Knowledge and equity: analysis of three models

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Abstract

The context of this paper is an analysis of three emerging models for developing a global knowledge commons. The concept of a ‘global knowledge commons’ builds on the vision of the original Budapest Open Access Initiative (2002) for the potential of combining academic tradition and the internet to remove various access barriers to the scholarly literature, thus laying the foundation for an unprecedented public good, uniting humanity in a common quest for knowledge. The global knowledge commons is a universal sharing of the knowledge of humankind, free for all to access (recognizing reasons for limiting sharing in some circumstances such as to protect individual privacy), and free for everyone qualified to contribute to. The three models are Plan S / cOAlition S, an EU-led initiative to transition all of scholarly publishing to an open access model on a short timeline; the Global Sustainability Coalition for Open Science Services (SCOSS), a recent initiative that builds on Ostrom's study of the commons; and PubMedCentral (PMC) International, building on the preservation and access to the medical research literature provided by the U.S. National Institutes of Health to support other national repositories of funded research and exchange of materials between regions. The research will involve analysis of official policy and background briefing documents on the three initiatives and relevant historical projects, such as the Research Council U.K.’s block grants for article processing charges, the EU-led OA2020 initiative, Europe PMC and the short-lived PMC-Canada. Theoretical analysis will draw on Ostrom’s work on the commons, theories of development, under-development, epistemic / knowledge inequity and the concepts of Chan and colleagues (2011) on the importance of moving beyond north-to-south access to knowledge

(charity model) to include south-to-south and south-to-north (equity model). This model analysis contributes to build a comparative view of transcontinental efforts for a global knowledge commons building with shared values of open access, sharing and collaboration, in contrast to the growing trend of commodification of scholarly knowledge evident in both traditional subscriptions / purchase-based scholarly publishing and in commercial open access publishing. We anticipate that our findings will indicate that a digital world of inclusiveness and reciprocity is possible, but cannot be taken for granted, and policy support is crucial. Global communication and information policy have much to contribute towards the development of a sustainable global knowledge commons.

Keywords: global knowledge commons, Plan S, SCOSS, PubMedCentral, open access, publishing, epistemic inequality

Knowledge and equity: analysis of three models

Introduction

The concept of the global knowledge commons builds on the vision of the original Budapest Open Access Initiative (2002) of the potential of combining academic tradition and the internet to remove access barriers to the scholarly literature, thus laying the foundation for an unprecedented public good, uniting humanity in a common quest for knowledge. In this study we conceptualize the global knowledge commons as a universal sharing of the knowledge of humankind, free for all to access (recognizing reasons for limiting sharing in some circumstances such as to protect individual privacy), and free for everyone qualified to contribute to. An equitable global knowledge commons strives to go beyond the access barrier and enables true participation and sharing.

The global knowledge commons is not the only, or the inevitable, approach to scholarly communication. Scholarly works such as journals and books today are often treated primarily as commodities for sale. This may have been necessary when the dominant format was print, to cover costs such as printing and mailing works. Given the potential of the internet, the use of intellectual property law to enforce commodity sale rights creates a false scarcity, as the only necessary costs are those of producing the first copy and modest costs of providing the service.

One key challenge to switching to open access is transitioning the underlying economics from demand (subscriptions / purchase) to supply (support for production). A number of authors have explored this possibility; Morrison (2013) conducted a macro analysis and found that a switch to open access could not only be affordable, but with attention to efficiency, it could be

accomplished at a fraction of the cost of the existing system. In many cases, open access involves converting local journals to international, and this is particularly beneficial for the researchers and publishers in the Global South as "it provides an unprecedented opportunity for South–South exchange and for local research to become an integral part of the global knowledge commons" (Chan et al, 2011, p. 1). Houghton et al. (2009) conducted a major macro study of three models for transition for the U.K., finding that all were affordable, with the most transformative approach (replacing traditional journals with institutional repositories and peer review overlay) having the potential to yield significant savings as well.

There are a variety of factors contributing to this key challenge of economic transition, and the challenge itself does not apply equally to all types of works and all regions. Scholarly publishing is a $25 billion USD a year industry (Johnson, Watkinson & Mabe, 2018), with profits in the 40% range for some of the largest scholarly publishers. However, in some areas of scholarship and some regions of the world, scholarly communication has never been profitable and has rather relied on a subsidy model. In Latin America, this tradition of subsidy made it easy to switch from demand to supply side to develop the common open access Scielo (Scientific Electronic Library Online) platform. New fully electronic journals avoid the costs associated with back issues in print and publishing in dual format; an open access start avoids the costs associated with limiting readership (e.g. subscriber lists, authentication). Dissertations in many areas have transitioned from extremely limited print available to wide open access as the norm.

Progress towards a global open access knowledge commons has been significant. As of May 2020, there are 14,535 fully open access journals from 133 countries listed in the Directory of Open Access Journals. The Directory of Open Access Repositories (OpenDOAR) lists

repositories from close to 130 countries. As reported by Shi (2020), there are approximately another 10,000 available through the Chinese Open Access Aggregator service. The Bielefeld Academic Search Engine (BASE) searches metadata for over 164 million documents, about 60% of which are open access, from close to 8,000 repositories. The Directory of Open Access Books lists over 28,000 academic peer-reviewed books from 380 publishers. Until the early 1990's, the U.S. National Library of Medicine's Medline index was only available through purchase or subscription. Today, there is no cost for a PubMed search for "cancer" of works published in the last 5 years, and free full text is available for about 50% of these results.

Nevertheless, it would be an error to underestimate the challenges that remain. Okerson (1989) documented and analyzed the serials crisis, that is, academic libraries paying more every year for resources and having less access. Contributing factors identified include market concentration and associated market power. A small number of publishers account for a disproportionate share of the market which gives them a disproportionate negotiating clout. Recently, Larivière, Haustein, & Mongeon (2015) documented ongoing market concentration, reporting that 50% of the papers included in Web of Science that were published from 1973 – 2013 were published by just five publishers, including Reed-Elsevier (owned by RELX, UK), Wiley-Blackwell (US), Springer (now part of SpringerNature, Germany), Taylor & Francis (owned by Informa, UK), and Sage Publications (US). As Morrison (2018) documented, it is this group of the large commercial publishers that now have the largest collections of fully open access journals, suggesting the possibility of market concentration from the demand side (subscriptions / purchase) transitioning into an open access environment. As of 2017, there was a very long tail, with most fully OA journals published by many small publishers, often university or society publishers, and most with just one journal, so this is not a foregone conclusion.

Many organizations of various sizes up to and including national and multi-national consortia have stepped up to develop and support approaches to addressing the key challenge of economic transition. In 2013, the Research Councils U.K. launched a program providing block grants to fund open access article processing charges (APCs). A 2015 white paper produced by Schimmer, Geschun, & Vogler for the Max Planck society outlined the rationale and plan to accomplish global transformation through the OA2020 initiative, not included in this paper due to conceptual and participation overlap with Plan S. The recently launched Global Sustainability Coalition for Open Science Services (SCOSS) is one of the foci of this paper; SCOSS itself is participating in an even more recent initiative called Invest in Open Infrastructure. The three projects included in this analysis have been selected as examples of three different types of initiatives with global ambitions. Each service conducts its own research, and programs are scrutinized in turn by researchers and publishers whose interests are impacted. This article is unique in bringing communication theoretical perspectives to address the question of whether the globalization of these open access (henceforth OA) initiatives will tend to produce and sustain a global knowledge commons as defined above.

Literature Review and Theoretical Framework

As the study of OA continues to grow globally (Suber, 2016), a range of critical studies interrogates whether OA-based research and scholarship is contributing to increasing epistemic inequality in terms of accessing, disseminating, and communicating knowledge, such as peer-reviewed journals.

We find the neo-Marxist approach, especially from the ‘development of underdevelopment’ and ‘dependency’ theories by world-systems scholars relevant to the

discussion of open access and inequality. In this approach, the long-term and circular globalization of capitalist mode of production around the world through colonialism and capital accumulation have created and sustained an international division of labor in all major areas of economic production, distribution, and consumption. This division is distinguished by a trimodal structure of strong and weak states that constitute three distinct geographical and relational regions: center (or core), periphery and semi-periphery (Wallerstein, 2004; Frank, 1966). The capital accumulation is governed by the law of uneven development and asymmetrical interdependence between the advanced-industrial and high-income core countries mostly located in the Global North and low-income peripheral countries mostly located in the Global South.

The international division of labor also applies to the global information order and modern knowledge economy, and it is further entrenched by the neoliberal privatization and commodification of intellectual property systems, such as using copyrights, patents, restrictive trade policies (Drahos & Braithwaite, 2007). The global commercial scholarly publishing outputs follow similar logic, with the concentration of capital accumulation in the research-rich Global North by only a handful conglomerations as stated earlier, resulting largely in a one-way North to South flow of knowledge (Chan et al, 2011). One of the aims of some in the OA movement is to create mechanisms to disrupt such logic. But these mechanisms, as Chan et al. points out, can be also co-opted by Northern commercial interests through evaluation standards and reward systems, such as commercial indexing and archiving, institutional site licensing, journal ranking, citation metrics and so on. This creates a new reality of knowledge inequality and oppressions in the knowledge production networks, as critiqued by several other researchers (Chan, 2019), especially with the growing digital integration of the vast academic infrastructures with the big publishing groups.

Any commercially motivated promotion and expansion of the OA, therefore, is likely to develop a new realm of underdevelopment. Here, open does not mean equitable. Chan (2019) also warns that openness does not necessarily equal to visibility: “Openness, when decontextualized from its historical and political roots, could become as exploitative and oppressive as the legacy system it seeks to displace.” The commercial publishers take advantage of the OA as a means to expand the business into the untapped markets, and this can make the whole chain of the OA knowledge production further oppressive for the Global South. Several authors point towards the detrimental cultural impacts of large-scale OA emanating from the West on the rest of the world (Holbrook, 2019; Inefuku, 2017; Sengupta, 2020). Knöchelmann (2020) further argues that the Western commercial and big-deal OA does the opposite of democratizing knowledge, it extends colonial hegemony and epistemological injustice: “Western academia, driven by politics of progressive neoliberalism, can even reinforce its hegemonic power by solidifying and legitimating the contemporary hierarchies of scholarly communication through OA” (p. 1). Indeed, the OA initiatives that center around the narrow principles of removing access barrier, are ill-equipped to solve the bigger problem: Western knowledge hegemony and its proprietary structures, platforms, standards, as well as its market imperative that are centered around visibility, ranking, reputation, and reward systems.

In this line, Andrews and Okpanachi (2012)’s study shows that although peripheral African nations have become independent from the core imperial powers, they remained attached to colonial intellectual roots. This has further sustained epistemic oppression by Western publishers and reinforcing academic dependency of African nations on Western academia. In their view, to overcome such dependency, the production of knowledge must be drawn from local traditions and contexts. Masaka (2018) offers a more radical critique that the idea of open

access as a planetary, open, free and unrestricted circulation of research outputs is deceptive and rather a harmful one for the indigenous cultures, because it enables the imposition of the epistemological paradigm of the hegemonic culture on the indigenous people. As the global OA movements are emerging mostly from the former colonial centers, the so called ‘research starved’ Global South is likely to become more dependant on the scholarship and epistemologies originated in the infrastructure-rich Global North:

> There are various knowledges or sciences much as there are various geopolitical centers that produce these knowledges or sciences. To portray the knowledge or science from one geopolitical center as the only one in existence and for which the developing world is “starved” of becomes untenable. The Open Access to a knowledge paradigm constructed from a Western geopolitical center is simply the perpetuation of the injustices of colonialism that center around the attempts of suppressing the undeniable historical contribution of African peoples to the Western knowledge canon. (Masaka, 2018, p. 367)

Masaka emphasizes that the OA initiatives and infrastructures, therefore, must be preceded by the open production of knowledge to genuinely reflect the diversity of global knowledges and knowledge producers. In order to achieve a true OA movement, the production of knowledge has to be decentred first, and the diversity of knowledge produced by non-Western centres, such as in African nations, and specifically by their indigenous researchers, must be represented and promoted. It is important to note that despite technological and financial limitations, OA has already changed the participation barrier of the countries in the Global South to some extent. For instance, the Directory of Open Access Journals (DOAJ) shows that Indonesia, Brazil, Iran, Turkey, and Colombia are among the top 10 countries in publishing OA journals in 2019. This signifies a growing interest in OA in these countries (Pashaei & Morrison, 2019).

A radical reimagination of OA demands that it must be free of commercial and market imperatives. It can be also democratically governed, collaboratively owned, bottom-up driven, and based on open infrastructures and open rights, such as small-scale open publishing initiatives like the Radical Open Access Collective, Open Library of Humanities, AmeliCA, and Redalyc (Knöchelmann, 2020). Creating and sustaining this radically reimagined approach to scholarly publishing might benefit from lessons derived from empirical study of existing commons.

Towards a more equitable global knowledge commons?

In our view, OA presents an opportunity to bridge different knowledge regimes and to reduce the asymmetry of power between the hegemonic Western epistemological paradigms and the diverse non-Western and indigenous knowledge traditions. If governed in the right way, OA initiatives can be made more democratized where the market-logic (commercial publishing and academic reward systems) and Western epistemologies do not dominate or manipulate the bridge for "one-directional flow of research materials" (Masaka, 2008, p. 359). This is why we scrutinize three emerging OA initiatives that are primarily Western in origin, while acknowledging that OA leadership also emerges from the developing world, such as the Scielo approach in Latin America. Ostrom's design principles for the commons are based on substantive empirical research on actually existing commons in many different countries. The commons per se is antithetical to Western traditions, as is Ostrom's research on the commons. We test whether it can be a useful tool for such scrutiny. In this sense, this article intertwines a two-fold analysis and offers insights and critiques for both the case and the framework.

Ostrom’s (1990) landmark work *Governing the Commons* articulates the potential of collective action as a sustainable solution for sharing of physical resources, and an attractive

alternative to the other typical solutions, the private sector or government. Ostrom presents compelling arguments to debunk common misconceptions of the commons, and substantive empirical evidence of long-standing commons. For example, Hardin's article *Tragedy of the Commons* is a thought piece with no empirical evidence that does not describe an actual commons. For example, Hardin's often quoted example of a commons tragedy, a pasture where anyone can bring their cows resulting in over-grazing, would actually be a tragedy of open access rather than a commons, as commons are managed by groups of people who set rules. These rules form part of a set of design principles for the commons that will form the basis of commons analysis of this article. First, it is necessary to distinguish between the global knowledge commons that is the vision of the work behind this article, and the institutions that have been developed to support this vision. It is important to distinguish between the physical and the virtual commons. Physical resources are limited in nature while electronic works can in theory be replicated endlessly. The question of whether our knowledge about physical common pool resources can be applied elsewhere has been addressed by other authors, including Hess and Ostrom (2007).

In brief, there are important differences between the commons but there are also potential to apply some of the principles to analyze a case or cases. The focus of our analysis is the 'design principles' (Ostrom,1990) as characteristic of successful common pool resources. We also examine the extent to which the three initiatives (Plan S, SCOSS, PMC-I) display characteristics of successful commons. The SCOSS (Knowledge Exchange, 2019) deliberately drew from Ostrom's work in its organizational design. In this study, we also identify this further by applying Ostrom's analysis of Commons on the applicable cases.

Research Questions and Method

Research Questions:

1. Can we analyze policy designed to facilitate open access from the perspective of likelihood of advancing epistemic equality?
2. Can Ostrom's design principles for the commons help in assessing this question?

Method

We present three case studies of emerging OA models and analyze according to Ostrom's design principles for the Commons and whether the models will advance epistemic equality or inequality.

Table 1: Three emerging OA models

Case	Start date	Scope/Location	Funding model
Plan S	2018	Regional, mostly European	National and charitable funders
SCOSS	2017	Global, although uneven	Collaborative and voluntary
PMC-International	2012	US & EU, short-lived in Canada	National funding, both charity and equity models

Case Studies: This section briefly presents the three emerging OA models

Plan S / cOAlition S

Plan S (2018) is an ambitious plan to require that by 2021 all research funded by members of cOAlition S, an international coalition of research funders, be made immediately open access through publication in journals or through repositories. Plan S was initiated in 2018 by Science Europe, with the support of the EU. As of 18 April 2020, Plan S is supported by 17 national funders from 15 countries, 5 charitable and international funders (notably includes two large international bodies including Bill & Melinda Gates Foundation and World Health Organization), and 2 EU bodies (European Commission and the European Research Council) (cOAlition S, 2020a, 2020b; 2019; Schiltz, 2018). Notably, with the exception of Zambia, Jordan, and South Africa, all other national funders are European (see Appendix 1).

The Plan S supports transformative agreements through which coalitia of research organizations transform existing journal subscriptions packages to include subscriptions and open access payments for authors from the buying group. This approach favours traditional publishers.

The Global Sustainability Coalition for Open Science Services (SCOSS)

The Global Sustainability Coalition for Open Science Services (SCOSS), established in 2017, describes itself as "a network of influential organisations committed to helping secure OA and OS infrastructure well into the future". The aim of SCOSS is to provide temporary funding for established, non-commercial infrastructure services for open science in need of support. SCOSS coordinates provision of economic support through a grant application process vetted by SCOSS members with payment on a voluntary (crowdfunding) model. As of May 2020, recent successful applicants are the Directory of Open Access Books (DOAB), the Public Knowledge Project (PKP), and OpenCitations and funding is still being sought for winners of the pilot

application round, Directory of Open Access Journals (DOAJ) and Sherpa RoMEO. SCOSS has grown rapidly and now includes 238 members from a wide variety of geographical areas. 2.3 million in EUR has been committed, and 6 infrastructure projects have been funded. SCOSS is itself a member of a similar more recent initiative, Invest in Open Infrastructure, launched in 2018. Groundwork for SCOSS was published in a report by Knowledge Exchange (2016).

PubMedCentral International (PMCI)

This description of PMCI is based on the U.S. PubMed, PubMedCentral, and PMC-International websites. In 1964, the U.S. National Library of Medicine (NLM, a division of the National Institutes of Health or NIH) initiated Medlars, a bibliographic database to literature in the life sciences. The online version is known as Medline. This database is the most comprehensive index to the world's medical literature, including citations to over 5,000 journals in 40 languages. Previously available only via subscription, in 1996 the U.S. government made the database freely available as a key component of PubMed. PubMedCentral (PMC) archives and makes available full-text for the works cited in PubMed. As of 2019, more than 5.7 million articles were freely available through PMC, and the average weekday sees 2.6 million uses. PMC provides an archival or preservation function; for this reason, articles are stored in NISO Z39.96-2015 JATS XML format, a standard format for preservation of electronic material. PMC-I is described as a network comprised of the U.S. PMC providers and funding organizations in other countries with similar aims. The idea includes mirror sites of PMC and a means for other countries to lead in collecting material published in their territory. Today, there is one active non-U.S. member of PMCI, Europe PMC. The short-lived PMC Canada ceased operations in 2018.

Anecdotally, our understanding is that the requirement to work in XML is a challenge for contributing journals, archives, and authors, many of whom are not familiar with working in this format.

The requirements for future PMCI serving centers at regional or national levels are as follows (from https://www.ncbi.nlm.nih.gov/pmc/about/pmci/)

- The need for a new center must be based on there being one or more research funding organizations in the region with public or open access policies that require the deposit of funded research papers in a PMC-like repository. There must be solid evidence that these policies, and the way in which they are implemented, will contribute a sufficient volume of papers on a continuing basis to justify the investment in a new center.
- The new center must be sponsored and managed by a national or international agency with a commitment to building and managing the archive for perpetuity. It may be a government agency, or a not-for-profit organization at an equivalent national or international level, formed by non-commercial entities such as funding agencies and research institutions.
- The new center must attain an operational level that meets standards defined by NLM, and must sign an agreement with NLM concerning the management of the archive.

Commons analysis of all cases: Commons design principles analysis

The following design principles are from Ostrom (1990, p. 90, Table 3.1). Each principle is in bold and followed by analysis of its application in the three initiatives, where applicable.

1. **Clearly defined boundaries**

Individuals or households who have rights to withdraw resource units from the Common Pool Resource (CPR) must be clearly defined, as must the boundaries of the CPR itself.

Plan S: the goal of open access to funded research changes access from those with the means to purchase subscriptions / books to anyone with an Internet connection. Boundaries are clear with respect to access to resources. If we look at the CPR as the research funding provided by cOAlition S members, the granting rules of the organization provide clear lines.

SCOSS: Although this is very different from a physical CPR e.g. a watershed, the boundaries for who is eligible to receive funds from SCOSS members is very clear. If you look at funded initiatives (DOAJ, PKP, OpenCitations etc.), the boundaries are very clear but flexible as these services are growing and evolving. One might even describe the process of creating this initiative as one of boundary setting (deciding which initiatives will be funded, and by whom).

PMCI: it is clear that everyone, at present, can withdraw from PubMed and PubMedCentral free of charge, and in this sense PMCI reflects a global knowledge commons. The statement that PubMed is intended “for Americans” does raise some concern about the potential for future limitations. The boundaries of PMCI per se are very clear. In this sense, PMCI does have some commons-like qualities, but these are not global in nature but rather restricted to those with the ability to participate.

Summary: the concept of clearly defined boundaries for open access in terms of access (scholarly works per se as a CPR) could use some clarification in the context of the global knowledge commons, in particular to ensure that existing global resources do not become locally or regionally limited in future. Full access rights to this CPR require global Internet access. Access to research funding, support for publication and for OA services can be analyzed as another kind of CPR that is at present extremely inequitable, with participation in PMC-International at one extreme limited to the very wealthiest regions and at the opposite end illustrated by the struggles of new OA infrastructures that SCOSS aims to address, and only on a temporary basis.

2. Congruence between appropriation and provision rules and local conditions

Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, material, and/or money.

Plan S: epitomizes top-down broad-brush policy, although efforts have been made to accommodate local conditions through response to consultation processes (see, database, cOAlition, 2019). The Plan S Principles and Implementations refer to the common practice of "waiver policies" through which authors from low and middle countries receive partial or full waivers of article processing charges to publish in open access journals. This approach, combined with an emphasis on transitioning existing publishers, in effect reinforces inequity in production capacity in low and middle income countries.

SCOSS: After SCOSS determines worthiness of services, it is up to members to decide which ones to support and how much to commit. This does appear to give flexibility for rules and local conditions. For example, wealthier participants could contribute more and poorer

ones less. One possibility for future consideration would be equitable participation; for example, each region might commit a certain portion of their overall budget.

PMCI: Provision rules requiring labor, material, and/or money are geared to the U.S. and regions with similar levels of funding available. In this sense, PMCI does not meet the criteria of relating rules to local conditions.

Summary: the concept of relating appropriation rules to local conditions appears to be fruitful in analyzing the equity of different approaches in these case studies, with PMCI demonstrating complete lack of relation to local conditions and SCOSS illustrating the most flexibility, with Plan S in between.

3. **Collective-choice arrangements: Most individuals affected by the operational rules can participate in modifying the operational rules.**

Plan S: is top-down, with some flexibility in approach built in and some opportunity to modify the operational rules through a consultation process.

SCOSS: the governance structure provides a means for funders to modify the operational rules. This principle would not apply to organizations seeking funding.

PMCI: the operational rules are set by the U.S. National Institutes of Health. PMCI reflects the least capacity in collective-choice arrangement.

Summary: collective-choice arrangements appears to be useful in analyzing whether OA initiatives might address epistemic inequality. None of the three case studies reflects a full collective choice arrangement, although both Plan S and SCOSS do show some characteristics of collective choice.

4. **Monitoring: Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.**

Plan S: the funding agencies are the monitors while open access services and readers of open access works are the appropriators. There is no overlap here. For example, neither authors nor readers from the developing world act as monitors of the conditions; they are subject to the CPR conditions, acted upon rather than actors.

The SCOSS rigorous evaluation process in some ways acts as monitoring service for a broader, undefined category of OA / OS infrastructures. Because funding is temporary, more will need to be done to ensure ongoing viability of these services, including monitoring. The SCOSS FAQ mentions that successful services pay SCOSS a one-time contribution of $25,000 for various services including monitoring. Because participation in SCOSS is much more global in nature than that of the other services, there is more opportunity for monitoring to serve as a mechanism to achieve global equity.

PMCI: this initiative is strong in monitoring and accountability of monitoring and this benefits the commons by ensuring that works are preserved as well as being made accessible. On the other hand, because monitoring is entirely under the control of the U.S. government, it is not clear that there is any opportunity for representatives from the developing world to contribute to rules or participate in monitoring.

Summary: robust OA services will require monitoring just as any other type of service would. In terms of epistemic equality, the key question appears to be “who monitors”? If authors

and readers from the developing world are mere subjects of policy with no voice in shaping conditions, this will continue if not exacerbate epistemic inequality.

5. **Graduated sanctions: Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.**

Plan S: cOAlition members agree to a process of monitoring compliance and sanctions for non-compliance, with details determined by each member.

SCOSS: There is no mention of sanctions at this time, but it may be early for this, and it is possible that sanctions are mentioned in internal documents that are beyond the scope of this research. There would appear to be scope for at least mild sanctions. For example, funded initiatives could have funding removed if they did not meet grant conditions and coalition members could be removed, or removed from a governance role, if they did not provide support as pledged.

PMCI: sanctions are not stated but implicit in the strong rules and monitoring. That is, network members who do not meet the criteria are obviously removed. Deviations from the expected norms are likely met with advice and guidance, suggesting a graduated sanctions approach.

Summary: the question of graduated sanctions may be more relevant to collective-choice arrangements such as SCOSS. Local determination of sanctions would be consistent with

epistemic equality; for example, ability to comply with particular expectations and the cost of sanctions may vary on a regional basis.

6. **Conflict-resolution mechanisms: Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.**

Plan S: yet to unfold.

SCOSS: Unknown; probably too early.

PMCI: unknown.

Summary: more research would be necessary to assess conflict-resolution mechanisms with respect to these case studies. In terms of epistemic equality, it might be necessary and desirable to create low-cost local mechanisms and perhaps these should work across services. For example, perhaps a committee could examine the ability of researchers in a particular region to publish works on topics of regional importance and/or the ability of researchers to reach a global audience and assess different services in this light.

7. **Minimal recognition of rights to organize: The rights of appropriators to devise their own institutions are not challenged by external government authorities.**

Plan S: cOAlition S members are an organization of government authorities and charitable organizations. Many appropriators (authors, societies, journals and publishers) have their own organizations. Plan S / cOAlition S by definition limits the rights of these

organizations to set their own rules, but they are free to organize and jointly respond to consultations.

SCOSS: This is not an issue for current members; but could this be a future challenge, or a challenge for some of the missing regions? Also note that in some cases members are government authorities.

PMCI: is an initiative of a government authority. There is no non-governmental or cross-governmental organization.

Summary: the nature of research and academic freedom (in the West) means that many groups involved in OA have rights to organize themselves as they please. This design principle could benefit from further research, particularly in countries where governments are more likely to interfere with academic freedom.

8. **For CPRs that are parts of larger systems: Nested enterprises. Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.**

Plan S: cOAlition S is an example of a nested enterprise, as an organization of organizations.

SCOSS, many of its members, and the Invest in Open Infrastructure group of which SCOSS is a member, exemplify the nesting principle Ostrom argued as key for commons to scale. For example, the University of Ottawa library is a member of CRKN, which is a member of SCOSS, which is a member of Invest in Open Infrastructure.

PMCI is part of a larger hierarchical structure and does not reflect a CPR in this respect.

Summary: the global knowledge commons will likely require nested enterprises to allow for the combination of global coordination and local control with respect to local conditions. It is possible that the global knowledge commons will require additional layers of nesting to be successful and achieve global equity.

Discussion

Plan S

While the impact of Plan S on the formation of a global knowledge commons is yet to unfold in coming years, there is reason to question whether this approach will help to achieve epistemic equality.

- Plan S advocates for strong open licensing (OL), not just full open access (OA). Strong open licensing allows downstream re-use, including modification and commercial use, on a blanket basis without requesting permission. For the developing world, this enhances the likelihood of impact and citation but can result in being left out of next-generation for-pay commercial services built to some extent on the contributions of authors from the developing world; this is already evident with Elsevier's SCOPUS. This feeds the development of underdevelopment (Morrison, 2019a).
- Plan S displays a positive and noble intention to help scientific findings accessible for public, but it will most likely increase epistemic dependency of the Global South on the Global North as it does not address the issue of production of knowledge but offers a cosmetic remedy for access barrier that keeps the traditional commercial publications afloat. It will also contribute to further platformization of Western knowledge and

contributing to the hegemonic university ranking and publication-reward ecosystems (Morrison, 2019b).

- As a feedback letter with 1800 signatories (Research Community, 2018) argues: Plan S may bear a long term consequence with creating a global knowledge divide with splitting the global scientific community into two separate systems: cOAlition S grantees vs. the rest of the world, with having no incentive for willingness of scientists to do something for anyone in 'the other system', such as acting as a peer reviewer for manuscripts and research proposals. "This perpetuates some of the principles of the large-scale deals, even though it aims to discredit hybrid OA: scholars supported by charitable or national funders in the Western dominion are positioned to afford openness, while the bulk of other scholars is required to rely on individual deals or personal subsistence. All the while, the funded scholars can grant access to their knowledge to an unfunded other." (Knöchelmann, 2020, p. 9)
- With cOAlition S members paying for APCs for each publication, the total costs of scholarly dissemination could rise under Plan S. There is some inconclusive evidence suggesting that this might be already the case with particular publishers, arising from a longitudinal APC study conducted by the Sustaining the Knowledge Commons (SKC) project at the University of Ottawa. For example, it was found that 67% of BioMedCentral (BMC) journals with APCs in both 2019 and 2020 increased in price, and journals with price increases had a higher average APC in 2019, i.e. more expensive journals appear to be more likely to increase in price (Shi & Morrison, 2020). BMC, initiated as a new type of fully open access publisher in 2000, was acquired by traditional publisher Springer in 2008 and is now fully owned by Holtzbrinck Publishing, a private

family-owned company that includes lines of business funded through subscriptions, purchase, and textbook sales and rentals in addition to open access article processing charges.

- In response to the Shi & Morrison (2020) findings, OA advocate and retired Cambridge University scholar Peter Murray-Rust, a former editor of a BMC journal, commented that "These are valuable figures that show that "Open Access" does not always bring knowledge justice…. the takeover by Springer has been ultra-capitalist and an example of knowledge neocolonialism…. It is critical to realise that OA does not guarantee: a) knowledge justice, b) global equality (in fact in companies like BMC it is divisive), c) innovation (commercial publishers have no incentive to innovate and this is holding science/scholarship back massively)." (Murray-Rust, 2020)
- The global responses to Plan S are ambivalent and do not indicate its democratic potential. India refused Plan S (Mukunth, 2019). Some Chinese national organizations have endorsed Plan S but not joined (Schiermeier, 2018; China. The National Science Library, CAS, 2019). Many Chinese scholars strongly prefer publishing in Western high-impact factor journals with gold access, over the local OA journals, as it accounts for their financial reward system, especially if becomes visible in Western-focused publishing indexes such as Web of Science (Knöchelmann, 2020, p. 15). Chou's (2014) book features scholarly research on this topic from the perspective of Taiwan. Plan S will contribute to this trend. Stack (2016) critiques the impact of university rankings in higher education in the West as well as globally, and coordinated a global round table at the University of British Columbia on this topic in 2016. A book on this topic by invited scholars is forthcoming. The issue of international journals and university rankings is not

limited to the developing world. Local knowledge is important everywhere. Smaller Western countries such as Canada need research on local history, sociology, laws and policy, topics that are less interesting to journals with an international scope. Support for local publishing is needed to support local research even in the West.

- Other regions have yet to respond to Plan S. Non-Western scholars, despite their expertise, will be more likely to be excluded from the scholarly productions process funded by cOAlition S members and supported by Plan S APC subsidy to high-ranking commercial publishers. Aguado-López and Becerril-Garcia (2019) argue that the Plan S would negatively impact OA efforts in Latin America by importing dependency on the APC model. One might argue that the attempt to influence other regions to adopt Plan S strategies epitomizes the "West knows best" attitude, particularly in an area such as Latin America which have long been far more advanced in open access publishing than in the case with the EU-centric cOAlition S members.
- Plan S may contribute further towards the epistemic dependency of the poorer parts of the Global South on the well-funded academic production majority of the Global North. South Africa (South African Medical Research Council) and Zambia (National Science and Technology Council) joining the cOAlition S is a good sign of Plan S reach and their effort to include non-Western counties into the movement. But the European researchers will still enjoy an upper hand in the capacity, efficiency, and market-utilization of knowledge production and outputs, such as citation metrics and altimetric.

SCOSS

- Of the three initiatives, SCOSS stands out as appearing to be actively working for a globally diverse governance structure, with some success. The coalition as of 2020 includes the Association of African Universities, major library associations in the U.S., Canada, and Europe, the Electronic Information for Libraries (EIFL) initiative tasked with supporting libraries in the global south, Mexico-based Redalyc, and France's Ministry of Higher Education, Research and Innovation. However, participation is far from global in scope. For example, missing regions include all of Asia, most of Latin America, and Oceania.
- The annual contribution level is very modest, at least for some of the members. For example, one of the members is the Canadian Research Knowledge Network (CRKN). According to the CRKN 2018/19 annual report, CRKN managed license expenditures of $125 million for its members (from: https://www.crkn-rcdr.ca/sites/crkn/files/2019-10/1028019_CRKN_AR_EN_web_FINAL_0.pdf). The SCOSS annual contribution for a large national consortium is 4,000 EUR (about 6,000 CAD), a fraction of a percent of CRKN members' annual expenditure.
- It is obvious that the focus on temporary support is not a long-term solution.

PMCI

- The U.S. National Institutes of Health (NIH) (n.d.) states that it "invests about $41.7 billion annually in medical research for the American people". The NIH is the world's largest funder of medical research, by far. Giving free access to the world to PubMed and PubMedCentral is an incredible gift to the global public good. The work of indexing and preserving the world's medical literature is an important service for the good of the global

community. In the long term does it make sense to leave this task in the hands of one government with one mirror site (Europe PMC)? Can, or should, the whole world count on a service developed and funded "for Americans"? In this sense, inviting the global community to participate in PMCI is a welcome development. However, the requirements to participate would appear to exclude poorer regions. Most countries cannot compete with the resources of the U.S. in this area. Also, participation involves signing an agreement with the U.S. National Library of Medicine (NLM). The NLM decides on and monitors other PMCs. PMCI is best described as currently a global public good but basically American-European with free access for everyone else, at least for now.

Conclusion

This paper presented and analyzed three emerging models for OA in the context of building a global knowledge commons aiming for equity in both access and participation, and whether Ostrom's design principles for the commons are useful in this analysis. The key lesson of this study has to do with contributions and decision-making power over the organization of the knowledge and infrastructure to make the knowledge freely accessible to all. PubMed, PubMedCentral, and PMC-International provide free access to the world's medical research literature and its indexing and is a model for access, while its fully U.S. dominant organizational structure means no participation from the developing world in decision-making, including decisions about contribution to the resource. The fact that PMC's mission states that it is "for Americans" should raise a red flag with respect to long-term global access that is currently a model. Plan S is a largely top-down, EU-centric model with very limited global participation; its focus on transitioning existing publishers seems likely to perpetuate Western epistemic

dominance. SCOSS has the broadest global participation, although this is somewhat unequal, and of the three initiatives it has the most commons-like qualities. However, its scope and funding are very small compared to the global spend in this area, and its focus on temporary solutions is an obvious major limitation.

Our study shows that Ostrom's design principles for the commons, initially developed in the context of physical common pool resources, can be useful for assessing these initiatives in terms of their abilities to facilitate epistemic equity. The design principles are not only helpful to identify deficiencies within a model commons, but also helps point to future recommendable trends. In particular, the ideas of building in collective choice, adaptation to local conditions, and building in a goal of epistemic equality in the question of deciding "who monitors" adherence to rules could be helpful in moving towards epistemic equality. The idea of "nested enterprises" will likely be necessary to achieve the common goal of a global knowledge commons while adapting to local conditions.

A key to achieving epistemic equality will involve making this a common goal of OA. While this is inherent in our vision and focus, it is not clear that this is a common vision of everyone in the OA movement today. The 2002 Budapest OA vision statement that speaks to "uniting humanity in a common quest for knowledge" is not reflected in the vision, goals or missions of later OA statements and initiatives. Major social changes are currently underway in 2020 on a global scale. The COVID pandemic has altered our travel and daily lives and accelerated the shift to a virtual environment. Black Lives Matter is raising awareness about racism and inspiring thoughts about how to address it. In this context, it may be timely to raise the question of what OA is for, and propose a response: global equity in both access to, and

participation in the production of, knowledge. Communication scholars have much to contribute to this discussion, in particular theoretical understanding of the development of underdevelopment and theories and empirical work on epistemic inequality and oppression.

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Appendix 1: Key players of cOAlition S:

- Launched by Science Europe, an association of major Research Funding Organisations (RFOs) and Research Performing Organisations (RPOs) based in Brussels. Supported by:
- **17 National funders from 15 countries:**
    - South Africa: South African Medical Research Council (SAMRC)
    - Austria: Austrian Science Fund (FWF)
    - Finland: Academy of Finland
    - France: Agence nationale de la recherche (ANR)
    - Ireland: Science Foundation Ireland
    - Italy: Istituto Nazionale di Fisica Nucleare (INFN)
    - Luxembourg: Luxembourger National Research Fund
    - Netherlands: Netherlands Organisation for Scientific Research (NWO)
    - Norway: Research Council of Norway
    - Poland: National Science Centre (NSC)
    - Slovenia: Slovenian Research Agency [ARRS]
    - Sweden: Swedish Research Council for Sustainable Development (Formas); Swedish Research Council for Health, Working Life and Welfare (Forte); Vinnova
    - Jordan: Higher Council for Science and Technology (HCST)
    - United Kingdom: United Kingdom Research and Innovation (UKRI)
    - Zambia: National Science and Technology Council (NSTC)
- **5 Charitable and international funders**
    - Wellcome Trust, UK

    - Bill & Melinda Gates Foundation, US
    - World Health Organization (WHO)
    - TDR (the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases)
    - Aligning Science Against Parkinson (ASAP) (Google co-founder Sergey Brin)
- **2 EU organizations**
    - European Commission (EC)
    - European Research Council (ERC)

Source: cOAlition S (2020b). Funders that have endorsed Plan S and are jointly working on its implementation. Accessed April 18, 2020. Retrieved from https://www.coalition-s.org/funders/