implication however of exposing their level of scholarly and other capacity wider than before.

The average number of journals (94.4) by the top 20 publishers (19% of the total number of publishers) overwhelms the average (2.72) of the rest of the publishers (about 81% of the total). This suggests an emerging concentration of OA publishing in a few publishers. Morrison et al. (2015) made a similar observation when she found that the lack of mid-sized publishers was a trend that may be worth keeping an eye on. The OAJ market is increasingly being consolidated similar to the traditional serials market in which a very small number of very large publishers control a disproportionately large share of the world's scholarly journals. Much earlier, Thompson (2005) had made a similar finding of a tendency towards concentration of publishing in a few publishers, and he considered this development as having important implications for long-term sustainability of a healthy scholarly publishing ecosystem. To this end, Edgar and Willinsky's (2010) suggestion that achieving a spread of participation in scholarly publishing is required to underpin a renaissance in scholar-led publishing expected in the OA era, is very apt.

Specifically, increasing participation of African publishers in publishing African research OAJs would ultimately imply the increase in African participation in modern science. Together the number of universities and non-profit based organisations (69.02%) participating in OA journal publishing in Africa is considerably high. However, in terms of the quantity of journals hosted, the role of profit-based corporations in academic OA publishing in Africa is still very high, accounting for 77.7 per cent of the journals published. The opinions of Morrison et al at the global level that the consolidation of OA publishing in a few corporate publishers will not favour the expected spread in the academic publishing market and the democratisation expected in an OA regime may be more significant at the Africa regional level. Furthermore, the high number of corporate publishers of OAJs may be lending support to the general opinions of the critiques of OA publishing that many of the OAJs in the region are merely fee-gauging houses, and on which basis Beall has classed them as predatory. There also appears to be a wider spread of participation by stakeholders at global level compared to stakeholders at African level, where universities/institutes, academy/societies, NGOs and individuals/ individual journals account for less than 23 per cent of the journals.

In respect of language in the case of Africa, only three (Afrikaans, Swahili and Xhosa) of Africa's over 500 languages were used in OA scholarly publishing, except Afrikaans, Swahili and Xhosa which were used alongside English. Besides singly accounting for 87.92 per cent of the publications, English was used in association with all other languages to publish papers from the region, except for French, Arabic and Afrikaans which were sole languages in five occasions and one occasion each. French, a widely spoken language in the region, accounts for the publication of only five journals. This result is reinforced by the findings of Nwagwu (2016) in a bibliometric study of biomedical literature in West Africa in which he showed that French, officially used in 10 of the 16 countries in the sub-region, was subsumed by English in respect of scholarly publishing. How will OA achieve the expected benefit of increasing access to scholarly information when English, spoken by a few, remains the medium of communication? Corporate publishers that are into publishing for the purpose of making money might not see the benefits of publishing in other languages, particularly when they are spoken by a few people.

IMPLICATIONS OF THE STUDY AND CONCLUSIONS

The study was based on the most authoritative database of OAJs in the world, namely the DOAJ, to descriptively uncover the status and performance of OAJs in Africa from a global comparative perspective. What can be concluded about the status and performance of OA in Africa based on the content of the database from which the data was collected for the study and what are the implications? With only 20 of the 56 countries in Africa having journals that are registered in the DOAJ, it can be inferred that OAJs in Africa have not grown as would have been expected. The 646 African OAJs accounted for only 6.3 per cent of the 10 152 journals in the DOAJ database. Very significantly, one country (Egypt) through the activities of Hindawi Corporation accounted for 75.5 per cent the journals from Africa – the rest of the 19 countries (that have journals in the DOAJ), and of course the remaining 53 countries in the region were only responsible for 24.5 per cent.

The information revealed here about OA in Africa evokes some reasons for further investigation. In the recent years, there has been so much optimism about OA contributing to the increasing volume of research papers published in scientific journals in Africa. An example is the World Bank's report that Africa's share of the world's articles almost doubled from 1.2 per cent to around 2.3 per cent (World Bank 2013). Yet only 20 African countries have journals listed in the DOAJ. We infer, on the one hand, that the increase in African share of papers due to OA might be explained by African scholars utilising OAJs other those emanating from Africa. On the other hand, we might also speculate that the DOAJ is probably omitting many African journals from its list. Although both opinions are valid, the fact of poor representation of African countries

in foreign indexes is a recurrent but common observation (Nwagwu 2006). To this end, Bowdoin (2011, 12) observes that:

> Indexing and abstracting of African scholarly journals is also a key necessity if a more even flow of information from Southern to Northern countries is to be achieved and if the journals themselves are to be truly accessible to other scholars.

To support this argument of poor representation in the DOAJ, UNESCO's Global Open Access Portal lists high quality OAJs in African countries about which the DOAJ made no entry. For example, *The Africa Statistica* from Senegal, and *African Journal of Neurological Sciences; Sciences & Nature* and *Afrique Science: Revue Internationale des Sciences et Technologie* from Ivory Coast, are listed in UNESCO's portal as high quality journals but they are not listed in the DOAJ. This observation is critical in view of the expectation that OA is a generally believed to be a positive means of showcasing domestic and regional research, whilst at the same time enabling researchers and other information users to access information from around the world (Nicholson 2011).

We acknowledge that there are differences between the UNESCO portal list and the DOAJ list: the UNESCO list is based on a survey while the DOAJ relies on the willingness of journal publishers to volunteer and register their journals. Thus, we may have to ask: How popular and acceptable is the DOAJ as a platform for indexing OAJs to journal managers in Africa? Why does it seem that many journal proprietors in Africa may be not interested in getting their journals indexed in the DOAJ? Are there aspects of the characteristics of the DOAJ that discourage African journals from seeking to enlist their journals in the database? We could suggest that the DOAJ should be pro-active in its indexing, specifically searching for and soliciting the applications from identified high quality journals that are not in the DOAJ instead of waiting for journal proprietors to apply for inclusion. This may be necessary in view of the DOAJ's philosophy of inclusiveness.

It is necessary to observe that some of the publishers of some of the journals listed in the DOAJ, for example, *Academic Journals* were also listed in Beall's database of predatory journals. This contradiction and its impact on scholarly publishing in Africa require further investigation. Beall's list of predatory journals includes journals that fall victim to his attributes of predatory journals as created by Beall himself. On the other hand, these journals were listed in the DOAJ because they met the criteria. However, while the DOAJ is a professionally curated list, Beall's list is self-curated – one of the reasons why many scholars consider the list to be unreliable (Nwagwu 2015). Also, while the DOAJ has generally been accepted to be egalitarian, Beall has been accused of being racist in his choice of language about his list of predatory journals (Nwagwu 2015; Truth 2012).

Finally, we recommend that African institutions and governments as well as development partners should increase their support for developing and promoting OAJs in Africa, building the necessary institutional and human capital required to strengthen

the quality of journals emanating from the continent. There is also a need to create an African Directory of Open Access Journals to cater specifically for OAJs of African origin – this resource might encourage publishers to volunteer their journals.

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