TRANSFORMING OPEN RESPONSIBLE RESEARCH AND INNOVATION THROUGH CHARM

TORCH

TORCH WP6

OPEN SCIENCE SURVEY AND GAP ANALYSIS

WORKING PAPER

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EXECUTIVE SUMMARY: COMPARATIVE CHARM-EU OPEN SCIENCE REPORT

The CHARM-EU Alliance is dedicated to make Open Science one of the main paradigms of scientific research in Europe. Work Package 6 of TORCH, titled 'Mainstreaming of comprehensive Open Science practices' had the main objective to capture and compare Open Science policies, practices, and capacities across the CHARM-EU partners (University of Barcelona, Trinity College Dublin, Utrecht University, Eötvös Loránd University Budapest, and University of Montpellier). This activity is essential due to the large existing differences between the partners: some institutions and their national policies have Open Science principles, processes, data management plans in place, some have developed best practices and researchers' awareness, while others may have only recently embarked on this path.

First, we developed a methodology, the Open Science Scope, a survey custumised to collect information on institutional as well as faculty levels. The entire methodology was built upon the input of the members of the alliance and approved on ELTE leadership level. The survey explored the way in which the university leadership mandates and advocates Open Science policies, in addition, all the 'Eight Pillars' of Open Science were selected to be monitored and analysed across the alliance. The eight pillars of Open Science are FAIR Data, Research Integrity, Next Generation Metrics, Future of Scholarly Communication, Public Engagement (including Citizen Science), Education and Skills, Rewards and Initiatives, and EOSC. In addition, we implemented questions concerning Resourcing/Benchmarking as well as the obstacles in the transition to Open Science.

Using ratings and free-text survey responses received from all members of the alliance, we employed the methodology of gap analysis in order to provide such a picture of our institutes' present open science that is able to highlight the gaps between the current state of affairs and our target goals. The gap analysis is expected to inform the members and executives of an organisation about the identified deficiencies from various perspectives.

The present report contains the survey responses in summarised and raw formats along with their analysis. Furthermore, we list a number of recommended actions to further improve and propagate each pillar of Open Science. The experiences, best practices, solutions, and strategies shared in this document should help the members of the alliance decrease the local barriers for mainstreaming Open Science in their research community.

The survey identified a number of good practices and directly implementable procedures that the members of the alliance can learn from each other. Concerning cultural change and leadership, forming and empowering an institutional Open Science workforce is an effective strategy. These workforces should be diverse, involving involve staff from the library, research support staff, HR, IT services as well as academics from across all faculties. In addition to top-down leadership, Open Science communities can disseminate and solidify the Open Science philosophy to everyday practice.

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The future of scholarly publishing is a focus in each university. Making full open access part of the university strategy and establishing a monitoring system for compliance with open access is in progress everywhere with different level of success. The importance of sharing research data, code, and materials is gaining recognition but their implementation is far from general.

Institutional policy for research data management needs further support, especially by providing infrastructure and guidance to follow FAIR principles. There is a general recognition that HR, library, IT data stewards, and the IT services to support the implementation of FAIR principles in the research community need more training and resources.

Integration of the institutional repositories with the European Open Science Cloud is not completed everywhere. What is needed is the development of a search and discovery service to enable users to find what research data are available and where they are located. These will be effective if they are supported by standards, guidelines, and protocols for data sharing.

A central method to make Open Science practices mainstream is by offering skill training for all areas of Open Science and tailoring it to groups of staff and students. Institutions should further encourage staff and students to join the local Open Science community, organise student groups on open alternatives. Academics should be invited to share their experiences on open access publishing. Making student and supervisor training mandatory on Open Science skills is also an effective identified strategy.

Open Science recognition and rewards are fairly underdeveloped in most universities. First, a vision on recognition and rewarding of Open Science practices is needed then it should be applied to be part of recruitment and performance evaluation.

Next-generation metrics are alternative metrics to citation and journal impact counts whenever assessing researchers' performance. A first step that universities can take in this direction is to join the Declaration on Research Assessment (DORA) which is a set of recommendations aiming to improve the measurement of quality and input of scientific input by abandoning the practice of assessing the merit of a scientist's contribution by journal-based metrics, such as impact factor. Next, internal policies are needed for the implementation of DORA recommendations. All of these changes should be assisted by guidance given to research administrators and academics on good practices in the use of new bibliometrics. Help cultural change in this regard is needed particularly on the early career researcher level.

Whereas maintaining research integrity is a general aim of the universities, a specific framework for requirements on roles, responsibilities, and entitlements of researchers is provided by the European Charter for Researchers and the Code of Conduct for Recruitment of Researchers are two documents of the European Commission. Members of the alliance should develop internal policies in order to adopt and promote the research integrity principles provided by these documents.

Public participation in research (Citizen Science) is gaining recognition but needs further support on several levels. Relevant charters are recommended to propagate the importance of high-quality

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citizen science at university level and to make citizen science contributions part of the researcher evaluation system.

All pillars of Open Science require institutional resources, therefore, the present report recommends that human and infrastructure resources are provided for all activities related to the pillars of Open Science and that the Open Science activities are monitored and assisted at an institutional level.

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1. INTRODUCTION

The CHARM-EU Alliance is dedicated to make Open Science one of the main paradigms of scientific research in Europe. Work Package 6 of TORCH, titled 'Mainstreaming of comprehensive Open Science practices' had a main objective to conduct an in-depth investigation and scoping process to collate data and report findings on the reality of all aspects of Open Science principles and practices across the TORCH Alliance universities (University of Barcelona –UB, Trinity College Dublin –TCD, Utrecht University –UU, Eötvös Loránd University Budapest –ELTE, and University of Montpellier –UM).

Capturing Open Science practices is an important starting point, as great variations can exist among research institutes in Open Science practices. Some institutions and their national policies have Open Science principles, processes, data management plans in place, while others are still early at adopting practices in certain areas of Open Science. By identifying the strengths and weaknesses of Open Science practices on an institutional level, we can focus the areas of development. Sharing local good practices and experiences can also be informative and it can also accelerate the progress of making Open Science mainstream practice among researchers and institutions.

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2. METHODOLOGY

A methodology of Task 6.1 of Work Package 6, Open Science Scope, was developed in order to collect information about the Open Science practice of the project partners. Open Science Scope is a survey costumised to collect information on institutional as well as faculty levels. The entire methodology was built upon the input of the members of the alliance and approved on ELTE leadership level.

The survey was based on the LERU Roadmap for Open Science and on EC National Action Plans for Open Science reporting. The survey explored the way in which the university leadership mandates and advocates Open Science policies, in addition all the 'Eight Pillars' of Open Science were selected to be monitored and analysed across the alliance. The eight pillars of Open Science are FAIR Data, Research Integrity, Next Generation Metrics, Future of Scholarly Communication, Public Engagement (including Citizen Science), Education and Skills, Rewards and Initiatives, and EOSC. In addition, we implemented questions concerning Resourching/Benchmarking as well as the obstacles in the transition to Open Science (Table 1).

Table 1. Structure and Content of the Open Science Scope Survey.

Survey section	Content	Survey items
Cultural change/ Leadership	Exploring whether and how the university developed a programme of cultural change to support the changes in principle and practice towards Open Science.	4-18
The future of scholarly publishing	Surveying the planning, advocacy, and policies of the university towards fully Open Access academic publishing.	19-32
FAIR data	Exploring the institutional policies, institutional support, infrastucture, and assessment aspects of research practices to make scientific data Findable, Accessible, Interoperable, and Reusable.	33-41
The European Open Science Cloud (Infrastructure and support services)	Surveying the universities' involvement in the EOSC association and the usage of data repositories and support services.	42-45
Education and skills	Questions concentrating on training, incentivisation, and assessment of Open Science skills and practices.	46-51
Recognition and rewards	Exporing the recognition and rewarding of Open Science practices in recruitment, performance evaluation, and career advancement policies.	52-55
Next-generation metrics	Exploring whether the university uses or developed alternative metrics to citation and journal impact counts whenever assessing researchers' performance.	56-61

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Research integrity	Surveying whether the university adopted the European Charter for Researchers and whether the institution entails Open Science practices to help researchers acting honestly, reliably, respectfully and are accountable for their actions.	62-63
Public participation in research (Citizen Science)	Policies, communications, and assessment of the role that the public has in scientific research.	64-74
Resourcing/ Benchmarking	Collecting data on institutional resources in stuff support towards implementing Open Science practices.	75-95
Limitations	Identifying the factors that prevent the transition to Open Science.	96

The following part of this report provides a gap analysis and action lists for each of the sections of the Open Science Scope survey. The inserted tables show the self-reported RAG (Red-Amber-Green) analysis of the items of the survey for each university.

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3. GAP ANALYSIS

We employed the methodology of gap analysis in order to provide such a picture of our institutes' present open science that is able to highlight the gaps between the current state of affairs and our target goals. With a completed gap analyses one should be able to find those deficiencies in the operation that need to be addressed. A gap analysis report is expected to inform the members and executives of an organisation about the identified deficiencies from various perspective.

Cultural change/ Leadership

Analysis

The aim of this section of our survey was to explore whether and how the members of the alliance developed a programme of cultural change to support the changes in principle and practice towards Open Science. In general, we observed that all our universities made some progress regarding this pillar of Open Science, we identified several areas of improvement (Table 2).

On the level of leadership, some institutes have an Open Science Team that manages the Open Science movement within the university, others appoint a senior leadership figure to be devoted to open science and research data. Dedicated Open Science programmes exist regarding recognition, reward, open access, and FAIR data, as well as public engagement. These strategic programmes target cultural change at staff development training new staff inductions ran by HR and library members as well as in master classes.

The philosophy of Open Science is often part of the strategy plan of the universities, but it is not yet adopted everywhere. On the national level, only two countries have published National Open Science Plan:

France: https://www.ouvrirlascience.fr/plan-national-pour-la-science-ouverte/

The Netherlands: https://www.openscience.nl/en/national-platform-open-science/national-plan-open-science

Other countries in our alliance are in progress of the preparation of such a document.

The picture is diverse in Open Science advocacy across the members of the alliance. Activities range from workshops, seminars, trainings, information days to webpage materials in promoting the benefits of open science best practices. An active open science community can be the engine of such activities. Open Educational Resources are generally promoted but formal policies on them are not established. Special support and repositories serve the development of individual initiatives.

We asked whether the university have communication strategies that enable the whole university body to become familiar with Open Science practices. Wherever there are Open Science task forces or communities, announcements are regular in newsletters, podcasts, in social media, and in faculty specific conferences.

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Funding sources are devoted to some pillars of Open Science, such as building the required infrastructure as well as open science communities and programmes. Awards are also established to support Open Science reforms but no university funds all the pillars of Open Science.

In general, open science and its different areas are more or less embedded in all members of the alliance.

Table 2. Gap analysis for the Cultural Change / Leadership section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
Cultural change/ Leadership						
Leadership	Has your university appointed a senior manager to lead Open Science approaches across all eight pillars of the Open Science?					
HR	Has your university developed a programme of cultural change, which is necessary to support the changes in principle and practice which Open Science brings?					
	Does the strategy of the university contain the philosophy of Open Science?					
Policy	Is there a National Plan/Strategy in your country?					
Policy	Is there an Oper Science policy in your university or there are several policies (Open Access, Research Data Management etc.)?					
Advocacy	Does your university have advocacy programmes to identify the benefits of Open Science approaches, whilst being realistic about the challenges?					
Advocacy	Does your university communicate extensively on the 'why' of Open Science?					
Advocacy	Does your university promote the creation and use of Open Educational Resrouces?					
Communication	Does your university have communication strategies which enable the whole university body to become familiar with Open Science practices?					
	Is there an Open Science Community to boost the Open Science movement?					
	Do the formal bodies (executive Board, deans, directors) within the university act as role models for Open Science?					
	Are there funding sources used in your institution for supporting the following open science areas?					
	How would you assess the level of embeddedness of open science and its different areas in your institution?					

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Action list

Where missing, universities should:

· form an Open Science Task Force to lead cultural change in all areas of Open Science;

· involve staff from the library, research support staff, HR, IT services as well as academics from across all faculties in the task force;

· appoint a senior management figure dedicated to Open Science strategy;

· make the philosophy of Open Science part of the university strategy;

· build an active Open Science community to communicate the purpose and practical implementations of the underlying principles (https://inosc-starter-kit.netlify.app/);

· establish comprehensive support for the creation of Open Educational Resources;

· create a communication strategy that regularly informs the staff about the opportunities to extend one's Open Science knowledge;

· create institutional funding for the aims of the Open Science pillars.

The future of scholarly publishing

Analysis

This section of our survey aimed to explore the planning, advocacy, and policies of the universities towards fully Open Access academic publishing. The results reflected that each member of the alliance made progress in this area but we also identified gaps between the aims and the present state (Table 3).

Support full open access in not mandated in all institutions but there are good examples. Some members have more than 10 years of advantage in this area and fully open access is part of their strategy plan. Open access compliance is monitored in the majority of the universities. Stakeholders often work together to deliver a roadmap for how they, or specific groupings, can develop agreed plans for the future of scholarly publishing in their institution. These typically involve the Open Science task force, the library's relevant department, and the leadership of the university. Author identifier systems such as ORCID are generally advocated across the insitutions. This can be manifested in advocacy programmes, ORCID consortium membership, workshops, trainings, reminders. The integration of ORCID within the insitutional research information systems can facilitate the synchronisation between the author's publications and other data on the researcher's profile.

There are mixed attitudes toward sharing research manuscripts as preprints. While the deposition of the accepted versions of research manuscripts is sometimes required from the researchers the

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advocacy is mostly done by research communities. Some prefer sharing only peer reviewed manuscripts to counteract any possible perception of open access as low quality. New forms of scholarly publishing, such as OpenEdition or Knowledge Unlatched, are not everywhere known. Some support alternative open access approaches such as The Global Sustainability Coalition Science Services or Open Book Publishing. Locally published journals are managed through Open Journal System. Trinity College Dublin is the most advanced in this regard. They report: "We have engaged with F1000 to support our researchers with submitting to the HRB Open Research Platform and a Trinity senior researcher provides feedback and advice for F1000 as part of the HRB Open Research stakeholders group. We have had discussions with F1000 on their archiving of HRB Open Research Platform in eDepositIreland (the latter is an Open Access repository for voluntary electronic legal deposit on a national level, hosted by TCD). Trinity's SOAPbox (Student Open Access Publishing project) supports and hosts eight open access journals on our OJS platform. The Library hosted a invited talk by Dr Paul Ayris (UCL) in 2018 demonstrating innovation in scholarly communication to our Library and research community and stimulating dsicussion in this area."

Most universities publish scientific journals on Diamond Open Access model or actively encourage employes to publish in such journals. Only two members of the alliance has university press with increasing volumes available open access. Although no university has formal policy in order to support authors to retain copyright of their publications, CC licensing is encouraged. Specific targets are generally not defined for open access to research publications or a timeline for achieving such target. One university has an open access policy aiming for diamond options and not for full open access.

Almost all members of the alliance monitor the number of publications authored from researchers in open access journals, sometimes limited to the ones for which the university covered the article processing charges. ELTE University Library and Archives started a project that aims to archive all Gold open access documents (articles, books, book chapters, conference proceedings etc.) ever published by ELTE affiliated authors in the institutional repository, based on documents indexed by Web of Science and Dimensions.

Plan S is an EU initiative to make the research publications available immediately (without embargoes) and under open licences. Some members have not taken any steps toward its implementations or are affected only indirectly by the plan. Trinity College Dublin is the most advanced in this regard. They report that they have already taken the following steps "1) Changes have been made to the institutional repository (TARA) to provide authors with a choice of Creative Commons licences, including CC BY, to apply to their deposited publications. 2) A series of webinars on Plan S requirements have been provided for both academic staff and research support staff, and further training is planned for the future. 3) A detailed guide to Plan S has been published on the Library website and has been promoted through university-wide emails, training sessions, and the Library webpages."

Universities provide researchers with the following support in order to make their research publications available in open access: institutional repositories, trainings on open access publishing,

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read-and-publish agreements to cover costs of open access, helpdesks, assistance campaigns, free university journals, and customer service.

All universities advocate the public share of research data, code, and materials. Some encourage the sharing of data as long as no ethical, legal, data protection, regulatory, commercial or other impediments to sharing exist. It is beneficial if training in research data management is provided as part of wider open science skills training.

Table 3. Gap analysis for the Future of scholarly publishing section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
The future of scholarly publishing						
Compliance	Does your university have institutional mandates to support the move to full Open Access and does it monitor implementation of these mandates?					
Planning	Can relevant stakeholders work together to deliver a roadmap for how they, or specific groupings, can develop agreed plans for the future of scholarly publishing in their institution?					
Advocacy	Does your university advocate the use of author identifier systems such as ORCID across the institution?					
Advocacy	Does your university advocate the share of research manuscripts as preprints?					
Innovation	Has your university considered supporting new forms of scholarly publishing from third parties, such as OpenEdition, and Knowledge Unlatched, which are dedicated to Open Access approaches?					
	Does your university publish scientifc journals? How open they are? Which OA model use (fdiamons, APC gold, hybrid)?					
	Does your university/country support authors to retain copyright of their publications?					
	Do you have a university press? How engaged is it with OA?					
	Has your university defined a specific target for open access to research publications and a timeline for achieving this target?					
	Does your university monitor the number of publications deposited by researchers in the institution's own or shared repository?					
	Does your university monitor the number of publications authored from researchers from your institution and published in open access journals (excluding hybrid journals)?					
	Is your university preparing for the implementation of Plan S?					
	What type of support does your university provide to researchers to make their research publications available in open access (both through repositories and open access publishing)?					
	Does your university advocate the public share of research data, code, and materials?					

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Action list

Where missing, universities should:

· make full open access part of the university's strategy;

· establish a monitoring system for compliance with open access;

· facilitate interaction among the stakeholders to work together in supporting open access mandates;

· widely advocate the share of research manuscripts as preprints;

· develop a system to monitor the publications published in open access or deposited in the institutes repository;

· prepare your institute for the implementation of Plan S by adjusting article licensing, training staff in webinars, training sessions and through information materials;

· provide support to researchers in order to make their research publications available in open access: institutional repositories, trainings on open access publishing, assistance campaigns, free university journals, and customer service;

· advocate the sharing of research data, code, and materials and provide guidance for their implementation.

FAIR data

In this section of the survey, we aimed to explore the institutional policies, institutional support, infrastructure, and assessment aspects of research practices to make scientific data *Findable, Accessible, Interoperable,* and *Reusable* (Table 4).

Analysis

Three of the universities have dedicated policy on research data, one more has it as part of a general policy on good research practice and ELTE has no research data policy or strategy. The FAIR principles are often included in them. Dedicated services to provide data stewardship to researchers is not everywhere developed. Utrecht University, however, has a whole support center, called Research data management support, with multiple consultants, data managers research engineers, and coordinators[1]. Trinity College Dublin has taken initial steps in this regard. They wrote "Two institutional data stewards have been identified and trained by Go-FAIR in Leiden as part of the Health Research Board (HRB) Open Data Pilot Project. They support researchers in writing their DMPs and costing FAIR data management in grant proposals insofar as possible on a part-time,

[1] https://www.uu.nl/en/research/research-data-management

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voluntary basis. They are part of a national network of such data stewards. However, no additional resourcing is currently provided at the institutional level for data stewardship.".

Some universities have their own platform for sharing and storing data. Others promote the use of the most appropriate third-party repositories, such as Zenodo, GitHub, OSF, or the Digital Repository of Ireland. Utrecht University developed a storage finder tool that helps researchers select the most appropriate option for sharing data.

Universities scarcely gather information about the data archived and published by its research community. Wherever it is done, it is not comprehensive as it relies on the activity from the research community. When we asked whether the university publishes all metadata about the research data generated or obtained within the research community, they pointed out some limitations as they cannot monitor the share of all research data the CRIS can be made compliant with the OpenAIRE Guidelines for Data Providers and DataCite schema.

Research data as a valuable output in research assessment is recognised in some places. Trinity College Dublin reports: "datasets are recognised and included as research outputs for the purposes of assessing individual researcher and School research productivity in a University-wide assessment methodology as well as in the Faculty Research Metrics (FRM) for Arts, Humanities and Social Sciences. The facility is there for datasets to be reported and highlighted in Junior and Senior Academic Promotions and probationary submissions alongside an individual's other research outputs."

Only the University of Montpellier reported to maintain an archive of Data Management Plans. Others are either not engaged in this topic yet or advocate the use of online tools to create Data Management Plans, such as https://dmponline.dcc.ac.uk/.

In general, universities support the researchers in the area of research data management, FAIR data, and data sharing in forms or trainings in research data management, promotion of data sharing, staff open science trainings, and the preparation of tools, guidelines, and templates. These support activities are provided by the HR, library, IT data stewards, and the IT services.

Action list

Where missing, universities should:

· develop an institutional research data policy;

· include FAIR principles in your policy;

·provide stewardship and infrastructure to support the implementation of FAIR principles;

· assist researchers in finding the most suitable repository for sharing their research data;

· include research data in the researcher assessment methodology and research metrics;

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· promote the creation and sharing of Data Management Plans;

· train HR, library, IT data stewards, and the IT services to support the implementation of FAIR principles in the research community.

Table 4. Gap analysis for the FAIR data section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
FAIR data						
Institutional policy	Does your university have a research data policy or strategy?					
Institutional policy	Does your university research data policy or strategy include FAIR principles?					
Institutional support	Has your university established a dedicated service to provide data stewardship to its researchers?					
Infrastructure	Does your university provide access to an infrastructure storage and publication of research data? If it does not, does your university inform its researchers of available infrastructures that follow the FAIR principles?					
Data	Does your university gather information about the data archived and published by its research community?					
Metadata	Does your university publish all metadata about research data generated or obtained within its research community?					
Assessment	Does your university include research data as a valuable output in research assessments?					
	Does your university maintain an archive of Data Management Plans?					

The European Open Science Cloud (Infrastructure and support services)

This section of the survey aimed to explore the universities' involvement in the EOSC association and the usage of data repositories and support services (Table 5).

Analysis

Only the University of Barcelona reported that they have established a data repository, or they have access to a third-party repository which can integrate with the EOSC. Others, just as Trinity College Dublin, support the use of external data repositories (e.g., Zenodo or DRI). OpenAIRE AMKE members, such as Trinity College Dublin, have agreed to promote the EOSC principles in research data management.

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Some universities have already developed a search and discovery service to enable users to find what research data are available and where they are located. ELTE, for example, is developing ELTE Find which will enable users to search internal and external data repositories.

Utrecht University and Montpellier University are involved in the EOSC Association as members, Trinity College Dublin and the University of Barcelona are indirectly involved, through their membership in other associations (OpenAIRE, LERU), ELTE is not a member of the EOSC.

We asked which standards, guidelines, and protocols are used in their university's own or shared repositories. Those that have dedicated research data infrastructure use the Dublin Core, Data Schema, OAI-PMH, Dspace, and SWORD2 protocols for standard data sharing. Utrecht University has a dedicated support website for research data management: https://www.uu.nl/en/research/research-data-management.

Action list

Where missing, universities should:

· become a member of the EOSC and promote its principles;

· integrate your institutional data repositories with EOSC;

· develop a search and discovery service to enable users to find what research data are available and where they are located;

· introduce standards, guidelines, and protocols for data sharing.

Table 5. Gap analysis for the The European Open Science Cloud (Infrastructure and support services) section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
The European Open Science Cloud (Infrastructure and support services)						
Infrastructure development	Has your university established a data repository, or does it have access to a 3rd party repository/repositories which can interact with the EOSC?					
Infrastructure development	Does your university have a search and discovery service, enabling users to find what research data is available, and where it is located?					
Policy development	Is your university involved in the EOSC Association? Are you a member?					

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Education and skills

In this section of the survey, our aim was to ask some questions concentrating on training, incentivisation, and assessment of Open Science skills and practices (Table 6).

Analysis

First, we inquired whether their university offers skill training specifically in Open Science in all or certain of the eight areas, or other Open Science aspects? All members of the alliance have some trainings in this regard. The target group of these trainings is often the doctorate students but they also exist for librarians, administration staff, and researchers at all career levels with certain extensions to bachelor students. These trainings cover open access publishing opportunities, research data management, citation management tools, using the institutional repositories, research metrics, and so. In places, these trainings are mandatory for PhD students but staff training is provided as part of new staff induction but it is not mandatory.

In three of the universities, there is no monitoring or assessment of the provision, uptake, and impact of open Science skill trainings. At ELTE, it is monitored in anonymous surveys, Trinity College Dublin monitors it only for the compulsory course of the doctoral students and the training of academic and research staff by TCD Research Informatics, in liaison with HR and the Research Office. All trainings put special attention for the education of the 'why' of Open Science. Rewards and incentives are not offered to those who participate in Open Science trainings other than in any other training sessions, however, Utrecht University made Open Science practices an integral part of their new vision on rewards and recognition[2].

Action list

Where missing, universities should:

· offer skill trainings for all areas of Open Science and tailor it to groups of staff and students;

· bring in experienced researchers to speed up skill acquisition;

· encourage staff and students to join the local Open Science community;

· organise student groups on open alternatives;

· academics should be invited to share their experiences on open access publishing;

· make student and supervisor trainings mandatory on Open Science skills.

[2] https://www.uu.nl/sites/default/files/UU-Recognition-and-Rewards-Vision.pdf

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Table 6. Gap analysis for the Education and skills section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
Education and skills						
Training	Does your university offer skill training specifically in Open Science (in all or certain of the eight areas, or other Open Science aspects)?					
Audience	Is any Open Science skills training mandatory, and for which categories of staff/researchers/students?					
Assessment	Does your university monitor or assess the provision, uptake and impact of Open Science skills training?					
	Is there special attention for education of the 'why' of Open Science?					
	Are any rewards and incentives offered to those who participate in Open Science training?					
	Is Open Science skills training specifically tailored to groups of staff/students? (i.e. early career researchers, disciplines, etc.)					

Recognition and rewards

With this section of our survey, we aimed to explore the recognition and rewarding of Open Science practices in recruitment, performance evaluation, and career advancement policies (Table 7).

Analysis

Utrecht University reported the most advanced embeddedness of the recognition and rewarding of Open Science in the vision of the university. There, the TRIPLE recognition and reward vision[3], which represent Team, Research, Impact, Professional performance, Leadership, and Education, has been developed from their Open Science Programme.

We asked whether the universities integrate Open Science in their HR and career frameworks as an explicit element in recruitment, performance evaluation, and career advancement policies. Other than Utrecht University, other institutions don't have explicit policies in this regard, or they are in preparations. Explaining the barriers, Trinity College Dublin writes "This has been discussed with HR and, while they are open to implementing it, it would require policy decisions at the University level (e.g., by the Academic Promotions Committee) to allow them to effect this. Given the diversity of practices across our diverse community of researchers, there cannot be a 'one size fits all' approach to evaluation and we are very mindful of the need to ensure that any move towards rewarding Open Science practices must be balanced against the need to not inhibit recognition for those whose fields are - for many reasons - less engaged in Open Science. Trinity is also actively engaged in discussion

[3] https://www.uu.nl/sites/default/files/UU-Recognition-and-Rewards-Vision.pdf

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on the National level regarding incentives and rewards for Open Science through the National Open Research Forum (NORF)."

Policies on researcher evaluation are not generally open and easily accessible. Utrecht University has an advantage here as their research evaluation vision is openly published. Others have only partial openness about these policies.

Action list

Where missing, universities should:

· develop a vision on recognition and rewarding of Open Science practices;

· make this policy part of recruitment and performance evaluation;

· make the policies on researcher evaluation open and easily accessible.

Table 7. Gap analysis for the Recognition and rewards section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
Recognition and rewards						
	Does the vision of your university include the recognition and rewarding of Open Science?					
HR policy	Does your university integrate Open Science in its HR and career frameworks as an explicit element in recruitment, performance evaluation, and career advancement policies?					
Assessment	Does your university assess the extent to which individuals, teams or units integrate Open Science in their daily practice? And does it recognize and/or rewards them for this?					
Communication	Does your university make information about its policies on researcher evaluation open and easily accessible?					

Next-generation metrics

With this section of the survey, we aimed to explore whether the university uses or developed alternative metrics to citation and journal impact counts whenever assessing researchers' performance (Table 8).

Analysis

The Declaration on Research Assessment (DORA) is a set of recommendations aiming to improve the measurement of quality and input of scientific input by abandoning the practice of assessing the

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merit of a scientist's contribution by journal-based metrics, such as impact factor. Signatories of DORA promise to follow these recommendations. Among our alliance members, Utrecht University signed the declaration and Trinity College Dublin might be considered a default signatory of DORA through the LERU Rectors' Assembly adoption. For the latter, it is also part of their most recent Policy on Good Research Practice to implementing the DORA principles as part of a fair and responsible approach for research assessment.

Beside journal impact factor and quartiles, the following bibliometric and alternative metrics and tools are in use at our alliance members: Scopus/SciVal, Web of Science/InCites, Google Scholar / Publish or Perish, Dimensions and Altmetric Explorer, quality assessment by peers, measuring open access publications, and category normalised/field-weighted citation index.

Next, we asked whether their university would develop a bibliometrics policy aiming to change the culture in the academic community about research assessment. Utrecht University is working on new indicators that can support their new recognition and reward principles (TRIPLE), others either take the DORA recommendations or don't have relevant development in this regard. One faculty of ELTE developed an internal point system which combines researchers' publishing productivity and activity in the research community.

Utrecht University has already altered their promotion/tenure tracks evaluation at various places according to their new evaluation system. The others are still before introducing policy changes at HR level. Inquiring about best practice guidance in this regard, we asked whether their university, via appropriate internal bodies, construct guidance for research administrators and academics on good and bad practice in the use of traditional bibliometrics and in the development of new metrics, working with the scientific community in this endeavour. Higher level coordination of this issue is scarce, in the best existing practices these initiatives are tracked.

We tried to find out, whether their university give particular focus to early career researchers, particularly those embarking on a course of doctoral study, providing training to enable them to embrace the change of culture and practice which the responsible use of metrics brings. Wherever it exists, it is part of the Open Science training. It is noted that these training programmes should deserve accreditation in order to receive further recognition.

Action list

Where missing, universities should:

· join the signatories of DORA;

· develop internal policies for the implementation of DORA recommendations;

· develop new researcher evaluation practices for promotion and reward;

· give guidance for research administrators and academics on good practices in use of bibliometrics

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help cultural change in this regard, particularly on early career researcher level.

Table 8. Gap analysis for the Next-generation metrics section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
Next-generation metrics						
	Did your university sign DORA and is it moving away from JIF/H-Indexes/#papers for research assessment?					
	What bibliometric and/or alternative metric tools does your universit/faculty use for research assessment?					
Policy development	Will your university develop a bibliometrics policy aiming to change the culture in the academic community about research assessment?					
HR	Will your university embed the new forms of research evaluation in its internal processes for promotion/reward and research evaluation?					
Best practice guidance	Will your university, via appropriate internal bodies, construct guidance for research administrators and academics on good and bad practice in the use of traditional bibliometrics and in the development of new metrics, working with the scientific community in this endeavour?					
Training for early career researchers	Will your university give particular focus to early career researchers, particularly those embarking on a course of doctoral study, providing training to enable them to embrace the change of culture and practice which the responsible use of metrics brings?					

Research integrity

In this section of the survey, our aim was to explore whether the university adopted the European Charter for Researchers and whether the institution entails Open Science practices to help researchers acting honestly, reliably, respectfully and are accountable for their actions (Table 9).

Analysis

The European Charter for Researchers and the Code of Conduct for Recruitment of Researchers[4] are two documents of the European Commission to boost researchers' careers constituting a framework of requirements that specifies the roles, responsibilities, and entitlements of researchers and their employers. Adopters of the principles of these documents follow general aims, such as adherence to ethical practices, good practice in research, non-discrimination etc. All universities endorsed and adopted the principles of the Charter. In fact, the commission of the European Charter

[4] https://euraxess.ec.europa.eu/jobs/charter-code-researchers

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for Researchers was impressed by the approach of Utrecht University to include Open Science in the HR strategy.

Research integrity is promoted by different approaches. For some, a chart is to be signed by all PhD candidates and their supervisors. PhD candidates must attend a training on responsible integrity, for others it is in the competence of research ethics committees. Trinity College Dublin reports: "Trinity also has a Research Ethics Policy Committee (REPC) that is a sub-committee of the university's Research Committee. It brings together key stakeholders who have responsibility for RI matters across the university (e.g., DPO, Senior Dean (Our Research Integrity Officer), College Secretary, Reps from each Faculty, etc.) and its goal is to strategically lead out on research ethics and integrity related matters. Hence, research integrity is emphasised in the university Policy on Good Research Practice, which is guided by the national policy statement Ensuring Research Integrity in Ireland and informed by our engagement with the LERU INTE group (Research Integrity Policy Group). The Schedules to the College Statutes also reference RI. Training in research integrity is mandatory for all doctoral students as part of the compulsory module 'Research Integrity and Impact in an Open Scholarship Era'."

Action list

Where missing, universities should:

· develop internal policies in order to adopt and promote the research integrity principles of the European Charter for Researchers and the Code of Conduct for Recruitment of Researchers.

Table 9. Gap analysis for the Research integrity section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
Research integrity						
	Did your university adopt the European Charter for Researchers/The Code of Conduct for Recruitment of researchers and does it entail Open Science principles?					

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Public participation in research (Citizen Science)

In this section of the survey, our aim was to explore the universities' policies, communications, and assessment of the role that the public has in scientific research (Table 10).

Analysis

Universities can recognise public participation in research and education on an institutional level. Trinity College Dublin, University of Montpellier, and Utrecht University reported details on such a policy. Trinity College Dublin is a signatory of the Campus Engage Charter for Civic and Community Engagement, which supports citizen science alongside the broader area of civic engagement and involvement. This document is supported by a set of metrics and indicators to measure civic engagement (including citizen science). Utrecht University has public engagement at the core of their open science programme. Formal university-level agendas for research topics with the involvement of societal stakeholders is not typical. These collaborations are mostly set on faculty or research group level. Utrecht University, however, has four strategic themes and hubs connected with societal stakeholders. Trinity College Dublin is partner on the EU Citizen Science project led by the European Citizen Science Association with the aim to create a European hub for citizen science. Having a single point for citizen science within the universities of the alliance is not typical. Trinity College Dublin has a designated Civic Engagement Officer in the form of its new Associate Dean of Civic Engagement and Social Innovation and Utrecht University has a public engagement program[5] and a centre for science and culture[6] that connects researchers and citizens.

Two of our universities have activities to raise awareness amongst researchers of criteria for high-quality citizen science (in terms of scientific and societal impact). Citizen science can be taught in modules, events being organised, or research conducted on the impact of public engagement activities. ELTE has a university-ide early-career researcher excellence prize for outstanding achievements in Open Science and citizen science.

We inquired whether citizen science contributions are assessed, and research evaluation and reputation systems adapted accordingly in these universities. While most universities did not show advancement in this area, Trinity College Dublin reported: "The institutional CRIS (Current Research Information System) has been extended recently to capture and report on civic engagement/involvement and involvement with citizens in research. In the Faculty of Health Science, Evidence of Public Patient Involvement (PPI) is counted towards the annual Faculty Research Metrics evaluation process. Evidence of PPI includes publications co-authored by public research stakeholders, including patients, members of the public, public or professional service providers, policy makers, civil and civic society organisations and other external partners. The Registrar's annual Civic Engagement Award is a university-wide award recognising and honouring researchers, students and administrators involved in Civic Engagement including Citizen Science).

[5] https://www.uu.nl/en/organisation/public-engagement-at-utrecht-university
[6] https://www.uu.nl/en/organisation/governance-and-organisation/the-university-service-departments/the-university-corporate-offices/centre-for-science-and-culture

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Information captured on Engagement and related areas are reported via the CRIS as part of the academic promotions process."

Although it is not general that proposals for granting bodies for citizen science projects include long-term commitment for infrastructures and data repositories among the members of the alliance, all European Commission funded applications include an obligatory recommendation to utilise open access data repositories and this is supported via an institutional commitment to institutional repository.

The European Citizen Science Association has published the '10 Principles of Citizen Science'[7]. These principles are taught in two modules at Trinity College Dublin and some research groups advocate them at the University of Barcelona.

An important part of citizen science is that citizens can act as co-researchers in certain projects. In the University of Barcelona, citizens can become co-designers or data interpreters, or even co-authors for a number of projects. For others, it happens on research group level and information is not centrally gathered on them. Occasionally, these participatory research projects are built and co-created in partnership with civil society organisations and public agencies. For example, the Environmental Protection Agency is involved in citizen science in Ireland, and they have been working with Trinity College researchers to better support citizen science through the implementation of the EU-Citizen Science platform.

Action list

Where missing, universities should:

- join the Campus Engage Charter for Civic and Community Engagement or relevant charters to support citizen science;
- recognise and propagate the importance of high-quality citizen science at university-level;
- make citizen science contributions part of the researcher evaluation system;
- support the implementation of the European Citizen Science Association's principles;
- create a single point for citizen science within your university to monitor and support the involvement of the public in scientific research and publications.

[7] https://osf.io/xpr2n/wiki/home

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Table 10. Gap analysis for Public participation in research (Citizen Science) section of the Open Science Scope survey results. Note: Green stands for *"Yes"* or *" the activity is in progress to being completed, or it is completed";* Yellow stands for *"some progress is made, but challenges remain"*; Red stands for *"the activity has not been delivered and there are no plans to deliver such an outcome".*

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
Public participation in research (Citizen Science)						
	Does your university recognise that public participation in research improves the quality of research and education?					
	Does your university set the agenda for research topics together with societal relevant stakeholders?					
Policy	Does your university recognise citizen science as an evolving set of research methods, as well as its societal and educational benefits?					
Communication	Is there a single point for citizen science within your university?					
Communication	Does your university raise awareness amongst researchers of criteria for high quality citizen science (in terms of scientific impact-as well as societal impact)?					
Assessment	Are citizen science contributions assessed and research evaluation and reputation systems adapted accordingly in your university?					
Policy	Do proposals for granting bodies for citizen science projects include long-term commitment for infrastructures and data repositories in your university?					
Policy / Communication	Does your university support the implementation of the ECSA 10 Principles of Citizen Science?					
	Are there participatory research projects in your university where citizens act as co-researchers? In which level? Are they co-authors of the scientific publications?					
	Are there participatory research/citizen science projects in your university that have had the capacity to promote societal change?					
	Are there participatory research/citizen science projects in your university built and co-created in partnership with civil society organisations and/or public agencies?					

Resourcing/ Benchmarking

The aim of this section of our survey was to collect data on institutional resources in stuff support towards implementing Open Science practices (Table 11).

Analysis

In this section asked questions about the FTE value of staff members employed to support the CRIS and related activities, Open Access publishing activities, repository support, managing APCs, research data management actives, Open Science training and advocacy activities, bibliometric and

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other research impact capture activities. In addition, we asked about resourcing of open education resource and practice-related activities. Although some questions were hard to answer as no records are stored for each activity, the results show inequalities among the members of the alliance in this regard. Utrecht University has the most and ELTE has the least staff employed in Open Science related activities.

These activities are mostly conducted by staff from library, research IT, and the student & academic affairs office. These staff members are typically specialised in scholarly Communication, Open Access, bibliometrics and research evaluation, Research Data Management, CRIS admin, CRIS development; CRIS technical support, technical standards and identifiers (ORCID, DOI, CERIF, etc.), OJS management and support, journal publishing, and finance.

The institutional repositories use the following software versions: DSpace 4.3 and DSpace 5.5, DSpace 6.3, always OpenAire compliant. University repositories can support open access harvesting with OAI-PMH, SWORD2, API. Trinity College Dublin wrote about their system: “TARA is registered with the OAI for OAI-PMH harvesting, it is OpenAIRE compliant (about to upgrade to latest OpenAIRE Guidelines) and supports SWORD2 (latter utilised to import data for the EC PEER project). It is registered with OpenDOAR and ROAR. It is integrated with the TCD CRIS which utilises multiple APIs (including internal web services to feed university webpages, a staff directory etc.) such as ORCID, PubMed, Scopus etc. TARA is harvested nightly by Rian (Ireland's Open Access Research Portal) and is harvested weekly by OpenAIRE and DART-Europe (Digital Access to Research Theses Europe)”. For ELTE, the following export formats are accessible: direct download from the page: CSV, BibTeX, RIS, XML, EDM XML, RDF/XML, N-Triples, TTL.

All universities, except the University of Montpellier provides DOIs. The University of Barcelona does it only for institutional journals, ELTE and Utrecht University provide it for PhD theses and datasets as well.

All members of the alliance support choice of Creative Commons licences. We asked, whether these universities support a publishing platform e.g., Open Journal System, Digital Commons, or others. Three of the five universities support the Open Journal System. ELTE reported: “ELTE University Library and Archives provides support in the publication and editorial work of journals published by any organizational unit of the university with the operation and administration of the institutional OJS (Open Journal Systems) system. Based on an individual assessment, journals that are not published by the university, but also publish the results of the teaching and research activities of Eötvös Loránd University, may also require the service.”

With the exception of ELTE, all members of the alliance have a CRIS (Current Research Information System). Trinity College Dublin reported: “CRIS was developed in 2001 and allows members of academic staff to input and update information on their academic interests, research expertise, and publications. It is CERIF-compliant and is based on Oracle and Oracle Apex. The TCD Research Support System is fully integrated with TARA (our institutional repository) as well as with the HR system, the Student Information System (for the e-theses process) and (shortly) with RPAMS (the

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pre- and post- awards management system in the Research Office). It is also integrated with Academe (for Business School accreditation data reporting). The Research Support System is managed and administered by the Research Informatics Unit in the Library under the direction of the Dean of Research and in collaboration with a dedicated Senior Analyst in Research IT who is also a member of the Research Informatics team."

Only Utrecht University has a platform to support citizen science and public engagement[8]. Trinity College Dublin, through particular research and a research team, support citizen science institutionally, nationally, and internationally the implementation of the EU-Citizen Science platform.

We asked whether their university have a Learning Management System (LMS) or Virtual Learning Environment (VLE) which support Open Education practices and standards and which facilitates provision of access to Open Education Resources. MOOC, Figshare, Blackboard and Moodle were mentioned.

Finally, we asked which aspects of Open Science are monitored and reported at institutional level. These aspects were a) The development/growth of OA to publications; b) The development/growth of OA to research data; c) (Alternative) metrics to reflect the impact of OA (e.g. citation count, impact on R&D budget etc)?; d) Number of research staff who have undertaken OA publications training?; e) Number of research staff who have received FAIR data management training?; f) Public engagement of research staff; g) Alignment of research works with the U.N. Sustainable Development Goals?; h) Research undertaken by staff from diverse groups (gender, specific fields, etc.). The results identified several gaps in the institutional monitoring of Open Science as Table 10 reflects.

Action list

Where missing, universities should:

· ensure that human and infrastructure resources are provided for all activities related to the pillars of Open Science;

· monitor Open Science activities at institutional level.

[8]https://www.uu.nl/en/organisation/public-engagement-at-utrecht-university

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Table 11. Summary table for the Resourcing/ Benchmarking section of the Open Science Scope survey results. Note: Green stands for *"Yes"*, gray stands for *"No"*.

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
Resourcing / Benchmarking						
Staff Support	How many staff members (FTE) does your institution employ in support of its **CRIS (current research information system) and related activities?**	1,75	5	5	7	0
Staff Support	How many staff members (FTE) does your institution employ in support of its **Open Access to Published Works activities, including repository support,**	0,75	5	10	6,5	3
Staff Support	How many staff members (FTE) does your institution employ in support of its **Research Data Management activities?**	0,5	1	6	22,5	0,4
Staff Support	How many staff members (FTE) does your institution employ in support of its **Open Science training and advocacy activities?**	0,75	1	1,5	35	0,7
Staff Support	How many staff members (FTE) does your institution employ in support of its **bibliometric and other research impact capture, analysis and reporting**	0,25	1	2	1,5	4,7
Staff Support	How many staff members (FTE) does your institution employ in support of its **Open Access Journal/Monograph Publishing activities?**	0,33	2	0	0	1,9
Staff Support	How many staff members (FTE) does your institution employ in support of its **Open Education Resources and Practices?**	0	0,2	0,1	0,5	0
Staff Support	**Can you provide an estimate a total number of FTE staff across all of the above?**	4,33	15	24,6	73	6
Infrastructure	Does your university have an institutional repository? If so, please provide details on a) the software and version currently installed. b) supported standards OpenAIRE compliant/DRIVER compliant, preservation standards etc)					
Infrastructure	Can your repository support OA harvesting or other import/export e.g., OAI-PMH, SWORD2, APIs, Other. If so, please specify.					
Infrastructure	Does your university have the capacity to generate Digital Object Identifiers?					
Infrastructure	Does your repository support choice of Creative Commons licences?					
Infrastructure	Does your university support a publishing platform e.g., Open Journal System, Digital Commons, Other.					
Infrastructure	Does your university have a CRIS (Current Research Information System)? .					
Infrastructure	Does your university provide tools/a platform to support Citizen Science / Public Engagement?					
Infrastructure	Does your university have an Learning Management System (LMS) or Virtual Learning Environment (VLE) which support Open Education practices and standards and which facilitates provision of access to Open Education Resources?					
Monitoring	Which of the following are monitored / reported at institutional level?					
	a) The development/growth of OA to publications					
	b) The development/growth of OA to research data					
	c) (Alternative) metrics to reflect the impact of OA (e.g. citation count, impact on R&D budget etc)?					
	d) Number of research staff who have undertaken OA publications training?					
	e) Number of research staff who have received FAIR data management training?					
	f) Public engagement of research staff					
	g) Alignment of research works with the U.N. Sustainable Development Goals?					
	h) Research undertaken by staff from diverse groups (gender, specific fields, etc.)					

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Limitations

The aim of this section of our survey was to identify the factors that prevent the transition to Open Science (Table 12).

Analysis

The area where all the five universities reported limitations to Open Science is the absence of incentives to promote Open Science activities (e.g. absence of impact on academic career assessment and career progression). The least concerned they are over the legal framework (e.g. data privacy, copyright regulations, and publishers' rules). ELTE added that a source of limitation is the diverging disciplinary practices and the lack of sufficient specialized support staff. TCD added: "Fairness and balance in the system −e.g. availability of funding to all re: OA publication/ impact on career progression/ status of established non-OA publication venues v risk of new OA, etc. Specific concerns from Arts and Humanities researchers are alive and active discussion right now. Concerns to support ECR to achieve Open Science. The issue of copyright retention has been highlighted during Plan S implementation and is recognised as both a challenge and an opportunity (which is most likely to be addressed at the national level). TCD is concerned to support bibliodiversity in Open Science (in order that 'big deal' read and publish agreements do not dominate open access solutions and drown out the extraordinary range of small, independent publishers that our researchers publish with. This is supported particularly by Arts and Humanities in TCD.".

Action list

All members of the alliance should explore who to decrease the number of limitations revealed in this survey. There is almost always a partner university that has already coped with the limitations. Their solutions and experiences in this report should be a good source for this effort.

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Table 12. Summary table for the Limitations section of the Open Science Scope survey results. Note: Red indicates the presence of limitates.

		Trinity College Dublin	University of Barcelona	University of Montpellier	Utrecht University	Eötvös Loránd University
Limitations						
	From the perspective of your university, what are the main barriers at institutional level in the transition to open science?					
	• Limited awareness at institutional level of the benefits of open science					
	• Concerns over the legal framework (e.g. data privacy, copyright regulations, publishers' rules)					
	• Absence of policies or guidelines at national level (e.g. from research funders)					
	• Technical complexity (e.g. lack of precise definitions, standards and procedures, variety of data formats)					
	• Different disciplinary practices					
	• Resistance to making data available or to sharing data					
	• Misconceptions of open science from the part of senior faculty or high leadership of the institution					
	• Concerns over increased costs (e.g. infrastructure, specialised staff)					
	• Lack of expertise and skilled staff on different areas of open science at institutional level					
	• Lack of coordination among the relevant actors within the university					
	• Lack of support structures at institutional level for researchers interested in open science activities					
	• Lack of awareness raising, including training opportunities, at institutional level for both early-stage					
	• Absence of incentives to promote open science activities (e.g. absence of impact on academic career					

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3. ACTION LIST

The following table (Table 13.) contains all the recommendations that were found to be relevant for the members of the alliance concerning the investigated aspects of Open Science.

Table 13. Action lists for each investigated aspects of Open Science.

	Recommended action
Cultural change / Leadership	· form an Open Science Task Force to lead cultural change in all areas of Open Science · involve staff from the library, research support staff, HR, IT services as well as academics from across all faculties in the task force · appoint a senior management figure dedicated to Open Science strategy · make the philosophy of Open Science part of the university strategy · build an active Open Science community to communicate the purpose and practical implementations of the underlying principles (https://inosc-starter-kit.netlify.app/) · establish comprehensive support for the creation of Open Educational Resources · create a communication strategy that regularly informs the staff about the opportunities to extend one's Open Science knowledge · create institutional funding for the aims of the Open Science pillars
The future of scholarly publishing	· make full open access part of the university's strategy · establish a monitoring system for compliance with open access · facilitate interaction among the stakeholders to work together in supporting open access mandates · widely advocate the share of research manuscripts as preprints · develop a system to monitor the publications published in open access or deposited in the institutes repository · prepare your institute for the implementation of Plan S by adjusting article licensing, training staff in webinars, training sessions and through information materials · provide support to researchers in order to make their research publications available in open access: institutional repositories, trainings on open access publishing, assistance campaigns, free university journals, and customer service · advocate the sharing of research data, code, and materials and provide guidance for their implementation

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FAIR data	· develop an institutional research data policy · include FAIR principles in your policy · provide stewardship and infrastructure to support the implementation of FAIR principles · assist researchers in finding the most suitable repository for sharing their research data · include research data in the researcher assessment methodology and research metrics · promote the creation and sharing of Data Management Plans · train HR, library, IT data stewards, and the IT services to support the implementation of FAIR principles in the research community
The European Open Science Cloud (Infrastructure and support services)	· become a member of the EOSC and promote its principles · integrate your institutional data repositories with EOSC · develop a search and discovery service to enable users to find what research data are available and where they are located · introduce standards, guidelines, and protocols for data sharing
Education and skills	· offer skill trainings for all areas of Open Science and tailor it to groups of staff and students · bring in experienced researchers to speed up skill acquisition · encourage staff and students to join the local Open Science community · organise student groups on open alternatives · academics should be invited to share their experiences on open access publishing · make student and supervisor trainings mandatory on Open Science skills
Recognition and rewards	· develop a vision on recognition and rewarding of Open Science practices · make this policy part of recruitment and performance evaluation · make the policies on researcher evaluation open and easily accessible
Next-generation metrics	· join the signatories of DORA · develop internal policies for the implementation of DORA recommendations · develop new researcher evaluation practices for promotion and reward · give guidance for research administrators and academics on good practices in use of bibliometrics · help cultural change in this regard, particularly on early career researcher level

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Research integrity	· develop internal policies in order to adopt and promote the research integrity principles of the European Charter for Researchers and the Code of Conduct for Recruitment of Researchers
Public participation in research (Citizen Science)	· join the Campus Engage Charter for Civic and Community Engagement or relevant charters to support citizen science · recognise and propagate the importance of high-quality citizen science at university-level · make citizen science contributions part of the researcher evaluation system · support the implementation of the European Citizen Science Association's principles · create a single point for citizen science within your university to monitor and support the involvement of the public in scientific research and publications
Resourcing/ Benchmarking	· ensure that human and infrastructure resources are provided for all activities related to the pillars of Open Science · monitor Open Science activities at institutional level
Limitations	· All members of the alliance should explore who to decrease the number of limitations revealed in this survey. There is almost always a partner university that has already coped with the limitations. Their solutions and experiences in this report should be a good source for this effort