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on Research Infrastructures



RI's advantages and challenges of joining EOSC

An opinion paper
by the ESFRI-EOSC Task Force and
Steering Board
expert group

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The workshop “**Prototyping the EOSC Federation: Nodes and Linkages**” held in Milan on 18-19 November 2024 brought together 47 participants, including 7 speakers, 12 panelists, and various experts from Research Infrastructures (RIs) to discuss the integration of RIs as nodes, or providers of the European Open Science Cloud (EOSC) Federation. The workshop focus was on the understanding of the collaborative processes for building the EOSC Federation while emphasising the role of RIs as “thematic nodes”.

The EOSC Federation is envisioned as a network of interconnected “nodes” designed to offer European researchers a seamless digital environment for reproducible cross-disciplinary research. The nodes will interlink directly or through the EU-node creating a work environment favouring collaboration, resource sharing and data interoperability across borders.

The workshop participants outlined the advantages of joining EOSC but also discussed the importance of addressing the connected challenges such as sustainability, governance, trust, quality control and data accessibility, as well as that of inclusivity and reduction of research inequalities across Europe.

Results of the Workshop

RIs will play a central role in the creation of the EOSC Federation, both as providers of advanced data services and data analytics resources and, in several cases, as nodes capable to expand the impact of their data and service solutions, enhancing their visibility and interoperability, benefiting the broadest European research and innovation community. The Federation itself will be strengthened by the active participation of RIs, which can contribute shaping governance, policies and standards necessary for seamless operation and continuous growth.

Joining the EOSC Federation offers **several key advantages for RIs**. Firstly, adhering to common frameworks and shared standards will promote practices that improve interoperability, ensuring smoother exchange and integration. Secondly, crucial services such as data quality assessment and security, cybersecurity, access to HPC and development of advanced AI solutions can be generated in an unfragmented manner, realising a more robust environment and economy of scale.

Moreover, engagement with the Federation may unlock new funding streams in the future, enhancing visibility within EU-level initiatives, and may create opportunities for long-term sustainability through collaborative models. Engaging with EOSC facilitates opportunities for **cross-disciplinary collaboration**, particularly in fields such as life sciences, materials science, social sciences and environmental health, thereby broadening the scope and impact of research carried out in existing RIs.

Ultimately, EOSC strengthens the connectivity between **data production and its open availability for use and re-use**, enhancing the overall effectiveness of RIs and supporting long-term, sustainable scientific collaboration.

Joining the federation also presents some challenges, that span technical, governance, funding and cultural aspects, all of which need to be addressed for a smooth integration process. One of the main obstacles is the **resistance to adopting FAIR data** practices. There's also the issue of interoperability, as aligning different established data standards and systems across various RIs is difficult and short-term benefits are not perceived. Although there are existing platforms that can facilitate integration, the diversity of research domains means that harmonising data formats and protocols to enable machine-actionable services is a challenge that requires dedicated resources.

Another significant issue is the **governance and its legal format**. The roles and responsibilities of EOSC nodes, especially multi-RI or thematic nodes, are not yet fully defined. While some RIs can navigate this issue due to their established legal entities, others face ambiguity about their legal obligations (data ownership), liabilities and governance frameworks. The current uncertainty complicates the process of joining EOSC at this time, as institutions need clarity on how to organise and manage their participation.

Sustainability is currently also a major concern, with many RIs relying on short-term funding from national or EU grants. For EOSC to thrive, a sustainable financial model is needed, one that goes beyond reliance on periodic funding cycles. In parallel, the lack of **skilled personnel** to manage the technical and operational demands of EOSC is a bottleneck. Many RIs struggle to hire the necessary expertise in data management and FAIR implementation, which limits their ability to scale services and integrate effectively into the EOSC framework.

Technical readiness is another challenge; services for interoperability developed by RIs, which are vital for data analysis within EOSC, are still in the process of scaling-up and federated search capabilities are developing slowly. Many RIs face limitations in the number of users they can support, which impacts their ability to provide seamless services to the EOSC community.

Finally, **cultural and collaborative** issues arise from the diversity of research domains involved. Each scientific community has its own set of priorities, methodologies and expectations, making it difficult to align efforts under a common EOSC framework. For instance, some communities focus on the computational aspects of data, while others, such as health or life sciences, have strict requirements for data privacy and security. Bridging these differences while ensuring open access and collaboration is a complex, but necessary, part of the EOSC construction process.

In summary, while EOSC presents immense potential for advancing open science and enhancing the impact of the results obtained using RIs, the process to federate resources and build the advanced environment enabling open science is definitely challenging. A concerted effort across technical, legal, financial, and cultural dimensions, along with a supported commitment to enforce high standards of data quality and interoperability is needed.

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