COAR Input to UNESCO Consultation on Open Science

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Introduction

The widespread and rapid sharing of research results, commonly referred to as open science or open scholarship, is fundamental for addressing some of today's most critical problems. Repositories provide essential services that manage and provide access to data, articles, and a wide array of other types of scholarly content. With over 5000 repositories around the world this international repository network represents critical infrastructure for open science.

The Confederation of Open Access Repositories (COAR) is an international association with over 150 members and partners from around the world representing libraries, universities, research institutions, government funders and others. COAR brings together individual repositories and repository networks in order to build capacity, align policies and practices, and act as a global voice for the repository community. As a member of the UNESCO Open Science Partnership, COAR is pleased to submit the following input to the UNESCO open science consultation.

COAR supports the goals of open science and we are working with our members, partners and the broader repository community to advance open and interoperable practices and services around the world. However, there is no one-size-fits-all solution for open science. Diversity of infrastructures and services, with the adoption of international, interoperable standards, is critical for allowing all domains and regions to participate. Good, representative governance for the systems and frameworks we adopt are also needed to ensure diverse perspectives are reflected in the policies, infrastructures and strategies we pursue.

Definition and elements of open science

There is no single accepted definition of open science. The FOSTER initiative provides an overview of several open science definitions, one of which best reflects the COAR understanding: Open Science is “an umbrella term that involves various movements aiming to remove the barriers for sharing any kind of output, resources, methods or tools, at any stage of the research process. Open access to publications, open research data, open source software, open collaboration, open peer review, open notebooks, open educational resources, open monographs, citizen science, or research crowdfunding, fall into the boundaries of Open Science.”[1]

Actors in open science

Researchers are the main actors in open science; but researchers must be supported and incentivized to “do research openly” through actions of other players. This means governments and research funders, universities and libraries, and infrastructure providers (including publishers) also have important roles to play in terms of policy adoption and infrastructure development.

There is a significant public good aspect to open science and the public is another important stakeholder community. This includes not only that fact that there will be greater adoption of science into society if research outputs are widely shared, but also the ability for the public to participate and engage in research, through citizen science activities. As asserted by the European Commission, citizen engagement in science will contribute to building a more scientifically literate society, inject differing perspectives and creativity in research design and results, and contribute to fostering more societally relevant and desirable research and innovation outcomes to help us tackle societal challenges.[2]

Diversity and inclusiveness is an important aspect of open science, however designing an effective system that fosters diversity of research domains, actors, languages and countries and also supports research at the global level is extremely challenging. It means achieving a careful balance between unity and diversity; international and local; and careful coordination across different stakeholder communities and regions in order to avoid a fragmented ecosystem. It will require appropriate funding and policies directed to local services and infrastructures, while also engaging at the international level to define the standards and best practices that will ensure interoperability across distributed tools and systems.

[1] https://www.fosteropenscience.eu/node/1420
[2] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/public-engagement-responsible-research-and-innovation

Guiding principles for open science implementation

While **openness** is a key aspect of open science / open scholarship, we must consider several other underlying principles:

Diversity and inclusion - Open science should accommodate a diversity of workflows, languages, research outputs, and research topics that support the needs and epistemic pluralism of different research communities, countries and regions

Public good - Research and scholarship are generated for the public good, and therefore should be available to everyone with as few barriers as possible

Intelligent access - Research outputs should be as open as possible, with immediate and machine readable access to content, metadata and usage statistics, while also respecting privacy of personal and sensitive information

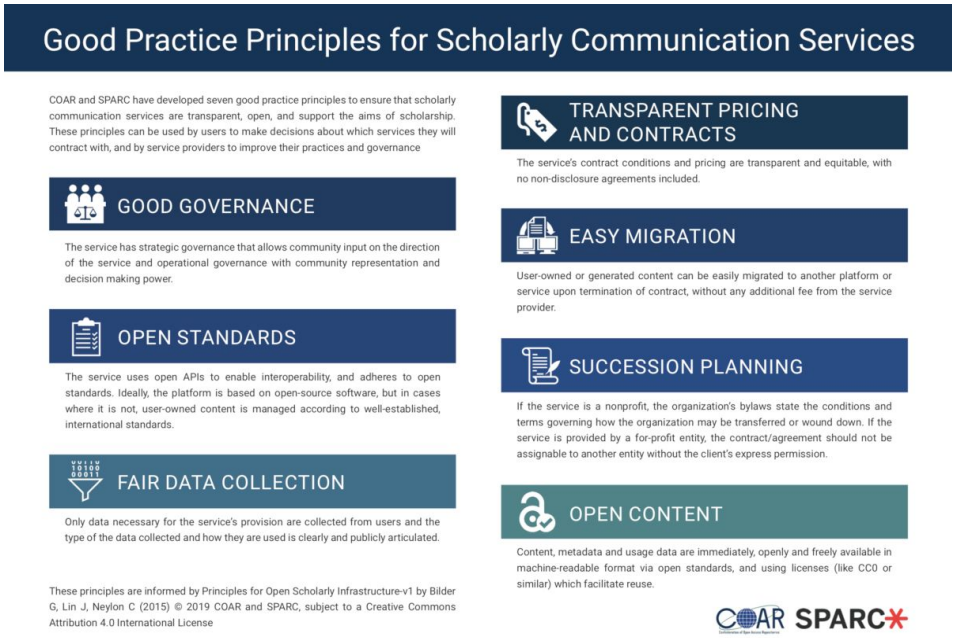
Standards and interoperability - Open science services and infrastructure should use of open standards and APIs to ensure international interoperability across domains and regions

Sustainability / price control - Open science services and infrastructures should be considered essential research infrastructure and adopt not-for-profit funding models

Quality - Open science should support high quality research by making research outputs widely available for rigorous review and scrutiny

Good governance - Open science services and platforms should be governed by the community they serve.

In 2018, COAR and SPARC published some good practice principles for scholarly communications service and infrastructure providers, which may also be of interest in the context of this consultation.



Opportunities of open science

The widespread adoption of open scholarship practices will bring significant benefits across several areas :

1. Speed up scientific progress and the rate of new discoveries
2. Increase the societal benefits from and impact of research
3. Contribute to greater transparency, credibility and trust in research.

Challenges for open science and how to overcome them

One of the major barriers related to advancing open science is that it requires a significant paradigm shift in how we approach research. In the current structure, researchers, research teams, and institutions are highly competitive; competing for funding, prestige publications, patents and so on. This hyper-competitive environment is in direct opposition with the values of open science. It discourages researchers from adopting open science practices, which involve collaborating across institutions and borders, as well as widespread and rapid sharing of research outputs. New incentives that encourage and reward researchers for sharing will need to be widely adopted across domains and countries.

Incentives for open science

Following on the previous point, open science will require a revision of the current incentive structures for research. Not only will we need to adopt new incentives that recognize and reward open practices, we will need to review and reassess the existing incentives, which are in conflict with open principles. The current scientific evaluation systems at research institutions and funders are heavily weighted towards the number of publications in prestige journals, which does not encourage researchers to provide early and open access to their research outputs.

COAR support the recommendations outlined in DORA (Declaration on Research Assessment), including the request that institutions and funders "consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice."[3]

Infrastructure and capacity needs

A variety of open infrastructures and services are needed to support open science that are localized and will serve the needs of different communities. The international repository network (which has about 5000 repositories) is critical infrastructure for open science. Repositories provide essential services that manage and provide access to data, articles, and a wide array of other types of scholarly content. Repositories, which are usually housed in universities and research centres need to be sustainably funded and adopt interoperable standards and best practices to ensure the content in repositories is appropriately vetted, discoverable and reusable by humans and machines.

[3] https://sfdora.org/read/

COAR is advancing a new, distributed and sustainable model for open science infrastructure for open science. The model is outlined in a paper published by COAR in November 2019, Pubfair: a distributed framework for open publishing services. Pubfair is a modular, distributed open source publishing and dissemination framework which builds upon the content contained in the network of over 5000 repositories around the world to enable the dissemination and quality-control of a range of research outputs including publications, data, and more. Pubfair introduces significant innovation by enabling different stakeholders (funders, institutions, scholarly societies, individuals scientists) to access a suite of functionalities to create their own dissemination channels, with built in open review and transparent processes. The model minimizes publishing costs while maintaining academic standards by connecting communities with iterative publishing services linked to their preferred repository.

There is a large human component to open science as well. New skills and human capital are needed to support open science. Researchers will have to learn about best practices for open science, for example, how to appropriately manage research data management so that it is discoverable and reusable. In addition, new staffing profiles across a range of stakeholders are needed to manage open science services, infrastructures and provide on the ground support for researchers.

Financial considerations

There are costs associated with open science, which requires the adoption of new infrastructures and services. One of the challenges with funding open science is that it is more difficult to rationalize investments because the services do not use transactional models (pay-for-service), and are generally free for all to use, which could lead to a free rider problem where some don't pay their share. Rather than following the traditional model of scholarly publishing, which has resulted in monopolization, very high prices for universities and funders (and unacceptable profit margins for commercial publishers)[4], open science services should be viewed as essential research infrastructures, governed by the community, and owned and funded collectively by governments, funders and institutions. A distributed approach to the governance and management of scientific resources (pre-prints, post-prints, research data, supporting software, etc.) and scholarly infrastructures is important to guard against a small number of actors can gain too much control and defining agendas in their own interest, rather than reflecting the diverse interests and needs of the research community and society.

[4] Larivière, Vincent., Haustein, Stefanie., Mongeon, Philippe . The Oligopoly of Academic Publishers in the Digital Era. PLoS ONE, 10(6), 2015. https://doi.org/10.1371/journal.pone.0127502

Policy recommendations

Policies are important levers for advancing open science. Open science policies adopted by funders and universities should include requirements such as data sharing, open access to publications and so on. However, these policies need to be aligned with the current incentive systems. As noted earlier in the document open science policies are often in conflict with the current incentive structures in place at universities and by funders, which prioritize things like publishing in prestige journals, patents and commercialization, and do not reward open science practices. In addition, we need to invest in the infrastructures and services so that researchers are able to practice open science and comply with any policy requirements.

Best practices and lessons learned

There are important lessons to be learned from our experience over many years with scholarly publishing. For decades, commercial companies in the academic publishing sector have been carrying out portfolio building strategies based on mergers and acquisitions of large companies as well as buying up small publishers or journals. The result of this has been a concentration of players in the sector, which today is dominated by a small number of companies who own thousands of journals and dozens of presses.[5] More recently, some of those companies have entered into diversification strategies, expanding their investments to services across the whole lifecycle of research[6]. This has led to a situation in which we are locked into commercial and proprietary services, leading to high prices and lack of innovation. We need to ensure that the system we develop for open science does not mirror those of publishing, by adopting the appropriate governance structures, and endorsing a number of shared principles that will ensure inclusiveness, openness and good governance.

As we argue in the paper, *Fostering Bibliodiversity in Scholarly Communications: A Call for Action*, "simply focusing on the technical and economic dimensions of infrastructure is not sufficient and we have to pay equal if not more attention to the socio-political dimensions of infrastructure design and building. We need to think beyond whether the system is open or closed, but also who builds the services and infrastructures, who sets the agenda, who makes the decisions about standards, for what purpose, and who has control, ownership and governance of the system (and knowledge produced). As infrastructures that underlie scholarly communications

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[6] Chen, George ; Posada, Alejandro, and Chan, Leslie, "Vertical Integration in Academic Publishing : Implications for Knowledge Inequality" In : *Connecting the Knowledge Commons — From Projects to Sustainable Infrastructure : The 22nd International Conference on Electronic Publishing* – Revised Selected Papers [en ligne]. Marseille : OpenEdition Press, 2019. DOI : 10.4000/books.oep.9068

are never neutral, we need to be cognizant about biases that may further entrench inequity in whose knowledge is privileged and whose knowledge is made invisible by the current system."[7]

Conclusion

We are living through unprecedented times, with a global pandemic sweeping across the world, leading to illness, death, and unparalleled economic upheaval. The current crisis has exposed the deficiencies in a system that is predominantly closed, and where we do not have comprehensive, standardized practices and infrastructures to support widespread sharing and research collaboration. Open science (also referred to as open scholarship) sets a new paradigm for research. Fundamentally, open science is about sharing and collaboration. It is about providing access to all valuable outputs of research but also adopting new ways of doing and evaluating research.

Open science will mean significant changes to how research is evaluated and conducted, and requires us to thoughtfully examine some of the basic assumptions underlying research and science, including competition, prestige, and the role of commercial entities. To that end, we must work together across multiple levels (local, domain, national, regional and international) to ensure that infrastructures, incentives, policies and principles are aligned and are advancing our common goals.

[7] https://zenodo.org/record/3752923#.Xs0f5JpE2fU