

OSPP Combined Recommendations for the Embedding of Open Science

Introduction

Open Science is an important initiative to accelerate research practice and enhance impact, to improve use, re-use and access to research findings, and to make science and scientists more accountable and valuable to society. For Open Science to be successful, openness must become an all-pervasive value of science, embedded at a fundamental level in the administration of science, the circulation of knowledge, and in the activities of scientists. It must become as commonly accepted as, for example, the principle of verifiability, rather than being perceived as a discrete set of activities separate from (and perhaps in competition with) the integrity and quality of research. Openness, as a behaviour and as a quality of any research output, must become the basis of rigorous high-quality science and fundamental to ensuring its integrity. This openness includes, but is not limited to, Open Access to publications, Open Data, Open Scientific Evaluation, Open Science Tools and Open Science Policy.

While it has been important to approach the task of embedding Open Science in stages, it is also important not to decompose the task too much, a simplification that introduces the risk that progress toward Open Science be successful only in creating new layers and silos within the management of science, rather than holistic, systemic change. The principles and recommendations that follow seek to respect the diversity of actors and arenas that need to be engaged in the delivery of Open Science, while simultaneously seeking to draw together related efforts, aligning streams of progress toward Open Science along convergent tracks. The principles and recommendations that follow aim to align perspectives from the research ecosystem with those of the wider public, in particular in relation to the close connection between technology and openness. Without an understanding of how the digital transformation acts to facilitate knowledge discovery and economic growth, current and future generations will not be equipped with the skills and cultural competencies to navigate, search, discover or steward data in an open digital research network.

What follows is a list of high-level principles that must underpin all efforts toward Open Science, followed by a set of more focussed recommendations, aimed at specific stakeholder groups. The work arises from the collaborative efforts of the OSPP Working Groups on Training, Rewards and Next-Generation Metrics, but can hopefully be extended with only minimal extra effort to cover the widest possible range of functions and behaviours that Open Science touches.

High-Level Principles

1. Open Science requires active promotion by all stakeholders across the entire research cycle to help promote the benefits and work to incentivise researchers and should be embedded in the

evaluation and reward systems for researchers and in the education and training of scientists at every stage of their career.

2. Open Science requires a sustainable infrastructure and skilled labour force that can support the sharing and collaboration of research ideas and outputs, and which harnesses and capitalises on existing community standards and approaches.
3. All core stakeholders must endorse and actively support – including financially where relevant – the FAIR Guiding Principles for scientific data management and stewardship, both in recognition of the status of scientific data from public funding investments in research as a public good, and as a key to enhancing the scientific, economic and societal benefits of scholarly research.
4. New quantitative and qualitative metrics and indicators that encompass both open behaviours by researchers and the impact of open outputs, such as the Open Science Career Assessment Matrix (OS-CAM), must be piloted, validated and incorporated into existing researcher and research assessment systems. Like the outputs of the researchers, the data involved in evaluation should be open and subject to independent scrutiny and analysis.
5. Open Science must inspire trust, and must therefore incorporate rigorous systems for professional quality assurance, underpinned by sustainable business models and services/platforms for long-term access and preservation.
6. Embedding data literacy skills at every level of education, from primary schools to advanced research institutions, must be a priority for EU member states and all stakeholders engaged in scientific research and scholarly communication.
7. The benefits of Open Science must be clearly articulated and discussed as a scientific and social good among decision makers, research and education organisations, libraries, private sector, industrial and citizen science organisations through the development of use cases, best practice exemplars and venues for debate and engagement.

Recommendations by Stakeholder Group

For the European Commission

1. ERAC (European Research Area Committees) should align OS-CAM to the researcher's careers framework.
2. The EC should work collaboratively with other major funding bodies in Europe (and ideally worldwide) to urgently commission a study to propose guidelines for best practice and tools for research assessment – in particular, concrete and adequate indicators that can be applied to measure and incentivise the goals and desired outcomes of open science.
3. H2020/FP9 should facilitate the collation of, access to, and cross-sector engagement with a set of exemplars of innovation and good practice in doing open science, illustrating the benefits it can bring to a range of audiences and consumers of research (e.g. a repository of enabler stories).
4. H2020/FP9 and the European Research Council (ERC) should pilot the use of a broader, tailored range of research-related indicators of research activity, progression and impact within its funding programs; indicators made available could be tailored according to different funding criteria. This would enable the testing of how open practices and behaviours could be

recognised and incentivised alongside more traditional consideration and indicators of research value and quality.

5. EC should support the construction of the infrastructure needed to enable open metrics, harnessing where possible existing open infrastructures.
6. DG Research should ensure the EOSC harnesses existing standards and approaches, supports various levels of interoperability and is truly open.
7. The EC, with stakeholder communities and member states, should jointly assess and identify how the OA mandate of research outputs should be achieved by 2020.
8. From 2020, the EC must move toward a broader definition of OA that is well understood and that incorporates the full range of emerging formats and applications of scientific research output.
9. The EC should support a cohesive agenda for the development of advanced IT and data skills for researchers, librarians, IT staff and citizen scientists, e.g. by financially supporting or organising appropriate advanced training.

For Other Stakeholder Groups

Universities & Research Performing Organisations must:

1. Explore how to incorporate openness (as a behaviour and as a quality of an output) into training and rewards systems. This necessarily involves establishing support in the form of infrastructures and expert advice to researchers; working with research managers and administrators to ensure uptake of open science indicators in performance assessment; and working with the researchers to ensure that they understand how certain practices are valued. It is also essential that there is a way for activity and practices to be 'systematically' captured and assessed where possible.
2. Develop evidence (e.g. from pilot studies) around what works best (and what doesn't) by testing the value of using a broader, tailored range of indicators of research activity, progression and impact to support effective and efficient research and researcher assessment.
3. Establish a culture of assessing what works in research practice and then implement best practice.
4. Include information management experts in evaluation panels, to support career and research assessment decision making.
5. Be transparent about the approaches being used to evaluate research and researchers, adopting the DORA principles.
6. Require standard identifiers for researcher (ORCID), outputs (DOI) and contributions (CRediT)
7. Support advocacy work with researchers at all levels (R1-R4) to ensure a recognition of the benefits of an open science approach and of changing the existing assessment, recognition and reward practices.
8. Build capacity by investing in and training relevant support staff to work alongside research administrators to help researchers deliver Open Science, so as to ensure availability of the right mixture of skills to support its realisation.
9. Find new avenues to support the disruptive interdisciplinarity that can harness the potential knowledge creation capacity of Open Science.

Scientific Societies must:

1. Instigate and host discussions aimed to identify best practice in open science implementation within the relevant communities. This is crucial to the production of Open Science tools that address the needs of researchers (e.g. DMPs targeted to the specific types of data and methods used).
2. Explore how to incorporate openness (as a behaviour and as a quality of an output) into training systems
3. Require standard identifiers for researcher (ORCID), outputs (DOI) and contributions (CRediT) in their events and publications, and encourage use of such standards among their members
4. Find new avenues to support the disruptive interdisciplinarity that can harness the potential knowledge creation capacity of Open Science

Research Funding Organisations must:

1. Explore how to incorporate openness (as a behaviour and as a quality of an output) into training and grant assessment systems
2. Develop evidence (e.g. from pilot studies) around what works best (and what doesn't) by testing the value of using a broader, tailored range of indicators of research activity, progression and impact to support effective and efficient research and researcher assessment.
3. Establish a culture of assessing what works in research practice and then implement best practice.
4. Include information management experts in evaluation panels to support career and research assessment decision making.
5. Be transparent about the approaches being used to evaluate research and researchers, adopting the DORA principles.
6. Require standard identifiers for researcher (ORCID), outputs (DOI) and contributions (CRediT)
7. Ensure that funding schemes support openness in the widest sense (not just through the willingness to support APCs).
8. Find new avenues to support disruptive interdisciplinarity that can harness the potential knowledge creation capacity of Open Science.

Citizen Science Organisations must:

1. Work to encourage both science and citizen-led approaches to responsible research and innovation and support citizen scientists in working in an Open Science way.

Publishers must:

1. Require standard identifiers for researcher (ORCID), outputs (DOI) and contributions (CRediT)
2. Find new avenues to expose and promote work emerging from disruptive interdisciplinarity
3. Provide upfront clarity (ideally through consistent use of terminology and up-front provision of clear and sufficient information) about OA and open data requirements, mandates and modalities of compliance to researchers and research institutions needing to take decisions around how to disseminate their outputs.

4. Capture and prominently display a broad range of research output-related indicators associated with their publications and ensure interoperability with other systems that collate such metrics. All sources of data should be clearly visible.

Open Science Platforms must:

1. Regularly interact with researchers and acquire feedback on their services, geared towards making their resources as user-friendly and responsive as possible.
2. Require standard identifiers for researcher (ORCID), outputs (DOI) and contributions (CRediT).
3. Invest in training and hiring required to ensure an adequate human capital base to support researchers in facilitating an Open Science approach.
4. Find new avenues to facilitate disruptive interdisciplinarity.

Libraries must:

1. Incorporate Open Science (OA publishing, data management, FAIR data and management of the data lifecycle, legal issues etc)- into the training programmes of students, researchers and other staff of research organisations. Provide training to other stakeholders involved.
2. Provide digital training materials and courses to support skills development.
3. Share and develop best practices in collaboration with researchers.
4. Enable interoperability (technical, semantic, organisational, legal) by providing services (metadata catalogues, persistent identifiers, ontologies) and training.
5. Support the use of standard identifiers for researcher (ORCID), outputs (DOI) and contributions (CRediT).
6. Provide a one-stop shop for researchers to support them in OS issues.
7. Develop infrastructures to collect new metrics of research output.

Individual Researchers must:

1. Ensure they are aware of, informed about and able to access expert advice regarding the “open-related” potential and specifics within their research areas and disciplinary culture. (I would not start with a “requirements” topic)
2. Ensure that they are aware and fully understand the ‘open-related’ requirements of their funders and stakeholders.
3. Consider openness the default position for their work.
4. Use standard identifiers for themselves (ORCID), their outputs (DOI) and their contributions (CRediT).

Document Authors: Jennifer Edmond, Rebecca Lawrence, Sabina Leonelli, Norbert Lossau, Catriona MacCallam, Eva Mendez Rodriguez, Kristiina Hormia-Poutanen,