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The Uptake, Visibility and Impact of Science on Regional Publishing Platforms: The Case of AfricArXiv

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Introduction

Epistemological domains, or the disciplines of science, emerged in the 19th century as science assumed more open (public) and structured characteristics (Eamon 1985; Fyfe et al. 2015) which, in turn, shaped its social organisation. The communication of science, the bedrock for the advancement of new knowledge (Merton 1973), mirrors the differentiation of science along disciplinary lines. Journals, for example, typically serve specific communities of scholars, and, similarly, scholarly book publishers build lists in specific science domains.

More recently, a new form of publication has emerged alongside journals, books and other more established forms – the preprint. Preprints are published open access on online platforms (preprints servers) ahead of peer review, relying on the scholarly community alone rather than on scholars in the service of publishers, to vet the quality of shared papers. Pre-print platforms allow for the early registration of scholarly outputs via self-archiving by scientists in the formal communication system to support collaborative and networked-based scientific endeavour, to increase the speed of discovery and access, and to allow for greater flexibility in terms of incorporating new forms of publication into the formal communication of science (Van de Sompel et al. 2004).

Most preprint servers also operate, by and large, along disciplinary lines (e.g., arXiv, bioRxiv, medRxiv, SSRN, etc.). More recently established preprint servers cut across disciplines and focus on promoting national or regional science. In June 2018, a group of open science advocates launched the first preprint server aimed exclusively at scientists from Africa: AfricArXiv. AfricArXiv exists alongsideother regional initiatives such as SciELO Preprints, IndiaRxiv and RINarxiv. The objective of AfricArXiv and other regional preprint servers is to increase the visibility of science from the Global South in the globally populous and competitive science communication network (Malapaty 2018).

One way of thinking about the possible impact of preprints and of regional preprint servers in science, is to consider their impact on existing information asymmetries as they relate to the

dissemination and accessibility of scientific knowledge (Collyer 2018). Digitisation and networked communication have reconfigured society (Castells 2009) and within this reconfiguration of how information is shared, the publication of and access to scientific knowledge could, theoretically at least, be universal. In other words, if distribution and access are no longer barriers in a digitally networked world, then previously invisible science could become more visible.

Make information visible presents challenges for those academics from Africa (and other developing countries) who are perceived to face specific context-determined barriers. First, while the volume of research production on the continent is growing, it is overshadowed by the more rapid growth in East Asia (particularly China) (Johnson et al. 2018; Mouton et al. 2018). Second, the literature is dominated by the performance and dynamics of scientific issues related to East Asia (Cloete et al. 2018). Third, limited representation in 'global' bibliometric databases do not make legible the full ambit of African scholarly production thus underestimating scientific activity on the continent (Smith 2017; Tijssen & Winnink 2018). The 'introversion' of American and European science further contributes to the exclusion of science from Africa (Collyer 2018). Under-representation may, however, be attributable to the large proportion of research consultancies undertaken by researchers at African universities, resulting in the publication of research reports rather than journal articles (Boshoff et al. 2018; Kasozi 2016).

Fourth, universities as the primary institutions of science on the continent do not collect accurate data on the scholarly publications produced by their staff (Cloete et al. 2018), they do not adopt a strategic approach to scholarly communication, and they do not utilise technology to extend the reach of their scholars' work (Trotter et al. 2014). Fifth is the problem of the poor state of scholarly publishing on the continent (Luescher & Van Schalkwyk 2018; Murray & Clobridge 2014).

For African science, disruptions in scholarly publishing also present opportunities. Gray (n.d.) argues that Africa could leapfrog the technology divide and adopt more radical modes of scholarly dissemination. The fact that Africa has a limited investment in the traditional print-based scholarly publication systems, frees academics, publishers and policymakers to innovate in ways that those in the Global North may be constrained from doing because of their legacy investments and institutional cultures (Luescher & Van Schalkwyk 2018). To exploit new technologies effectively, academics, publishers and policymakers in Africa need to be attentive to and capable of using the available technologies. In the African context, evidence suggests that academics are not sufficiently aware of the opportunities available to them (Nobes & Harris 2019).

It is unclear whether regional rather than discipline-focused preprint platforms as an innovation in the communication of science are removing any of the barriers outlined above, or whether they are increasing access to and visibility of science from Africa. In response, this paper focuses on the uptake, visibility, and academic impact of the regional preprint publishing platform AfricArXiv. The following questions are posed:

1. What is the trend in the uptake of AfricArXiv?
2. Who is publishing on AfricArXiv?
3. What is the visibility of the articles published on AfricArXiv?
4. What is the scientific impact of AfricArXiv?

Methods

Dimensions collects bibliometric data on preprint servers and makes indicator data publicly available on its website. Data for AfricArXiv was extracted from Dimensions on 31 March 2020 using the following search query: "publication year: 2018 or 2019 or 2020 or 2021; source title: AfricArXiv". The data returned from the search query was scraped and parsed for analysis in MSExcel. Data was cleaned (e.g. duplicate entries removed) and missing data (e.g. for missing author affiliation data) captured by conducting a manual examination of the PDFs of papers uploaded to AfricArXiv. For comparisons with other Global South regional, non-discipline focused preprint platforms, the same search query was used, and the term "AfricaArXiv" replaced with "SciELO Preprints" and "IndiaRxiv". Data on number or publications and number of authors was used an indicator of uptake, defined as the use of the platform by authors of scholarly works for the purposes of disseminating those works.

To measure visibility, a case study approach was adopted. In other words, certain papers were selected as cases to illustrate visibility where visibility is understood as the presence of papers in the media and other online sources. Data from Altmetric was used a proxy for visibility in the media. Altmetric scores were sourced from Dimensions, and the disaggregated data for each score was sourced from the publicly-available Almetric pages for each publication. Altmetric's data for geographical breakdown on Twitter was used to code the data into four regions – local, Global South, Global North, Africa – where local referred to the country indicated for the lead author of the paper. Altmetric's data for demographic breakdown was used to determine the percentage of scientists who (re)tweeted the paper.

Findings

Dimensions reports 362 publications uploaded for the period 2018–2021; with a minimum of 24 publications in 2018 and a maximum of 148 publications in 2021. Data show 320 unique authors for all publications from 2018 to 2021. The most represented author uploaded 33 publications (either single or co-authored). The next most represented author uploaded 7 publications, followed by a long tail of authors with 3 or fewer publications.

From the 320 authors, 170 unique institutional affiliations were identified (Table 1). Table 1 shows the predominance of university affiliations for authors publishing on AfricArXiv, followed by government scientific organisations (such as research institutes or councils) and not-for-profit organisations.

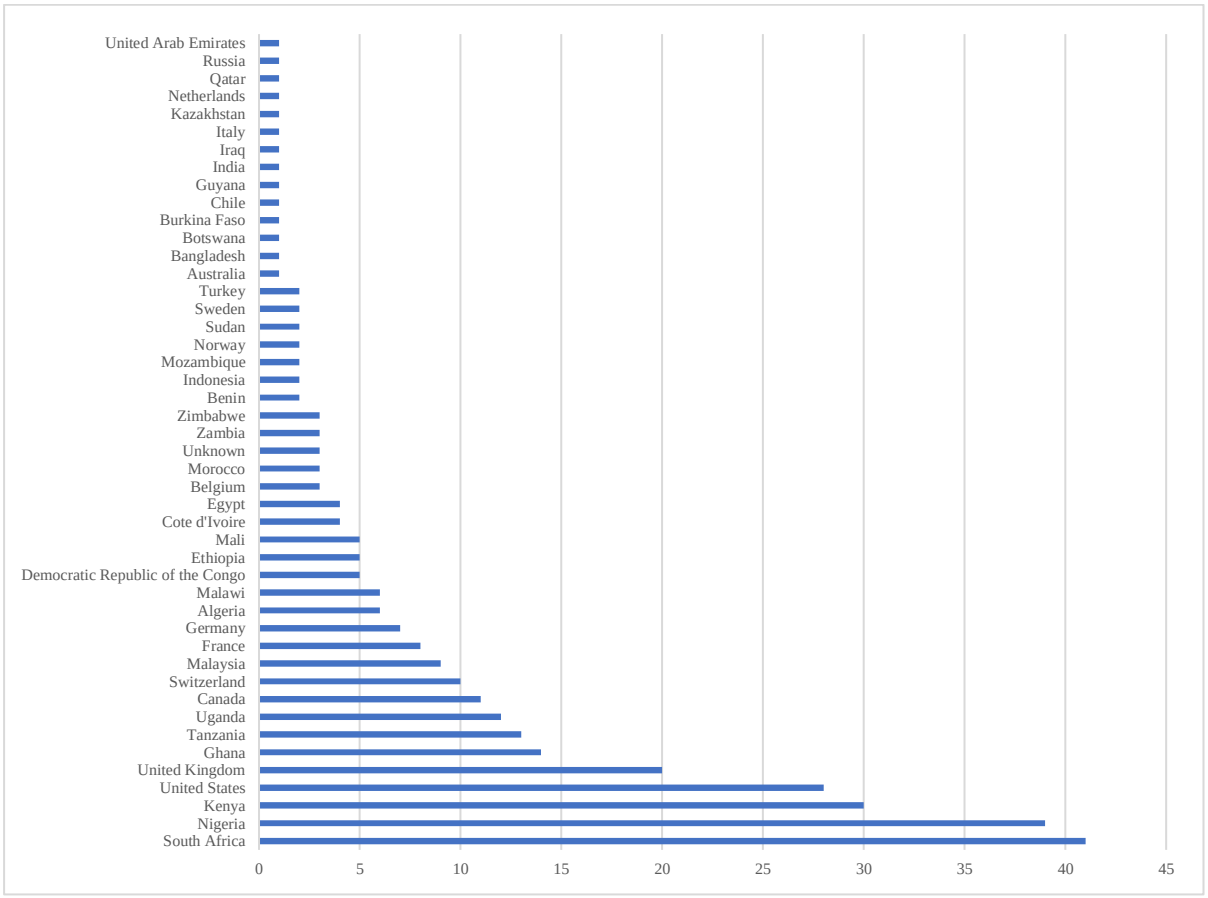
Table 1: Authors' institutional affiliations on AfricArXiv by institutional type (n)

Institutional type	No.
University	263
Government scientific organisation	23
Not-for-profit organisation	15
Company	4
Government MDA*	5
Independent scientific organisation	3
Other	5

* Ministry, department or agency

Figure 1 shows that most authors were affiliated with institutions in South Africa (n=41), Nigeria (n=39) and Kenya (n=30). Along with institutions from two countries outside of Africa (UK=20 and US=28), the top 5 countries account for close to half (49.38%) of all publications on AfricArXiv.

Figure 1: Publications on AfricArXiv by country of authors' affiliated institution (n=320)



From a regional perspective, Figure 2 shows that most authors were from countries in Africa (n=201) followed by countries in the Gobal North (n=96). Relatively few authors are affiliated with institutions located in the Global South outside of Africa (n=20).

Figure 2: Publications on AfricArXiv by region of authors' affiliated institution (n=320)

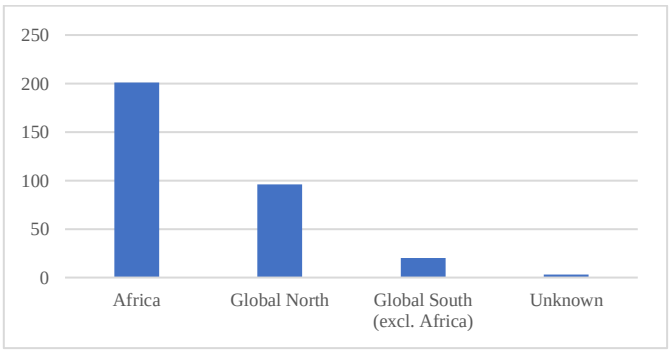


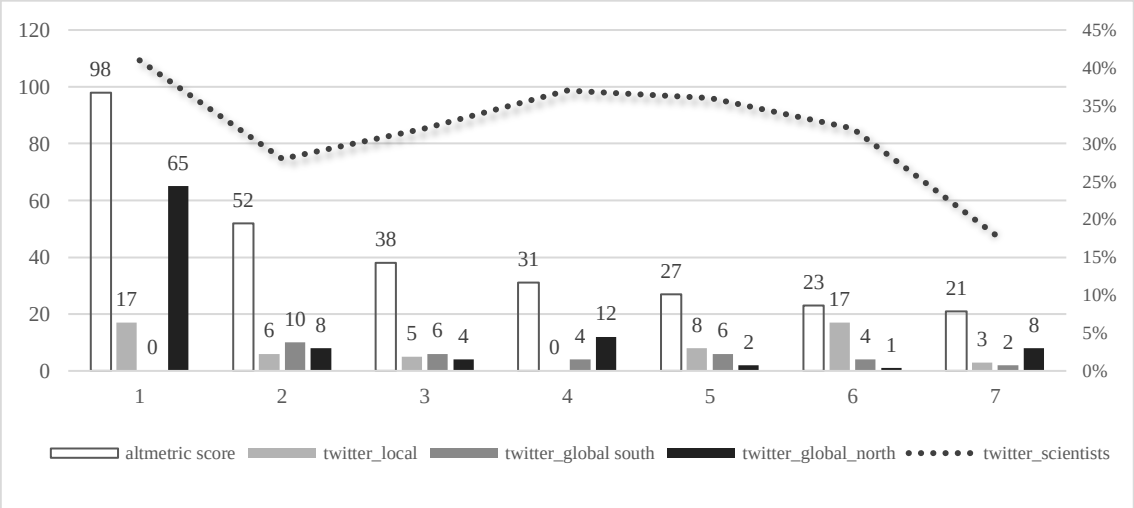
Table 2 shows those institutions with five or more publications on the AfricArXiv platform. The table shows that the list is, as to be expected, dominated by universities. While most of the universities are located in Africa, three universities are from the Global North (University of Bern, London School of Hygiene & Tropical Medicine, and University of Oxford) as well as one university from the Global South outside of Africa (Universiti Putra Malaysia).

Table 2: Frequently occurring institutional affiliations on AfricArXiv (n ≥ 5)

Institution	N
University of Cape Town	10
Stellenbosch University	8
University of Bern	8
University of Oran	7
Kenya Marine and Fisheries Research Institute	6
University of Port Harcourt	6
Jomo Kenyatta University of Agriculture and Technology	5
London School of Hygiene & Tropical Medicine	5
Olabisi Onabanjo University	5
Universiti Putra Malaysia	5
University of Cape Coast	5
University of Ilorin	5
University of Kinshasa	5
University of Oxford	5

The visibility of seven articles with the highest Altmetric scores (all with scores of more than 20) published on AfricArXiv is shown in Figure 3. The data show that Articles 2, 3, 5 and 6 received most attention in their local context and in other Global South countries compared with the Global North. Conversely, Articles 1, 4 and 7 received more attention in the Global North. The topics of the articles may account for this disparity as Articles 2, 3, 5 and 6 are related to their local context (Nigeria, Kenya and Tanzania) while Articles 1, 4 and 7 are not place-specific. Consistent, however, is the fact that scientists make up less than a third of the attentive audience on Twitter.

Figure 3: Visibility of AfricArXiv papers on Twitter (as at 31 March 2022)



According to Dimensions, the 362 publications on AfricArXiv attracted 70 citations in total. By way of comparison, Dimensions shows that IndiaRxiv published 135 articles during the same period with 61 citations, and SciELO Preprints published 1,016 publications over a two-year period (2020-2021) with 576 citations. In all cases, regional preprint platforms lag their more discipline-specific global counterparts for the same time-period (e.g., SSRN published 167,717 publications with 151,698 citations, while bioRxiv published 125,492 preprints with 241,630 citations).

Discussion

The findings show that there is uptake of the preprint platform AfricArXiv, and that uptake is growing. While more time is required to make definitive claims about the success of AricArXiv as a new publishing space for scientists from Africa, uptake in its early phases exceeds that of the preprint server IndiaRxiv, but lags that of the Latin American equivalent, SciELO Preprints. This may be attributable to a more established open access publishing culture in Latin America (Babini & Machin-Mastromatteo 2015; Debat & Babini 2020).

Most of the uptake is from scholars on the African continent, particularly from South Africa, Nigeria and Kenya, and AfricArXiv appears to have been successful in attracting scholars from a wide range of institutional types with most success in the case of university-based researchers.

Findings indicate that in the early phases of the platform's lifespan, the visibility of its publications has remained relatively low. Similarly, citations scores are meagre and point to introverted citation patterns, suggesting, for the time being, limited scientific impact of the knowledge available on the platform.

Collyer (2018) points out that regional initiatives as 'alternative transregional circuits of publication' can have a positive impact on the consolidation of regional research capabilities and stimulate South-South collaboration. From an authorship perspective, there is little evidence to suggest that AfricArXiv provides a space for South–South collaboration. With the exception of the presence of authors affiliated to one Malaysian university, most collaboration is North–South with some institutions and countries from the Global North occupying high positions in terms of number of papers co-authored on AfricArXiv.

Exclusively regional publishing initiatives risk being disconnected from the global science communication network and do not necessarily guarantee global visibility as the findings from this study have shown. Regionalisation as a strategy holds greater potential in terms of visibility if regional networks are integrated into the global science communication network. But by connecting to global science, regional networks must accept the norms and standards of those networks (Castells 2009), and this may entrench rather than challenge existing power dynamics in the global science communication network.

Participation in the global science network is therefore not only a matter of availability or visibility but of either accepting or challenging prevailing global norms and practices in science. If Africa is to increase its participation in and contribution to global science, it must find ways to redefine and negotiate what counts as valuable knowledge (Connell et al. 2018). This requires strong science institutions in Africa, including state support for national science systems and research universities (Cloete et al. 2022), developing local research cultures (Mamdani 2016), creating incentives for scientific research to break the consultancy treadmill (Felde et al. 2021) and supporting equitable research collaboration (Maassen 2022).

Conclusion

There remains much to understand in terms of achieving optimal conditions to increase the visibility and impact of science from Africa. Future research is needed to fill knowledge gaps and to develop empirically based theories that account for the changes in the scholarly publishing landscape and the consequences of those changes for the visibility of science from Africa.

Future research should focus on scientists' expectations and experiences with using regional publishing platforms, and whether there are any observable advantages derived from publishing

on regional platforms compared with uploading publications to disciplinary platforms or academic social media networks. Further insight into how AfricArXiv works, what initiatives are in place to promote and attract submissions, and how AfricArXiv sees its role in an evolving science communication landscape – for example, in relation to other regional platforms and/or institutional repositories on the African continent – will add further context in which to interpret the findings presented in this paper.

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