

Evaluation of Open Science practices: main challenges and future avenues to develop a cost-benefit analysis framework

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Overview

1. Defining Open Science
2. Motivation and Literature
3. Developing a framework of OS-specific CBA
4. Conclusion

Overview

1. Defining Open Science

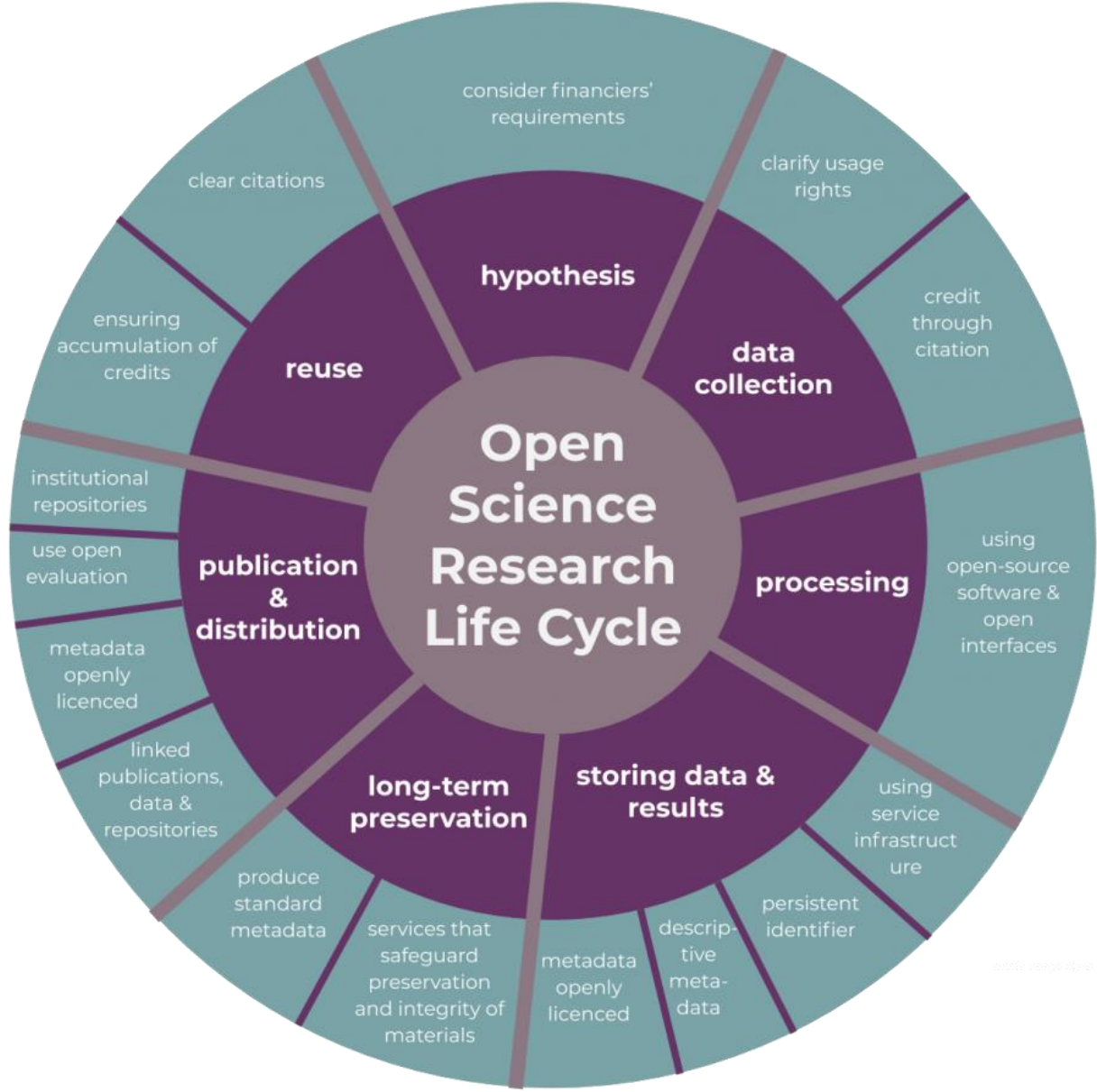
2. Motivation and Literature

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What is Open Science?

“efforts— by researchers, governments, research funding agencies or the scientific community itself—to make the primary output of publicly funded research more widely accessible in digital format to the scientific community, the business sector, or society more generally.” OECD (2015)



The rationale for Open Science

- **Efficiency** and **reliability** in research
- **Innovation** aligned with **societal needs**
- **Public trust** and **public engagement**

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Motivation

- **Global Trend:** Many institutions adopting OS policies globally
- **EU Commitment:** OS is a policy priority in the EU policy agenda
- **Challenges Ahead:** OS faces challenges, especially due to limited evidence of its economic impacts.

Literature review identifies few relevant papers

- Some positive indications of the potential of OA and Open/FAIR data to power economic activity, but largely without rigorous quantification ([Fell, 2019](#))
- User challenges on exploiting the shared knowledge ([Houghton et al., 2011](#); [Johnson et al., 2017](#); [Fell 2019](#))
- The social costs are not always extensively discussed ([Fell, 2019](#))

Literature

What is missing:

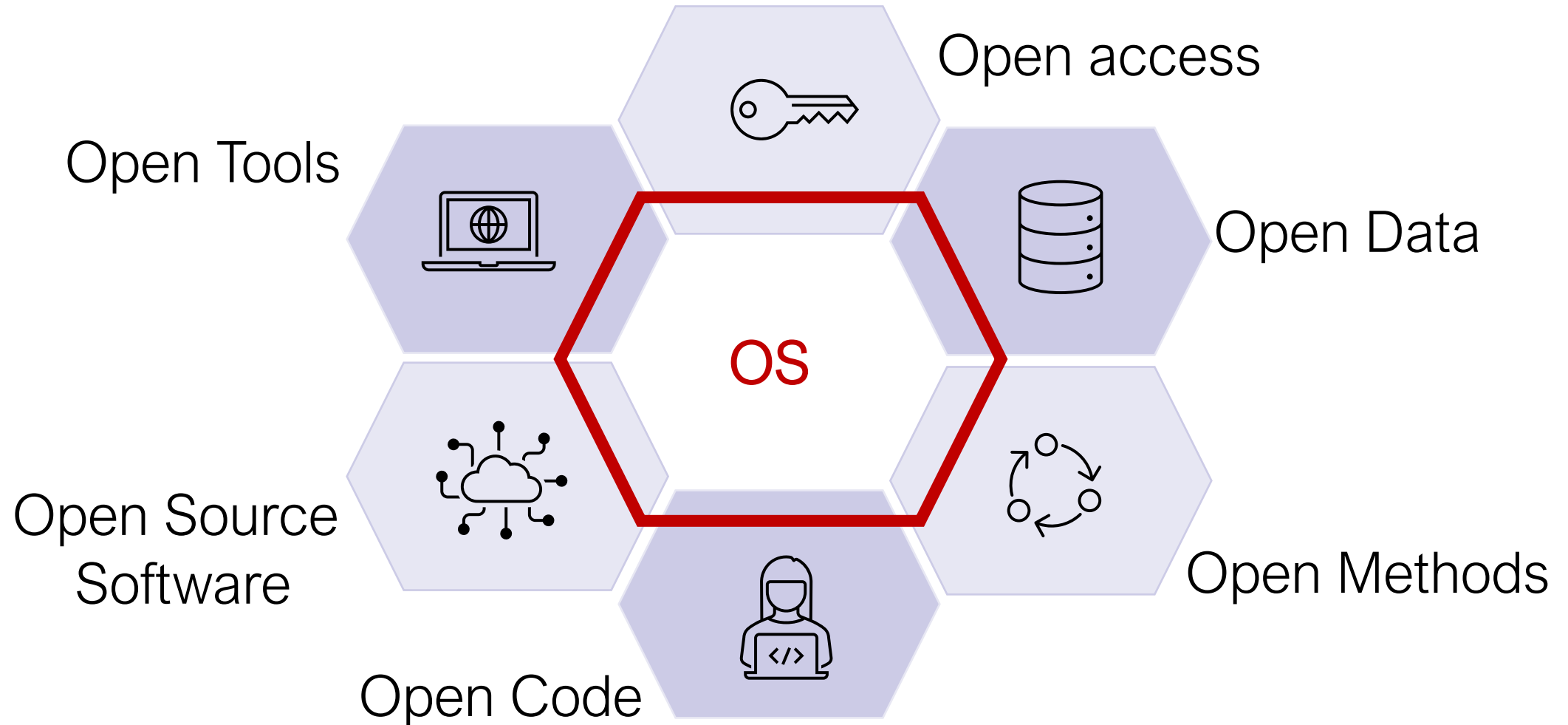
A framework to classify social costs & benefits that ensures reproducibility and requires incremental evaluation – counterfactual approach.

PathOS project

Understanding and quantifying the impacts of OS on academia, society, and economy.

- Identifying the causal pathways of OS using a data-driven approach
- **Creating a framework for OS-specific CBA**
- Fostering inclusive dialogue with policy and decision-makers to align research and innovation to society needs

Open Science Practices of Interest



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The CBA of OS: main challenges at stake

- Delineating the **boundaries** of a single OS practice can be more challenging than tangible services
- Attribute costs and benefits across multiple actors (the risk of **double counting**)

Social Cost Classification

Investment costs

- Planning and design
- Tangible and intangible assets acquisition
- IT and other equipment purchase
- Utilities consumed during the setup phase (e.g., energy)
- Start-up costs
- Scientific, technical, and administrative personnel
- ...



To be fine-tuned during Pathos project

Operating costs

- Scientific, technical, and administrative personnel
- Ordinary maintenance
- Utilities consumption
- Services purchased from third parties
- Environmental protection measures
- General management and administration
- ...

Social Benefit Classification

Efficiency gains



To be fine-tuned during Pathos project

Access cost savings

Accessing scientific outputs for free



Labour cost savings

Saving the time of producing the same output



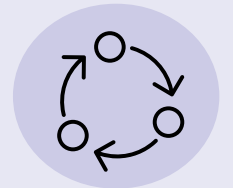
Storage cost savings

Availability of open repositories affects store habits of researchers



Transaction cost savings

Time and the money saved for agreements and procedure to access data



Social Benefit Assessment

- Stated preferences techniques are a viable approach to measure efficiency gains through willingness-to-pay
- WTP refers to the monetary amount individuals are willing to pay to enjoy a particular benefit or avoid a certain cost.

Using stated preferences to estimate the value of OS

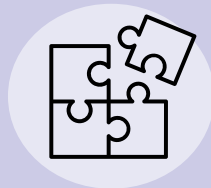
- Value of data repositories in different fields by UK research data centres ([Beagrie and Houghton 2014](#))
- Impact assessment of the European Bioinformatics Institute data and services using a CV approach to quantify the WTP for having the services and WTA to forego them ([Beagrie and Houghton, 2016, 2021](#))
- Research Collaboratory for Structural Bioinformatics protein data bank operating at Rutgers University and the University of California San Diego ([Sullivan et al., 2017](#))
- The value and impact of Nectar Virtual Laboratories ([Sweeny et al., 2017](#))
- Socio-economic impact and a cost-benefit analysis of a European Research Infrastructure for Heritage Science ([Vignetti et al., 2019](#))
- Benefit of the OpenAIRE project (Open Access Infrastructure for Research in Europe) ([Koundouri et al., 2021](#))

Others Social Benefits

Enablement Benefits – not entirely directly caused by OS

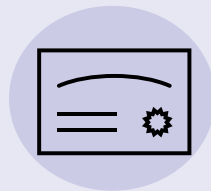
New products and services

New products and services are enabled by knowledge spillovers



Patents

Increased patent registration of innovative products, services, and technologies



New companies

The OS environment enables new ecosystems of companies



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To sum up

The framework meets the demand for evidence of the OS socioeconomic impacts

- **Very early stage of a long journey:** benefits, costs and assessment methods will be tested during the case study phase of PathOS
- **Ambitious goal:** going beyond what has been done until now in literature
- **Aware of practical challenges**

Thank you

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