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D6.1 Mapping of existing professional networks

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Deliverable Abstract

This report provides an overview of the current landscape of Open Science related professional networks in Europe.

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Acronym list

Acronym	*Definition*
AI	Artificial Intelligence
CEDEFOP	European Centre for the Development of Vocational Training
COAR	Confederation of Open Access Repositories
CODATA	The Committee on Data of the International Science Council
CoNOSC	Council for National Open Science Coordination
DiSSCo	The Distributed System of Scientific Collections
DMP	Data Management Plan
DS	Data steward
ELIXIR	The European life-sciences Infrastructure for biological Information
ENRIO	European Network of Research Integrity Offices
EOSC	European Open Science Cloud
ESFRI	The European Strategy Forum on Research Infrastructures
EU	European Union
EUDAT CDI	European Association of Databases for Education and Training - Collaborative Data Infrastructure
EuroCC	European Competence Centre
FAIR	Findable, Accessible, Interoperable, Reusable
HEI	Higher Education Institutions
HPC	High Performance Computing
IGDORE	Institute for Globally Distributed Open Research and Education
ISO	International Organization for Standardization

IT	Information technology
LDA	Latent Dirichlet Allocation
LIBER	Ligue des Bibliothèques Européennes de Recherche (Association of European Research Libraries)
MOOCs	Massive open online courses
NCC	National Competence Centre
OA	Open Access
OpenDOAR	Directory of Open Access Repositories
OS	Open Science
PLAN-E	Platform of National eScience Centers in Europe
RDA	Research Data Alliance
RDM	Research Data Management
Re3data	Registry of Research Data Repositories
SPARC	The Scholarly Publishing and Academic Resources Coalition
TM	Text mining
VT	Voyant Tools
WP	Work Package

Contents

Executive summary

The objective of this report is to summarise the results of the mapping of existing Open Science (OS) professional networks and highlight gaps in the European landscape. Towards that objective, the report demonstrates a strong basis on underlying data: the actual results of the mapping.[1]

Task 6.1 has mapped professional OS networks within all 18 European Skills4EOSC consortium countries as well as 6 other European countries that were identified as important frontrunners or as relevant regional partner countries. Professional OS networks are defined as groups of individuals who are connected through shared professional interests, goals and values related to OS principles and practices. The network mapping was carried out on the basis of desk research and requests to relevant institutions. The searches were conducted both in English and in the respective national language, based on a search methodology inspired by systematic reviews. The search strings stem from the OS field and were narrowed down to central Skills4EOSC topics, thereby focusing mostly on data-centred practices within OS.

We identified 328 active national, regional and international networks in the 24 analysed countries matching the criteria of our searches. Researchers and research support staff are the main target groups of the networks. The networks are organised around four major topic clusters: 1) *data practices* like research data management and data stewardship, 2) *computing*, including data analytics and artificial intelligence, 3) *open scholarship practices* like open access publishing, open code & software, transparency or reproducibility practices and 4) *research infrastructure support*. The networks' main activity is knowledge sharing among their members, but they also provide trainings and, partially, engage in policy-making activities.

[1] The data are accessible at doi: 10.5281/zenodo.7591902.

1 Introduction

In the project proposal, Skills4EOSC's objective is described as follows: "Skills4EOSC core objective is to **advance Open Science (OS) skills by unifying the current training landscape into a common and trusted pan-European ecosystem**, closing the three gaps identified in the EOSC Strategic Research and Innovation Agenda in relation to OS competences: **lack of OS and data expertise, lack of a clear definition of data professional profiles and corresponding career paths, and fragmentation in training resources**." Work Package (WP) 6 contributes to project objective 7, namely to "support **lifelong learning through professional networks** as an enabling environment to discuss, co-create and exchange best practices among OS professionals and researchers."

The objective of Task 6.1 is to give an overview of the existing OS-related professional networks within the countries of the Skills4EOSC consortium and to identify capability gaps in the landscape. Professional networks are groups of individuals who share common professional interests, interact, and provide support, resources and opportunities to one another. This report summarises the key findings and gaps that were identified during data analysis. The results of Task 6.1 will be used by other WP6 tasks, e.g. Task 6.3.1 "Data Steward Networks", Task 6.3.2 "Open Science Communities" and Task 6.3.3 "Thematic Networks", as well as in other WPs in the Skills4EOSC project, e.g. Task 7.1.

The report is structured as follows. Section 2 outlines the theoretical backdrop of our study, i.e. what role professional networks play for lifelong learning. Section 3 "Methodology" gives an overview of the data collection and data analysis methods. Section 4 "The current landscape of professional OS networks in Europe" gives an overview of the main findings of the mapping process and the data analysis. The section is divided into three subsections that focus on topics of particular interest. Section 4.1 explores the organizational set-up of the networks. We discuss what characterises the existing networks in terms of geographical scope and driving forces behind the networks. Section 4.2 dives deeper into the OS-related topics that the

networks cover. Section 4.3 describes the activities in which the networks engage. Section 5 “Summary” gives an overview of the key findings.

2 Lifelong learning through professional networks

The European Centre for the Development of Vocational Training (CEDEFOP) defines lifelong learning as "all learning activity undertaken throughout life, with the aim of improving knowledge, skills/competences and/or qualifications for personal, social and/or professional reasons" (Cedefop, 2014). Traditionally, the concept of lifelong learning has been narrowed to the idea of individuals endlessly attending formal courses (Kolb & Kolb, 2017), and this view has informed educational policies long into the 2010s (Volles, 2016). In recent years, the concept has been extended by including non-formal and informal learning processes in teams or groups that are seen as complementary to formal learning (Hager, 2021).

Formal, non-formal and informal learning contribute to lifelong learning in different ways (Cedefop, 2014; Kolb & Kolb, 2017; Hager, 2021).

Formal learning comprises structured learning experiences that are planned and organised, such as training, workshops, seminars, or courses with certified and trained teachers. They often have a set curriculum, clear learning objectives, a specific outcome or certification, and are usually delivered through a school or an institution. Examples are college and university degrees, formal training programs, and professional certification courses. Formal learning can provide individuals with specialised knowledge and skills related to their profession.

Non-formal learning refers to planned learning activities that occur through practical experiences and interactions in professional contexts outside of a traditional classroom setting, but with set goals and objectives. Examples of non-formal learning include on-the-job training, mentoring, self-directed learning, and networking. Non-formal learning can provide individuals with practical experience and a deeper understanding of their profession.

Informal learning refers to learning through daily experiences, social interactions, and self-directed exploration. The learning activities, related to work, family, or leisure, are usually unplanned and unstructured and are

often perceived as unintentional from the learner's perspective. Examples are learning through hobbies, personal interests, and self-directed reading. Individuals can acquire professional knowledge and new skills, personal growth, and cultural awareness through informal learning.

Professional networks play a pivotal role for non-formal learning processes that allow professionals to build relationships with colleagues to learn from each other and stay informed about developments in the field. This is especially relevant within a relatively young and still evolving field like OS. Here, on the one hand, the professional networks facilitate dissemination of good practices among peers and create a relevant critical mass adopting open practices (Armeni et al., 2021). On the other hand, the networks can create a space, where professionals with different backgrounds and interests including researchers, research support staff, infrastructure support staff etc., can engage around a shared topic of interest.

3 Methodology

3.1 Previous landscaping studies

During the past years, a number of studies on the OS landscape in EU member states and associated countries have been conducted. Several EU-funded regional projects analyse the OS landscape in different European countries: EOSC-Nordic (Hammargren et al., 2020, Hammargren et al., 2021, Hansson et al., 2022), EOSC-Pillar (Bodlos et al., 2020), EOSC-Synergy (EOSC-Synergy landscaping country reports at: https://www.eosc-synergy.eu) and NI4OS-Europe (Kosanović & Ševkušić, 2019, Kosanović & Ševkušić, 2022). Other relevant studies include a report on the role of EOSC within national strategies for digital skills (LDK SA, 2020), a report on digital skills and OS by the EOSC Executive Board Skills and Training Working Group (Manola et al., 2021) and EOSC Secretariat's meta-analysis of the EOSC landscape (Forlenza, 2021). All these studies focus on national OS initiatives, OS policies, OS research infrastructures, and OS stakeholders within the countries covered by the projects. They are based on different methodological designs ranging from qualitative interviews to representative surveys.

The objective of this landscaping study is to map existing professional OS networks within the countries of the Skills4EOSC consortium and to identify capability gaps in the landscape. It differs from the earlier ones in thematic focus, geographical scope, and methodological design.

The thematic focus is on *professional networks*. We define professional networks within OS as groups of individuals who are connected through shared professional interests, goals, and values related to OS principles and practices. These networks can be local, regional, national, or international in scope. They may include researchers, research support staff, policy-makers, and other stakeholders committed to advancing OS initiatives and promoting the openness, transparency, and reproducibility of scientific research. In accordance with the task description from the project proposal, we focus on data-centred OS practices, excluding e.g. Citizen Science networks.[2]

[2] The Skills4EOSC project proposal describes Task 6.1's objectives as follows: "Map existing

The geographical scope includes *all 18 European Skills4EOSC consortium countries as well as 6 additional European countries* (Iceland, Ireland, Lithuania, Latvia, Portugal, and Switzerland) (Fig. 1). The additional countries are included, because they are relevant regional partner countries that have been covered in previous landscaping studies (Iceland, Lithuania, Latvia) or because they are recognised as important frontrunners within OS (Ireland, Portugal, Switzerland).

Fig.1 - Countries included in the landscaping study

For the methodological design of our landscaping study, we use a different approach than the above mentioned landscape studies. Neither an interview-based nor a survey-based study seemed promising, given the less top-down organised and often quite informal character of our object of study,

professional networks within countries/regions and across domains to identify any gaps; focus on networks of data stewards (including data curators, data librarians and other data professionals), Open Science Communities (OSCs) at national and European levels, as well as thematic networks (e.g. AI research, museum curators)."

professional networks. We chose to conduct desk research instead, adopting a methodological design inspired by systematic review methodology (Petticrew & Roberts, 2005). Our desktop research builds on structured searches that are based on systematically constructed search strings and uses clear criteria for the appraisal and selection of relevant search results.[3] We call this design "*systematic desktop research*".

3.2 Systematic desktop research

The search terms for the systematic desktop research were generated from the task description in Skills4EOSC's project proposal and then enriched with relevant terms from FOSTER's OS taxonomy (Pontika, 2015). In addition to the OS-related terms, we included descriptors of thematic networks such as "Artificial intelligence (AI)".

We operated with 18 search terms in total that were transformed into search strings for the searches.[4] The search strings were generated both in English and in the national languages by combining the search terms, synonyms and abbreviations of the search terms together with "network" and the respective country.[5] We used both plain search strings like "Data stewardship network denmark, data stewardship netværk danmark, data steward netværk danmark, ds netværk danmark, data stewards netværk danmark" and Boolean search strings such as "("data stewardship" OR "DS" OR "data steward" OR "data stewards") AND (network OR netværk) AND (denmark OR danmark)". The use of Boolean search queries economised the search process significantly, but they did not consistently yield comprehensive results. Therefore, the decision whether to use plain or Boolean search strings was left to the individual researcher.[6]

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[3] The documentation of search terms and search strings is inspired by the section "Search Strategy" of Visintini's (2017) Review Protocol Template.

[4] All used search terms and search strings are documented in detail in the overview of the search strings (doi: 10.5281/zenodo.7591902).

[5] We generated search strings in all national languages that we were able to cover with the linguistic competencies of the task members. Some languages (Finnish, Estonian) were covered by partners from the Skills4EOSC consortium. Some countries (Latvia, Lithuania, Portugal) were only searched in English.

[6] Laurence Horton (DCC) programmed a markdown to assist with the searches. The markdown

All searches were conducted using the search engine Google.[7] For each country, the searches were run on the local Google site by adding the country code local top-level domain, e.g. "site:.dk", to the search strings.

The searches yielded generally very large search results that had to be appraised in relation to their relevance. Especially searches on AI or data analysis generated search results unrelated to academic professional networks, such as information on private companies, training courses, university curricula, press and academic articles. The appraisal process was a qualitative process, where the researchers relied on their expertise and insight into the national landscape to select relevant search results. Relevance was assessed on the basis of our working definition of professional networks within OS: *For the purposes of our study, we define professional networks within OS as groups of individuals who are connected through shared professional interests, goals, and values related to OS principles and practices. These networks can be local[8], national, or international in scope. They may include researchers, research support staff, policy-makers, and other stakeholders committed to advancing open science initiatives and promoting the openness, transparency, and reproducibility of scientific research.*

We derived the following inclusion and exclusion criteria from the working definition:

Table 1 – Inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Type	Professional networks, communities, groups	Hobby networks, commercial networks

automatises the search terms and opens a browser tab for each term. The code is shared at GitHub: https://github.com/centre-for-humanities-computing/skills4eosc-T6.1

[7] We intensely discussed the adoption of Google as a search engine, especially because of the risk of inherent biases introduced by Google's algorithm. Therefore, DuckDuckGo was considered as an alternative to Google. However, some test runs showed that DuckDuckGo did not yield comprehensive search results and, therefore, we continued using Google.

[8] Many universities host local professional networks, e.g. are all Dutch Open Science Communities local (see https://www.osc-nl.com/). We did not include local networks in our search results (cf. exclusion criteria) and focused on regional, national and international networks instead.

Domain	Research, academia, university	Industry
Scope	Meso-level national networks (established between at least three different institutions) & relevant macro-level international networks operating within Europe	Micro-level networks, working groups or initiatives with members from a single institution

All relevant networks were included in the results table with information about the name of the network (in English and in the national language), abbreviation, country, country code, website, description, activities, year of establishment, target group, and OS topics. In addition, some relevant networks that had not been generated by the systematic searches were manually added.[9]

Finally, we sent requests to the national nodes of two international organisations, OpenAIRE and Research Data Alliance (RDA), to inquire about the status of the national node (active/inactive) and their activities. This information was also added to the results table.

To sum up, the systematic desktop research identified 328 relevant results for the 24 countries included in the study. Given the bias inherent in Google's search algorithm and the qualitative nature of the appraisal and selection process, our search results are not reproducible. However, we strive for full transparency in our method description. It is important to note that although the collected data do not provide a statistically representative picture of the current OS professional network landscape, they do allow us to infer some general traits and tendencies. The data also offer an interesting window into the developing landscape of professional OS networks in the countries covered.

[9] See the data at doi: 10.5281/zenodo.7591902.

3.3 Data analysis

3.3.1 Quantitative analyses with R[10]

The decision to use computational methods for interpreting and visualising the data was taken after most of the search results had been obtained. The quantitative methods allowed for easy pattern identification in the search results. Therefore, some columns needed to be cleaned manually, e.g., removal of textual input from the "Year of establishment" column, so that they contained only numerical values.

In addition, a new column was added with the ISO 3166-1 alpha-3 country code[11]. This is a standardised three letter code assigned to each country in the world. This was necessary, since the country column contained a mix of region, nation, and country labels. Each row then contains one of the official three letter country codes or the value "regional" or "international".[12]

We then used R to generate different types of visualisations, e.g. showing the network distributions over countries, the year of establishment, or topic distributions in countries.

3.3.2 Quantitative analyses with text mining (TM) tools

In order to identify the main OS topics covered by the networks, we grouped together per country all the descriptions of the identified networks, google-translated to English the descriptions that were in other languages, and applied text mining techniques with the *Voyant Tools* (VT) environment[13]. VT is an open-source web-based tool for digital text analysis. To identify relevant topics emerging from the descriptions of the networks, we applied a topic modelling technique called Latent Dirichlet Allocation (LDA). This technique generates clusters of terms that appear together in the network descriptions.

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[10] The R code used for the visualisations can be found at https://github.com/centre-for-humanities-computing/skills4eosc-T6.1

[11] https://en.wikipedia.org/wiki/ISO_3166-1_alpha-3

[12] We distinguish between "regional" and "international" as follows: If a network spans two to four countries, we consider it regional. It is labelled "international", if it spans more than four countries.

[13] Voyant Tools, https://voyant-tools.org/

Before doing the analysis we pre-processed the corpus by deleting stop-words (and, at, by, so, etc.), numbers, symbols, and words that did not add anything to the value of the corpus. In total, we considered 25 documents (23 countries, regional and international groups) with 23905 total words of which 3085 were unique. The longest and shortest document lengths – an indication of the number of networks for each country - were:

- Longest: International (4517); France (2633); Switzerland (1811); Germany (1793); Italy (1739).
- Shortest: Serbia (47); Ireland (77); Latvia (96); Regional (157); Poland (178).

4 The current landscape of professional OS-related networks in Europe

This section provides an overview of the main findings of the mapping process and the data analysis. Section 4.1 explores the organizational set-up of the networks. We discuss what characterises the existing networks in terms of geographical scope and driving forces behind the networks. Section 4.2 dives deeper into the OS-related topics that the networks cover. Section 4.3 describes the activities in which the networks engage.

4.1 The organizational set-up of professional networks

Armeni et al. (2021) have described how the transition to OS practices within academia is driven both by top-down and bottom-up initiatives. Top-down initiatives are spear-headed by policy makers, funders and publishers and formulated in explicit requirements regarding the transparency of the research process and the openness of research results. They lead often to the development of relevant research infrastructures that allow academics to live up to the requirements and expectations formulated in OS policies. Bottom-up initiatives, on the other hand, serve both the refinement and dissemination of OS practices. They play a central role in achieving the necessary culture shift in the transition to open as the new normal.

The professional OS networks we have mapped can either be characterised as top-down or bottom-up networks. Top-down networks are often established on the national or international level in relation to research infrastructures. Examples are networks associated with international research infrastructures like COAR, DARIAH, DiSSCo, ELIXIR, EUDAT CDI or EuroCC, or national infrastructures like NFDI in Germany. Other examples of top-down networks include international expert networks focusing on policy-making and strategy like CoNOSC, ENRIO, Knowledge Exchange or SPARC Europe. Finally, there are top-down networks facilitated by national offices or nodes of international organizations like OpenAIRE, RDA or Codata; and networks created as working groups of international professional

organizations, e.g. LIBER's working groups or GoFAIR's implementation networks. These networks often aim at advancing established research support roles to better support OS locally at the institutions.

Bottom-up or grass-roots networks are usually not driven by a policy agenda or connected to a research infrastructure, but are value-based networks, e.g. based on openness or on transparency as a shared value. Their goals include increasing the accessibility and reuse of research data and other materials, improving the transparency and reproducibility of scientific research and fostering collaboration and sharing among researchers. Examples of these networks are for instance the national chapters of the Open Knowledge Network, FORRT, IGDORE or the many national Reproducibility Networks.

Both types of networks are important to push the transition to OS within academia. Given that many networks are relatively young and only have been established within the past 5 years (Figure 2), we can expect an increased uptake of OS practices in the next few years.

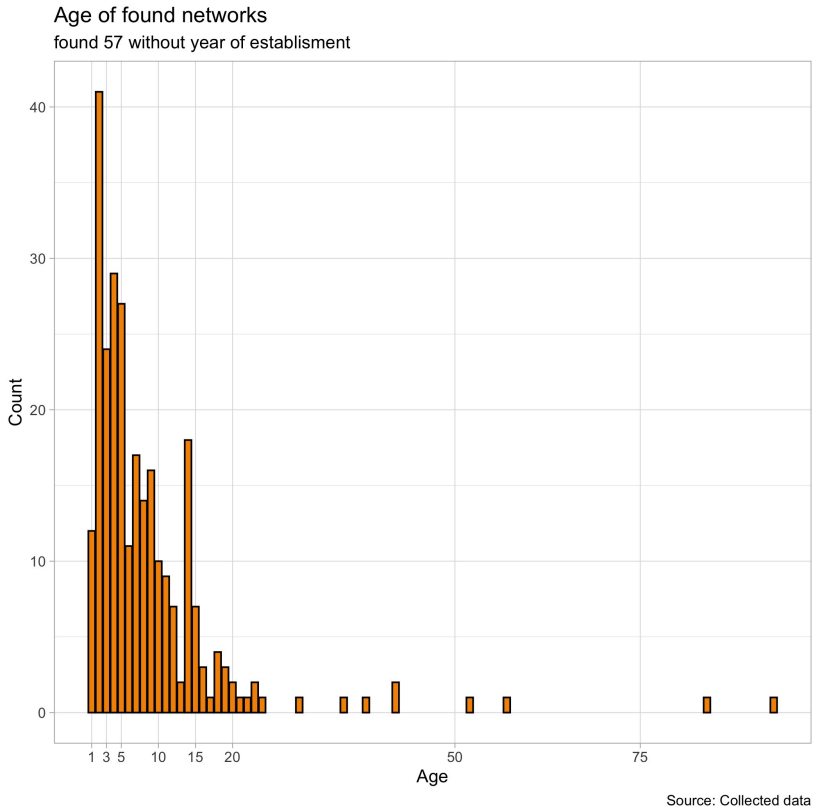

Figure 2. "Age" of professional OS networks

4.2 Which OS related topics do the networks cover?

The word cloud in Figure 3 illustrates the most frequently occurring words in the TM analysis with VT, showcasing the top 75 of these. Among the ten highest-ranking topic words “research” features with 375 mentions, “open” with 322 mentions, “data” with 256, “science” with 253, “network” with 133, “rda” with 105, “ai” with 104, “support” with 83, “knowledge” with 75, and “researchers” with 74 mentions.

Figure 3. Word cloud with the top-75 words from the network descriptions

If we look into the corpus *collocates*, which shows words that appear more frequently in proximity forming phrases, we discover that the term “open science” appears 211 times, “research data” 117 times, “research support” 43 times, “open access” 43 times, “open data” 36 times, “data management” 35 times, “open policy” 28 times, “ai research” 27 times, “science support” 21 times , and “research infrastructure” 21 times.

Figure 4 shows a line and stacked bar with the relative frequencies of these phrases in relation to each country. When a country appears to have a high relative frequency of a specific phrase, it means that this country is very much invested in the specific topic, though it does not mean that this country is

outperforming all other countries regarding this topic. The phrases indicate the diversity of topics within OS that the identified networks engage with. The majority of the countries show a variety of topics or phrases in the description of networks. Here, Latvia, Ireland and Serbia are an exception. Networks operating in France, Germany, Denmark, and Norway mention an especially wide range of topics or phrases in their networks descriptions.

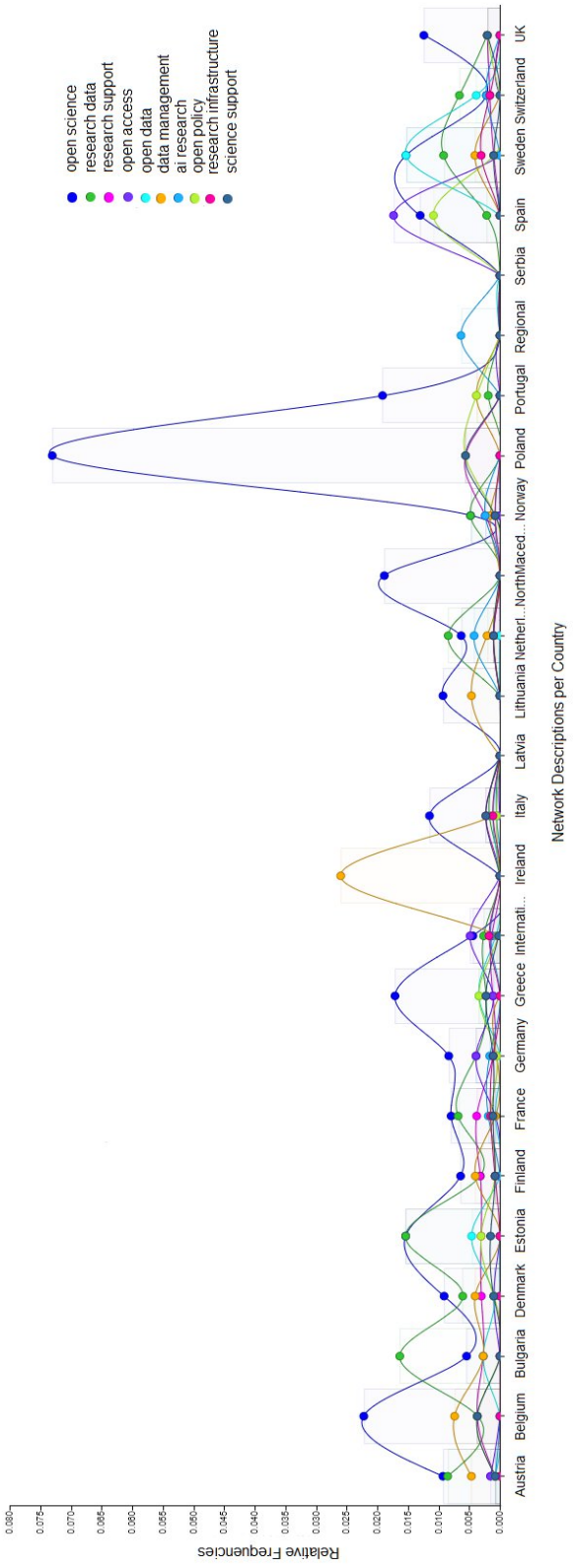

Figure 4. Line and stacked bar depicting the distribution of the occurrence of phrases in countries' networks descriptions

From the LDA (Latent Dirichlet Allocation) topic modelling analysis, the following main topics emerged from the descriptions that the networks themselves provide (see Figure 5):

- initiatives to *promote and coordinate best practices on open science*, *FAIR principles and data management*, and also train stakeholders and members;
- *research services and infrastructure* with an emphasis on artificial intelligence, educational networks, policy and community activities;
- *data support and data management networks* for researchers and institutions that enables research communities and the society to develop expertise; and
- *artificial intelligence and high performance computing* with a focus on international projects and partners.

Figure 5. The four main topics of the network descriptions and how they paint the OS landscape in each country

Figure 6 gives a different overview of the OS topics important for the networks in the different countries. These topic descriptions are not directly derived from the descriptions of the networks themselves, but they are categorisations that we have added.

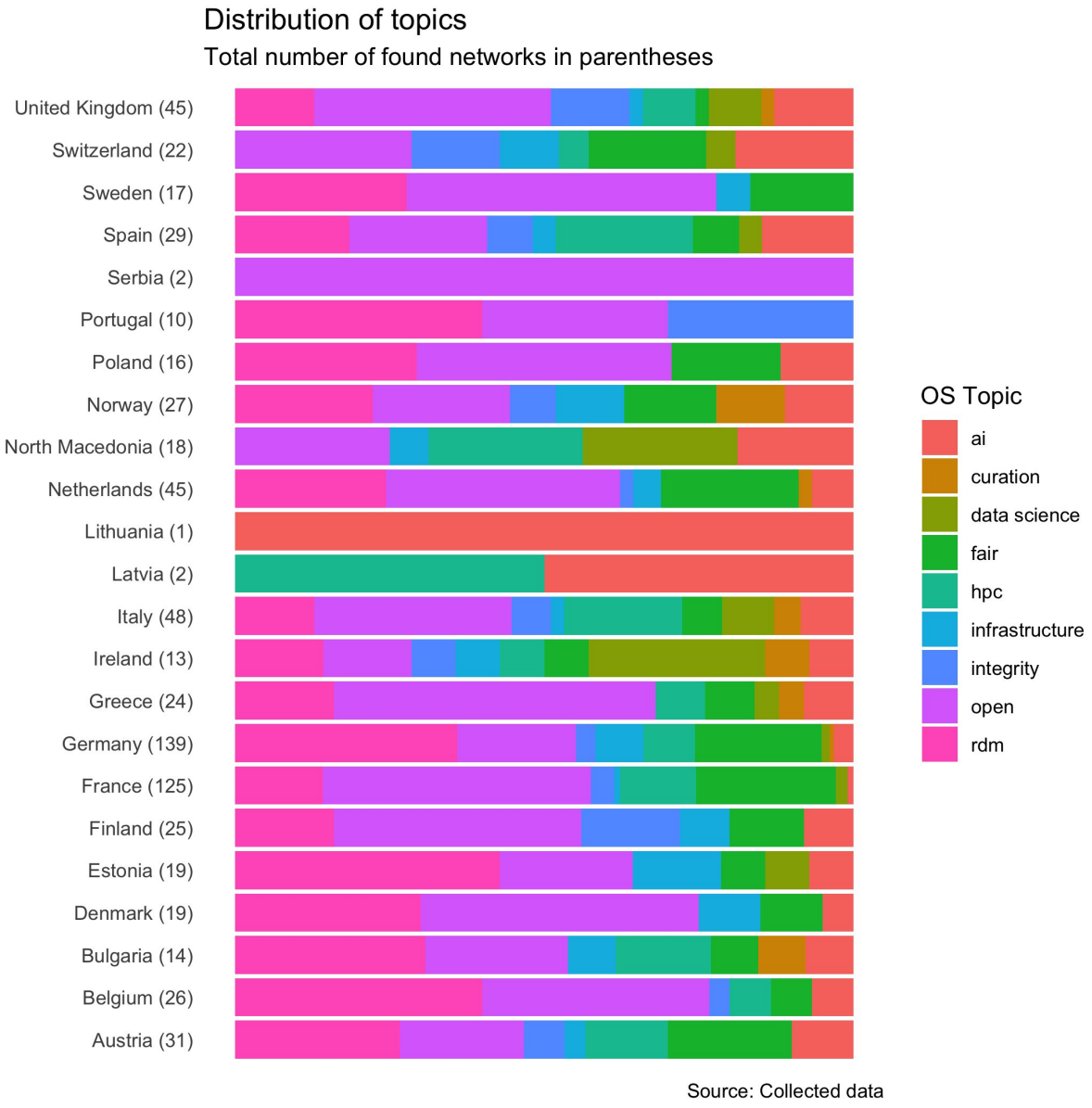

Figure 6. Distribution of OS-topics per country (external classification)

Figure 6 confirms the correlation between the number of networks in a given country and the diversity of OS topics that are covered by these networks that the analysis of collocates already had established (see Figure 4). In other

words: The smaller the number of networks in a given country, the less diverse is the landscape in terms of OS topics. This tendency is exemplified by Latvia, Lithuania and Serbia.

4.3 What activities do the networks engage in?

4.3.1 Purposes of OS networks

Most networks describe their purpose as promoting and achieving ambitions for OS at national and European levels and supporting the ongoing cultural shift to OS in academia. This includes promoting and strengthening the adoption of Open Scholarship, Open Knowledge, FAIR principles, Open data, Open Source, RDM best practices, and OA as the predominant model of communication for scholarly outputs, and the development of Open Standards and Open Technologies. Contributing to the definition of European policies as well as implementing OS policies, OS strategies and data stewardship are also the purpose of many networks. Another aspect of achieving OS is networks that aim to support the development of digital infrastructures to enable OS.

Related to the purpose of promoting and achieving OS, many networks aim at improving and enabling world-class research. “Accessibility”, “availability”, “FAIRness”, “findability”, “integrity”, “quality”, “reliability”, “replicability”, “reproducibility”, “rigorousness”, “robustness”, “transparency”, “trustworthiness”, “usefulness” and “visibility” are all mentioned by the different networks as focus points of improvement of research. Both research processes, data, and publication are targets for improvement. Providing research infrastructures is another purpose described by the networks which make it easier for researchers to find, share and analyse data as well as exchange knowledge and agree on best practices. Other networks aim to provide researchers with guidance on RDM requirements.

Many professional OS networks describe their purposes as creating synergy across the sector - ensuring coordination of efforts and activities nationally and internationally in relation to RDM, open data, FAIR data, and AI. Additionally, they aim to align policies and practices, share experiences, and

promote training opportunities. Other networks focus on collaboration and interdisciplinary cooperation to strengthen communities, share data and findings. Bringing communities together to connect and exchange knowledge is mostly the purpose of networks engaged in FAIR data and Open Knowledge.

Finally, many networks aim to maintain their respective nation's leading role in various research disciplines, such as AI, IT, computing, and other data-intensive research disciplines, and to increase their nation's competitiveness. Some networks aim to support their respective nations in becoming leaders in research, education, and innovation.

4.3.2 Activities of OS networks

Knowledge sharing:

Sharing knowledge about OS topics among network members is one of the main activities of professional OS networks. Knowledge is shared at different types of events organised or shared by the networks which span from in-person and virtual meetings, webinars, lectures, and workshops held by experts to deepen members' knowledge, symposiums, conferences, congresses, data sprints, "hackathons", pitch talks, panel discussions, summits, tech dives, and OS labs to social gatherings. Additionally, network members often come together in various groups such as work groups, advisory groups, research groups, task forces and committees. At these events and gatherings, network members meet to share experiences, discuss problems in the field, identify opportunities for the advancement of OS, inspire each other, and formulate guidelines and best practices for OS and DMP writing.

The networks also aim to disseminate knowledge of best OS practices to external stakeholders including researchers, policy-makers, the general public, and to advise institutions on how to integrate OS practices into their operations.

Knowledge is shared through different media like reports, podcasts, blogs, news articles, websites, wikis, online fora and mailing lists. Some networks

are also engaged in OA publishing, publishing of researchers' metadata, running of journals, online magazines, books, and e-books.

Awareness raising:

Professional OS networks undertake awareness-raising activities to increase awareness of OS, open data and data literacy, RDM, and requirements for researchers for opening up research data. Awareness-raising activities are typically targeting researchers, decision- and policy makers but also the next generation of professionals in the OS field. Events, training activities, and other opportunities are promoted by the networks.

Training:

Professional OS networks are engaged in training activities addressing topics such as RDM, open data publication, OS, data stewardship, data storage, data competencies, digital rights, utilizing computing services, and FAIR data. The training activities are targeting researchers, data professionals, entrepreneurs, engineers, and students to navigate and build competencies in OS. A wide array of training formats from master classes, courses, online courses, MOOCs (massive open online courses), summer schools, and train-the-trainer events to mentoring is offered by the networks. Furthermore, OS networks produce educational material such as curricula for academic courses and end-user training, learning resources, and instructional videos to provide guidance and support.

Research support:

Professional OS networks provide a wide range of support for researchers at HEIs and other research institutions. Network members, predominantly those employed at HEIs, offer guidance for researchers to produce DMPs, use online DMP tools, and in ethical and legal terms of RDM; offer guidelines and standards; offer support in documentation, data organization, managing and securing sensitive data; advise researchers on questions of accessibility, replicability, and transparency; help researchers register, find, identify, archive and cite research data; and offer support on data analyses.

Additionally, professional OS networks monitor and provide data analysis tools, digital infrastructure, cloud and storage services, sustainable archiving of research data, specialised databases, online tools and services, and computer resources for the processing of big data. They also seek to provide access to databases, free access to journals, books, repositories, OA policies, evaluations of journal selection, storage and preservation of scientific publications for future users and ensure interoperability between tools and data systems. Some professional OS networks also engage in developing infrastructure to support FAIR data management.

Policy-making:

Another core activity of professional OS networks is to advocate for OS and provide input and recommendations to national OS strategies and policies, as well as develop initiatives for implementing OS, standards, and reporting guidelines. Network members also assist in the implementation of policies, guidelines, and data stewardship models at research institutions. It is mainly research stakeholders such as policy- and decision-makers, national funding agencies, ministries, research assessment bodies, and research councils that networks engage in policy-making activities with.

Collaboration:

Finally, a common activity of professional OS networks is coordinating and facilitating collaboration between various stakeholders such as research institutions, academies, research support services, governments and policy-makers, research funding bodies, and companies. The goal is often to ensure coordination of effort across the sector. Furthermore, many networks aim to facilitate cooperation by setting up international projects, establishing local network nodes in participating countries of international networks and facilitating collaboration between the different nodes of networks.

5 Summary

Task 6.1 sought to map professional OS networks within the 18 European Skills4EOSC consortium countries as well as 6 other European countries identified as frontrunners or as relevant regional partner countries. The mapping was carried out on the basis of desk research and requests to relevant institutions. The searches were conducted both in English and in the respective national language, based on a search methodology inspired by systematic reviews. The search strings originate from the OS field and were narrowed so as to focus specifically to central Skills4EOSC topics, primarily emphasising data-centric practices within OS.

Across the 24 countries included in the study, we identified 328 active national, regional and international networks meeting the criteria of our searches. The main target groups of these networks are researchers and research support staff. The networks are organised around four major topic clusters: 1) *data practices* like research data management and data stewardship, 2) *computing*, including data analytics and artificial intelligence, 3) *open scholarship practices* like open access publishing, open code & software, transparency or reproducibility practices and 4) *research infrastructure support*. The primary focus of the networks involves knowledge sharing among their members. However, they also offer trainings and to some extent, participate in policy-making activities.

Three final observations:

1. There is currently a lack of standardised and well-maintained national or international registries of OS networks or communities. The major international OS-related registries, such as FAIRSharing, OpenDOAR, re3data, etc., do not provide information about professional networks or communities.
2. The smaller the overall number of existing networks in a given country, the less diverse is the OS landscape in this country.
3. The life sciences still appear to be the most active research community and thereby dominate the OS landscape.

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No	Description/Link
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