REPORT

TRUSTparency

Deliverable 1.3

A framework to map epistemological disparities and DEI challenges among end-user communities

Authors: Daniele Fanelli

Editors: Daniele Fanelli, Panagiotis Kavouras

Project title: Increasing reproducibility through the co-creation of interventions that support a transparent and trustworthy ecosystem

Project acronym: TRUSTparency

Grant Agreement no.:101188172
Lead contractor for this deliverable: Science of Science ltd (SoS)

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Deliverable factsheet:

Project Number:	134601135783
Project Acronym:	TRUSTparency
Project Title:	Increasing reproducibility through the co-creation of interventions that support a transparent and trustworthy research ecosystem
Title of Deliverable:	A framework to map the epistemological disparities and DEI challenges among end-user communities
Work Package:	WP1
Author:	Daniele Fanelli
Editor:	Daniele Fanelli, Panagiotis Kavouras
Reviewers:	Panagiotis Kavouras, Mads P. Sørensen, Signe Mezinska, Ivars Neiders

ABSTRACT:	Reproducibility interventions have context-specific costs that might hinder research fields or create inequalities amongst researchers. TRUSTparency aims to help institutions evaluate these potential costs and risks when deploying reproducibility interventions within their particular context. Task 1.4 aimed to build a framework to help institutions map the potential sources of inequalities, by building upon results of three EU projects on reproducibility – iRISE, TIER2 and OSIRIS. We inspected deliverables and articles published by these projects and recorded factors that these documents suggested to be relevant. The resulting list of 65 factors identified was subsequently analysis to uncover common themes. We obtained a scheme comprising three higher-level themes (resources, receptivity and relevance) each measurable along three dimensions, for a total nine dimensions, respectively: funds, time, infrastructure, knowledge, incentives, regulation, complexity, codification, epistemology. These dimensions may help stakeholders and policy makers assess the criticalities of an intervention with regards to the potential hindrances and inequalities it could unintentionally generate for researchers.
Keyword List:	Reproducibility, disparities, inequality, inclusivity.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Consortium

	Role	Name	Short Name	Country
1.	COO	Universitetet i Oslo	UIO	NO
2.	BEN	Aarhus Universitet	AU	DK
3.	BEN	Science of Science Limited	SoS	UK
4.	BEN	Stichting Amsterdam UMC	AUMC	NL
5.	BEN	Latvijas Universitāte	UOL	LV
6.	BEN	Ethnicon Metsovion Polytechnion	NTUA	EL
7.	BEN	Tieteellisten Seurain Valtuuskunnasta	TENK	FI
8.	BEN	Aristotelio Panepistimio Thessalonikis	AUTH	EL
9.	BEN	Universidade Federal de Santa Catarina	UFSC	BR
10.	BEN	National University Incorporated	NU	PH
11.	BEN	Kwame Nkrumah University of Science and Technology Kumasi	KNUST	GH
12.	BEN	Lviv Polytechnic National University	LPNU	UA
13.	AP	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek TNO	OSNL	NL

Revision History

Version	Date	Revised by	Reason
0.1	18 January 2026	Daniele Fanelli	Seeking early feedback from coordinators
0.2	26 January 2026	Daniele Fanelli	Feedback from consortium
1.0	28 January 2026	Daniele Fanelli	Final feedback from consortium

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Table of contents

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Introduction

The TRUSTparency project aims to empower institutions involved in the research process to develop their own reproducibility policies and guidelines. In particular, TRUSTparency will develop and test a tool, the Reproducibility Promotion Plan (RPP), which helps institutions implement and evaluate possible interventions – that is, concrete actions that they can implement to transfer reproducibility practices into their everyday work and monitor their effectiveness.

However, the RPP cannot offer one-size-fits-all approaches to reproducibility policy-making. Indeed, one of the core assumptions of TRUSTparency, which is tasked to build directly on the results of three ongoing large EU projects on reproducibility (iRISE, TIER2 and OSIRIS), is that the concept of reproducibility does not apply equally to all types of research, and it can take many forms, have different determinants and varying cost/benefits tradeoffs, depending on the context.

Multiple tasks and deliverables in iRISE, TIER2 and OSIRIS are devoted to understanding how the meaning of terms like "reproducibility" vary across different types of research, and how the effectiveness and costs of interventions to increase the reprodocuibility of results may be unequally distributed amongst fields and demographics of researchers, such that an intervention deployed in the wrong context may end up having unintended negative consequences that hinder research progress and may unwittingly put particular categories of researchers at an unfair disadvantage.

Therefore, in order to best support reproducibility policy-making at the level of institutions, the "toolbox" produced by TRUSTparency aims to offer, in association with the RPP and the list of interventions, guidelines that alert policy-makers about the factors to consider when deciding whether or not to implement a particular policy or intervention within a particular context.

Task 1.4 supports this objective by offering a framework that will help institutions evaluate candidate interventions along multiple dimensions that are relevant to the inclusivity of research. In particular, task 1.4 aimed to take stock of the analyses and results of iRISE, TIER2 and Osiris to offer a framework that helps policymakers evaluate more thoroughly the potential inequalities that a reproducibility intervention might bring. In particular, we aimed to map the sources of two types of disparities:

1. Epistemological disparities: that is, differences between research fields that may create unequal outcomes for the same reproducibility intervention
2. Inclusivity challenges: differences between demographic categories of researchers that may put some researchers at a disadvantage by the implementation of a reproducibility intervention.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Methods

Document collection

Our aim was to take stock of results of the three EU projects upon that preceded TRUSTparency and that had examined the topic of epistemic or demographic inequalities in relation to reproducibility. To this end, we searched the websites of the three relevant EU projects, iRISE, TIER2 and OSIRIS, for potentially relevant deliverables, published articles and working papers. The following documents were identified, retrieved and examined for potential inclusion:

a) iRISE

1) *Report D3.1 Embedding and mainstreaming EDI considerations into efforts to improve reproducibility: Interim guidelines and reflections from meta-research*. This is the deliverable of iRISE WP 3, dedicated to Equity, Diversity and Inclusion. [1]
2) *Report D4.1 Interim report on facilitators and barriers to implementation of interventions and practices*. Results of a Delphi consultation study to prioritize reproducibility measures and interventions. [2]
3) *Towards a theoretical framework for reproducibility: contextualising the costs and benefits of interventions using Information Theory*. This is a working paper, not published at the time of writing the report, that offers a mathematical analysis and model [3].

b) TIER2

1) *Report D2.5 - Policy Brief 1: Reproducibility and Epistemic Diversity*. Deliverable of Tier2's WP2, concerning aspects including the type of reproducibility and the nature of the research. [4]
2) *Report D3.1 - State-of-play on reproducibility across diverse epistemic contexts*. Deliverable from Tier2's WP3, which aims to capture the complexity in the meaning(s) of reproducibility across contexts, provide a conceptual framework that systematically relates epistemic diversity to reproducibility by identifying key research characteristics affecting the relevance and feasibility of different types of reproducibility. [5]
3) *Toward equitable open research: stakeholder co-created recommendations for research institutions, funders and researchers*. Peer-reviewed article published in Royal Society Open Science, discusses the tensions between aspects of DEI on the one hand, and Open Science initiatives on the other. [6]
4) *Reproducibility and replicability of qualitative research: an integrative review of concepts, barriers and enablers*. Working paper that examines the applicability of reproducibility and replicability concepts and interventions in the context of qualitative research [7]
5) *How to get there from here? Barriers and enablers on the road towards reproducibility in research*. Currently available as a pre-print (non peer-reviewed) in the Open Science Framework, this working paper reports on results of a series of workshops and it identifies themes and categories of barriers identified by various stakeholder categories. [8]
6) *Open science, done wrong, will compound inequities*. World View (opinion piece) published in the Nature news section, which points out some unintended consequences of research reforms. [9]
7) *Knowledge Production Modes: The Relevance and Feasibility of Reproducibility*. Second version of a working paper that develops the key concepts underlying Tier2's Work package 2, with concept that underly the project's Deliverable 2.5. [10]
8) *Exploring the Gray Area: Similarities and Differences in Questionable Research Practices (QRPs) Across Main Areas of Research*. A peer-reviewed article published in Science and Engineering Ethics. [11]
9) *Dynamics of cumulative advantage and threats to equity in open science: a scoping review*. Peer-revewed article published in the journal Royal Society Open Science. [12]
10) *A conceptual review of uses and meanings of reproducibility and replication*. Currently available on the Open Science Framework as a non peer-reviewed working paper. [13]

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

c) OSIRIS

1) *What helps and hinders reproducible research? Researchers' perspectives from a cross-disciplinary interview study*. Currently available as a non peer-reviewed working paper from Osiris' website. [14]

Stakeholder consultation

In addition to the document analysis, we collected opinions and suggestions from stakeholders. As part of the online workshop of the 1st stage of the Mutual Learning Exercise for Reproducibility, organised for the co-creation of TRUSTparency's deliverable 1.2 (see D1.2 for further details) we invited participating representatives from National Reproducibility Networks to answer anonymously two questions:

1. Which demographic categories, if any, do you think might be hindered by policies to improve reproducibility, how and why?
2. Which fields, methods or types of research, if any, do you think might be hindered by policies to increase reproducibility, how and why?

A total of 13 participants submitted their responses, (N=18 for the first question, N=21 for the second). The texts of these responses were used to integrate and validate the analysis, as reported below.

Analysis

Once all factors were recorded, we conducted a thematic analysis of thedocuments compiled from iRISE, TIER2, and OSIRIS [15]. Following an inductive approach, factors were grouped by similarity, in an iterative process that aimed to identify patterns amongst the factors or mechanistic hypotheses invoked, in order to reduce the number of possible classifying dimensions (now identified as themes).

We aimed to reduce the number of dimensions to no more than 5 (with possible further secondary, non-prioritised dimensions) for each of the two areas of interest (epistemological and inclusivity disparities) for a total maximum of 10 dimensions.

The resulting scheme was then applied to the responses collected from stakeholders, to assess its efficacy in collecting common concerns expressed by experts.

Results

Document analysis

Of the 14 documents examined, 7 yielded relevant elements (see Appendix), from which we identified 65 factors that are suggested to create inequalities in the effectiveness, benefits, and successful implementation of reproducibility interventions. Table 1 in the Appendix lists each of the 65 factors and the mechanistic hypothesis invoked.

Our analysis led to identifying three higher-level themes (Resources, Receptivity, Relevance) each comprising three dimensions (respectively: Funding, Time, Facilities; Knowledge, Incentives, Ethics & Law; Phenomenology, Methodology, Epistemology). Through this constructed classification, we aimed to capture the diversity of arguments and present them in a balanced manner.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Stakeholder validation

The consultation with National Reproducibility Networks yielded arguments that were similar to those encountered in the documents, offering an independent validation of the scheme.

Final framework

Here below we describe the three higher level and nine fundamental dimensions comprising the framework:

a) Resources

The availability of the resources necessary to implement a reproducibility intervention is the primary source of potential inequalities. In particular, reproducibility interventions may require varying amounts of three types of resources:

1) **Funds:** Interventions may vary in the amount of funding required, and the availability of grants is highly variable across research fields, countries and research institutions, potentially leading to both epistemic and demographic disparities. For example, research fields that have less funding available, or researchers in teaching-oriented institutions would be at a disadvantage.
2) **Time:** Regardless of funding, reproducibility interventions may require variable amounts of additional time, and time is a finite resource. Depending on their field, institution, position and personal circumstances, researchers will have widely different amounts of time available, which creates inequities, often of a systemic kind. For example, less time is available to researchers with caring responsibilities, which happen to be more often women.
3) **Infrastructure:** Interventions vary, for example, in the amount of materials, facilities, computational time, proprietary software they require, and the availability and access to such resources is highly unequally distributed across research fields and institutions. For example, data storage and computing facilities may be less adequate in teaching-oriented universities and in low- and middle-income countries.

b) Receptivity

Independent of funds, time and infrastructure, research communities might be differently receptive to implementing particular reproducibility interventions, depending on how well such interventions resonate with their skills, research culture, and regulations. In particular, research communities may be more or less able to successfully implement a reproducibility intervention depending on three conditions:

1) **Knowledge:** Interventions may require levels of competence that may be unequally distributed across fields, institutions and researcher demographics. For example, senior researchers or scholars in the Humanities may be less aware and adept at programming computers and using data sharing tools, which places them at a disadvantage.
2) **Incentives:** The levels of competition and the forms such competition takes vary widely across countries, institutions and fields. Such competition is not necessarily a hindrance to progress in itself, and yet it might interfere with researchers' ability to implement interventions. For example, extremely competitive fields require rapid publication of results, and any intervention that slows the publication process will put researchers in those fields at a disadvantage.
3) **Regulations**: Research fields, countries and institutions vary widely in the ethical requirements, policies and regulations that must be complied with. In many instances, these might conflict with the implementation of reproducibility interventions. For example, data sharing is harder to implement in research that collects sensitive data or that is subject to commercial or governmental confidentiality.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

c) Relevance:

Regardless of available resources and potential receptivity, reproducibility interventions might be less relevant to particular types of research, due in particular to the degree to which they presuppose the following properties:

1) **Phenomena stability:** Some fields of research are not empirical and deal with perfectly stable theoretical or mechanical systems. Fields that are empirical study phenomena that differ widely in their properties, and primarily in the extent to which they are bound to change over time and/or space. This phenomneological variability entails that the same intervention may be more or less applicable and cost-effective. For example, data re-use might be less valuable in research that studies fast-changing cultural phenomena.
2) **Methods homogeneity:** Research fields vary enormously in what they do and the extent to which what they do is codified and to a high level of consensus. This entails that widely different standards of evidence quality and methodological consistency will apply to different types of research and within research fields over time (because methodologies and standards evolve). Therefore, any given reproducibility intervention is unlikely to be equally useful and relevant to all fields.
3) **Philosophical compatibility:** Some researchers endorse ontological and epistemological frameworks that are incompatible with tenets of reproducibility. For example, several authors maintain that the concept of replication and reproducibility is meaningless in the context of interpretivist, qualitative research. Whether this is truly the case is the subject of scholarly debate, but there is no question that many researchers do hold such an epistemological stance and they will be unreceptive, unable, or unwilling to adopt reproducibility interventions, creating inequities.

Table 1 in the Appendix lists the 65 factors extracted and how these are classified into one or more of the nine dimensions, and whether they are relevant to epistemic or demographic disparities. Note how most of these dimensions are a potential cause of both epistemic and demographic inequities. For example, limitations in the access to resources can cause inequities between countries, institutions and individuals, as well as across disciplines and fields, because the availability of funds, time and facilities varies across any such grouping.

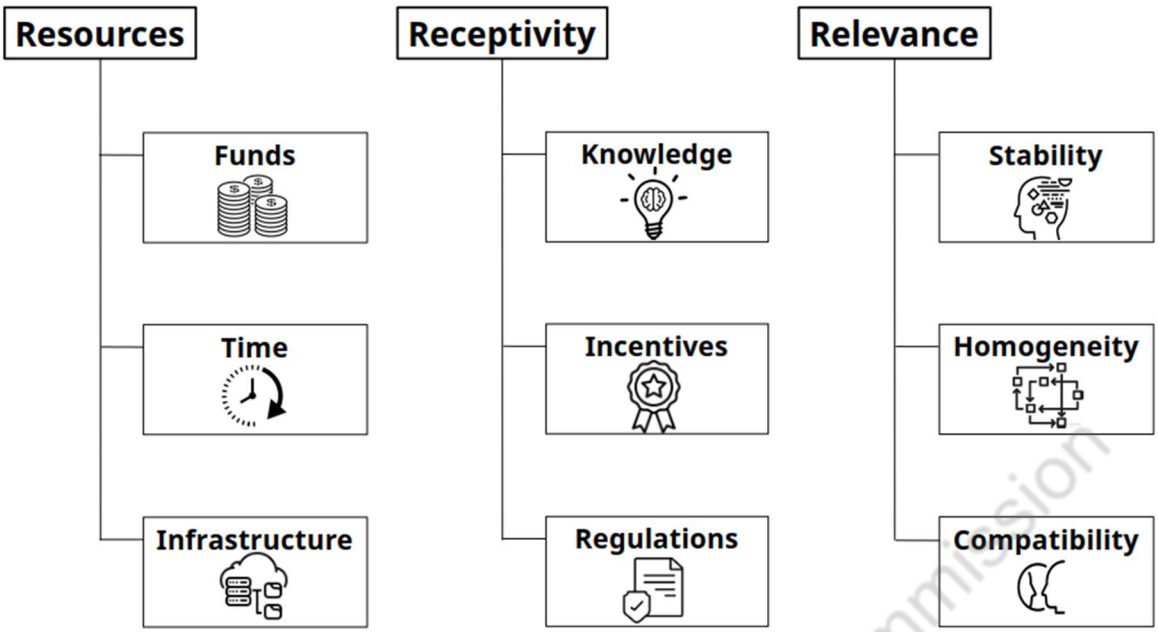
Tables 2 and 3 in the Appendix show the responses submitted by contributions made by stakeholders and how they fall into the nine-dimensional classification scheme. In some cases, the classification is speculative, because the participant did not fully articulate the reasoning. However, as shown in the tables, most if not all suggestions made by the participants fall quite clearly into one or more of the nine dimensions identified.

Discussion

Our analysis proposes a 9-dimensional classification scheme that allows to map any particular intervention in terms of the possible disparities and inequities it may produce, as schematised below:

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.



This scheme is first and foremost a conceptual map, which points to the relevant elements to consider when discussing reproduciblity interventions. Institutional leaders considering such interventions and policies could use the nine dimensions as a guide to examine relevance, costs and benefits in their context.

Furthermore, the scheme may be used as a rating tool, to quantify the risk of inequity brought about by a particular intervention. For example, an intervention that requires expensive facilities but is implemented rapidly will score high on the dimensions of “funds” and “infrastructure”, but low on “time”. Or, an intervention that presupposes the exact replication of results might score high on the “complexity” and the “codification” dimensions, since fields characterised by high phenomena variability and low methodological consensus will not stand to gain as much from the intervention as others.

A possible limitation of the scheme proposed is that it was developed inductively, from a relatively limited set of available documents (Table 1 in Appendix). This scheme was supported by the stakeholder consultation, whose answers all seem to fall into one or more of the identified dimensions. However, the consultation itself was limited to a small number of stakeholders and we cannot exclude that a more extensive consultation or literature review might suggest a different or expanded scheme.

Since this scheme will inform and feature future TRUSTparency tasks and outputs, like the toolbox of reproducibility interventions, we will assess how well it performs and consider updating it in light of any feedback received, especially from the pilot testing.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

References

[1] Salholz-Hillel, M. and Zellers, S. (2025). *D3.1 Embedding and mainstreaming EDI considerationsinto efforts to improve reproducibility: Interim guidelinesand reflections from meta-research*, iRISE Report.

[2] Pejdo, D.; Marušić, P. A.; Buljan, I.; Haven, T.; Gopalakrishna, G. and Heyard, R. (2025). *D4.1 Interim report on facilitators and barriers toimplementation of interventions and practices*, iRISE report .

[3] Fanelli, D.; Domotor, E. and Maniadis, Z. (2026). *Towards a theoretical framework for reproducibility: contextualisingthe costs and benefits of interventions using Information Theory*, unpublished working paper, produced within the iRISE project .

[4] Schneider, J.; Ulpts, S.; Cole, N. L. and Ross-Hellauer, T. (2023). *Deliverable D2.5 -Policy Brief 1: Reproducibility and EpistemicDiversity*, Tier2 report, available at https://osf.io/va45y/.

[5] Ross-Hellauer, T.; Ulpts, S.; Kormann, E.; Cole, N.; Kopeinik, S.; Kowald, D.; Osborne, C. and Schneider, J. (2024). *D3.1 - State-of-play on reproducibility across diverse epistemic contexts*, Tier2 report, available at https://osf.io/2ma67/ .

[6] Cole, N. L.; Reichmann, S. and Ross-Hellauer, T. (2023). *Toward equitable open research: stakeholder co-created recommendations for research institutions, funders and researchers*, Royal Society Open Science 10. DOI: 10.1098/rsos.221460.

[7] Cole, N. L.; Ulpts, S.; Bochynska, A.; Kormann, E.; Good, M.; Leitner, B. and Ross-Hellauer, T. (2024). *Reproducibility and replicability of qualitative research: an integrative review of concepts, barriers and enablers*, working paper produced within the Tier2 project, available at: https://osf.io/n5zkw.

[8] Horbach, S. P. J. M.; Cole, N. L.; Kopeinik, S.; Leitner, B.; Ross-Hellauer, T. and Tijdink, J. (2025). *How to get there from here? Barriers and enablers on the road towards reproducibility in research*, working paper produced within the TIer2 project, available at https://osf.io/gx9jq_v1.

[9] Ross-Hellauer, T. (2022). *Open science, done wrong, will compound inequities*, Nature 603 : 363-363.

[10] Ulpts, S. and Schneider, J. W. (2023). *Knowledge Production Modes: The Relevance and Feasibility of Reproducibility*, working paper produced within the Tier2 project, version 2, available at: https://osf.io/ujnd9_v2.

[11] Ravn, T. and Sørensen, M. P. (2021). *Exploring the Gray Area: Similarities and Differences in Questionable Research Practices (QRPs) Across Main Areas of Research*, Science and Engineering Ethics 27.

[12] Ross-Hellauer, T.; Reichmann, S.; Cole, N. L.; Fessl, A.; Klebel, T. and Pontika, N. (2022). *Dynamics of cumulative advantage and threats to equity in open science: a scoping review*, Royal Society Open Science 9.

[13] Ulpts, S. and Schneider, J. W. (2025). *A conceptual review of uses and meanings of reproducibility and replication*, working paper produced within the Tier2 project, avialable at: https://osf.io/entu4_v3.

[14] Kozula, M.; DeVito, N. J.; Onghena, P.; Colombo, C.; Dudda, L.; Teno, P. M. and den Eynden, V. V. (2023). *What helps and hinders reproducible research? Researchers' perspectives from a cross-disciplinary interview study*, working paper produced within the OSIRIS project, avilable at: https://osf.io/5w7y4/files/exy5f.

[15] Braun, V. and Clarke, V., 2022. *Thematic analysis*. SAGE, Los Angeles.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Appendix

Table 1: A list of the 65 factors extracted and how these are classified into one or more of the nine dimensions, and whether they are relevant to epistemic or demographic disparities

Resources			Receptivity			Relevance			inclusivity relevance					
funds	time	infrastructure	knowledge	incentives	regulations	stability	homogeneity	compatibility	epistemic	demographic	factor description	mechanism of action	Ref number	page
				1					1		Competitive nature of field	Fields might vary in their level of concerns with academic competition, the risk of being scooped, or the perceived economic value of research outputs are barriers to sharing of materials, methods etc. This may affect their(perceived/actual) costs and barriers to implement open-science and other reproducibility practices.	1	17
			1						1		Heterogeneity of standards	Awareness of reproducibility standards varies in interdisciplinary and in generally fragmented collaborations, impeding reproducibility	1	19
		1	1						1	1	Knowledge and skills about reproducibility	Low skills and inexperience, including gaps in foundational statistical or methodological knowledge, as well as unfamiliarity with the sharing process and infrastructure, hamper implementation of reproducibility. The level of skill might vary across fields and institutions and researcher demographics.	1	20
		1							1	1	Facilities, infrastructure/resource availability	Institutions/countries/fields might lack the material resources and facilities needed to implement open science/reproducibility practices.	1	21
		1							1	1	Missing or incompatible repositories	Fields/countries might lack adequate repositories or might use repositories that are incompatible with others' systems, making it difficult to store and disseminate complex datasets, particularity large image files.	1	21

		1	1						1		Protocols and process might lack standardisation	Even in technically advanced labs and data-intensive fields, protocols detailing how to store data, materials etc. might lack standardization.	1	22
	1									1	Caring responsibilities	These, often falling on the shoulders of women, are a resource drain that makes time-intensive interventions unequal in outcomes.	1	23
1									1		Cost of materials and methods of a study	High costs of studies impede internal validation and independent replication	1	24
1									1		Costs of accessing data	Data that requires access fees or travel to be retrieved impedes independent reproduction of analyses	1	24
1									1	1	Costs of data sharing	Storage fees, repository charges, formatting/conversion costs are an obstacle to data sharing, and data sharing with appropriate formats	1	24
1		1							1	1	Underfunded institutions	Underfunded institutions may lack subscriptions to academic databases, cannot afford open access publishing fees, have limited access to equipment, limited capacity to publish in high-impact journals.	1	25
			1						1		Tacit know-how required	Fields vary in the extent to which tacit knowledge (e.g. skills in handling particular materials, adjust experimental conditions, make interpretive judgements during data collection and other skills that cannot be put in writing and can only be learned by experience and training/mentoring) are required to conduct a study.	1	26
						1			1		Inherent variability of research object	Fields vary in the variability of research objects and environments. For example, fields working with seasonal, biology, or climate-dependent systems confront natural fluctuations that produce divergent results despite strict adherence to protocols.	1	26
						1	1		1		Inconsistencies in engineered artefacts	Small differences in manufacturing of objects or tools/materials make exact replication impossible in many fields.	1	27
						1			1		Unicity of data	Location-bound unique data, i.e. data from irreplaceable physical documents or objects housed in museums, collections and archives, impede the re-analysis and replication of studies.	1	27
						1	1		1		Language variability of texts	Fields working with textual materials or datasets across multiple languages face barriers to fidelity and interpretability.	1	27
							1	1	1		Intrinsically subjective research	Components of qualitative research, such as interpretation, interview dynamics, researcher's own positionality are barriers to reproducing and replicating.	1	28
					1				1		Data privacy and confidentiality	Across qualitative, medical,and politically or economically sensitive research, data privacy and confidentiality are barriers to replicating and reproducing.	1	30

					1				1		Non-disclosure agreements	Fields in Engineering and other areas engage in industrial and governmental collaborations that involve non-disclosure agreements, which prohibit the sharing of industrial secrets, and therefore impede the sharing of methodological details and data	1	31
1									1	1	Costs of open access	Low-income fields and institutions have comparatively greater difficulty in covering open-access fees. Moreover, publication fees vary highly across disciplines and regions.	2	7
			1						1		Readiness of data formats	Some fields/studies produce data that is easier to share than others, which instead require complex formatting.	2	9
					1				1		Human-subjects research	Data in human-subject research is often subject to privacy and confidentiality or other ethical constraints that impede open data sharing.	2	9
		1							1	1	Computational resources	In addition to costs and skills, open data sharing requires computational resources	2	9
			1						1	1	Reproducibility culture	Fields and countries vary in their awareness of reproducibility and its importance, which is a barrier to reproducibility	3	10
				1					1	1	Valuing quality	Fields and institutions may vary in how much they value quality over quantity, and hence how much they might be prepared to invest in reproducibility measures	3	11
				1					1	1	Incentives for quality/reproducibility	Institutions may vary in how much they reward, directly or indirectly, quality-enhancing activities like reproducibility, therefore facilitating or impeding the discussion of reproducibility practices.	3	11
		1							1	1	Reproducibility infrastructure	Fields and institutions might vary in the infrastructure available for reproducibility.	3	19
		1							1		Meta-data standards	Sharing data is not sufficient, as this needs to be connected and connectable to other repositories and the original publications. Fields might vary in the extent to which their meta-data standards are adequate.	3	19
		1							1		Proprietary software tools	Reproducibility tools or analytical methods that rely on proprietary software pose a barrier to reproducibility	3	19
							1		1		AI reliance in methods	Especially in qualitative fields, methods increasingly will rely on AI to conduct coding and other critical methodologies, decreasing internal quality checks and decreasing the ability of others to reproduce results	3	20
1									1	1	Reproducibility funding	Fields and countries might vary in the extent to which funds are available for reproducibility activities, interventions and infrastructure	3	20

1	1									1	Reproducibility costs	The time and resources required to conduct replications or improve reproducibility are the ,main limiting factor.	3	21
					1				1		Proprietary nature of data produced	Some fields, particularly when collaborating with industry, have IP restrictions to what they can share.	3	22
						1		1	1		Constructivist vs positivist assumptions about the nature of phenomena	The concept of replication is inapplicable under an ontological “assumption that phenomena are understood differently by individuals with such understanding being socially and historically influenced”	4	19
							1	1	1		Interpretivist vs empiricalist	The nature of some research methodologies, particularly qualitative ones, is to be open-ended, dynamic, exploratory, abductive, theory-developing interpretive and therefore not amenable to the concept of replication	4	20
							1	1	1		Exploratory nature of research	Some research fields/studies, e.g. much qualitative research, are intrinsically exploratory and flexible, and do not aim at testing theories, and therefore not amenable to replication discourse	4	22
						1		1	1		Researcher’s involvement in data generation	Fields/studies in which researchers are ”active participants in the research” would find Open Science practices problematic	4	24
							1		1		Data types diversity	Established data repository categories may be inadequate to capture the diversity of data types present in some fields, e.g. in qualitative research	4	22
							1		1		Methodological diversity	Diversity of methodologies, forms of evidence, and research settings may impede data sharing even within the same field.	4	24
						1	1		1		Contextual information availability	Qualitative data requires contextual information about the study wherein data were generated. Even when (some) context is provided, reuse may still be limited because a secondary researcher will not have first-hand knowledge of or experience in the original context of the study. But the full experience of the researcher will never be fully documentable, making exact replication impossible	4	25
					1				1		Participant approval to data reuse	The requirements of data sharing and data re-use may not be applicable in fields/studies where data use requires the consent of participants, and where the trust relationship with participants is foundational. Fully informed prior consent for reuse cannot be established, since all possible re-uses are unknowable. Sharing data without explicit consent may breach the trust between researcher and participant.	4	29
					1				1		De-identification risk	Data sharing is obviously impeded in fields in which the anonymity of participants needs preserving, and the risk of de-identification is significant, i.e. studies or fields	4	27

												in which data cannot be safely anonymised, and/or if properly anonymised it loses meaning.		
					1				1		Sensitive nature of data	All else equal, in studies/fields where data is highly sensitive in nature face greater risks in data sharing	4	28
1	1								1		Costs of anonymisation	The anonymisation of some types of data, especially qualitative, is time-intensive and costly.	4	28
			1						1	1	Awareness raising and training	Mentoring and training that respects epistemic diversity and helps develop community standards and open research practices is a facilitator. Conversely, fields (and institutions) that lack such training are less likely to successfully adopt open science practices.	4	35
			1						1		Disciplinary and epistemic differences	The understanding and application of reproducibility varies across disciplines (Cobey et al., 2023), and responsible and reproducible research manifests differently across fields and knowledge production modes.	5	5
			1		1				1		Interdisciplinarity adequateness	Research teams should reflect the breadth of academic disciplines and sectors they are studying and developing tools for. Else, they risk overlooking domain specific practices and producing "errors of interdisciplinarity," by which researchers have such limited awareness of another field that they unknowingly make incorrect assumptions and overlook hurdles for applicability and generalizability	5	6
			1		1					1	Stakeholder representativeness	Applied research should also involve representatives from stakeholder groups at whom the interventions are targeted, and actors across sectors should work together to co-create actionable interventions, taking motivation, opportunity, and capability into account	5	6
			1							1	Relevant knowledge	Differences in both "professional" characteristics, such as institutional affiliation, and "personal" characteristics, such as age, between scientists can contribute to their knowledge of reproducible and other responsible research practices	5	7
1		1								1	Access to resources	Differences in both "professional" characteristics, such as institutional affiliation, and "personal" characteristics, such as age, between scientists can contribute to their access to resources for reproducible and other responsible research practices	5	7
				1						1	Incentives for reproducible and other responsible research practices	Differences in both "professional" characteristics, such as institutional affiliation, and "personal" characteristics, such as age, between scientists can contribute to their incentives for reproducible and other responsible research practices	5	7
						1	1		1		maximum attainable replicability of studies	All else equal, reproducibility interventions are less cost-effective for fields/studies in which the replicability, i.e. the ability even in principle to repeat a study exactly, is lower.	6	NA

						1			1		expected degree of divergence of phenomena (conditions) of a study over time	All else equal, reproducibility interventions are less cost-effective to the degree that phenomena vary over time. Fields/studies with an expected rapid divergence of phenomena over time stand to benefit less from a given intervention.	6	NA
						1			1		expected degree of divergence of phenomena (conditions) of a study over space (populations, locations)	All else equal, reproducibility interventions are less cost-effective to the degree that phenomena vary over space – that is, over populations, countries, locations. Fields/studies with an expected rapid divergence of phenomena over space stand to benefit less from a given intervention.	6	NA
							1		1		expected degree of divergence of theories and methods across studies	All else equal, reproducibility interventions are less cost-effective to the degree that the theories and methods used are likely to vary across studies, due to low consensus and codification. Fields/studies with an expected rapid divergence of between-study methodology stand to benefit less from a given intervention.	6	NA
1									1		Value of the knowledge claim whose reproducibility is being increased	All else equal, the costs of an intervention must be compensated by the return on investment of the reproducibility intervention. The increase in information yield (similarity of effect size in replication vs original) resulting from the intervention must be sufficient to cover the costs of the intervention itself. Thus, fields/studies with lower information yield (higher noise, smaller effect sizes) stand to gain less from a give intervention.	6	NA
1	1		1						1		required frequency of application	Interventions (fields/studies) that require the repeated application of the same intervention for it to be effective stand to gain less from the interventoin itself. In other words, conditions or types of interventions that allow an intervention to be applied once and for all are favoured.	6	NA
1	1		1			1	1		1		Increase in similarity resulting from the intervention	The potential effectiveness of an intervention is the degree to which an intervention will reduce the divergence between replication and original study on some dimension (phenomenological or methodological). The greatest benefits are accrued when the divergence is initially maximal (similarity is zero) and the intervention removes it (bringing the similarity to one) on that dimension.	6	NA
								1	1		Epistemology	The epistemological orientation underlying a study critically influences whether forms of redoing and enabling are relevant and which kind of redoing might be appropriate.	7	13
							1	1	1		Systems of justification	A study's epistemology affects what system of justification the study entials, and thus if and what reproducibility criteria apply.	7	14
						1			1		Nature of the subject of investigation	The nature of the subject of investigation influences how research is conducted because it provides a set of conditions under which investigation has to take place and which aspects have to be taken into account during research, affecting whether and how reproducibility standards apply.	7	17

				1						1	Commercial or proprietary conflicts	Considerations about the goal and motivation behind a study, given by the specific context, provide important information about the situatedness of research that influences the relevance of redoing and enabling.	7	17
1		1							1		Necessary Investment	The kinds of instruments, technologies, procedures, and methods are used in studies within a specific context determine the necessary investment to conduct a study and realise certain practices.	7	18
	1									1	Time	Redoing and enabling require work and can often not be ensured or considered due to time constraints in the research system.	7	18
							1		1	1	Uncertainty	Uncertainty (theoretical and methodological) is the characteristic that situates the feasibility of redoing and enabling within the specific social conditions of the community of researchers who potentially are enabling or actually redoing something. Uncertainty is a community characteristic.	7	19

Table 2: The responses submitted by contributions made by stakeholders and how they fall into the nine-dimensional classification scheme.

		Resources			Receptivity			Relevance		
Question	**Which fields, methods or types of research, if any, do you think might be hindered by policies to increase reproducibility, how and why?**	funds	time	infrastructure	knowledge	incentives	regulations	stability	homogeneity	compatibility
1	I think at least the perception is that more qualitatively oriented approaches might be hindered more, e.g. within the humanities. (Some) researchers there do not identify with the term reproducibility and there are far less templates available for these researchers as to yet although they are there.				1					1
2	Fields with high variability in experimental conditions (biological variability), because it makes makes exact replication difficult							1	1	
3	Why qualitative research? Because of epistemic positions, but also the nature of work, socialisation, culture and norms, etc.				1	1	1			1
4	When it comes to Qualitative research and/or exploratory research (both quantitative and qualitative), blind application of reproducibility policies can be counterproductive. For example pre-registration is often impossible when the nature of the research is exploratory, however this could be mitigated by making it explicit in the preregistration that some part (or all) of the study is exploratory. Some data collection protocol might study phenomena that are not reproducible (e.g. unique events). In the end transparency is what is important and reproducibility can just be a derivative of transparency.							1	1	1
5	Low- and middle-income countries have limited resources for research, which may be a reason for the low reproducibility of research in some cases, especially when expensive devices are required, power shortages, and costly reagents are present.	1		1						
6	It will depend on the kind of "reproducibility policies" (they must be discipline-sensitive). For most humanities (especially history and philosophy), specific attention is needed!							1	1	1
7	Qualitative SSH research where repeatability is low.							1	1	

8	Large-scale collaborations, eg CERN, where "reproducibility" means different things to those typically assumed. See eg OpenMAPP project.							1	1	
9	all fields and types of research that build on positivist methodology and/or assume hypothesis-driven research to be default or superior									1
10	Depends on the policies and requirements; hopefully they will address differences of research types							1	1	1
11	fields: humanities, social sciences; types of research: non-hypothesis-driver research, qualitative research, constructivist approaches, exploratory research								1	1
12	Qualitative research and research in arts and humanities. Because many policies related to reproducibility assume a positivist epistemology.									1
13	qualitative social sciences, interpretive bioethics, anthropology, and participatory health research								1	1
14	Qualitative social sciences and humanities, if there is lack of tailored approaches								1	1
15	Hard to say. However, it may be more challenging for more qualitative-oriented research fields.								1	1
16	Qualitative research (esp. in humanities), research which heavily depends on working with people and collecting personal data.						1	1	1	
17	Social anthropology research							1	1	

Table 3: The responses submitted by contributions made by stakeholders and how they fall into the nine-dimensional classification scheme.

		Resources			Receptivity			Relevance		
Question	**Which demographic categories, if any, do you think might be hindered by policies to improve reproducibility, how and why?**	funds	time	infrastructure	knowledge	incentives	regulations	stability	homogeneity	compatibility
1	People from low-income countries.	1								
2	People who already experience extensive demands in the workplace and work-life conflict (e.g., parents).		1							
3	When reproducibility requirements/policies depend on software availability, infrastructure, capacity, resources (be it human or financial), resource-poor research performing entities are at risk. These may be single-person research groups, low income countries, small research institutions with underdeveloped support services, (some) early career researchers, researchers in disciplines where almost all resources are consumed by materials/equipment ... Hence a pledge for resource-sensitivity of reproducibility measures.	1	1	1						
4	Young researchers (e.g., PhD students) with supervisors that don't support reproducibility due to reasons such as the "publish or perish" mindset.				1	1				
5	Those for who data sovereignty is important, eg some indigenous peoples and those whose data, if shared openly, would be exploited in an 'extractive' way by organisations with better resources and infrastructure.						1			
6	Again depends on the exact nature of the policies and if tools/infrastructure/support is provided	1		1	1					
7	Some senior researchers feel hindered. For them it is more difficult to 'learn' how to work reproducibly, because they are older and because they grew up in a 'closed' system.				1	1				
8	Increase in reproducibility often means increase of workload for researchers. And this often affects junior researchers doing the "actual work" like doctoral students or postdoctoral researchers. It is easy to add more policies and requirements, without thinking that these mean more work and more efforts for the youngest members of our community. Research organisations should support reproducibility with further services (e.g. data curation services, reproducible software/coding help).		1	1	1					

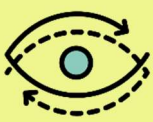
9	Many groups of qualitative researchers due to working in research methodologies where reproducibility does not apply								1	1
10	Policies and tools must be accessible to researchers with disabilities.		1	1						
11	Generally all researchers as more resources will be needed, and they will not be provided in all settings - obviously. Especially ECRs and other precarious groups.		1							
12	researchers in low-resource countries and settings	1		1						
13	All kinds of vulnerable people (minorities, stigmatised, politically oppressed, etc)						1			
14	Early-career researchers and researchers in underfunded research systems, as they may have less access to support staff and other tools, increasing the burden on the researcher. Maybe also smaller researchers in smaller institutes for a similar reason.		1	1						
15	Especially people from low and middle income countries, but within Europe also from countries situated in the south/east where resources are generally lower.	1		1						
16	Underfunded researchers who do not have the time or means for making research fully reproducible (also due to lack of incentives for reproducible research)	1	1	1		1				
17	I believe that for increased reproducibility, there should be the necessary resources (e.g., time, experience). Thus, all groups with diminished resources may face a challenge.		1		1					
18	Likely to be the usual list of those disadvantaged in the research system: early career researchers, global south, minoritised and marginalised researchers... Because they may lack access to the resources that the policies assume are available.	1	1	1						
19	Policies that are not sensitive to disciplinary norms and/or cultural practices can create disparities				1	1	1		1	1
20	LMI countries, because of lack of resources to implement policies	1	1	1						
21	Potentially lower and middle income countries	1	1	1						
22	ECRs as they need specific training.				1					

References that yielded relevant elements

1. Kozula, M.; DeVito, N. J.; Onghena, P.; Colombo, C.; Dudda, L.; Teno, P. M. and den Eynden, V. V. (2023). What helps and hinders reproducible research? Researchers' perspectives from a cross-disciplinary interview study, working paper produced within the OSIRIS project, avilable at: https://osf.io/5w7y4/files/exy5f
2. Ross-Hellauer, T.; Reichmann, S.; Cole, N. L.; Fessl, A.; Klebel, T. and Pontika, N. (2022). Dynamics of cumulative advantage and threats to equity in open science: a scoping review, Royal Society Open Science 9.
3. Horbach, S. P. J. M.; Cole, N. L.; Kopeinik, S.; Leitner, B.; Ross-Hellauer, T. and Tijdink, J. (2025). How to get there from here? Barriers and enablers on the road towards reproducibility in research, working paper produced within the TIER2 project, DOI: 10.31222/osf.io/gx9jq_v1.
4. Reproducibility and replicability of qualitative research: an integrative review of concepts, barriers and enablers Nicki Lisa Cole, Sven Ulpts, Agata Bochynska, Eva Kormann, Matthew Good, Barbara Leitner, Tony Ross-Hellauer
5. Salholz-Hillel, M. and Zellers, S. (2025). D3.1 Embedding and mainstreaming EDI considerationsinto efforts to improve reproducibility: Interim guidelinesand reflections from meta-research, iRISE Report.
6. Fanelli, D.; Domotor, E. and Maniadis, Z. (2026). Towards a theoretical framework for reproducibility: contextualisingthe costs and benefits of interventions using Information Theory, unpublished working paper, produced within the iRISE project .
7. Knowledge Production Modes: The Relevance and Feasibility of Reproducibility, working paper produced within the TIER2 project, DOI: 10.31222/osf.io/ujnd9.

Authors: Daniele Fanelli

Editor: Daniele Fanelli



TRUSTparency