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What's Next:

which parts of open science can grow bigger in the coming years

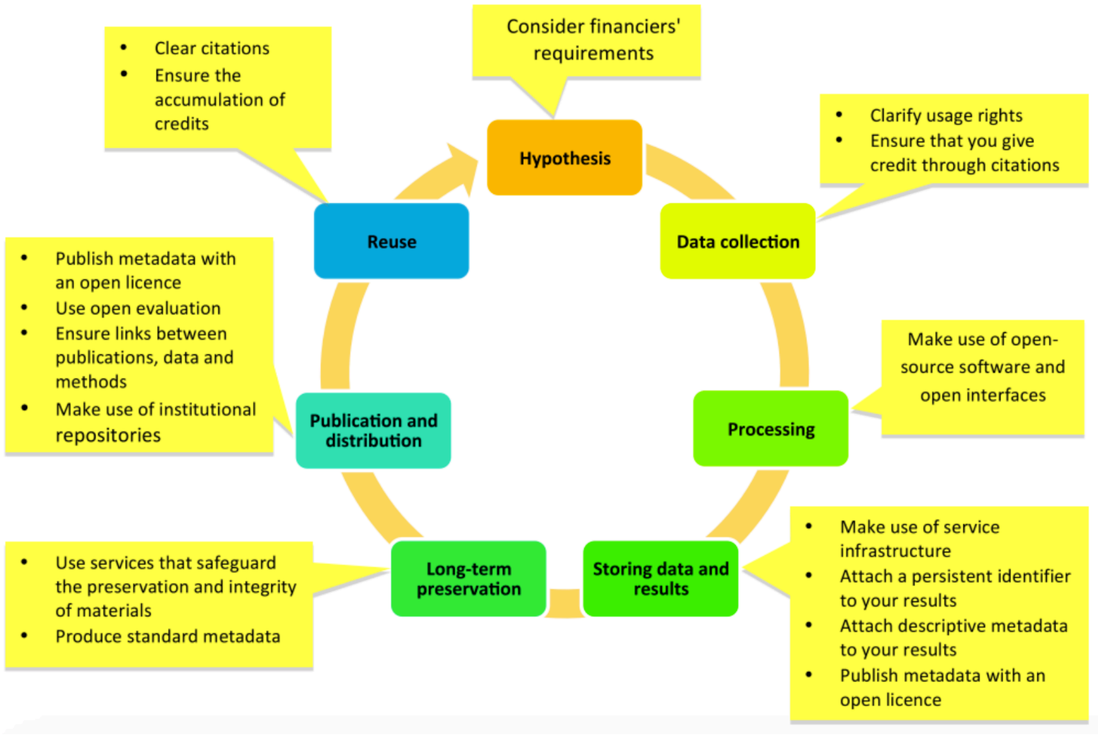
(and how we can help them grow)?

Open Science definitions by Foster

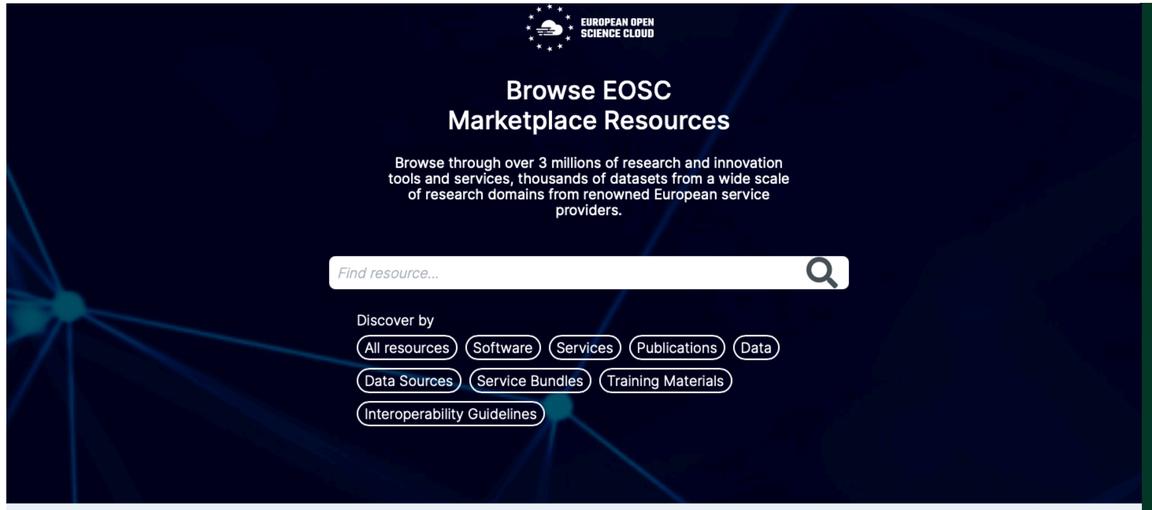
„(…)but it is more than that. Open Science is about extending the principles of openness to the whole research cycle (see figure 1), fostering sharing and collaboration as early as possible thus entailing a systemic change to the way science and research is done.” (Foster Portal, 2018)

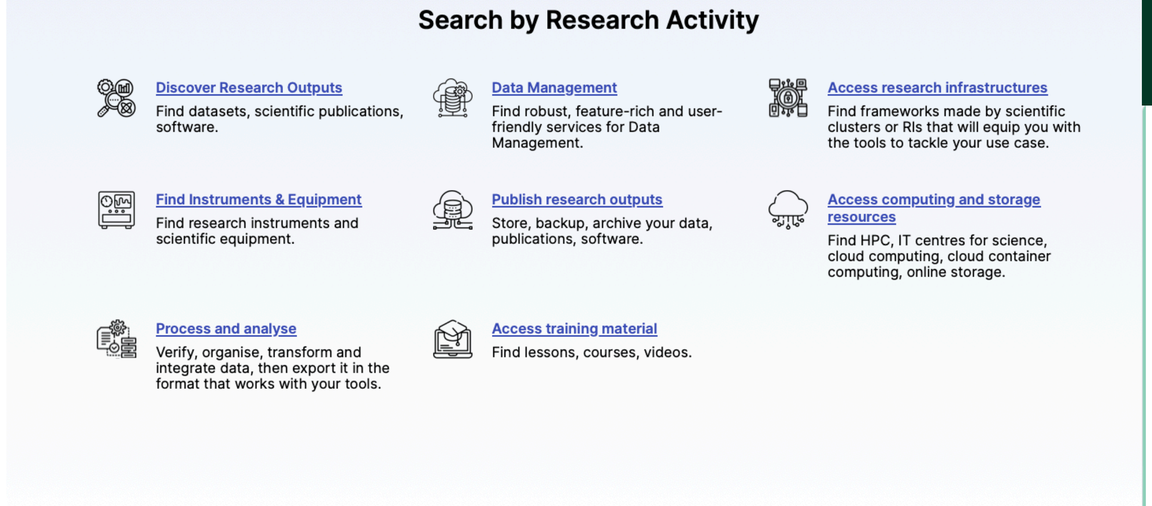
- „a new approach to the scientific process based on **cooperative work** and new ways of diffusing knowledge **by using digital technologies and new collaborative tools**” (European Commission, 2016b:33)

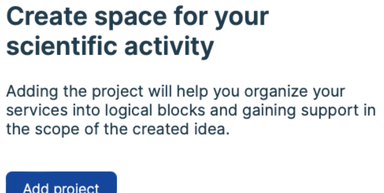
- “to make the primary outputs of publicly funded research results – publications and the research data – **publicly accessible in digital format** with no or minimal restriction” (OECD, 2015:7)



Promoting openness at different stages of the research process by Open Science and Research Initiative (ATT), 2014







Starting point for our story:

EOSC Marketplace

The **EOSC Marketplace** is an integrated platform that allows easy access to multiple services and resources for various research domains along with integrated data to support daily routine in the scientific process.

2018 (2016) - now

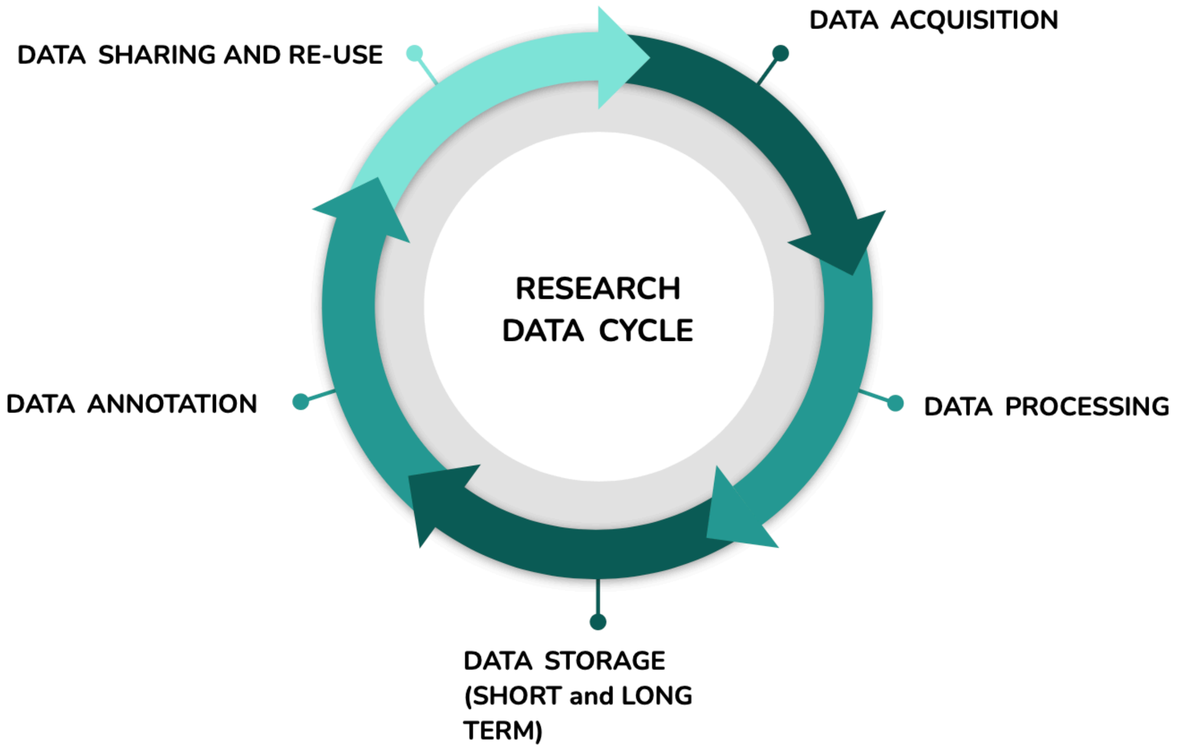
Horizon 2020, Horizon Europe projects

Practical, pragmatic and user-centric approach

Data in the Service of Science and Society

10-12.04.2024 Cracow, Poland

Which led to:
Research Data Life-Cycle

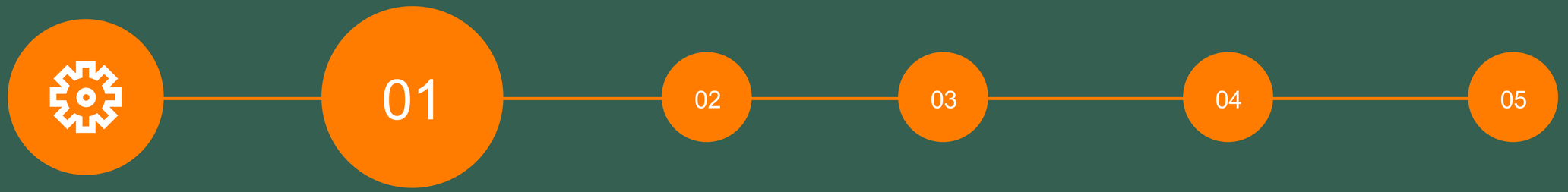


To make the science-making more efficient, we decided to automate as much as possible the research data cycle. It's impossible without following the open science paradigm.

Let's see why. User-centric approach was the key….

Take a closer look at the

Research Data Management Process



Data Acquisition

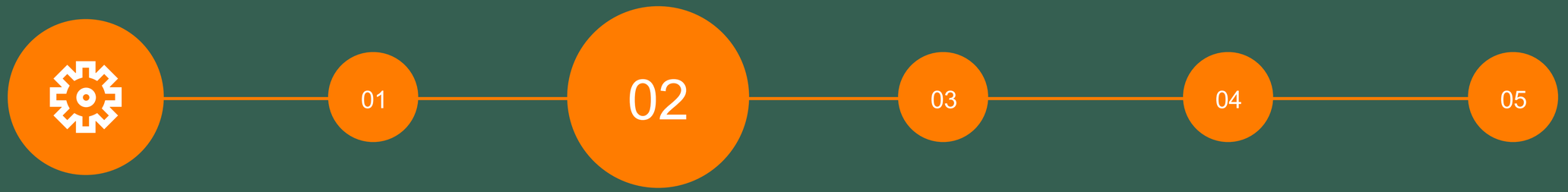
Produce or **find and reuse** data for your research

Open data makes this step much faster and cheaper. Necessary circumstances:

- Publicly available metadata allowing data discovery
- Development of policies and licences following the needs and different use-cases of the possible data sharing
- Training the researchers on how to effectively find data
- Common metadata standards
- Metadata stadards recognise multiple dimensions of data annotation
- Open science policies in Research Infrastructures supporting sharing the data produced in experiments hosted on their premises

Take a closer look at the

Research Data Management Process



Data Processing

Produce data for your research using domain-specific services and e-infrastructures

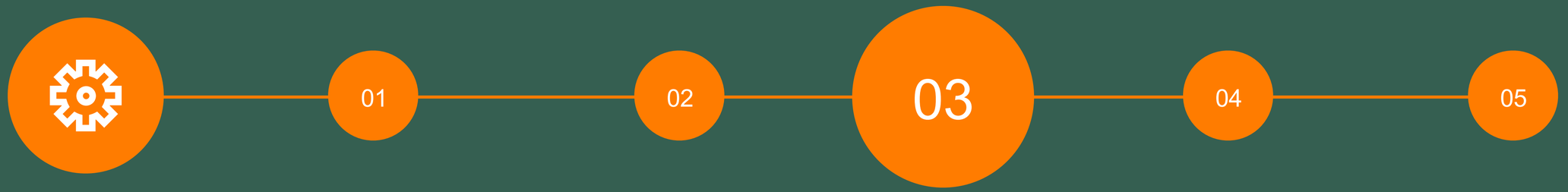
Open infrastructures and services give researchers necessary (new) tools to deliver more precise results much faster

Necessary circumstances:

- Repositories (metadata implemented) must acknowledge the infrastructures to support interoperability
- Researchers know about the infrastructures
- The funding mechanism should recognise the soon-to-be default role of research and e-infrastructures in the research processes. Accounting mechanisms can play a key role in the reporting stage.

Take a closer look at the

Research Data Management Process



Data Storage

Store your data in the processing pipe-line and preserve relevant results

Free* access to storage capacity is a must in a world of big data and data-sharing on all data levels. Open-hardware notion may help that happen.
Necessary circumstances:

- Sharing experience in creating efficient storage infrastructures and data transfer techniques
- Sustainable (supported by government) storage infrastructures
- Adequate business model for scientific society to leverage storage capacities
- Consistent and effective policies for long-term data preservations
- New technologies allowing to store more data on the same* storage infrastructure

Take a closer look at the

Research Data Management Process

Data Annotation

Give your newly-created data information on all relevant dimensions. Domain-specific, technical provenience, technical properties, interoperability aspects, relevant for reporting etc. It’s a lot, we know, but be thorough.

That’s simply the key. Without it, we’re lost. Necessary circumstances:

- Knowledge among researchers how to do it
- Cultural - change preferably initiated by good incentives to start doing it
- Common metadata standards
- Constant cross-disciplinary exchange of knowledge and cooperation
- Techncial support by e.g. meta-data crosswalks

Take a closer look at the

Research Data Management Process

Data Sharing and Re-Use

Choose the right place (repository) and publish you data metadata for the sake of further reuse. Someone might double-check your work (don’t be afraid of that please), someone might take it further and attribute your data as their starting point

With the use of reliable open repositories and modern open research graphs, data* sharing and re-use might become a ‚new normal’. Necessary circumstances:

- Knowledge among researchers about available repositories and how to choose them (they must exist in the first place)
- Good quality and sustainable repositories
- Change in the research-career path to acknowledge the openness factor

To make one scientist happy (and it all works in the background),

Many stakeholders must come along.

Funders, policy makers

Delivery of actionable top-level policies and business models, updated career-paths, new funding models

Research communities

Guiding community policies, defining and curating the standards, opening data and services, inclusiveness

Publishers and Journals

Including open science policies, sharing good practices, implementing the interoperability standards

Research infrastructures

Access to their services, adopting open science policies, developing and implementing the interoperability standards

e-Infrastructures

Access to their services, adopting open science policies, developing and implementing the interoperability standards

Computing and Data Centres

Developing technologies, implementing the interoperability standards, opening up their services

Research institutes

Promoting open science practices, adopting open science standards, training researchers, collaboration with other institutes and infras

Libraries

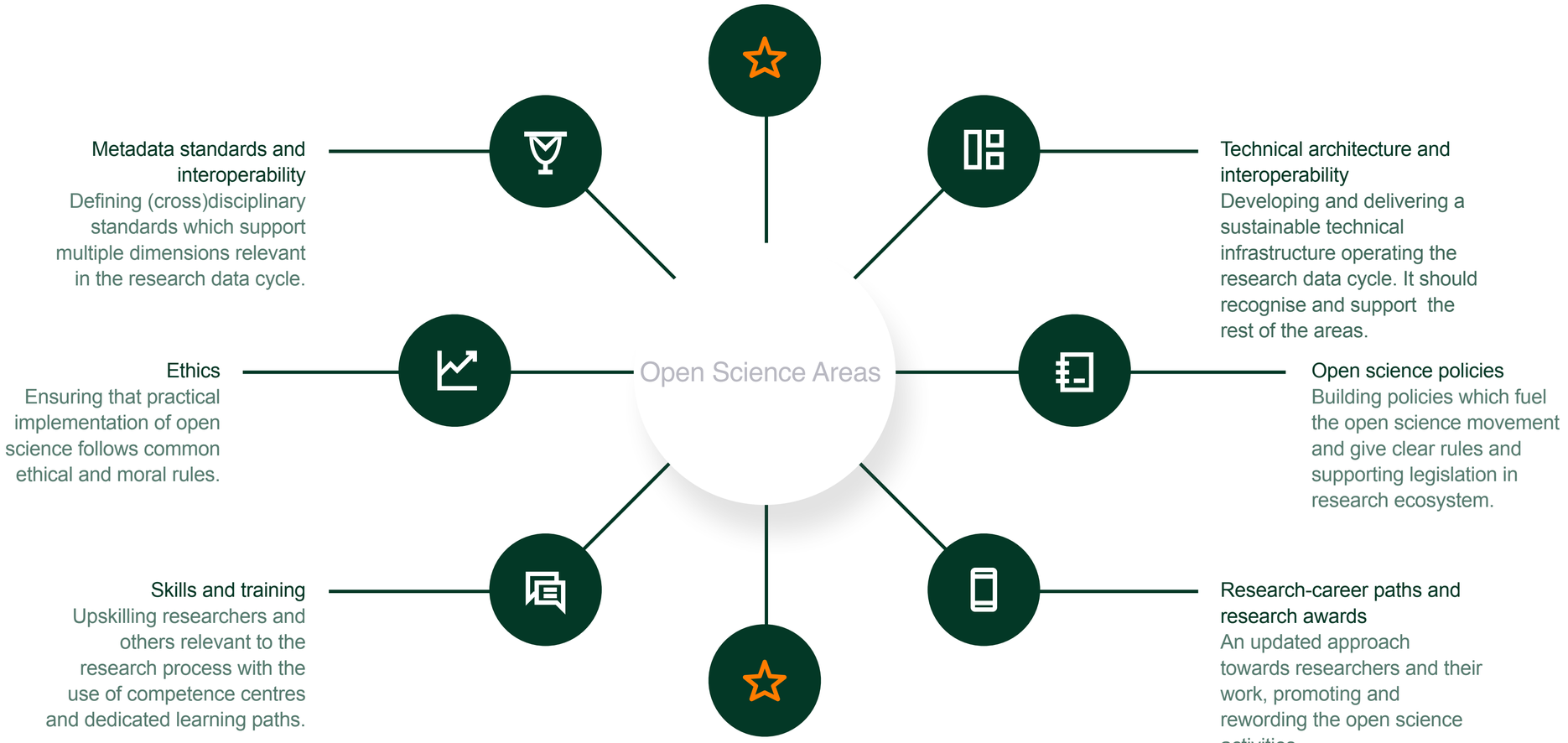
Defining and adopting open science policies, curating metadata, promoting open science practices and training

Archives and Repositories

Adhering to the open science policies, implementing metadata standards, running sustainable services, promotion

And by accompanied by developed

(Possible) Open Science areas



Metadata standards and interoperability
Defining (cross)disciplinary standards which support multiple dimensions relevant in the research data cycle.

Technical architecture and interoperability
Developing and delivering a sustainable technical infrastructure operating the research data cycle. It should recognise and support the rest of the areas.

Ethics
Ensuring that practical implementation of open science follows common ethical and moral rules.

Open science policies
Building policies which fuel the open science movement and give clear rules and supporting legislation in research ecosystem.

Skills and training
Upskilling researchers and others relevant to the research process with the use of competence centres and dedicated learning paths.

Research-career paths and research awards
An updated approach towards researchers and their work, promoting and rewording the open science activities.

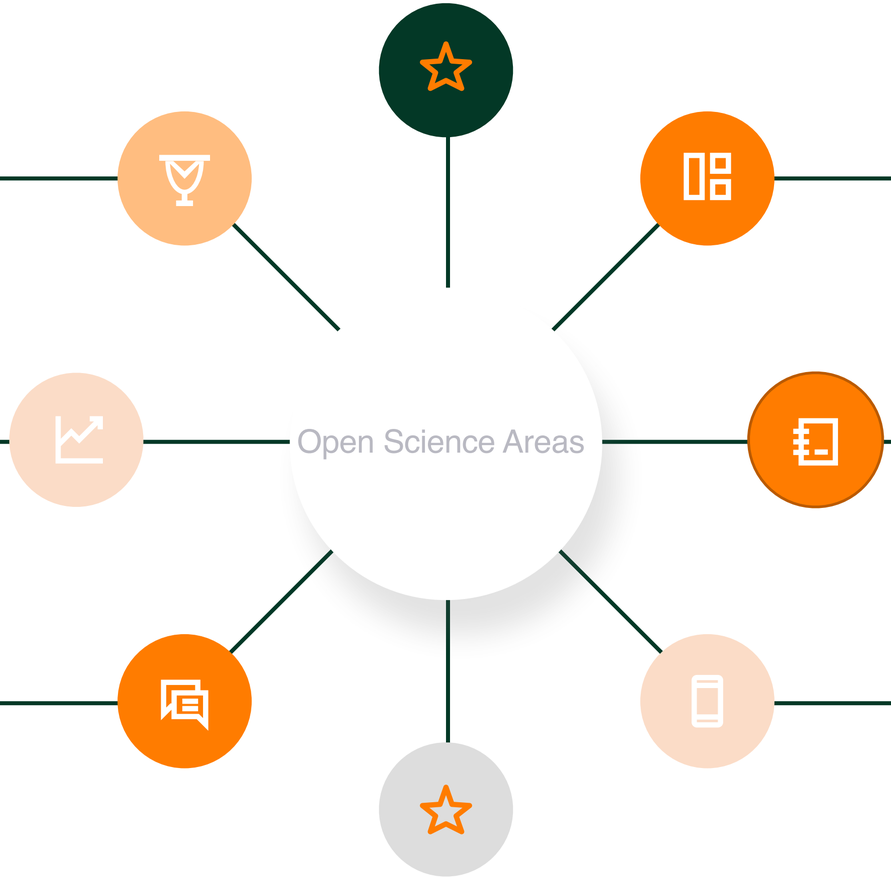
Open science business models and funding mechanism
Finding new ways to transfer the funds needed in (open) research where researchers can leverage existing resources free of charge and resource providers can be adequately rewarded and not worry about their sustainability.

Some
Open Science
Initiatives

Doing great job in progressing
the open science notion.

How will/might grow (and why)

(Possible) Open Science areas



Metadata standards and interoperability
There is probably a most invested and developed community (cross-everything) discussing and delivering conclusions in that area, but due to the subject's enormous complexity and scale, there's still a long road ahead. Getting everyone to agree on something is the hardest part.

Ethics
Not a very hip topic but fortunately there are groups discussing this aspect and making sure that the policies and technical solutions are aligned with ethics . However, it's still rather rarely a stand-alone topic of discussion

Skills and training
Due to a rather significant growth in the implementation of open science, there are many materials allowing further dissemination. The need for development of this area is apparent and every initiatives invests in it/

Technical architecture and interoperability
Technical upgrade is easy to reach, under the condition of the development in other areas. A lot of funds is now being invested in that area.

Open science policies
Definitely the area mostly recognised and discussed in the research universe. A lot of first successfully running policies covering some aspects of open science.

Research-career paths and research awards
Despite many working groups and dedicated initiatives, the consensus and practical changes are hard to reach due to the cultural heritage and momentum needed to move current systems. There are first implementations of new approaches on the institutional levels.

Open science business models and funding mechanism
There are some discussions around that matter but because of the topic's complexity and the fact that it tackles the backbone of the finance system in the research environment, there are no relevant outcomes in that field. It seems purposefully disregarded and abandoned.(cause it's hard, I don't blame them/us :))

And now

What we can do? **Now**

Find the initiative of your choice. Join

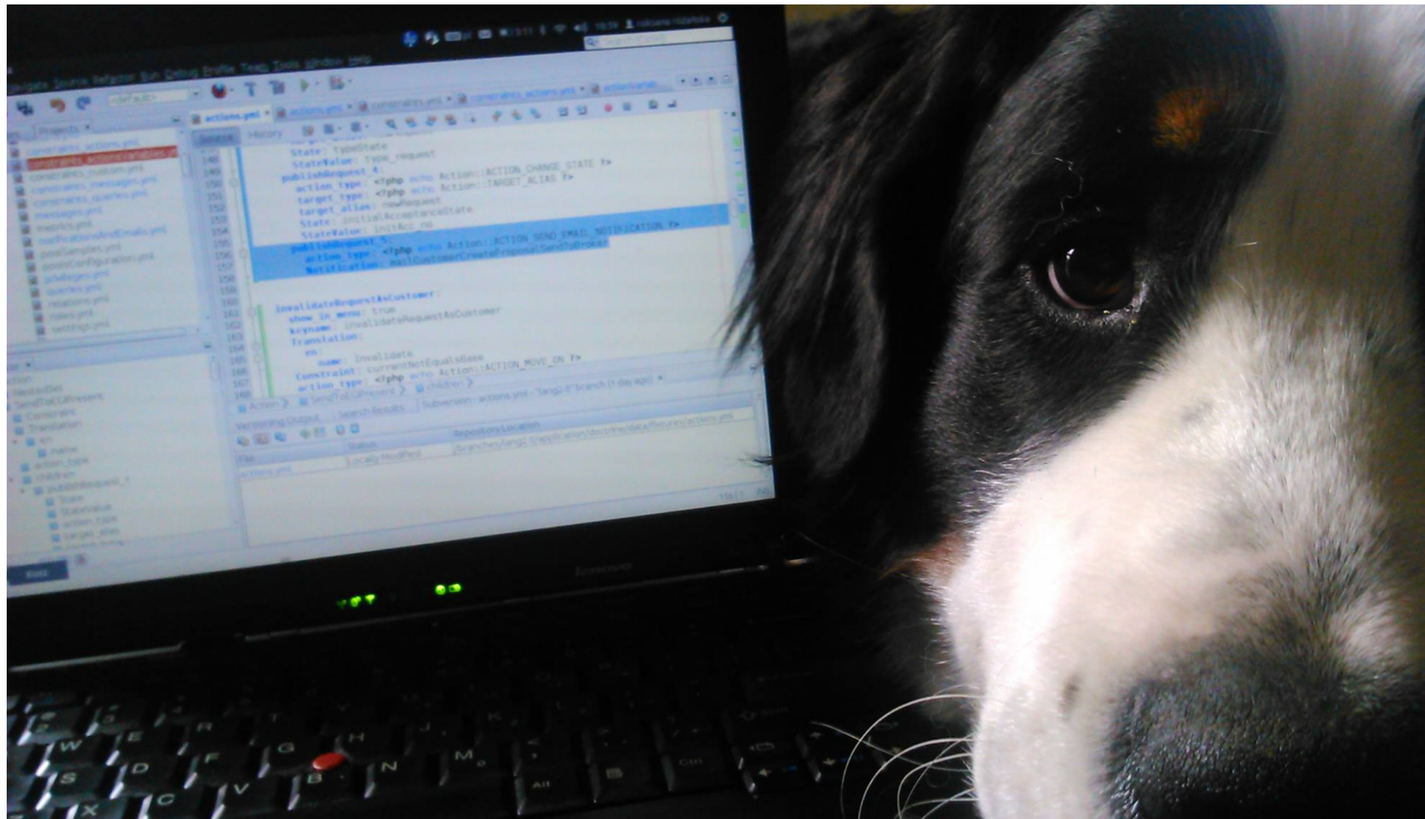
All of the initiatives have possibilities to join for the individuals and institutions. It’s worth to do so, as both sides can learn from each other and progress the evolution of open science.

Think about the meta-data. Please

It’s the most crucial element in this puzzle. There will be no sharing the knowledge without the proper parameters to represent what this knowledge describes and holds. Follow and adjust to the standards.

Implement the open science policy

Act on it. Advocate, work on, or allow the open science policies relevant to your institution. Take the example from those, who have already done it. Then follow with procedures allowing the operations around it.

Thank you for your audience.

r.wilk@cyfronet.pl