# Strategy Development

Version 1.0 | October 16, 2017 (in prep.)

Foundations for Open Scholarship Drafting Committee: Jonathan Tennant*, Jonathan Dugan, Rachel Harding, Tony Ross-Hellauer, Kshitiz Khanal, Thomas Pasquier, Jeroen Bosman, Asura Enkhbayar, Gail Clement, David Eccles, Fiona Bradley, (Björn Brembs), (Pawel Szczesny), Lisa Matthias, Jesper Nørgaard Kjær, Daniel S. Katz, Tom Crick, Christopher R. Madan, Paul Macklin, Johanna Havemann, Jennifer E. Beamer, Michael Schulte-Mecklenbeck, Dan Sholler, Paola Masuzzo, Tobias Steiner, Tim Koder, David Nichols, Jadranka Stojanovski, Daniel Graziotin, Alastair Dunning, Andy Turner, Neo Christopher

# Chung

*Contact

**How to contribute**

- Please bear in mind the purpose of this document: to identify how we can all work together as a global community to advance Open Scholarship.
- This document can be freely edited by anyone, and we encourage as broad a participation as possible. Please share with any colleagues who might be interested.
- Authorship decisions are down to each contributor, but any contribution in theory can constitute co-authorship.
- Please feel free to add any information, thoughts, or links that you see fit.
- If you are unsure about something, please leave a comment.
- Please be courteous, and do not delete the contributions of others.
- Please do not share any copyrighted content or content which you do not have permission to re-use.
- Please be as explicit and detailed as possible.

# 1. Purpose of this Document

*This document aims to agree on a broad, international strategy for the implementation of open scholarship that meets the needs of different national and regional communities but works globally.*

Scholarly research can be an inspirational process for advancing our collective knowledge to the benefit of all humankind. However, current research practices often struggle with a range of tensions and conflicts as it adapts to a largely digital system. What is broadly termed as ‘Open Scholarship’ is an attempt to realign modern research practices with this ideal. We do not propose a definition of ‘Open Scholarship’, but recognise that it is a holistic term that encompasses many disciplines, practices, and principles, sometimes also referred to as ‘Open

Science' or 'Open Research'. We choose the term 'Open Scholarship' to be more inclusive of these other terms.

The purpose of this document is to provide a concise analysis of where the global Open Scholarship movement currently stands: what the common threads and strengths are, where the greatest opportunities and challenges lie, and how we can more effectively work together as a global community to recognise the top strategic priorities. This document was inspired by the Foundations for OER Strategy Development and work in the FORCE11 Scholarly Commons Working Group, and developed by an open contribution working group.

Our hope is that this document will serve as a foundational resource for continuing discussions and initiatives about implementing effective strategies to help streamline the integration of Open Scholarship practices into a modern, digital research culture. Through this, we hope to extend the reach and impact of Open Scholarship into a global context, making sure that it is truly 'open for all'. We also hope that this document will evolve as the conversations around Open Scholarship progress, and help to provide useful insight for both global co-ordination and local action. We believe this is a step forward in making Open Scholarship the norm.

Ultimately, we expect the impact of widespread adoption of Open Scholarship to be diverse. We expect novel research practices to increase the pace of innovation, and therefore stimulate critical industries around the world. We could also expect to see an increase in public trust of science, as transparency becomes more normative. As such, we expect interest in Open Scholarship to increase at multiple levels, due to its inherent influence on society and global economics.

# 2. Strategy

"*Strategy generally involves setting goals, determining actions to achieve the goals, and mobilizing resources to execute the actions. A strategy describes how the ends (goals) will be achieved by the means (resources).*"[1]

In order to overcome the challenges and achieve our priorities, we need to build on our strengths. We have identified three main temporal components (short-, mid-, and long-term) of

[1] https://en.wikipedia.org/wiki/Strategy

our overall strategy to be used as direct suggestions for action on the individual, group, institutional or national (or higher) level.

We note that, due to the diversity of actors and stakeholders and their views and practices, this strategy is not a consensus document. How the different aspects are prioritised is a matter of debate based on varying perspectives. Its effectiveness will be realised when individuals and communities can implement different parts of it as cultural norms develop and shift towards a more 'open state'. Indeed, many view the progress of Open Scholarship in the last 2-3 decades as painfully insubstantive, a factor which might reflect its general lack of strategic thinking and implementation.

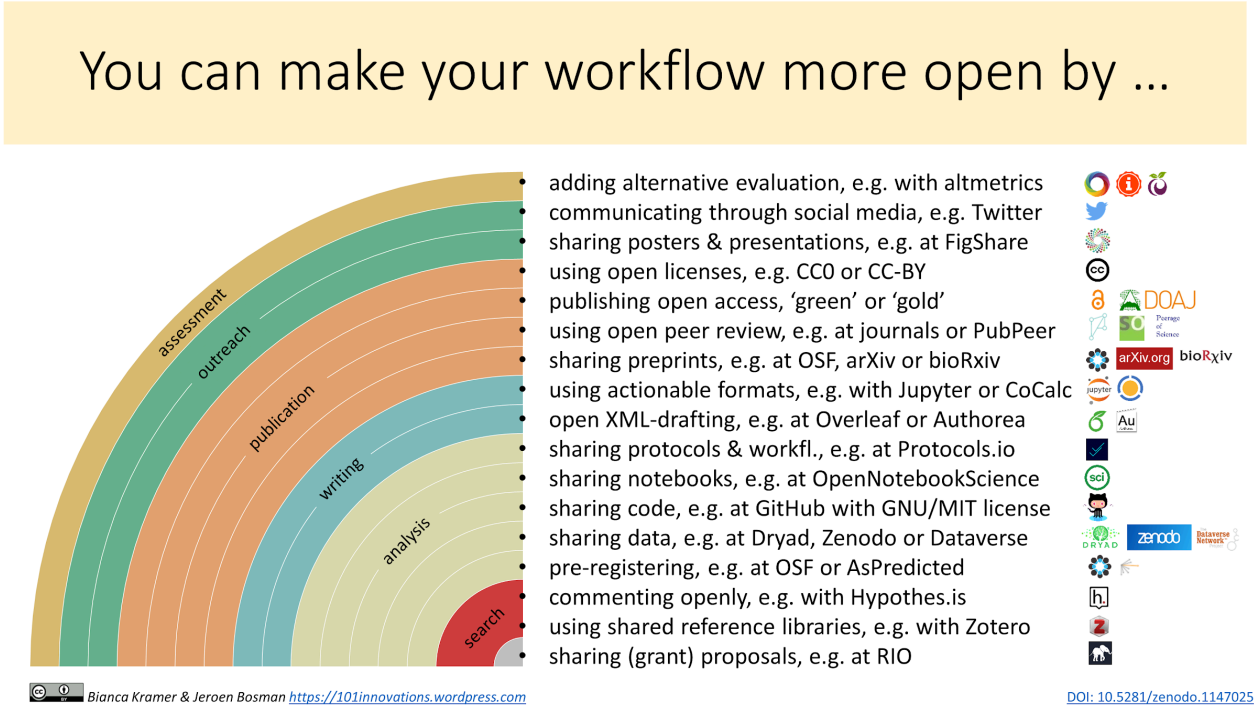
We also note that this strategy can only be based on information which we as a collective have, and it remains highly likely that there are many initiatives, policies and programs that we have inadvertently missed. As such, it is probable that there are strategies that we have missed or not even considered. Nonetheless, we have attempted to justify our strategy where possible using evidence and reasoning, the discussion of which can be found below the strategy in Section 5.

## 2.1 Short-term strategy (>2 years)

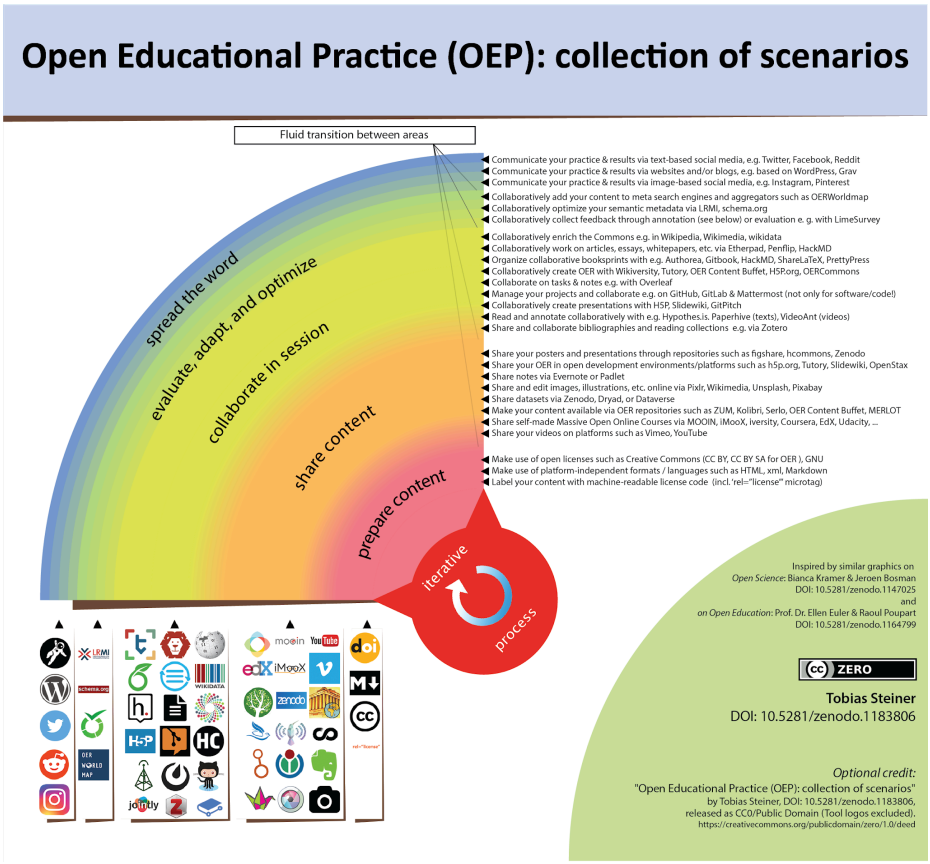
**Individual Level**

- Advocate for funding organisations, governments and research institutions to adopt policies and mandates related to Open Scholarship practices beyond Open Access (OA) and data sharing; for example, on open peer review, use of persistent identifiers (PIDs), open evaluation, and preprints.
- Make one's own contributions to 'openness' visible in public (e.g., one a CV or personal website).
- Adopt a broad-scale approach to the variety of open scholarly research and education practices.
- Adopt the use of open and free software for the conduct of research and analysis so that the computational processing can be audited by the community, and so that the tools used are available to everyone to increase productivity.
- Commit to a variety of personal Open Scholarship practices, such as sharing research data and materials in free, openly-licensed formats so that methods and results can be freely examined and built upon by the wider community.
- Establish support structures (e.g., openLab, walk-in labs, makerspaces in the wider sense) that help to guide other individuals along the path to Open Scholarship. This can

include questions of how to publish, teach, learn and do research in the open, and what tools are available to use.




Kramer, Bianca, & Bosman, Jeroen. (2018, January). Rainbow of open science practices. Zenodo. http://doi.org/10.5281/zenodo.1147025




Steiner, Tobias. Open Educational Practice (OEP): collection of scenarios. (2018, February). Zenodo. https://zenodo.org/record/1183806

- Form better relationships with other stakeholders involved in Open Scholarship developments (e.g., librarians, policymakers, publishers and other service providers, OA advocates, and those actively teaching in education).
- Work for and collaborate with researchers who practice various aspects of Open Scholarship, ranging from developing open source software and tools to posting preprints and citizen science.
- Encourage the wider adoption of an 'open mindset' that emphasises the importance of the research process over the outcome.
- Sign the San Francisco Declaration on Research Assessment (DORA)[2] as a commitment to improving how research is assessed.

**Group Level (e.g., labs, departments)**

[2] DORA.

- Locate ‘Open Scholarship hotspots’ (i.e., venues or groups for regular exchange and discussion about community building) and find a way to link them together to help community expansion. If a local one does not yet exist, establish it.

- Establish rights experts who might help with questions regarding copyright issues and the effective use of Creative Commons licenses.

- Highlight Best Practice showcases in order to demonstrate what is actually possible with Open Scholarship, and what the wider advantages can be.

- Adopt best practices for Open Scholarship, including shared data as a research output and addressing publication bias and “questionable research practices” with bias-reducing workflows.

- Advocate to decision makers at scholarly journals, publishers, funders, and higher education and research institutes to recognize and reward a variety of Open Scholarship activities, particularly regarding research evaluation policies.

- Start lobbying University Ranking Providers (e.g., QS, Times Higher Education) to include an openness element to their indicators.

- Initiate debates on meaningful standards and practices at a disciplinary level for publishing data (e.g., the FAIR principles).

- Improve engagement between faculty advisory boards, researchers, students and librarians.

**Institute Level (including research and funding bodies)**

- Research libraries should collect information about how the sector as a whole interacts with the research literature. Such information could be used to help negotiations, break up publisher big deals, and cancel subscriptions by providing evidence into the cross-sectorial value of services, and includes:

    - Which venues researchers are publishing in;

    - Who is doing the editorial and peer review work;

    - How much is being spent on serial subscriptions;

    - How much is being spent on Article Processing Charges (APCs) for Open Access; and

    - Which articles are being downloaded and cited.

- Map and coordinate when current subscription and ‘big deal’ licenses will run out across institutes, and let it happen. Where cancellations or terminations occur, ensure that there

is adequate post-subscription access using existing legal mechanisms (e.g., Inter-Library Loan). Explore routes for reinvesting money saved for library budgets.

- Purchase back any legacy documents and incorporate them into the scholarly body of work. Also improve the open sharing and archiving of legacy articles on which copyright has expired[3].

- Research funders can define the limits of what is an acceptable standard of publication. They therefore have the power to mandate publication in journals with a cap on APCs, or in OA-only venues, or in those with short or zero-length embargoes (e.g., Emerald, The Royal Society).

- Development of rights retention policies for scholarly research at research institutes that currently lack them.

- Adoption of the CRediT (Contributor Rules Taxonomy) guidelines[4] to help identify author contributions more clearly.

- Encourage further adoption by publishers of the Initiative for Open Citations[5] (I4OC) in conjunction with the wider uptake of open standards.

- For research institutes that currently lack them, either launch and maintain an Open Access repository or find an existing resource to use, and adopt an Open Access policy[6]. Make these easily discoverable and accessible on the institutional website.

- Promote and compensate time and effort spent on training and advocacy for the various aspects of Open Scholarship, including Open Source, Open Access, and Open Education.

- Engage with research communities to develop and advertise quantifiable incentives for sharing preprints, open data, reproducible analyses, and OA in hiring, promotion, and tenure decisions. Define new ways of describing these wider contributions to scientific communities.

**National Level (or higher)**

- Create new or support/contact existing international library consortia/collaborations (e.g., the International Coalition of Library Consortia[7]) to co-operate on infrastructure developments (e.g., LIBER, EIFL, ARL, SPARC).

[3] Author Alliance termination of transfer tool.
[4] CASRAI CRediT scheme.
[5] Initiative for Open Citations.
[6] Good practices for university open-access policies, Harvard University.
[7] International Coalition of Library Consortia.

    - Consortia like Projekt DEAL could provide examples of how to take the first step towards this at a national level. Support from SPARC for any such developments would also be useful.

- Build on faculty and funder support for OA and related quality assurance initiatives (e.g., peer review) that are decoupled from journals. Agree on a governance structure for a world-wide scholarly infrastructure. (e.g., W3C).

- Create scholarly standards to implement an alternative scholarly publishing platform/environment (using the funds freed from subscriptions, building on existing repositories/environments).

- Support collaborations such as Metadata 2020[8], NISO/NIST, and eLife, to help build a richer connectivity between systems and communities.

- Take action against the privatisation of scholarly works and processes in order to achieve transformation of the publishing industry into one comprised of fair licensing, fair market competition, and under the ownership of the scholarly community.

- Create a cost-effectiveness analysis of Open Scholarship (e.g., true cost of article publishing) to be used as the basis for an argument about how much taxpayer money it costs every year to delay decisions in the above areas.

- Implement currently available sort, filter and search/discovery technology across scholarship outputs.

- Research funders and libraries hold most of the purse strings, and further engagement on this front is essential, especially in defining their relative roles in developing or funding scholarly infrastructure. Simply channeling more money into the existing system, with perverse incentives and skewed power dynamics, is clearly no longer sustainable for research.

- Encourage research funders to diversify the portfolio of what is considered as a research output for assessment purposes.

    - Wider adoption of preprint and OA policies similar to those at the NIH and Wellcome Trust.

- A reduction of article-processing charges (APCs) in hybrid titles to match the market average for OA-only journals.

    - The scholarly publishing market might require a detailed government-level investigation in order to stabilise this.

[8] Metadata 2020 (http://www.metadata2020.org/, accessed January 2018).

- Mandating ORCID for researchers across all research outputs to help assist in the identification of authors across the entire research literature, and easier research discoverability.

- Where subscriptions have not yet expired, mandating offsetting agreements for hybrid titles in order to reduce double-dipping.

    - Where offsetting deals are in place, these can be streamlined and standardised across sectors to reduce administrative burden.

- For scholarly publishers to engage with the new UK Scholarly Communications License (SCL). This would reduce the time spent on embargo processing, the cost spent on hybrid APCs, and for researchers in the UK, help them to comply with the RCUK open access policy[9].

    - For those outside of the UK to consider extending the UK SCL (or relevant variations of it) towards other regional funding strategies.

- Sector-wide adoption of no-questions-asked fee waiver policies for researchers from lower to middle income countries.

- To transform the majority of scholarly journals from subscription to OA publishing in accordance with community-specific publication preferences.[10]

- To invite universities, research institutions, funders, libraries, and publishers to collaborate on a transition to open practices for the benefit of scholarship and society at large.[11]

- Create showcases / highlights / good practices of Open Practices on national open scholarship / open science website together with relevant information and resources.

## 2.2 Mid-term strategy (3 - 5 years)

**Individual Level**

- Continue instructing new researchers in best practices regarding Open Scholarship.

- Develop workflows that take advantage of Open Scholarship practices to demonstrate their increased effectiveness.

- Continue to develop the aspects of the Short-term strategy (Section 2.1).

[9] UKSCL.
[10] Converting scholarly journals to Open Access: A review of approaches and experiences.
[11] Open Access policies and Science Europe: State of play.

**Group Level**

- Create a comprehensive set of mechanisms that allow fully open research processes to public participation (no more piggybacking, no more “human processing units”, etc.).
- Develop Open Scholarship workflows for all group members to take advantage of increasingly well-developed open scholarly infrastructure and tools.
- Continue to develop the aspects of the Short-term strategy (Section 2.1).

**Institute Level**

- Implement opt-out automatization of manuscript handling/single-click submission to an open repository under default open licenses.
    - Implement opt-out automatization of data deposition under default open licenses.
    - Implement opt-out automatization of code accessibility and version control under default open licenses.
- To convert resources currently spent on journal subscriptions into funds supporting sustainable OA business models and scholarly infrastructure.
- Develop and teach courses on the various practices of Open Scholarship (e.g., as required seminars/workshops for graduate school programs).

**National (or higher) Level**

- Start implementing semantic technology across all scholarship outputs.
- Formulation of recommended career metrics that incentivize open data publication, open source software release, and research support.
- For any remaining hybrid journals that attain a higher proportion of open access over subscription articles, encourage them to ‘flip’ them to pure open access with an APC that reflects the running costs of the journal.
    - For remaining hybrid journals that have not attained this level, refuse to support publication of OA articles in those venues.
- Increase funding for outreach, especially to underrepresented minorities.

## 2.3 Long-term strategy (5 -10 years)

**Individual Level**

- Support the training of junior researchers in the usage of newly formed scholarly infrastructure tools and services.
- Teach students about open lab notebooks, version control, continuous analysis, and other aspects of Open Scholarship processes in introductory research courses.
- Develop training material (OER) for further Open Scholarship development.
- Continue developing elements of the Short- and Mid-term strategies.

**Group Level**

- Continue developing elements of the Short- and Mid-term strategies.
- Communicate the advantages or impact of adopting Open Scholarship workflows to other groups.

**Institute Level**

- Establish a permanent fund to be used towards open source software development, APCs, preprint servers, and other costs related to Open Scholarship.
- Incentivize and mandate all research outputs to be published in Open Access journals or platforms.
- Incentivize junior scholars to practice openness in their research.

**National (or higher)  Level**

- Develop innovative solutions and functionalities that do not exist today.
- Require government-funded research to be published in Open Access journals or other Open platforms or repositories. Apply penalties for those who do not conform to the mandate.
- Eliminate the “publish or perish” pressure by focusing on more diverse research outputs and processes for evaluation and assessment criteria.
- Help researchers to take control of the research and evaluation processes based on what they believe will contribute most to scientific progress.

# 3. What is Open Scholarship?

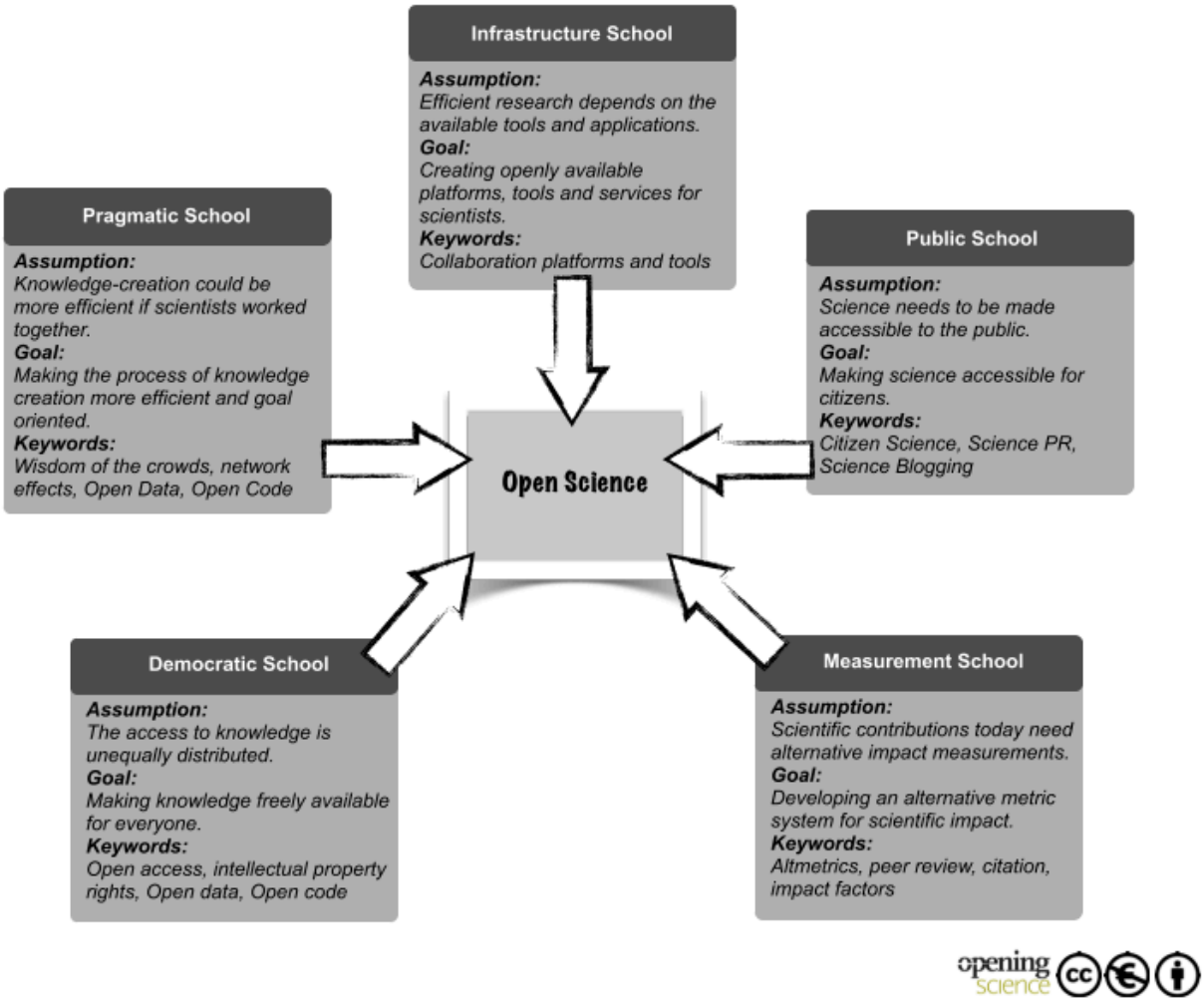
For more than two decades, the movement for Open Scholarship has evolved from a collection of small, localized efforts to a broad international network of institutions, organizations, governments, practitioners, advocates, and funders. While significant progress has been made on both expanding the understanding and practice of Open Scholarship (e.g., Peters et al., 2012) Friesike et al., 2015; Munafò et al., 2017), Open Scholarship practices and values are not yet the norm in most disciplines and adoption is spread unevenly around the world[12]. In this document we consider the term "Open Scholarship" to broadly refer to the process, communication, and re-use of research as practiced in any scholarly research discipline, and its inclusion and role within wider society.

The goals and broader vision for Open Scholarship are outlined in foundational documents including the Budapest Open Access Initiative, The Open Archives Initiative, Vienna Principles, Scholarly Commons principles, and The Panton Principles. Through time, there have been dozens of declarations, charters, and statements about the priorities of Open Scholarship. The result of this is that there are now numerous competing, parallel, or overlapping definitions of what Open Scholarship comprises in terms of both research principles and practice, which aim to encapsulate the movement towards fostering scientific growth alongside public access. Herein, we consider Open Scholarship to be analogous to a 'boundary object', in that it is flexibly adaptive, interpreted differently across communities but with enough immutable content to maintain integrity.

We find Fecher and Friesike (2013)'s five "schools of thought" to be particularly useful in framing this strategy: Infrastructure, Measurement, Public, Democratic and Pragmatic. Furthermore, we extend this to suggest a sixth school of Community and Inclusion. The OCSD (Open and Collaborative Science in Development) Network has an Open Science Manifesto for a more inclusive Open Science for social and environmental well-being that is also highly useful in framing for this strategy.

These previous works have been, and remain to be, crucial for building a central identity for the global Open Scholarship community, communicating the case for Open Scholarship to wider society, and providing a basis to push the global movement forward. To realize the full potential and vision of Open Scholarship, we believe that a document is needed that asks critical questions about the internal structure of Open Scholarship as a movement, and addresses strategic questions about how we, as a global movement, can identify concrete steps to achieving these goals. For those unfamiliar with the 'language' of Open Scholarship, we refer them to the Open Research Glossary, hosted by the Right to Research Coalition[13].

[12]The Knowledge Gap: Knowledge, power and inequality in Open Science policies, accessed November 2017.
[13] Open Research Glossary, accessed November 2017.




Fecher and Frieseke (2015)'s five schools of thought in Open Scholarship (Source).

# 4. State of the Movement

A movement can be defined as "a group of people working together to advance their shared political, social, or artistic ideas."[14] Open Scholarship supporters are enormously diverse, including non-academic citizens, activists, faculty and students at a range of academic or career levels as well as research institutes, publishers, librarians, policymakers, and NGOs. These community members come from countries around the globe and a range of socio-economic situations. As such, Open Scholarship has a range of different social, economic and cultural contexts. While this diversity is a strength for the Open Scholarship movement by bringing a

[14] Oxford Dictionary, accessed November 2017.

wide variety of perspectives, experiences, capacities, and resources, it also presents challenges for setting strategic direction and building shared plans.

Perhaps the most widespread commonality between Open Scholarship stakeholders is the belief that increased adoption of Open Scholarship practices is a ‘good thing’, and that it would bring wider benefits to the research community, environment, global economies and society. Given this common value, we can identify the core challenges and opportunities in Open Scholarship to define strategies that can be adopted at different levels and by varying stakeholder groups. From this, we gain a collective sense of priority as to the sorts of definitive actions that can be taken to help the advancement of Open Scholarship.

[Maybe make use of “Openness Triangle” that is part of Peters & Roberts “The Virtues of Openness”? This would fit into the “”good thing” debate]

## 4.1 Shared Perspectives

### 4.1.1 General Value Proposition

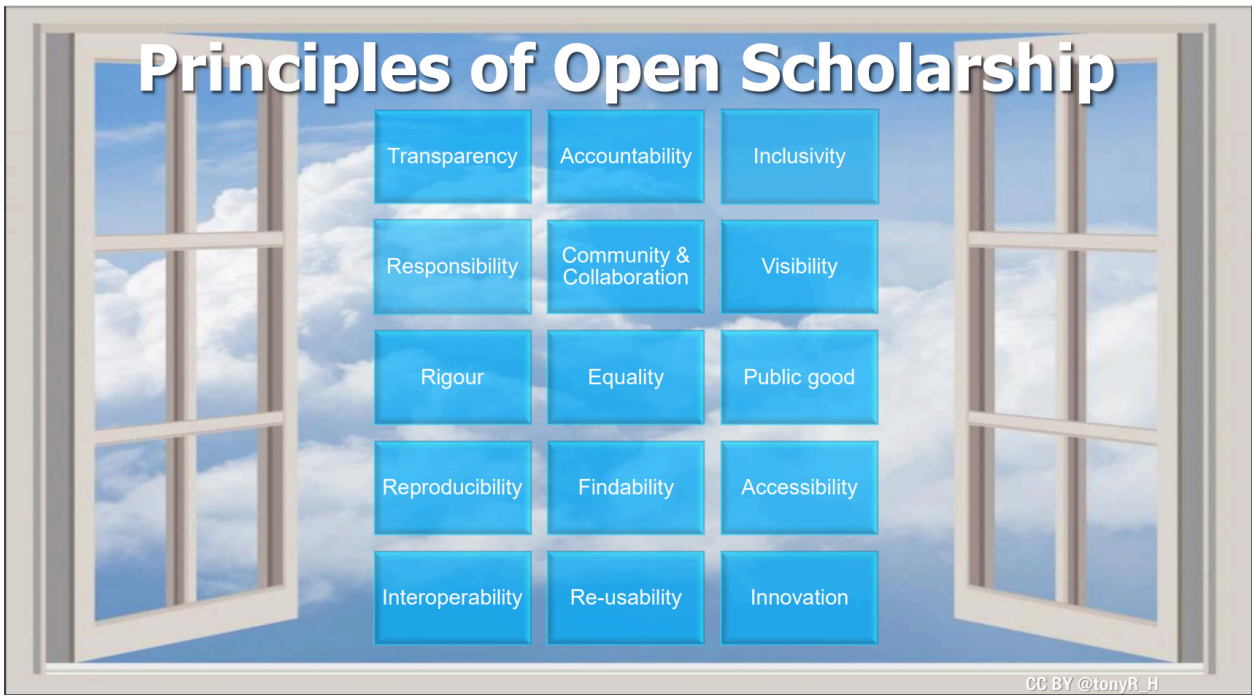
Open Scholarship makes research outputs and scholarly practices more accessible and inclusive, and expands our horizons on what is possible from the process of scholarly research.

### 4.1.2 Overall goals and vision

Research practices and scholarly communications are constantly evolving. However, despite the fact that the Web was originally designed around 30 years ago to disrupt the hierarchical approach of information management by the decentralisation of scholarly communications (Berners-Lee, 1989), the pervasive spread of the Web has left much of the pre-existing scholarly publication model and industry unchanged. Such a perceived slow rate of change or inertia can possibly be attributed to the wide range of diverse stakeholders engaged in this domain, and the deep entrenchment of interests and positions. As such, one common perspective is that scholarly communication processes need to increasingly embrace the power of Web-native technologies. Alignment of this ideal with the process of research itself is what is broadly agreed on as Open Scholarship, and there has been an undeniable explosion in the rate of innovation in scholarly communication in this in the last 30 years. The primary vision here, and one which we are optimistic of achieving, is that educational resources and research outputs, as a global societal common good should be accessible free of charge to all publics who wish to benefit from them, and integrated into wider society.

### 4.1.3 Definition as a ‘boundary object’

Open Scholarship when performed[15] as a boundary object (Star, 1989) allows us to balance different categories and meanings across many communities of practice (Star and Griesemer, 1989). Broadly, the core aspects of Open Scholarship can be divided into two major categories: practices and principles. For the former, this relates to aspects such as Open Access, Open Data, and Open Source. The core principles of Open Scholarship include participation, equality, transparency, cognitive justice[16], collaboration, sharing, equity, and inclusivity. Generally, it is agreed upon that the combination of these practices and principles will result in a better research process, all grouped under the broad heading of Open Scholarship. Indeed, Watson (2015) believes that these attributes are not exclusive to Open Scholarship, but should be key traits of good science in general. However, we acknowledge that Open Scholarship is not a simple construct to understand, and often has its own language. We fully acknowledge that such a barrier must be overcome in order to maximise participation and engagement with both the principles and the practices (Masuzzo and Martens, 2017).




[15] According to Bowker & Star (2000), scientific work is always composed of members of different communities of practice, and therefore the creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting communities.

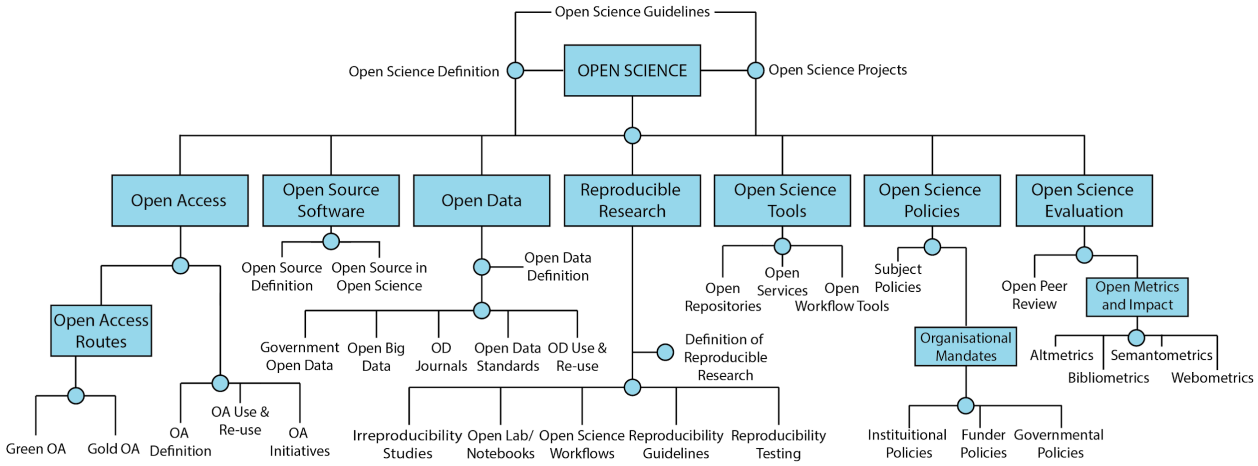
[16] https://en.wikipedia.org/wiki/Cognitive_justice

Principles of Open Scholarship, by Tony Ross-Hellauer (Source, CC BY).

### 4.1.4 Open Scholarship ecosystem

Four major elements exist as preconditions to Open Scholarship adoption:

1. Users: Awareness of Open Scholarship to engage with the practices.
2. Process: Open Scholarship tools that guide adoption of practices.
3. Context: Community and systemic support to create a sustainable Open Scholarship environment.
4. Incentives: Motivations to engage with the practices.




Adapted from the Foster Open Scholarship Taxonomy (CC BY 4.0). Please note that this is a non-exhaustive taxonomy of all possible aspects of 'Open Science'.

## 4.2 Varied Perspectives

As well as these shared commonalities, tensions also exist between the best way to adopt Open Scholarship practices. Open Scholarship is an agenda with multiple stakeholders, whose diverse cultures, backgrounds and interests mean that one-size-fits-all solutions could potentially harm local interests (or vice versa). On the other hand, there is a need to ensure that strategies are joined-up so that the actions of those with similar aims are not working at cross-purposes. Such "fault-lines" for the creation of a cohesive strategy are:

### 4.2.1 Geographic specificities

- Hundreds of individual initiatives and organisations already exist to help provide and promote Open Access at different levels around the world[17].

- Thousands of individual initiatives and organisations already exist to help provide and promote Open Education at different levels around the world[18].

- High costs associated with Open Access publishing actively discriminate against researchers from Low and Middle Income Countries (LMICs).

### 4.2.2 Disciplinary specificities

- As the widely-used term 'Open Science' contains the word 'Science', this can have an adverse effect of excluding researchers from the arts and humanities. This problem seems mainly confined to native english speaking researchers. Other terms such as 'e-Research' and 'Digital Humanities' describe similar practices across different communities.

- Differences in attitudes towards, and rates of uptake of, different practices. For example, many 'Open Science' practices are geared towards empirical and quantitative research, and therefore require different evaluation and incentive structures than other scholarly disciplines.

- Accounting for domain-specific issues. For example, accounting for variation in biological supplies from different laboratory companies is a significant issue in reproducibility for biological research. Open Access books are a major problem in the Humanities (Eve, 2014), but less so in STEM, and are often sidelined as an issue as a result.

- At the present there are few preprints from the pharmaceutical industry[19], and none covering primary clinical data. There are at present considerable barriers to preprints of industry work, including the possibility of material that has not yet been peer-reviewed being seen as promotional, and the possibility of readers changing clinical practice based on material that has not yet been peer-reviewed – however well labeled a preprint is.

### 4.2.3 Stakeholder specificities

- Consider the range of stakeholders who have a direct interest in the development of Open Scholarship - Researchers, students, funders, research managers, scholarly societies, infrastructure providers, industry, wider society, publishers & other OS service

[17] Open Access Directory, Advocacy Organizations for OA (accessed 24/11/2017).
[18] OER World Map (accessed 06/03/2018).
[19] https://openpharma.blog/2017/08/14/when-will-preprints-take-off-in-medicine/

> providers, [more ...]. Each of these groups engage in the Open Scholarship agenda for different reasons, and often these goals will be in conflict ...

Regarding Open Access, there is little consensus on the best way forward for this at a multitude of scales (geographic, institutional, individual). The result of such ongoing tensions is, perhaps not surprisingly, the lack of well-defined strategic priorities for Open Scholarship. Conflicts between different stakeholder groups can often be distinguished based on competing interests, which filter through at multiple levels in communication, policy, and practices. The result of this is that the relationship network of stakeholders engaged in scholarly communication, and in particular developments in Open Scholarship, is particularly complex. Some of the most highly debated points include:

## 4.3 Extent of Open Scholarship adoption to consider the movement ‘successful’

There are varied opinions, and a lack of consensus, around what extent of Open Scholarship adoption is necessary to constitute success.

- Transforming the present scholarly communications market so that it flips to Open Scholarship services as the default model for research processes and outputs.
- Shifting public funding models to pay for the dissemination of services and outputs, rather than individual copies/subscriptions of content.
- Providing sufficiently high quality and diversity of services to permit adequate choice for researchers.
- Mainstreaming Open Scholarship so that it competes with traditional processes, in terms of reach, uptake, and incentivisation and reward.
- Building a  significant number of education, training and support systems based on Open Scholarship skills development.
- Replacing entire research workflows by Open Scholarship methodologies.
- Measurably increasing quality of research and achievement that leads to greater career prospects.
- Adoption of open access by funding agencies; policies that explicitly allow use of preprints and other pre-publications in funding applications.

# 5. Top Strategic Priorities for Open Scholarship

Taking into account the strategic goals and success criteria listed above, it is possible to define several leading sub-domains of actions that need to be implemented in order to achieve them. While there is no consensus on this from the Open Scholarship movement, or what the priority order is, there is a general agreement that all of these actions are, at least to some degree, important. This strategy is adapted from Fecher and Friesike (2013).

## 5.1 Democratization

Believing that there is an unequal distribution of access to knowledge, Open Scholarship is concerned with making scholarly knowledge (including publications, code, methods, and data) accessible and available freely for everyone with access to modern technology (e.g., a computer and internet connection).

Importantly, democracy in Open Scholarship means not only equal access to knowledge, but also equal possibilities to contribute to knowledge and equal rights to participate in the world-wide community's decisions that affect knowledge creation and distribution. The latter means that Open Scholarship is antithetical to closed power clubs which are limited to a small number of participants deciding for the whole international community, whether such closed clubs are supported by institutional/governmental funders or are bottom-up organisations (e.g., small groups of prestigious authors). Indeed, it is quite unlikely that more than 10 million scientists, highly educated and intelligent, would agree with some rules created for them by a small number of people (or even worse, by some groups with financial interest). A more likely scenario is that the new rules governing Open Scholarship will appear in the open debate, through many collective projects, just like collectively editing this manuscript. Several specific mechanisms have been proposed to realise democratic values in Open Scholarship in a decentralised way, blockchain mechanism being one of them [refs to be added, section to be extended -- VT].

- Open Access publishing that allows not only free to read access but also free to reuse and free to distribute[20].
    - One of the strongest arguments for Open Access is that publicly (or taxpayer) funded research should be accessible to the public. The increasing private sector funding of research is a difficult aspect to reconcile with this view at the present.
- Open Licences, licensing, and rights waivers for copyright that are understandable by both humans and machines. Typically, this has been administered through some combination of Creative Commons and Open Source licensing.

[20] Open Access (the book) - Peter Suber (bit.ly/oa-book)

    - In working towards principles of Open Scholarship, we acknowledge that there is the potential for complexity, or even conflict in our objectives as policies and working practices evolve. Awareness of the broader research, industry and education landscape will help to position Open Scholarship to have the greatest possible impact, and to mitigate the potential of other policies and priorities to limit its potential. For example, copyright proposals in the EU that would limit who is permitted to undertake TDM (text and data mining), or policies promoting intellectual property (IP) and commercialisation should be balanced with policies that permit a wide range of uses of data, research, and knowledge.

- Moving away from patenting
    - One example of the open approach to patent management is “weak licensing - strong certification” - a situation especially easy to apply in medicine, where therapeutic devices or compounds are weakly licensed in terms of patents but the requirements for entering the market are set high from the regulator.
- Recognising the value of open source and open scholarship in accelerating innovation and research discovery (e.g., Woelfle et al., 2011; Balasegaram et al., 2017).
- Data repositories, data journals
- Changing publishing norms to make all objects within a research output to be 1st class (FAIR)
- Software/code
- Research material repositories and the sharing of physical research outputs
    - Research material sharing is critical for issues of reproducibility, reducing redundancy, and promoting open scientific collaboration. Issues were empirically examined by Science Commons.
    - Sharing well curated and annotated materials within communities without restrictive licensing or complex material transfer agreements which slow scientific progress due to complex legal jargon or stringent terms and conditions
    - Streamlined Material Transfer Agreements (MTAs) and Open Scholarship Trust Agreements (OSTAs) - legal agreement templates which may be easily amended for any researcher, irrespective of discipline, at any institution to simply share almost all categories of research materials they generate in the course of their research allowing efficient, open and collaborative scientific practices. Principles described herein “The core feature of trusts—holding property for the benefit of others—is well suited to constructing a research community that treats reagents as public goods.” Edwards et al (2017)

    - E.g. OSTA template: SGC “click-trust” agreement  E.g. MTA (Material Transfer Agreement) templates through Science Commons

- OER (Open Educational Resources)

## 5.2 Pragmatism and transparency

Following the principle that the creation of knowledge is made more efficient through collaboration and strengthened through critique, Open Scholarship seeks to harness network effects by connecting scholars and making scholarly processes at all levels transparent.

- Transparency and process
- Reproducibility (Leek and Peng, 2015; Patil et al., 2016)
    - Crisis in medicine, psychology, economics, and sociology
    - To generate the results in a research paper through data and code
- Sustainability
    - Being able to durably test a paper's results over time, which would include data archiving and software longevity and versioning.
- Replicability
    - To obtain the similar conclusions from new experiments, observations, and analyses based on a previously published manuscript
- Benefaction? (starting from and expanding someone workflow/codebase/tools, avoiding unnecessary duplication of technical task)
- Open Methodology
- Research tools for open work
- Preprints
- Open Peer Review
- Blinding
- Open Provenance
- Open funding models

## 5.3 Infrastructure

Achieving the full benefits of Open Scholarship requires platforms, tools and services for dissemination and collaboration. Such infrastructure can be built with current off-shelf technologies and at a much lower cost than traditional publishing methods. Presently, there is a general lack of funding and support for critical existing aspects of open scholarly infrastructure. Examples of these include the DOAJ, arXiv, the Open Scholarship Foundation, Sherpa/RoMEO, ORCID, the Open Scholarship Framework, Public Knowledge Project, [add more], which offer crucial services to a range of stakeholders. Without sustainable funding sources, these services remain vulnerable to either collapse, or being acquired by players in the private sector, an increasingly common occurrence.

To reduce the risk of infrastructure collapse, and to increase its capacity, continued funder support is required for any sort of sustainable scholarly infrastructure (e.g., Anderson et al., 2017). A proportion of research funder budgets should be allocated to support this (e.g., 2%). This includes elements such as:

- Standards & Persistent Identifiers
- Shared services (Abstracting/indexing services, research data)
- Support and dissemination services
- Repository services
- Publishing services
- Collaboration platforms and tools
- Automation of open practices (“open by default”)
- Open citation services building upon ORCID and Crossref initiative (opencitations). (Also I4OC)
- Interoperability of services
- Semantic web technology: metadata, harvesting, exchange services

## 5.4 Public good

Based on the recognition that true societal impact requires societal engagement in research and readily understandable communication of scientific results, Open Scholarship seeks to bring the public to collaborate in research through community science, and make scholarship more readily understandable through lay summaries, blogging and other less formal communicative methods. Societal impact (e.g., a better understanding of the world) should not be a secondary or niche consideration for research.

- Removing barriers based on race, gender, income, status, geography
- Access to funding
- Community science (also known as Citizen Science)
- Involving society in research priority setting
- Documenting and sharing all research outputs created during the research lifecycle, from lab notebooks used during the project to methods, materials, algorithms, data, code and the paper
- Leveraging public spaces and infrastructure such as public libraries, museums and schools

## 5.5 Measurement

To shift academics' behaviour it is necessary to change how they are measured; to change how they are measured means new metrics that reflect different values.

Practically, getting a research openness measure to factor into University Ranking systems calculations would be a way to embed openness values into policy and align measures with values. Alternatively, doing away with any form of measurement, which some consider to be generally bad for scientific research.

Motivated by the acknowledgement that traditional metrics for measuring scientific impact have proven problematic (by being too heavily focused on publications, often only at the journal-level, for instance), Open Scholarship seeks “alternative metrics” (also known broadly as ‘altmetrics’; not to be confused with the company, Altmetric) that can make use of the new possibilities of digitally networked tools to track and measure the impact of scholarship through formerly invisible activities. Of course, there are also dangers with new metrics, since all metrics can be

gamed, and new metrics offer new, little understood opportunities for gaming. New metrics will also not solve the publish or perish problem, but only transfer it.

- Changing norms of research evaluation
- Stop using the Impact factor and commit to San Francisco Declaration on Research Assessment (DORA), Leiden Manifest, see also UK Research Councils statement, also this
- Consider alternative metrics, including those explicitly designed to measure openness (Nichols and Twidale, 2017)
    - See also the Humane Metrics Initiative and the Metrics Toolkit.
    - Pre-registrations
    - Registered Reports
- Science-based assessment: experimentation before implementation of any metric

Issues of transparency and reproducibility apply both to scholarship itself and to the mechanisms through which our research is measured (e.g. can this metric be independently reproduced?). Furner (2014) provides an ethical framework for bibliometrics, which can be generalised to broader sets of metrics.

## 5.6 Community and inclusion

Motivated by the acknowledgement that scholarship requires all voices to be heard, and the involvement of a committed community of actors, Open Scholarship seeks to ensure diversity and inclusion are key principles in scholarly conversations.

- Diversity and inclusion
    - Definition
    - Build awareness
    - Develop tools and techniques to fix existing issues
    - Create and disseminate research resources
- Community cohesion and messaging
    - Develop practice standards

    - Create educational curriculum for practitioners
    - Public goods and public funding
    - Collaborate with other related or overlapping communities, including Open Scholarship Hardware, Open Source Software on common areas of interest
- Community science (also known as Citizen Science)
    - Tackling megaprojects
    - Spill-over effects to and from education
    - Strengthen ability to participate intellectually, donate computing power, biological samples or other resources, including money (crowdfunded research)

# 6. Movement Strengths

- Organisational structure and collective impact
- Diverse participation of passionate individuals
    - Significant successes in Open Scholarship are often attributed to passionate, persevering champions, particularly in the policy and advocacy/adoption arenas. These individuals demonstrate a great capacity to achieve substantial changes, and create strong influences, almost single-handedly. As an asset to the movement, they become especially important when their experiences and knowledge can be shared and multiplied, through building of collaborations, networks and communities, and mentorship models.
- Concurrent movements like open access, Open Scholarship, open data, open hardware, open source software etc. based on similar principles
- Strength of research and evidence supporting Open Scholarship practices (e.g., McKiernan et al., 2016).
    - Key projects, groups, and scholars have been conducting research into various aspects of Open Scholarship and its impacts, finding them to be almost overwhelmingly positive. As the movement grows, the evidence base, and the depth of critical analysis continues to develop.
- Breadth of creativity in coming up with technical and sociotechnical solutions.

    - For example, green and gold routes to Open Access. The former relates to self-archiving, and the latter to publishing in an Open Access journal. While some variations exist, these models generally transcend geographical, institutional, or sectoral variations.

    - The growth and adoption of preprints as a method of getting research out sooner and more transparently

- Availability of many charters and declarations offering (internally) consistent sets of goals and actions that are result of a lot of thinking and discussing

- Strong push to develop policy models: Dynamic, broad and cohesive top-down (policy initiatives from funders, governments, institutions) and bottom-up (grassroots) approaches. It remains important that the imperative and agenda for Open Scholarship remains recognised at the highest political levels. The UK House of Commons Science and Technology Committee into research integrity is an excellent example of this[21].

- Diversity of goals enables progress on many fronts simultaneously.

- Common language (English, usually) for ease of understanding (although see below for why this can also be a challenge).

- Geographical heterogeneity and variably successful initiatives (e.g., SciELO in Latin America).

    - Open Scholarship has been recognised by key international organisations active in research and education, and has strong support from institutes around the world.

- Uptake (albeit spotty) from influential research institutions.

- Growing ties with the Open Movement.

    - Open Scholarship activism as part of a broader open movement is benefitting from cross-collaborations with advocates of open data, open access, open education, open government, open source, and open culture. For example, now Open Scholarship is seen as a gateway to open education, but has policies strengthened by experiences from the open source movement.

[21] Research integrity examined with experts and academics (https://www.parliament.uk/business/committees/committees-a-z/commons-select/science-and-technology-committee/news-parliament-2017/research-integrity3-evidence-17-19/ - accessed December, 2017).

# 7. Movement Challenges

These challenges represent potential focal points of future discussion, research, and policy development. They include both external conditions in the greater research ecosystem, and internal conditions that exist within the Open Scholarship movement. Not all challenges are equal, or present in every potential context or community. However, these are frequently discussed in discussions about Open Scholarship strategy, and therefore should be highlighted here.

## 7.1 External conditions

- Reconciling private interests
- Political agendas
- Researcher awareness and apathy
    - Awareness of Open Scholarship is still very low. This is true in the understanding that Open Scholarship exists as a way of increasing standard research workflow efficiency (not as a direct alternative), and the benefits of doing so. It is also strange that many researchers appear to adopt Open Scholarship practices (e.g., data sharing, Open Access publishing), but just do not equate this with the term ‘Open Scholarship’. Even where awareness levels are high, this does not necessarily translate into adoption, often due to a lack of information, sufficient incentives and motivation, or general disinterest.
- That researchers might adopt open scholarship practices based on pragmatic reasons, but don’t use the label or identify it as open scholarship, or that they are open scholars.
- The disconnect between open scholarship awareness and practices.
- Language and appearance of community
- Promotion of scholarship in non-English languages. The hegemony of English often works to further empower Global North countries in conversations about such strategies
- The most influential scientists got their position by being successful in closed system
- How to deal with open washing: using the Open Scholarship terms for things hardly open, rendering the term meaningless

- Realizing that legal (copyright) and economic (ownership/business models) knowledge may be as important as technical knowledge
- Limited reach and awareness of Open Scholarship in the developing countries
- Overcoming the misconception that Open Scholarship is anti-commercial/demonstrating return on investment (e.g., Balasegaram et al., 2017; Hakoum et al., 2017).
- Resolving frictions between a scholarly commons model for research, and its operation within a capitalistic model[22].
- Seek development of alternative business models, such as the Open Library of Humanities (Eve and Edwards, 2015)
- General inertia where current business models are concerned.
- Confusing Open Scholarship with open access, or Open Science.
- Copyright challenges.
- Engaging non-academic actors
- Adoption of Open Scholarship at policy level by national and subnational governments (like the way open data has been adopted by governments)
- Research is a highly competitive endeavour across the world. Due to the relative novelty of many Open Scholarship practices, it is understandable that institutes do not want to risk their reputation on a global playing field by adopting new operational processes.

## 7.2 Internal conditions

- Rate of growth (Andrews et al., 2006)
    - All current evidence indicates that Open Scholarship momentum is building, in terms of more widespread understanding of issues and adoption of practices (e.g., in terms of number of institutional Open Access policies[23]). But such diffusion is often slow and granular, and beset by frictions. Further experimentation should be encouraged to demonstrate the applicability of larger-scale adoption of practices and to increase the rate of growth, and ultimate impact, of Open Scholarship.
- Avoiding quarreling about details, not realizing amount of agreement on the main issues.

[22] https://danielskatzblog.wordpress.com/2016/10/25/clash-of-cultures-why-all-science-isnt-open-science/
[23] ROARMAP

- Overcoming lack of money / Financial Sustainability
- Lack of patience among Open Scholarship proponents.
    - We fully recognise the burdens and pressures that researchers already have, in maintaining high productivity levels, funding applications, administration, teaching, and other duties. This means that often, Open Scholarship, is not highly prioritised, as the current reward system is still highly focussed on publication of novel results in high impact journals, which can stifle the rate of growth. Open Scholarship proponents need to be patient and understand this burden.
- Seeing how diverse initiatives working at different speeds in different communities can still reinforce each other in working towards the same broad goals.
    - Researchers do not necessarily need to be ‘open activists’. However, they should be aware of the functions of the wider scholarly communication system, and the diverse range of processes and norms that are involved in this.
- Dealing with (lack of) diversity, bias of English speaking communities
    - Related - need to recognise that not all strategies fit all regions - allow for flexibility - make sure that other regions are not negatively impacted by decisions taken by other groups

# 8. Opportunities

- Universities and research institutes from across the world are waking up to the promise of Open Scholarship. Discussions are happening at different levels, and universities in particular are in a strong position to help guide and develop policy frameworks, best practices, and education on the various aspects of Open Scholarship, including by providing administrative support.
- Universities and research funders are in a position to adopt new practices in hiring, promotion, and tenure, and in particular control how Open Scholarship feeds in to this. Rewarding openness at this level is a key driver in the increased adoption of open practices.
- Scholarly communication is a rapidly evolving landscape. There is a huge scope for systematic training and education in this domain, which could be adopted by research institutes. A huge global network of experts already exists with this professional capacity, but funding of such networks would be critical for any sort of sustainability. Platforms and technology exists today that can support this movement.

# 9. Threats

- Continuing barriers to Open Access (OA): embargoes, continued transferal of copyright, lack of article-processing charge (APC) funding, wide application of high and unsustainable APCs (+ lack of knowledge in negotiating these difficulties), continuing perceptions of lack of prestige for many OA journals,
    - Publisher embargo rules are currently complex, confusing, and time-consuming and expensive to navigate and comply with. They are also often lacking in evidence to support, and in direct conflict with funder policies on self-archiving.
    - OA: If APC model becomes universal (esp. If publishers are allowed to dictate costs), Global South lose publishing options, current journal ecosystem could be carried over (w/ flaws which incentivise bad research and all), just with author-pays OA and no reduction in costs
    - OA: Still no widely agreed large-scale solution for issue of OA for books.
    - Offsetting deals.
    - Note that around 70% of journals indexed in the DOAJ do not charge article processing charges[24].
- Barriers to data sharing:
    - lack of skills & awareness of best practice,
    - lack of agreement on how Research Data Management (RDM) activities should be funded,
    - licensing issues (& lack of awareness),
    - lack of infrastructure to support good RDM throughout research lifecycle
    - Neglect to explicitly grant reuse rights in data, so they inherit poor reuse right from publications (see my comment above, and an example of an “open access” journal that has a no derivatives clause that disallows data reuse in any meaningful way. “You can see the knowledge for free, but you can’t use it.”
    - A lack of suitable incentives creating fear from traditionally-embedded mentality and practices; for instance that sharing data reduces one’s competitiveness (e.g. “someone will use my data in the ‘wrong’ way,” or “I need to get 5 more publications out of this data”).

[24] https://sustainingknowledgecommons.org/2018/02/06/doaj-apc-information-as-of-jan-31-2018/

- Incentives must change to facilitate cultural change.
    - Continued reliance on non-transparent, non-reproducible metrics information from commercial providers will be detrimental to scholarship.
    - New metrics must be designed to create incentives to influence researcher behaviour, preferably based around openness.
- Big publishers - Elsevier & Holzbrinck (via Digital Science) seem to be developing services for across research workflow - definite threat that they will start trying to bundle these services for institutions via "big deals" - so that institutions get locked into using sub-optimal services for some things in order to have access to services they consider vital (i.e., same strategy used in bundling journals) (Moody 2017; Posada and Chen 2017; Schonfeld 2017) - this would lead to new inefficiencies, lock-in, price bloat
- Preprints - colonisation of landscape by commercial interests (which is bad because … ?) (e.g., Elsevier acquisition of SSRN leading to wider commercial control, irrespective of final venue of publication).
- Overall: need to harmonise policy landscape to simplify compliance for researchers
    - need to avoid license proliferation, with many one-off licences that may not be mutually compatible, and require too much work to interpret. Open source "solved" this with OSI-approved licenses, and MIT/BSD/GPL emerged as most common licenses with clearly understood mutual compatibility. Need equivalent for data licenses (I would propose something closer to CC BY.)
- Continuing gap between positive attitudes to most aspects of openness & actual practice - how to close this?
- Resistance to change: people are generally resistant to change, and giving them too much choice (as is common in open scholarship) could put them off changing at all. People tend to choose things that are most similar to what they already have, or things that are most similar to other choices they have (e.g. see Dan Ariely's TED talk on making decisions). It's important to make sure that people can still do what they are already doing, even if they participate in open scholarship. [This can be seen in the example of the introduction of Linux in Munich, where an attempt to switch completely over to Linux couldn't find solutions for all existing software, resulting in a council vote to switch back to Windows by 2020. The city of Barcelona has a contrasting plan aiming to introduce Linux, with a plan that prioritises making sure that existing user applications have an open source solution that works on Windows as well, eventually leaving a situation where the only existing software to change is the operating system.]

Policy Piece - TBD where/if it fits:

As noted earlier in this document, Open Scholarship is characterized by "numerous competing, parallel, or overlapping definitions ... in terms of both research principles and practice." Accordingly, stakeholders such as governments, public and private funding agencies, and institutions continually develop various, diverse policies to govern Open Scholarship initiatives. These policies span countries, scientific disciplines, and components of the Open Scholarship ecosystem. Below, we review some of the past and ongoing policy developments, categorized as top-down and bottom-up.

Top-down policies impose rules, regulations, and guidelines upon the scientific research community via mechanisms including government policies, grant funding requirements, institutional mandates, and …

- Top-down
  - Governments: Legislation, Directives, etc.
    - Africa
    - Antarctica
    - Asia
    - Australia
    - Europe
      - EU Horizon 2020 is one of the most notable government initiatives involving Open Scholarship policies. For example, the Responsible Research and Innovation (RRI) component of the Work Programme "Science with and for Society" makes open education, research, and access explicit targets of EU policy.
      - EU Statement on Making All Research Open by 2020; Horizon 2020;
    - North America
      - USA (perhaps break down federal vs. state)
        - FASTR Act; OPEN Government Data Act; Federal Source Code Policy (https://sourcecode.cio.gov); Affordable College Textbook Act; U.S. National

Cancer Moonshot Initiative; Dept of Ed Open Licensing Rule; Executive Directive on Public Access; California Taxpayer Access to Publicly Funded Research Act; Illinois Open Access to Articles Act

- South America

- Funders
  - *Open Research Funders Group*
  - Public
    - US NIH Public Access Policy;
  - Private
    - Bill and Melinda Gates Foundation
    - The Wellcome Trust (https://wellcome.ac.uk/news/our-new-policy-sharing-research-data-what-it-means-you)
    -
- Industry
- Institutions
- Subject policies (?)
- Resources:
  - Registry of Open Access Repository Mandates and Policies (ROARMAP)
  - SHERPA/JULIET
  - SPARC Article and Data Sharing Policies

One issue with top-down policies is that bodies such as governments and funders demand researchers to comply with rules about data sharing, open code, and the like, yet do not always provide the resources or structures necessary for compliant behavior.

Bottom-up policies weave together best-practices from existing scientific research communities and, compared to top-down approaches, are more often voluntary than mandatory.

- Open source/science projects
- Community efforts/community (citizen) science

- (Mis)alignment between top-down and bottom-up approaches

Evaluating the degree of alignment between top-down and bottom-up policies might help to illustrate how both approaches can better accommodate and promote Open Scholarship.

**Conflicts of Interest**

JPT is the founder of the Open Science MOOC and the digital publishing platform, paleorXiv.

TJK is a Communications Director at Oxford PharmaGenesis.

Andrews, J. F., Gentry, M. A., DeLana, M., & Cocke, D. (2006). Bilingual students—deaf and hearing–learn about science: Using visual strategies, technology and culture. *Submitted for Publication in Language Learner*.