ROSiE

D1.2: Suggested framework for addressing the (epistemic-ethical) challenges with knowledge production, that feeds into D1.3.

Authors: Søren Holm, Kadri Simm, Rosemarie Bernabe

Editors: Kadri Simm and Rosemarie Bernabe

Project title: Responsible Open Science in Europe

Project acronym: ROSiE

Grant Agreement no.: 101006430
Lead contractor for this deliverable: UT, UiO

Deliverable factsheet:

Project Number:	101006430
Project Acronym:	ROSiE
Project Title:	Responsible Open Science in Europe
Title of Deliverable:	D1.2: Suggested framework for addressing the (epistemic-ethical) challenges with knowledge production, that feeds into D1.3.
Work Package:	WP 1
Due date according to contract:	31 August 2022
Editor(s):	Kadri Simm, Rosemarie Bernabe
Contributor(s):	Søren Holm, Kadri Simm, Rosemarie Bernabe
Reviewer(s):	
Approved by	Rosemarie Bernabe

ABSTRACT:	This suggested framework attempts to provide guidance by providing the normative foundations of OS; making explicit the ethical and epistemic issues of OS; and raising epistemic/normative questions as guideposts for discussion. The definitive framework will be presented in D1.3 as well as the analysis and discussion of the several RI issues raised by OS.
Keyword List:	Research ethics, research integrity, open science, open science principles, respect for persons, open science virtues

Consortium:

	ROLE	NAME	Short Name	Country
1.	Coordinator	University of Oslo	UiO	Norway
2.	Partner	Austrian Agency for Research Integrity	OeAWI	Austria
3.	Partner	European Citizen Science Association	ECSA	Germany
4.	Partner	European Network of Research Ethics Committees	EUREC	Germany
5.	Partner	Federation of Finnish Learned Societies	TSV	Finland
6.	Partner	High Council for the Evaluation of Research and Higher Education	Hceres	France
7.	Partner	National Research Institute for Agriculture, Food and Environment	INRAe	France
8.	Partner	National Technical University of Athens	NTUA	Greece
9.	Partner	University of Porto	UP	Portugal
10.	Partner	Latvijas Universitate	UL	Latvia
11.	Partner	Tartu Ulikool	UT	Estonia
12.	Partner	Universitetet I Sorost Norge	USN	Norway

Revision history:

VERSION	DATE	Revised by	Reason
0.1	14-9-2022	First draft by Søren	
1.0	14-10-2022	Draft revised by Kadri Simm and Rosemarie Bernabe	The first draft needed to be complete with an elaboration of the normative foundations as well as restructuring and further elaboration of the OS issues.

Contents

Suggested normative framework on the discussion of challenges of OS

Introduction

Open Science (OS) raises a number of epistemic, ethical, and research integrity challenges. In this Deliverable, we propose a framework for addressing the epistemic-ethical challenges that arise in knowledge production within an OS context.

The *UNESCO Recommendation on OS* defines OS as follows:

> OS is defined as an inclusive construct that combines various movements and practices aiming to make multilingual scientific knowledge openly available, accessible, and reusable for everyone, to increase scientific collaborations and sharing of information for the benefits of science and society, and to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community. It comprises all scientific disciplines and aspects of scholarly practices, including basic and applied sciences, natural and social sciences and the humanities, and it builds on the following key pillars: open scientific knowledge, open science infrastructures, science communication, open engagement of societal actors, and open dialogue with other knowledge systems.

Science as an activity and social practice is aimed at generating knowledge, and the most basic justification of OS as an overarching goal is that through implementation of OS practices we will, as a global society, produce more and more reliable knowledge "for the benefit of science and society"[1]. And, that this will enable the development of more and better evidence-based technologies and societal policies and contribute to public trust. From the view of science as an activity aimed at knowledge generation flows a set of epistemic values or principles, and from the view of science as a social practice flows a set of ethical values or principles. Both sets of values or principles are internal to the activity and not imposed from the outside[2]. The precise specification of these values or principles will always be a topic of contention, as will the precise justificatory relationship between different values and principles. Transparency can, for instance be seen as an important freestanding value underpinning OS, or it can be seen as a prerequisite for other values like reproducibility, reliability, or accountability. It is not possible in this project to settle these contentious and ongoing discussions and we have therefore based the analysis and proposed framework on values and principles that are generally recognised to be important in relation to scientific activity. This suggested framework attempts to provide guidance by providing the normative foundations of OS; making explicit the ethical and epistemic issues of OS; and raising epistemic/normative questions as guideposts for discussion. The definitive framework will be presented in D1.3 as well as the analysis and discussion of the several RI issues raised by OS.

[1] UNESCO Recommendation on Open Science, https://en.unesco.org/science-sustainable-future/open-science/recommendation

[2] MacIntyre, Alasdair. *After Virtue: A Study in Moral Theory*. London: Duckworth, 1981.
Tranöy, Knut Erik. "Ethical problems of scientific research: an action-theoretic approach." *The Monist* 79, no. 2 (1996): 183-196.

Normative Foundations

OS, though indeed revolutionary, is also rooted, and so should the philosophico-ethical framework used to address epistemic-ethical challenges that arise in knowledge production within an OS context. This normative framework affirms the wisdom and the principles of research ethics (RE) and research integrity (RI) as enshrined in various declarations and guidelines, as well as the derived and increasingly widely agreed principles of OS.

OS, as well as RE and RI, have in common its foundation on the universality of human rights. In full alignment with the *Universal Declaration of Human Rights*, OS assumes and serves the principle that "All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood."

From this basic principle flows the RE principle enshrined in the *UNESCO Universal Declaration on Bioethics and Human Rights* which states that "Human dignity, human rights and fundamental freedoms are to be fully respected" and that "The interests and welfare of the individual should have priority over the sole interest of science or society."

OS is also rooted in RI, which, interpreted from the perspective of and founded on basic and generic respect for persons, defines good research practice as that which is based on the following fundamental principles, as stated in the *European Code of Conduct for Research Integrity*:

> **Reliability** in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources. **Honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way. **Respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment. **Accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts.

From the perspective of research as a naturally collaborative practice, which includes North-South collaborations, OS is also rooted in principles governing research collaborations in resource-poor settings, as elaborated in the *TRUST Global Code of Conduct for Research in Resource-Poor Settings*, specifically the principles of **fairness**, **respect**, **care**, and **honesty**.

OS, as much as it is rooted in the above-mentioned principles, must also be governed by the following widely accepted foundations of the **principle of openness,** as reflected in the *UNESCO Recommendation on OS*: **Quality and integrity**; **collective benefit**; **equity and fairness**; **diversity and inclusiveness.**

Lastly, the principles supporting the principle of openness are enabled by the following principles, as stated in the *UNESCO Recommendation on OS***: transparency, scrutiny, critique, and reproducibility; equality of opportunities; responsibility, respect, and accountability; collaboration, participation, and inclusion; flexibility; sustainability.**

Challenges

The documents outlined above are not reducible to one particular normative theory. Rather they are a collection of important values and principles to guide researchers and they have their roots in various normative paradigms. Such pluralism, coupled with the highly abstract nature of the principles and values, creates challenges of interpretation and potential conflicts between two or more principles (for example when the values of open access and data sharing might endanger research participant privacy). There are often no simple rules for adjudicating between these conflicts but the values and principles highlighted here will offer some guidance and can be used as tools for articulating, debating and solving those challenges.

OS is a broad discourse accommodating a variety of objectives and values ranging from democratization of scientific processes to more effective use of public resources.[3] OS thus contains a number sources of normativity – what counts as good OS – and this is one source of challenges in itself as in satisfying some objectives, it is seen as failing others. It has been argued, that OS is a mindset, rather than a fixed framework[4] and this has consequences for the kind of norms that can realistically be formulated for a diverse and dynamic field.

A few general remarks regarding the nature of the challenges. Many of them have systemic aspects and cannot be adequately addressed by only one class of agents in the science system. Not only researchers but also RPOs, RFOs and all other types of agents will have important obligations to discharge to meet the challenges fully. A number of challenges arise from the diversity and complexity of scientific practices. Their resolution lies less in the trumping of certain principles above others and more in the transparency about the goals of research and practice of open science and careful attention to the particularities of research context.

Epistemic challenges

Engendering public trust and epistemic standards

A significant assumption in many documents relating to OS is that openness about the scientific process and projects will engender public trust in science and in research results. This leads to transparency being identified as one of the enabling values underpinning OS, although transparency (in relation to other researchers) is also a prerequisite for other OS values such as scrutiny, critique, and reproducibility; accountability; quality and integrity, among others.

It is, however questionable whether full transparency, as an expression of the virtue of honesty, will always and automatically engender public trust - actual scientific processes are often messy and do not conform to the idealised processes that are written about in textbooks on methodology, or presented in the final scientific outputs in journals or more popular scientific writings. There is also considerable evidence that the public's understanding of how science 'works', their 'folk philosophy of science' is very idealised, and that actual scientific practices are likely to fall significantly short of this idealised picture. Since scientific results

[3] Fecher and Friesike (2014). "Open Science: One Term, Five Schools of Thought". In: Bartling, S., Friesike, S. (eds) *Opening Science*. Springer, Cham. https://doi.org/10.1007/978-3-319-00026-8_2

[4] Hillyer et al (2017). „Framing a Situated and Inclusive Open Science: Emerging Lessons from the Open and Collaborative Science in Development Network". In Chan and Loizides (eds) *Expanding Perspectives on Open Science: Communities, Culutures and Diversity in Concepts and Practices.* IOS Press.

are often complex and nuanced, there is a potential danger of "epistemic relativism" of many truths. In some circumstances, opening up science and increasing transparency may therefore decrease trust[5], unless accompanied with significant contextualisation.

Transparency can therefore not be taken to be an unalloyed good in itself or a goal to be pursued in isolation, but needs to be conceptualised as one element of a multi-faceted and nuanced engagement with the public about how science works and the epistemic status of scientific knowledge claims.

Epistemic justice

Epistemic injustice occurs when knowledge claims are unfairly rejected, or when the knowledge possessed by certain types of knowers are excluded or not taken seriously because of prejudices about the knower[6], in violation of the principles responsibility, respect, and accountability. Issues of epistemic injustice are common in science where research results published by well-known groups at prestigious universities have often been evaluated as 'better' than publications from less well known groups, and where evidence presented in publications in high prestige journals have been often been evaluated as more reliable even though these journals have high retraction rates. Such bias goes against the principle of equality of opportunities.

In the OS context these epistemic reception biases leading to epistemic injustice are likely to persist, and they are likely to be extended to open data. Thus, the envisioned advantage of OS in terms of quality and integrity and consequently more efficient knowledge production might not materialise but rather the already existing advantages of the privileged will become even more entrenched. These issues of epistemic injustice and bias can be 'converted' into issues of distributive injustice if research perfoming organisations and research funders do not take them into account when recognising or making decisions on the basis of an evaluation of research contribution.

Data collection/procurement

Collection of research data is arguably one of the most challenging aspects of OS practice because it is most vulnerable to misconduct and most difficult to prevent.[7] Trust is essential for successful and accountable collaborations thus training in research ethics and methodologies is crucial for ensuring that researchers from diverse fields, as well as citizen scientists, share an understanding of the research standards and ethical norms.

Data collection is an important part of research itself and the effort and resources involved in the procurement and standardisation of data need to be sufficiently acknowledged. Data is valuable and researchers are under pressure to publish which might hinder their willingness to share data or share it early enough (as it would work against their self-interest or the interests of their institution). This may be a violation of the principle of openness.

---

[5] John, Stephen. "Epistemic trust and the ethics of science communication: Against transparency, openness, sincerity and honesty." *Social Epistemology* 32, no. 2 (2018): 75-87.
[6] Fricker, Miranda. *Epistemic injustice: Power and the ethics of knowing*. Oxford: Oxford University Press, 2007.
[7] Bjørn Hofmann, 2022. "**Open Science Knowledge Production: Addressing Epistemological Challenges and Ethical Implications**," Publications, MDPI, vol. 10(3), pages 1-15, July.

Disciplinary/methodological challenges

Certain research methodologies and scientific fields, especially those that rely on large datasets and quantitative methods, are an especially good fit with OS. Qualitative data, often impossible to anonymize completely, cannot be shared as easily without identifying (and therefore potentially stigmatizing or harming) research participants, thus potentially violating the principles respect for persons and care. These constraints need to be taken into account as practicing OS is increasingly seen as an important criteria for academic career advancement.

Ethical challenges

Protecting research participants

The rights and interests of research participants lie at the core of RE and one of the major ethical challenges of practicing OS lies in how the goals of openness and data sharing can be fulfilled while also protecting the rights, dignity, and welfare of research participants.

The privacy of individual research participants can be fully protected in an OS data set if the data set can be completely anonymised. For many types of data this is possible (although often difficult).For other types of data, complete anonymisation is impossible, but it is nevertheless important to allow other researchers to use these datasets that might be unique (e.g. oral histories of participants in significant historical events or movements, genetic data etc).

Research participants may in some contexts have enduring control interests in relation to the data they have provided to researchers, e.g. in relation to what the data is used for and who uses the data; and they may perceive some uses of their data as misuses. A common example in the literature is that a person might be happy for *bona fide* researchers to use their health data under conditions of broad consent for 'health related research' but might nevertheless find the use of the data in tobacco industry sponsored research ostensibly on the health effects of smoking highly problematic[8].

Autonomy of research participants is a crucial value and ensuring this in OS potentially requires alternative modes of engagement and consent. Given that research participants cannot withdraw their data once they have been deposited as an open data set in repository other mechanisms have to be developed that will allow research participants to protect their legitimate control interests. This may involve the initial consent to include consent for specific governance mechanisms, and those governance mechanisms actually protecting the interests of participants.

Distributive justice in international knowledge production

OS is committed to the principle of openness expressed through the production of knowledge as a public good[9], and to data and code also being shared as public goods. Furthermore, in relation to researchers, OS practices are in principle reciprocal and symmetrical. Everyone contributes knowledge and data by making them openly accessible, and everyone can then use the knowledge and data for further research.

[8] Holm, Søren. "Who should control the use of human embryonic stem cell lines: A defence of the donors' ability to control." *Journal of Bioethical Inquiry* 3, no. 1 (2006): 55-68.
[9] By 'public good' we mean a good that is non-rivalrous and non-excludable

This egalitarian picture of OS is, however, highly idealised. Many OS practices, e.g. preparing and annotating a dataset to fully comply with FAIR standards require resource, as does utilising a data set made openly available by other researchers. The ability of a researcher or group of researchers to fully comply with OS ideals and mandates, and their ability to fruitfully exploit what others make openly available thus depends on their access to financial and other resources.

This means that researchers who are resource poor, e.g. researchers in LMICs and in the scientific periphery in more affluent countries, are systematically disadvantaged in relation to realising the benefits of OS. While open access articles tend to be more cited, publishing open access is often prohibitively costly. For researchers who are resource poor, OS therefore creates a classic Matthew Effect of cumulative advantage[10] (*For whosoever hath, to him shall be given, and he shall have more abundance: but whosoever hath not, from him shall be taken away even that he hath.* Matthew 13:12 - *The Bible).*

This situation raises issues of justice and fairness that cannot be fully solved on a project by project basis, but need a systemic solution. Researchers have obligations to act fairly in the project collaborations, but other agents in the research system have obligations in relation to ensuring that resources are made available to researchers in LMICs that enable them to participate fully in OS. One element of this could be to extend the *Global Code of Conduct for Research in Resource-Poor Settings*[11] with a section on the responsibilities and obligations that OS practices create for researchers, RPOs, and RFOs.

Citizen science

Citizen scientists are valuable partners in many OS projects and their collaboration, participation, and inclusion are crucial for achieving a number of overall OS goals. However, participation of citizen scientists also has its challenges, for example in terms of blurring of the research object/subject roles in research that have largely been kept separate in traditional RE guidance[12], or in terms of accommodating the activism of some citizen science with the more discovery-oriented stance of academic research[13]. Transparency about the goals of research, openness regarding the various roles and interests of (citizen) scientists, and open data publication may help to alleviate these concerns.

Participatory research, while often offering valuable opportunities for all involved, has in some cases been associated with exploitation when citizen scientists are instrumentalised as a form of free labour and their contributions are not duly recognized (for example through authorship or ownership rights, if appropriate).

---

[10] Hellauer T, Reichmann S, Cole NL, Fessl A, Klebel T, Pontika N. 2022 Dynamics of cumulative advantage and threats to equity in open science: a scoping review. R. Soc. Open Sci. 9: 211032. https://doi.org/10.1098/rsos.211032

[11] https://www.globalcodeofconduct.org/the-code/

[12] Resnik, DB. 2019. Citizen Scientists as Human Subjects: Ethical Issues. Citizen Science: Theory and Practice, 4(1): 11, pp. 1–7, DOI

[13] Rasmussen, LM and Cooper, C. 2019. Citizen Science Ethics. Citizen Science: Theory and Practice, 4(1): 5, pp. 1–3. DOI: https://doi.org/10.5334/cstp.235

Scientific practice, while very diverse, still adheres to a set of basic research ethical norms intended to protect the participants and support the reliability and accountability of knowledge production. Data quality and integrity issues have been raised in this context as citizen scientists have often not been trained in research ethics and methodologies. Citizen scientists need to be included in having access to this knowledge and training. In the long term, such training and research involvement is likely to support the overall OS goals of public education as well contribute towards dissemination of research results and implementation of evidence-based policies.

Proper recognition of research contributions – alternative metrics

Another aspect of distributive justice in OS knowledge production is related to the proper recognition of all contributions to the research processes, and a proper alignment of the scientific reward system with the overarching goals of OS. This has been recognised as a major challenge for some time, but although many of the relevant organisations, RPOs, RFOs etc have officially signed up to take action in this area practical progress has been slow.

The lack of progress has both practical and more theoretical reasons. The main theoretical problem is that it is difficult to provide a principled account of how OS contributions, e.g. preparing a data set to FAIR standards and making it available equates to more traditional quantifiable contributions like authorship, citations, or grant success.

Openness beyond publications, data and code

In relation to a consensus commitment to openness and an implementation of OS practices most progress has been made in relation to open publishing, data, and code. There are, however many other elements of the research process that are not routinely shared openly and where there is no current consensus that they ought to be shared. This includes elements of the research process that are strictly necessary to reproduce particular research result (for example, highly specialised equipment and reagents, unique research sites, modified model organisms etc[14]). These elements are currently often 'traded' for collaborative opportunities, or authorship or kept as proprietary 'property' in order to exclude competitors from utilising them in their own research. The situation is thus very similar to the traditional way in which research data was conceived of and handled before OS became generally accepted in relation to data.

However, there seems to be no good reason to exclude many of these research elements from the obligation to openness and sharing. Many could be made public goods with a resource investment that is comparable to the investment necessary to make data fully FAIR compliant. Their initial production clearly requires work, effort, intellectual input etc., but so does the production of any high quality scientific data set. Sharing these research elements might require new infrastructures that make storage, access and distribution possible and they also require discussions around the nature of Intellectual Property rights within OS. ˇ.

[14] Gould, John, and Jose W. Valdez. "The Gollum effect: the issue of research opportunity guarding in academia." *Frontiers in Ecology and Evolution* (2022) 10: 543. https://doi.org/10.3389/fevo.2022.889236