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The Potential of Open Science for Research Visibility in the Global South: Rwandan Librarians' Perspectives

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Abstract. The weak visibility of African research outputs and scholarship in established global publication outlets and research networks is often the subject of debate. Encouragingly, some discourses around open science appear to offer a solution for this issue. In this paper we explore whether and how open science can help in addressing the inequities that seem to hinder African scholarship, by taking a closer look at the research environment of one particular country, Rwanda. We drew upon the experiential knowledge of four senior librarians in Rwandan higher learning institutions through a week-long data gathering and engagement workshop. We then analysed this data and compared it to three literature-based perspectives on the issues underlying the perceived invisibility of African scholarship. From our findings, we conclude that research contexts may be systemically and structurally constituted and that open science initiatives may only offer partial solutions when considered within a broader appreciation of these constraints. We offer support to decolonial approaches in reframing these efforts.

Keywords: Open Science, African Scholarship, Cognitive Injustice, Rwanda, Research Lifecycle

1 Introduction

Open science is an important new development in the governance and practice of research (LERU, 2018). Originating in the Global North, it encompasses a number of different discourses (Albagli, 2015), but as an idealistic movement to reform science, there is an expectation that it should be able to address inequities in how science works and improve opportunities for all scholars (Levin et al., 2016). One notable documented inequity in the practice of scholarship is the weak global visibility of African research (Chan & Gray, 2013). An oft-quoted statistic is that sub-Saharan Africa produces less than 1% of the world's research output (e.g. Fonn et al., 2018; Ngongalah et al., 2018). We will suggest in this paper that the apparent weak visibility of African scholarship can be centred around three conflicting perspectives.

A number of authors are optimistic that open science offers some scope to address these endemic challenges to the visibility of African scholarship (e.g. Raju et al., 2015; Ahinon & Havemann, 2018). This paper will engage with this debate by exploring its

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potential in a particular research context in the Global South, that of Rwanda in East Africa. With its historical and colonial legacies, Rwanda presents a unique and illustrative case through which these issues can be examined. The perception of the key enablers and constraints of the Rwandan research context through data collected from Rwandan librarians provided a basis on which to consider the potential of open scholarship as a change agent in their situation. The paper seeks to answer two research questions: *1. What are Rwandan librarians' perceptions of the challenges for research in their country? 2. How is open scholarship relevant to addressing these challenges?*

Next, we present in the literature review existing perspectives on open science and explore debates about the invisibility of research outputs from the Global South, specifically African scholarship. We then explain the methodological approach used for study, the results of which we present in the findings section. We discuss these findings and explore the implications of open science for addressing the identified challenges. We conclude with implications of this study.

2 Literature review

2.1 Open Science/Open Scholarship

There is growing momentum in policy and practice in the Global North around the concept of open science or more broadly open scholarship. Open science adheres to ideologies pertinent to “openness” as a social movement (LERU, 2018). Here, openness is meant to refer to democratisation of knowledge and therefore links to ethical and moral standpoints privileging public access to, and participation in, knowledge production (Albagli, 2015; Fecher & Friesike, 2013). Open science initiatives are thus part of a long-standing tradition to “open up” the products and processes of scientific practice to all (David, 2008). At the simplest level, this is about the open sharing of resources and ideas. Examples include: open access journals where content is freely available to any reader without subscription; also, use of open access repositories which enable researchers costless access to published papers. Some of these are based on subject area, while others are run by institutions, for all the outputs of all their authors. Sharing of a version of research data or coding underlying results in a data repository, is another aspect of open scholarship.

The benefits of such openness include ensuring rigour and reliability of research, increasing the speed and reach of dissemination, broadening participation in research, and better resource usage (National Academies of Sciences, 2018). Acknowledged barriers are the costs and infrastructure needs; the current scholarly communications system; lack of the appropriate culture; various privacy or security issues; and disciplinary differences (National Academies of Sciences, 2018). Key to the concept of open scholarship is that it includes but extends beyond mere access. Opening up the practice of scientific knowledge production in these ways necessarily affects the research process since each stage of a typical “research lifecycle” will be affected. Thus, accounts of open science suggest the need to refer to a significantly wider range of open practices. Grigorov et al. (2016), amongst others, for example, have mapped various different open scholarship interventions to the research lifecycle.

Much of the rhetoric around open scholarship, as with open access before it, revolves around the equity and integrity of scholarship but it rarely engages explicitly with the issues challenging research in the Global South. Limited research on the relationship between the open movement and development outcomes has sought to examine how open science could be harnessed to enrich local research environments (Chan et al., 2015; Hillyer et al., 2017). These arguments suggest that through strengthening the research environment, the local research community would be better able to leverage knowledge to address local problems (e.g. Guerrero-Medina et al., 2013). Actual research into how open science *does* influence these local research environments is scarce, however (Rappert & Bezuidenhout, 2016). In considering whether and how open scholarship can help in addressing the inequities that seem to hinder African scholarship, we first take a look at three perspectives from the literature on this topic.

2.2 Perspective 1: Open Scholarship and Inequalities in the Scholarly Communication System

One perspective on the relative invisibility of African research is to locate the problem firmly within the scholarly communication system as currently constituted (Chan & Gray, 2013). This system is dominated by a number of powerful commercial publishers based primarily in the USA and UK, and publishing in English (Chan, 2018). Run on for-profit grounds, the journals they publish are relatively expensive to license, especially for resource-constrained contexts and the costs have historically spiralled upwards (Milne, 1999). Journal impact factors, which operate as a means of measuring research significance within this system (Hecht et al., 1998), reinforce their legitimacy by effectively encouraging citation frequency within this same network of journals. Material published outside the system is invisible and so effectively has no impact (Chan & Gray, 2013). The way the publishing industry works places authors in the Global North in a powerful position to dominate academic knowledge (Haider, 2018). The research agenda is often set by issues defined in the Global North (Gwynn, 2019). A large proportion of papers published about the Global South are not co-authored by researchers from the Global South (Boshoff, 2009).

Open scholarship is positioned to address key issues within the scholarly communication system, though its efficacy is open to question. For example, it assumes that everyone has a network connection and the digital skills to locate and use open material. Given the greater scale of research in the Global North, openness could reinforce its dominance, i.e., those in a position to benefit from open infrastructures would be the primary beneficiaries, which unfortunately does not include most lower middle income countries (Herb & Schöpfel, 2018). There are also fears that scholars in the Global North use their infrastructural advantages to access and exploit data produced in the Global South (Rappert & Bezuidenhout, 2016). There are certainly other problematic aspects of the scholarly communication system that do not seem to be addressed via dominant discourses of open scholarship. For example, the problem of “linguistic imperialism” (Canagarajah & Ben Said, 2011), due to the dominance of English as the language of science, is not addressed.

2.3 Perspective 2: Open Scholarship and Deficits in the In-Country Research Environment

An alternative perspective on the relative invisibility of research outputs from sub-Saharan Africa, could be dubbed the “country deficit” perspective. This places centre stage a web of in-country issues which are assumed to create research environments that function poorly when compared to those of the Global North. This perspective emphasises what the country lacks and how it can “catch up” to more developed country research contexts, without necessarily positioning these issues within broader systems of imbalance such as the inequalities created by the international scholarly communication system. Rather, it focuses on the way that a weaker in-country environment for research makes it more difficult to perform research on par with scholars in the Global North. Some of the key issues highlighted within this perspective are briefly reviewed here.

Inadequate investment in research and higher education is often cited as a central issue leading to, and often led by, dependency on foreign aid organisations, like the World Bank, and their development agendas (Fonn et al., 2018; Beaudry et al. 2018; Collins and Rhoads, 2010). Another issue often highlighted in this perspective is the lack of support at the institutional and supra-institutional levels for researcher development (Beaudry et al. 2018; Ngongalah et al., 2018) including lack of alignment of research policy to local contexts (Boshoff, 2009). Yet another common issue identified is inadequate development of research support infrastructures (Gwynn, 2019), like institutional repositories, for example (Dlamini and Snyman, 2017), and support for open science (Nwagwu, 2013). Reinforcing the in-country deficit view is the migration of trained scholars (Ondari-Okemwa, 2007), seen to be as much as 30% in the 1980s and 90s (Beaudry et al. 2018), leading to human capacity issues.

These in-country deficits spill over into the development of open initiatives, thus complicating any ameliorating effect that open scholarship could bring to this situation. Low investment in higher education leads, for example, to lack of access to licensed content and insufficient funding for some open access routes. Lack of support for research development and infrastructure could mean that even where open access content is available, scholars may lack the bandwidth or digital and information literacy skills to access the content. Lack of support for running repository infrastructures efficiently would contribute to further invisibility of African scholarly publications.

2.4 Perspective 3: Open Scholarship and Cognitive Injustices

A third perspective can be seen emerging which potentially underlies both the scholarly communication system and country deficit perspectives, but locates the fundamental issue in neo-colonialism and the diminution, even erasure, of African ideas within human knowledge systems dominated by the Global North. We follow Nkoudou (2015) and Piron et al. (2016) in labelling this the cognitive injustices perspective.

Nyamnjoh’s (2012) analysis traces the deprecation of African knowledge, as epistemicide, to the violence of colonialization when endogenous knowledge was seen as inferior and primitive. This has resulted in African education retaining vestiges of

“epistemological xenophilia and knowledge dependency” Nyamnjoh (2012: 143) with scholars trying to make sense of local problems through the Global North’s knowledge system, rather than develop their own theory (Andrews and Okpanachi, 2012).

In the African open scholarship context, this argument is most recently articulated by Nkoudou (2015) and Piron et al. (2016) through identifying eight, inter-related “cognitive injustices” that beset African scholarship. Nkoudou (2016) identifies both endogenous and exogenous cognitive injustices. Endogenous factors include the continuing neo-colonialism of African education which is directed to reproducing local elites and is based on the assumption that local African knowledge is inferior to the knowledges of the Global North. The lack of policy and infrastructure to support research in African countries is seen as a further endogenous, cognitive injustice arising from this sense of inferiority. A further effect of the dependence on ideas originating in the Global North is to alienate African citizenry from research, reinforcing a strong barrier between science and society (Nkoudou, 2016).

Central to exogenous epistemic injustice is the impact of the for-profit scientific publication system (Piron et al., 2016). This is premised on the purpose of research being to promote economic growth, a perspective found pervasively in policy justifications of open science. But the authors argue that this is an alien model of development because it does not fit Africa’s needs. The for-profit publishing system effectively restricts access to the apparatus of scholarly publishing, both to publish and to read.

Ultimately, within this argument, minor reforms to how science works now are unlikely to address the underlying issue that African knowledge remains undervalued. Open science is often explained as a return to fundamental principles found in the early centuries of Western science in Europe (e.g. National Academies of Sciences, 2018). This makes the assumption that Western science is the model for all knowledge creation. Just as open access has not evolved in an afro-centric direction (Nwagwu, 2013), there is a risk that open scholarship as defined in the Global North will fail to reflect African realities, and so may not therefore bring the hoped for benefits, despite the often good intentions. Thus Nkoudou (2015) and Piron et al. (2016) do see benefits in open science, but only if it is defined as the democratisation of access to science, not if it is understood as a means to accelerate scientific productivity or for economic growth.

We summarize the three perspectives. Taken from perspective one, the problem of invisibility of African scholarship is systemic; dominant actors from the Global North effectively exclude participation from Global South scholars. Open science can bring visibility through disrupting aspects of the research process towards more open, inclusive and collaborative approaches. From perspective two, the problem is due to in-country research environment failure; state and institutional actors create a weak environment for scholarship in general. Open science could face implementation barriers and therefore be ineffective in providing solutions. From perspective three, the problem is due to the entrenched epistemic injustices legacy of colonialism, which is also implicated in perpetuating aspects of perspectives one and two. Open science would need to be positioned as a liberating force, but may be unable to unseat the status quo. The three perspectives therefore give conflicting views on the role open science could play.

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Given this, we decided use the research lifecycle (e.g. Grigorov et al., 2016) as an orienting framework for understanding research challenges in Rwanda and to assess, in the light of the three perspectives, the transformative potentials of open science.

3 Methods

Data for this paper were collected as part of a project engaging with the higher learning institution (HLI) librarian community in Rwanda. We collaborated with 4 librarians from 3 HLIs in Rwanda: University of Rwanda (2 participants), University of Lay Adventists of Kigali (1 participant) and Ruhengeri Institute of Higher Education (1 participant). All participants were directors of their respective libraries, at either a specific campus or serving the entire institution. During a six-month period, we conducted quasi-monthly video-conference meetings with the participants to plan a week-long engagement workshop with them at the Information School, University of Sheffield, UK. The participants devised questionnaires and conducted informal enquiries in their institutions about the research practices of their academic user base. The areas of enquiry were: Rwandan researchers' main publishing challenges (globally and locally), issues related to English language publishing, literature search, sharing data and dealing with digital research outputs.

During the week-long workshop, we conducted daily data gathering activities involving the participants including: 3 group interviews and discussions, a "rich picture" collaborative group exercise (similar to Walker et al., 2014), 1 panel discussion and 1 focus group. Altogether, we collected around 12 hours of recorded material over the week-long period supplemented by 6 "rich pictures", 10 flipcharts representing discussions and 30 A4 pages of notes. The collected data were discussed by the two Information School researchers in 4 meetings for which each researcher prepared by reading the notes related to the engagement workshop and reviewing the audio-visual and physical materials produced. The researchers discussed and agreed upon broad themes emerging from the data and an analytical framework to structure the themes. This framework was then used for systematic analysis of the data to prepare the results matrix shown in Table 1. These approaches are based on qualitative inductive analysis methods (Miles & Huberman, 1994).

The results matrix organised the data along two dimensions: (1) the research lifecycle, taken here as the stages *idea generation*, *data collection and analysis*, *dissemination of results* and (2) broad contextual factors from the emerging thematic areas. The research lifecycle stages were further subdivided by emerging categories from the data such as *motivation*, *access to literature* (idea generation aspects) and *local publication*, *publication in international journals*, *open access* and *dissemination to the public* (dissemination of results aspects). The contextual themes were categorised as: *researcher position*, *costs*, *national and institutional support infrastructure*, *skills* and *access*. For each stage/sub-category of the research lifecycle, these factors were elaborated on, so as to relate the issues found in the context to that specific research stage. The resulting matrix thus effectively formed a representation of the librarians' perceptions of the Rwandan research context.

4 Findings: Challenges for researchers in Rwanda

We discuss the five interconnected contextual themes emerging from the data and represented in Table 1. The first theme revolved around the motives and challenges for the researcher. Researchers were subject to a “publish or perish” model: in which the motivation to undertake research was to gain funding, build reputation and publish in international journals. But this was highly problematic because research funding is very competitive with success rates at 2-5%. It also skewed research towards quite a narrow research agenda, so that 70% of publications came from just one sector: health. What funding there was came from external funders, so they drove agendas, not researcher interest or in-country need. Participants felt strongly that external funders were not aware enough of in-country needs. The result was a disconnection between research and policy. This was further reinforced by funders’ preference for publication in international journals that local policy makers would be very unlikely to access. Teaching loads made doing any research hard. Most contracts stated that 50% of time was for teaching (30% research; 20% administration). But class sizes were very large, so that in reality there was little time for research. Getting published was also hard, because again rejection rates were high.

The second theme was the financial issue. The motive to undertake research was weak financially: salaries were low but typically academics found it easier to do extra teaching at another institution if they needed to make more money. There was no shortage of such work. At the same time, there was a sense of the many expenses throughout the research lifecycle: subscription costs, lab costs, data collection costs and later publication costs, such as for translation and proofing work and for APCs.

A third issue was the infrastructure, including ICTs. At both national and institutional levels there were issues with basic electricity supply, computer access and ownership, bandwidth, software and IT support. There were not enough computer labs; not all researchers have computers. Once IT support staff are trained they tend to leave. There was also a sense that the skills to maintain an open access infrastructure were lacking within institutions.

Fourthly, another challenge was researchers’ skills, which were lacking across a range of critical areas, including writing, particularly in English, but also information searching and understanding the publishing process. One underlying factor seemed to be language. Rwandan culture is mainly oral, with most day-to-day interactions based on Kinyarwanda which is not used much in education or research. The driver to publish research results in English language international journals effectively makes results inaccessible, because public access to knowledge is mainly oral and English is not the natural language of communication. Research outputs were thus disconnected from citizens and policy makers. Furthermore, many Rwandans have learned French as a second language; the introduction of English as a language for teaching or publication is relatively recent. Like many non-native English-speaking researchers, translating their ideas into English for publication in international journals thus incurred additional costs and effort.

Table 1. Matrix representing a map of Rwandan librarians' perceptions of the local research context.

Research Lifecycle Themes	Idea generation		Data coll. & analysis				Dissemination of results	
	Motivation	Access to literature		Local publication	Publication in international journals	Open access	Dissemination to the public	
Researcher position	Publish or perish model Limited funding for research, mostly from external funders, disconnected from local agendas Teaching loads			International journal publication needed for promotion	High rejection rates Predatory publishers	Lack of institutional open access mandates	External funders drive the research agenda – disconnect to in-country need	
Costs	Lack of financial motive to do research Doing extra teaching is easier than doing research	High cost of access to literature content	Lab costs Data collection costs – paying participants' travel or fees		Publication costs: reviewing costs, APCs (notwithstanding discounts)			
National and institutional support infrastructure		Poor technical infrastructure: electricity, computer ownership, bandwidth, software and IT support ICT support staff leave quickly when they have been trained Hard to work from home because of network cost Librarians low status				No robust open access infrastructure at institutional level Lack of skills to maintain open access infrastructure	Internet connectivity is limited and expensive	
Skills		Lack of reading habits Lack of search skills Low English skills			Low English skills Lack of academic writing skills Lack of understanding of publishing process	Little understanding of IPR in publication context		
Access		Lack of local content High cost of subscriptions			Rwanda has graduated out of Research4Life		Scholars publish in international journals in English, not for local audiences, including policy makers	

The fifth challenge was access to content, which from international journals was expensive. Researchers often had to find money for journal subscriptions themselves. Research4Life had been very useful, but publishers now consider Rwanda's GDP to be high enough to be able to afford the content. In reality this is not the case, therefore full text access has been lost. Government and consortia efforts to acquire content had failed, resulting in a lack of access to key material for scholars. Equally, local content about Rwanda was lacking, making it harder to establish a baseline of knowledge on which to build research. The local publishing industry was hardly developed. Many materials used in learning were not adapted to local context, because they were produced outside the country. Library collections focussed on printed material; there were problems collecting and organising local cultural materials. Researchers were not motivated to report results in ways to have an impact on policy.

5 Discussion and Conclusion

Regarding the first research question, we find that the Rwandan librarians' perceptions of the research challenges for Rwanda appear to align quite strongly with the in-country deficit perspective, recognising the role of weak researcher motivation and support, and poor infrastructure. Most of the findings emphasize the material (e.g. resources and finance), human capacity, infrastructural and institutional barriers for African scholarship to engage with global research networks. Such a view suggests that there is something specific about the Rwandan context that can account for a lack of engagement in research in-country and in broader networks. Furthermore, there is an implication that the solution would be that of addressing such shortfalls in-country. It apportioned the 'blame' to the country itself. It is important, however, to determine if the problem is situated locally or is part of a more systemic issue, within which this context can be placed. In the case of Rwanda, the participants highlighted certain cultural norms and language policies that could be seen as specific to Rwanda and influential on the development of the research context, and they are non-trivial. The extent of their influence, however, could also be seen as part of broader systems and structures influencing Rwandan scholarship. The colonial heritage of this country, for example, to some extent has exacerbated issues related to learning and publishing in the English language.

Less obvious from these findings were the systemic and structural considerations of the imbalances in the scholarly communication system and continuing neocolonialism. As librarians, participants were certainly aware of the inequities of the scholarly communication system although their roles placed them in the paradoxical position of having to promote access to international literature despite the obvious barriers this presented. Within their institutions, they also faced systemic pressures of "low status", which translated into an inability to change the status quo, and powerlessness to satisfy their user community, e.g., in gaining access to Research4Life articles behind the pay-wall.

Amongst the data we collected, there was less awareness of the kind of trenchant analysis offered from the epistemic injustice perspective. By definition, librarians' role is to promote access to content within the existing system. In this context, any African

library's attempts to promote literacy is in danger of being seen as supporting linguistic imperialism (Canagarajah & Ben Said, 2011). The Rwandan Librarians' views emphasised the way that the "normal" of a Global North research system does not exist in their country. Therefore, the usual premises about how research works also do not hold. At every step, the researcher was hampered compared to their counterparts in the Global North. If we accept that the problematic research context is only partly locally situated (with respect to specificities of the context) but more broadly influenced by the systemic and structural issues explored in the scholarly communications system and cognitive injustices perspectives, then we can start to think of ways in which these issues can be addressed, for example, through open science.

We now turn to the second research question about whether open access and the broader concept of open scholarship have the potential to improve the condition of Rwandan research. While our participants were not uncritical of the scholarly communication system, which is the focus of the reform proposed in open science, they did not see the problem as lying primarily here. Rather, they tended to see the issue through the in-country deficit perspective, which is not deeply touched by the reforms proposed by open science. Open science does little to address the under-investment in research, workloads of scholars or costs they incur. This is apparent if we compare the mapping of issues to the research lifecycle in Table 1, to the representation of open scholarship mapped to the lifecycle as by Grigorov et al. (2016), we can see there are many gaps where open scholarship does not address the fundamental issue in the African context. In this sense, open science does not seem to have immediate value for Rwanda.

Furthermore, current conceptions of open scholarship developed in the Global North fail (not surprisingly perhaps) to challenge the dominance of English language publishing or seek to open up to alternative epistemologies (Hillyer et al., 2017). However, within the epistemic injustices perspective a different model of open scholarship does have some resonance. If open science implies breaking down the barrier between science and citizens, then it does address the key failure that this perspective identifies within African scholarship: the gap between African research modelled on patterns from the global North and its potential publics (Nkoudou, 2015). This is not necessarily utopian but to truly work would require many significant shifts. The strands of thinking within open science that give emphasis to democratisation of access and participation would need to come to the fore. In addition, a shift in thinking around the construction of the local research system would be needed. African governments would have to invest more in research and use this to promote research into local issues and local knowledge. Universities would have to give staff more time for research. They would need to give greater status to publication in local journals, in local languages. This would increase local engagement with research by policy makers and citizens. Rather than forcing researchers to operate within the existing scholarly communication system, always working at a relative disadvantage, they would need to commit to a very different model of scholarship. An eagerness in the global north to truly hear different voices in research might be one very positive factor in achieving such change.

In conclusion, our contribution to this debate has been to propose a way of resolving the conflicting discourses on the role of open science in making African (or Global

South, more generally) scholarship more visible by illustrating how reframing a dominant in-country deficit perspective through different lenses can offer alternative and more context-specific solutions.

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