

# The Varying Openness of Digital Open Science Tools

[doi.org/10.12688/f1000research.26615.1](https://doi.org/10.12688/f1000research.26615.1)



**Louise Bezuidenhout**

[orcid.org/0000-0003-4328-3963](https://orcid.org/0000-0003-4328-3963)

&

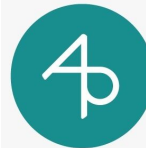


**Jo Havemann**

[orcid.org/0000-0002-6157-1494](https://orcid.org/0000-0002-6157-1494)



**Institute for Science,  
Innovation and Society**  
University of Oxford



Access 2  
Perspectives

# Outline

**Intro:** Digital OpenScience Tools (DOSTs) and their role in the research workflow

**Problem Identification:** Key restrictions to unlimited openness of DOSTs

**Overview of Project:** Mapping and key findings

**Findings:** Limitations to an “unlimited digital commons” in DOSTs

**Q&A & group discussion**

# Open Science

*“Open Science encompasses a collection of activities, principles and tools oriented at making scientific research accessible to all levels of society proposed to increase transparency and efficiency in research workflows and scholarly publishing.”*

[Rahal and Havemann, 2019](#)

**Open Access**

**Open Peer Review**

**Open Data**

**Open Methodologies**

**Free and Open Source Software**

**Open Hardware**

**Open Educational Resources**

**Citizen Science**

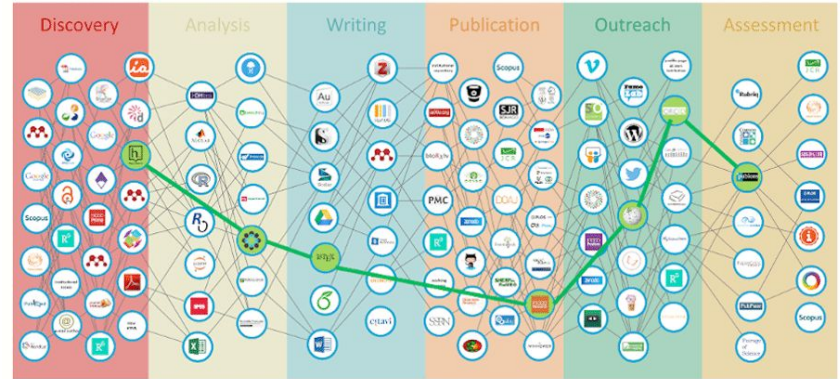
# Open Science Ecosystem

- **Evolution of the digital infrastructures**, tools and online working practices that underpin open research activities
- **Digital tools are a ubiquitous** part of Open Science
- Online applications assist researchers to **share and collaborate, and thus increase openness and transparency** at all stages of the research lifecycle.
- Many tools have **changed the way that research is done** and how research resources – including datasets, publications, educational resources and software – are **circulated globally**
- Lack of **critical evaluations** of the evolving landscape

# Digital Open Science Tools (DOSTs)

doi: [10.12688/f1000research.8414.1](https://doi.org/10.12688/f1000research.8414.1)

**= any digital tool (for-profit, non-profit and community-led) used in open research, irrespective of whether they were designed explicitly for Open Science or have been co-opted into Open Science practices.**



underlying values

financial models

language choices

geographical location

user communities



# The Evolution of DOSTs

## Highly variable development of DOSTs

- **Structure** of organization managing development and roll-out
  - commercial, NGO, community, institutional, project-funded academic
- **Funding** for activities
  - grants, subscription, commercial company investment, volunteer
- **Geographic location** of DOST registration and of funding organizations
- **Language** of activity and the interface
- **Recruitment strategies** to build user communities
  - bottom-up community endorsement, advertising, integration with other DOSTs or commercial endorsement
- **Scope**
  - disciplinary - specific or generic
- **Purpose**
  - pragmatic, idealistic, user need-driven
- **Power dynamics**
  - high-profile user communities, funders, government support

# Key Questions to Ask of DOSTs

1. **What is the impact** of a small number of countries dominating DOST design and deployment?
2. Do **heterogeneities in values, funding, and stakeholders** that influence tool design and interconnection affect the openness of the DOST ecosystem?
3. How (if at all) are **external power dynamics and influences** recognized and addressed in the DOST ecosystem

# Mapping the DOST Landscape

[Link to dataset \(Spreadsheet\);](#)  
doi: [10.5281/zenodo.4013811](https://doi.org/10.5281/zenodo.4013811).

Label	Workflow step	OS Category	Host organization (where)	Reliant on other DOSTs	URL	Description
Mendeley Data	Analysis	open data	Elsevier	none mentioned	<a href="https://data.mendeley.com/">https://data.mendeley.com/</a>	Mendeley Data is an
Digital Commons	Assessment	open access	Elsevier	none mentioned	<a href="https://www.elsevier.com/digitalcommons">https://www.elsevier.com/digitalcommons</a>	Institutional repository
Pure	Assessment	Open Science	Elsevier	none mentioned	<a href="https://www.elsevier.com/pure">https://www.elsevier.com/pure</a>	Research information
Research Metrics	Assessment	Open Science	Elsevier	none mentioned	<a href="https://www.elsevier.com/researchmetrics">https://www.elsevier.com/researchmetrics</a>	A comprehensive suite
Plum Analytics	Assessment	Open Science	Elsevier	none mentioned	<a href="https://plumanalytics.com/">https://plumanalytics.com/</a>	uses research metrics
ScienceDirect	Discovery	open access	Elsevier	none mentioned	<a href="https://www.science.com/">https://www.science.com/</a>	Explore and read peer
Mendeley	Discovery	Open Science	Elsevier	none mentioned	<a href="http://www.mendeley.com/">http://www.mendeley.com/</a>	reference manager
SciVal	Outreach	open data	Elsevier	none mentioned	<a href="https://www.elsevier.com/scival">https://www.elsevier.com/scival</a>	Visualize research performance
SSRN	Publication	open access	Elsevier	none mentioned	<a href="https://www.ssrn.com">https://www.ssrn.com</a>	SSRN is an open-access
Labfolder	Analysis	open methodology	self-hosted	none mentioned	<a href="https://www.labfolder.com/">https://www.labfolder.com/</a>	Electronic Lab Notebook
DataCite	Discovery Outreach	open data	self-hosted	Re3Data	<a href="https://www.datacite.org/">https://www.datacite.org/</a>	provides DOIs for research
Paperhive	Assessment	open access	self-hosted Paperhive	none mentioned	<a href="https://paperhive.org/">https://paperhive.org/</a>	co-working hub
Elsevier	Publication	Open Science	RELX Group	none mentioned	<a href="https://www.elsevier.com/">https://www.elsevier.com/</a>	publisher
ROAD	Publication	open access	ISSN International Centre	none mentioned	<a href="http://road.issn.org/">http://road.issn.org/</a>	ISSN directory of OA
Citavi	Writing	open access open source software	self-hosted	none mentioned	<a href="https://www.citavi.com/">https://www.citavi.com/</a>	Reference manager
Figshare	Discovery	open access open data	Digital Science	none mentioned	<a href="http://www.figshare.com/">http://www.figshare.com/</a>	Repository
Digital Science	Discovery	open access	Digital Science	none mentioned	<a href="https://www.digitalscience.org/">https://www.digitalscience.org/</a>	Open tools host
Overleaf	Writing	open access open source software	Digital Science	Latex	<a href="https://www.overleaf.com/">https://www.overleaf.com/</a>	collaborative latex tool
Gigascience	Publication	open access open data	Oxford University Press	GitHub	<a href="https://academic.oup.com/gigascience">https://academic.oup.com/gigascience</a>	journal
Qeios	Publication	open access	Qeios	none mentioned	<a href="https://www.qeios.com/">https://www.qeios.com/</a>	collaboration software
Digital Science	Discovery	Open Science	self-hosted	none mentioned	<a href="https://www.digitalscience.org/">https://www.digitalscience.org/</a>	software tools
F1000	Discovery Assessment	open access	self-hosted	F1000prime F1000workspace F1000	<a href="https://f1000.com/">https://f1000.com/</a>	discover new research
AuthorEA	Writing	open access	Authorea	none mentioned	<a href="http://www.authorea.com/">http://www.authorea.com/</a>	open publishing platform
Google Scholar	Discovery	open access	Google	none mentioned	<a href="http://www.scholar.google.com/">http://www.scholar.google.com/</a>	Search engine
Google Docs	Writing	Open Science	Google	none mentioned	<a href="http://www.docs.google.com/">http://www.docs.google.com/</a>	writing tool
Paperspace	Analysis	open source software	Independent	GitHub	<a href="https://www.paperspace.com/">https://www.paperspace.com/</a>	Cloud platform
RefWorks	Writing	open access	ProQuest	none mentioned	<a href="http://www.refworks.com/">http://www.refworks.com/</a>	content host



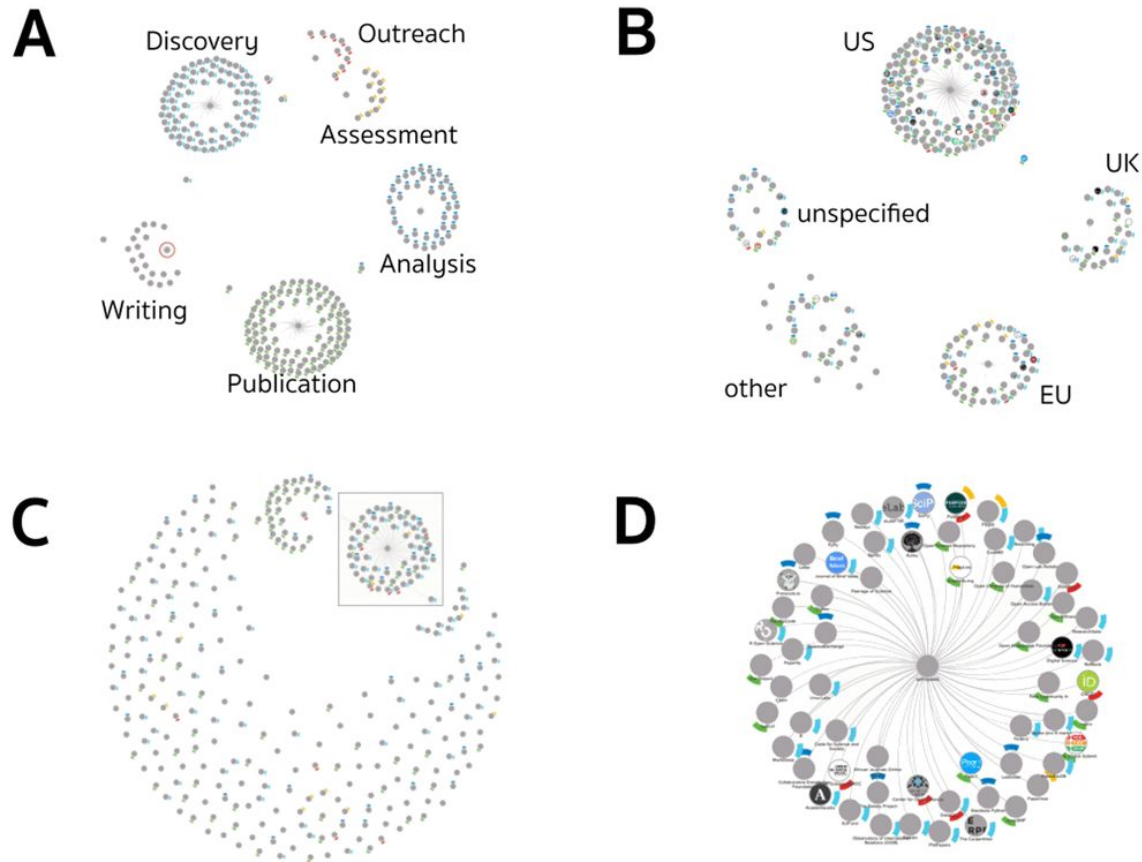
# Findings

## Key pressures on the DOST ecosystem.

Attributes	Elements	Impact on OS ecosystem
Objectives driving tool creation	Business models, investment, venture capital, grants, philanthropy, profit, community activities	Influence on design decisions Longevity
Recruitment of user community marketing	Word of mouth, advertising, sponsorship, mandated by funder, institution, government, disciplinary community	Evolution of user community Prioritisation of tool over competitors, alternatives
Integration with other tools	Intentional design to connect with specified tools, widespread adoption into other tool designs, community-evolved connections	Interoperability
Host	Host organization, host country	Requirements and expectations of host, political constituency, interruption through economic sanctions
Regulations and legislation	Location-specific legislation, selection of regulation, oversight of activities	Financial legislation Oversight and mandated practice Selection of other codes, regulations, requirements
Materialities and infrastructures	Reliance on underlying digital landscape and information and communication technologies	Integration into digital landscape Financial/technical resources required to effectively use tool
Systems of thought	Social and political values, rationales	Endorsement and influence by capitalism, democracy, egalitarianism, socialism
Specified practice	Data formats, language, software systems	Need for data standards, file formats, user language, etc

# Findings

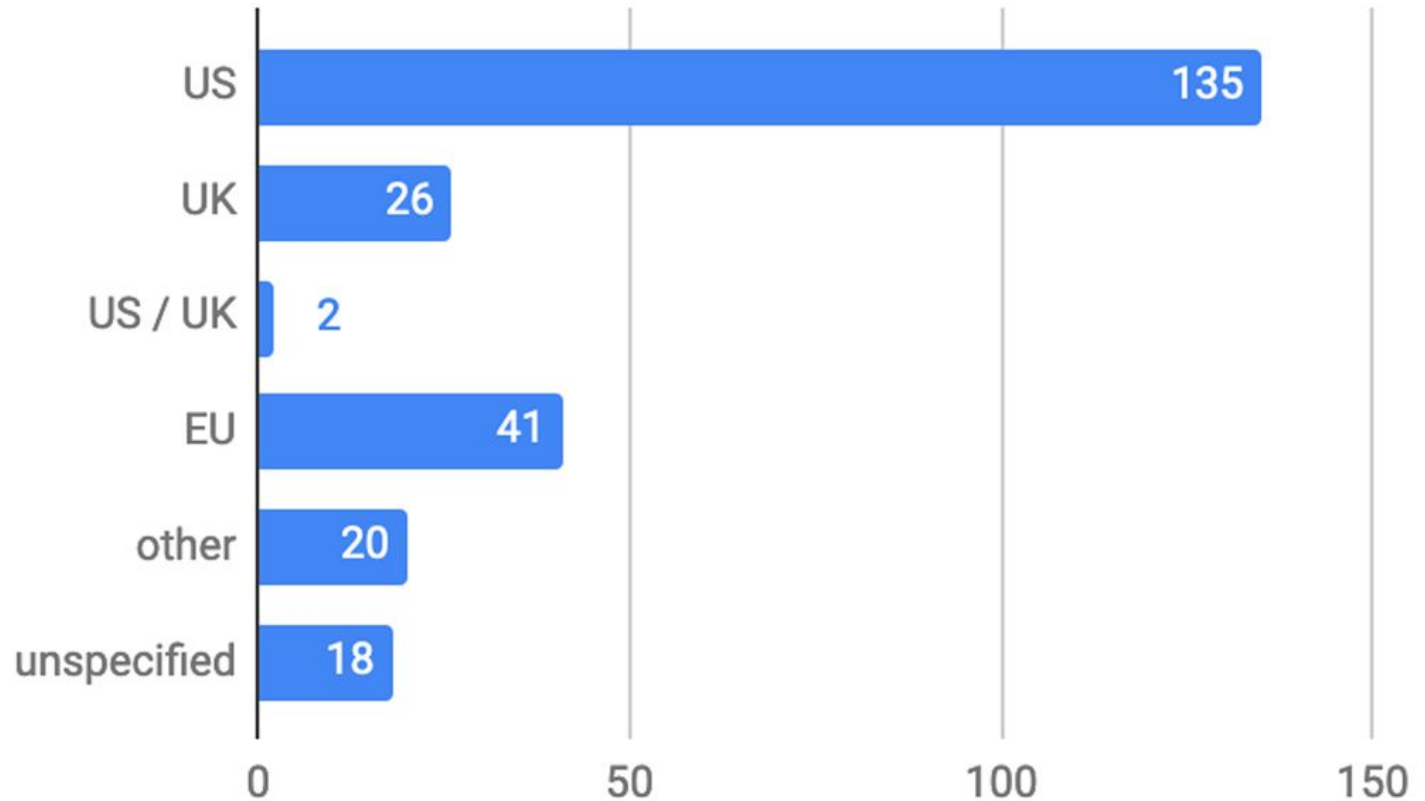
## Visual map using the software Kumu.io



**A)** Clustering overview of all tools sorted by workflow step (url: <https://kumu.io/a2p/dost#dataset/workflow-step>); **B)** Clustering overview by geographical location of the tool or the respective host institution (url: <https://kumu.io/a2p/dost#dataset/workflow-step>); **C)** Clustering overview by host institution for the tool (url: <https://kumu.io/a2p/dost#dataset/host>); **D)** Focus view on self-hosted tools – closeup from square in **C)**.

# Findings

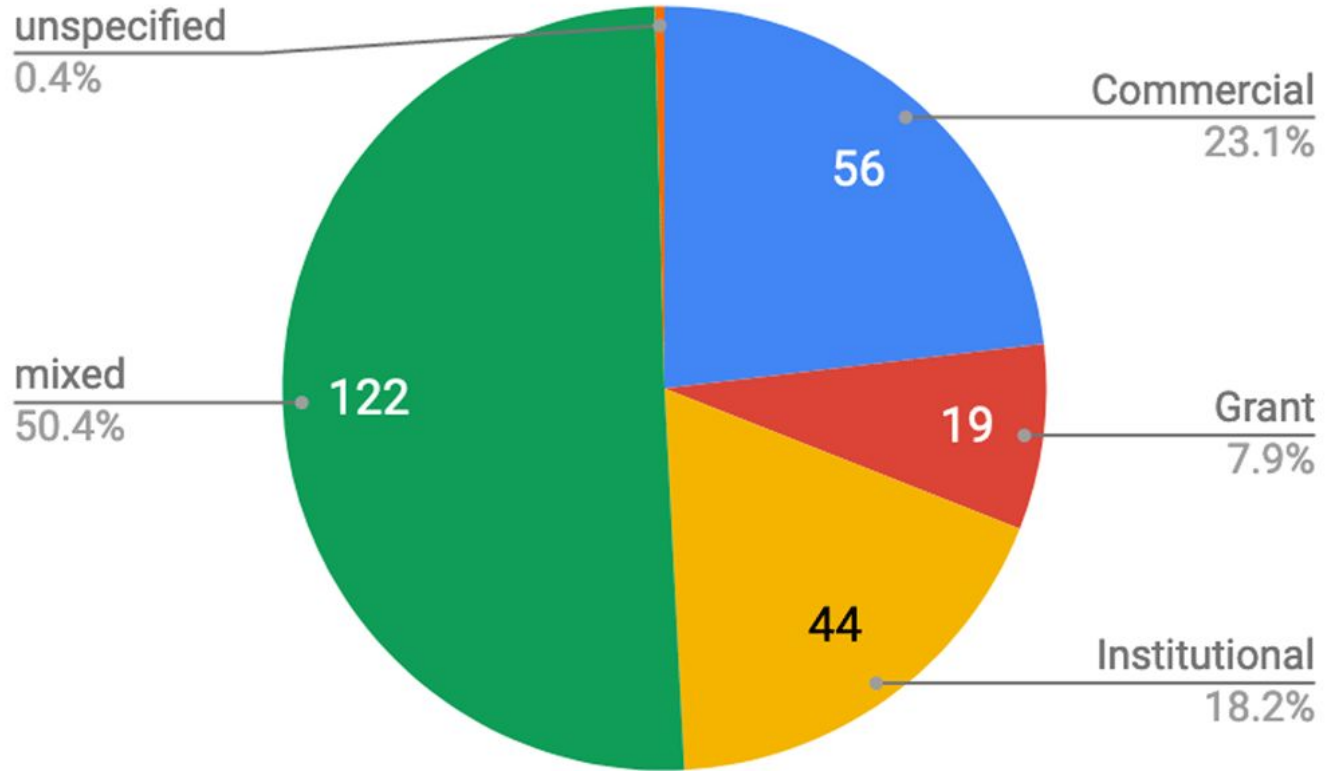
**Number of tools per host location.**



Regions displayed are the United States of America (US), the European Union (EU), the United Kingdom (UK) and other parts of the world with concentration on US territory. 'Other' includes Argentina (n=1), Australia (n=2), Brazil (n=1), Canada (n=7), Colombia (n=1), Mexico (n=1), South Africa (n=1), Switzerland (n=5), with a total of n=242.

# Findings

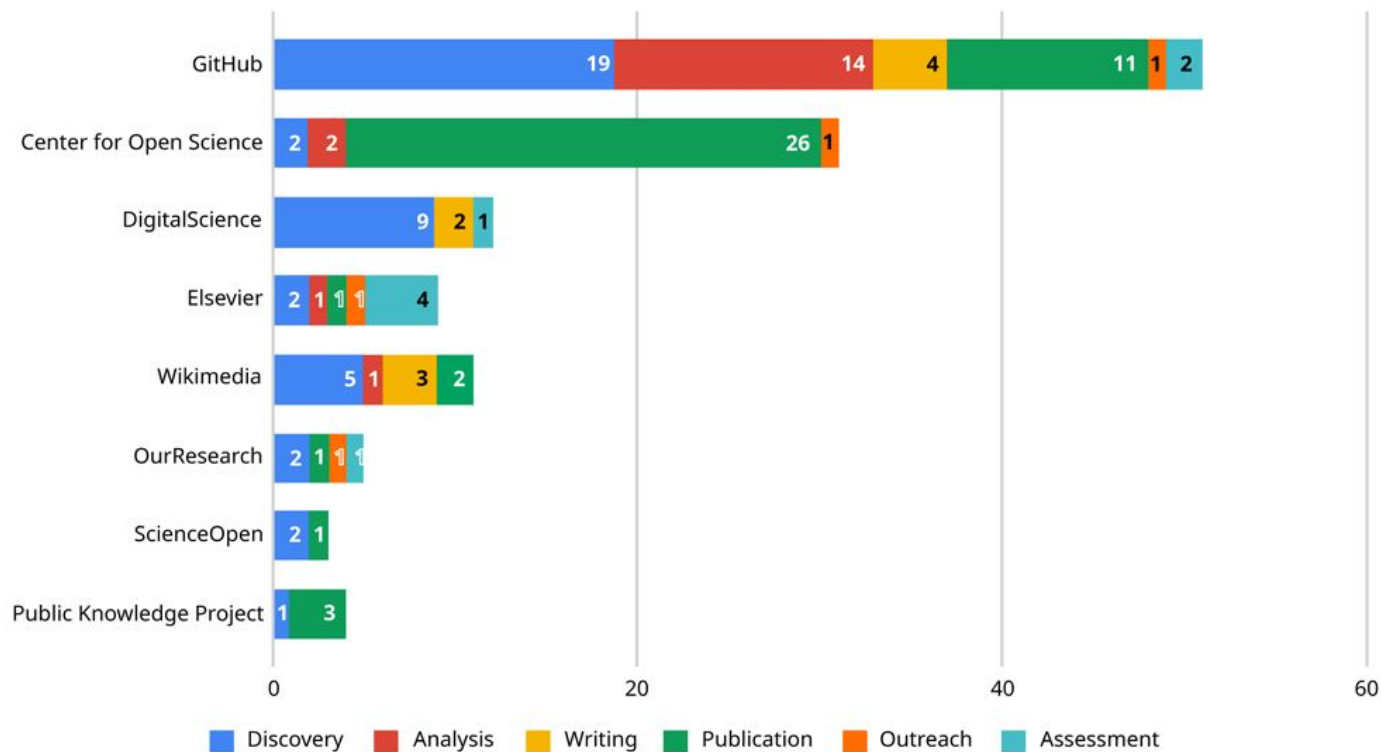
## Illustration of the funding models of DOSTs.



The funding sources for the respective tools were classified as a) Commercial (n=56, 23.1%); b) Grant (n=19, 7.9%); c) mixed (commercial and grant, n=122, 50.4%), and d) Institutional (n=44, 18.2%). 0.4% of the tools (n=1) had no funding source specified. n=242.

# Findings

Tool providers across workflow showing the number of tools per workflow step.



# Findings

Example T&Cs of two entities within the OS ecosystem.

DOST	Statement in T&Cs	Notes
GitHub	<p>You may not use GitHub in violation of export control or sanctions laws of the United States or any other applicable jurisdiction. You may not use GitHub if you are or are working on behalf of a <b>Specially Designated National (SDN)</b> or a person subject to similar blocking or denied party prohibitions administered by a U.S. government agency. GitHub may allow persons in certain sanctioned countries or territories to access certain GitHub services pursuant to U.S. government authorizations. [...] To comply with U.S. trade control laws, GitHub recently made some required changes to the way we conduct our services. As U.S. trade controls laws evolve, we will continue to work with U.S. regulators about the extent to which we can offer free code collaboration services to developers in sanctioned markets. We believe that offering those free services supports U.S. foreign policy of encouraging the free flow of information and free speech in those markets<sup>18</sup>.</p>	<p>The countries affected are Crimea, Cuba, Iran, North Korea, and Syria. There have been reports of access to GitHub being blocked in these countries.</p>
Center for Open Science	<p>The COS is based in the United States. The COS makes no claims that the data or content on its Websites or Services is appropriate or may be downloaded outside of the United States. Access to the Websites and Services may not be legal by certain persons or in certain countries... . You may not use the Websites or Services to violate any applicable local, state, national, or international law, including without limitation any applicable laws relating to antitrust or other illegal trade or business practices, federal and state securities laws, regulations promulgated by the U.S. Securities and Exchange Commission, any rules of any national or other securities exchange, and any U.S. laws, rules, and regulations governing the export and re-export of commodities or technical data<sup>19</sup>.</p>	<p>The T&amp;Cs for the COS are hosted on GitHub, which makes access to the T&amp;Cs from US-sanctioned countries difficult.</p>

# Unequal Levels of Openness

- Tools may be uncritically integrated into the ecosystem causing existing power dynamics to be perpetuated, leading to the marginalization of certain user groups
- Governments and commercial companies have undue influence on the landscape due to their hosting, financing, and otherwise influential roles
- The existing DOST ecosystem may become prescriptive of a specific way of “doing”, as one tool becomes hyper-dominant

# Critiquing the Notion of a “Digital Commons”

- The **heterogeneity of the actors**, power dynamics and stakeholders that are currently driving and dominating the evolution of the DOST ecosystem
- We cannot simply assume that the **resultant ecosystem will automatically reflect and perpetuate the core values** of open science
- A range of different **factors inherent within DOST design** create a landscape that continues to perpetuate marginalization and exclusion
- Undermines **the ideal of a “digital commons”** that provides unlimited access to shared resources



# Key Considerations for DOST Creators and Users

- Thinking about DOST design in terms of **Responsible Research and Innovation (RRI)**
- Need to consider what an RRI model for Open Science tools could look like:
  - how to foster a free and open “ecosystem” when the OS tools are generated by a diversity of actors - NPO, NGO, governmental, commercial, volunteer) that can hold highly divergent values while supporting Open Science
- DOST community has the history, expertise and perspectives to address these issues. Need to ask:
  - How they guide and adapt the ecosystem that is rapidly changing research
  - How Open Science responsibilities can be reframed - from contributing labour and data to discussing the complex power dynamics underpinning the evolving ecosystem

# Thank you for your interest in our work!



Contact:



[info@access2perspectives.com](mailto:info@access2perspectives.com)



Lou: @loubezuidenhout

Jo: @openscicomm

