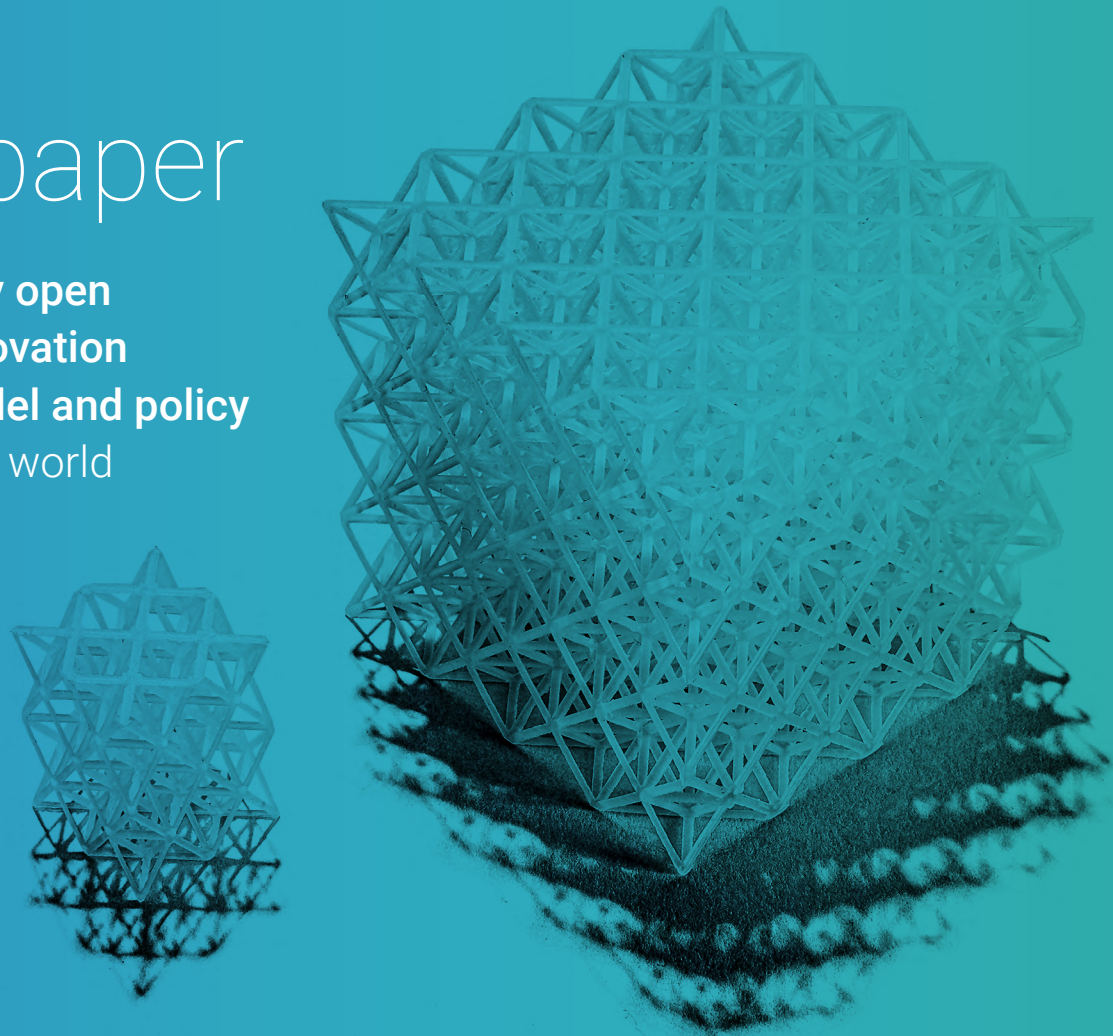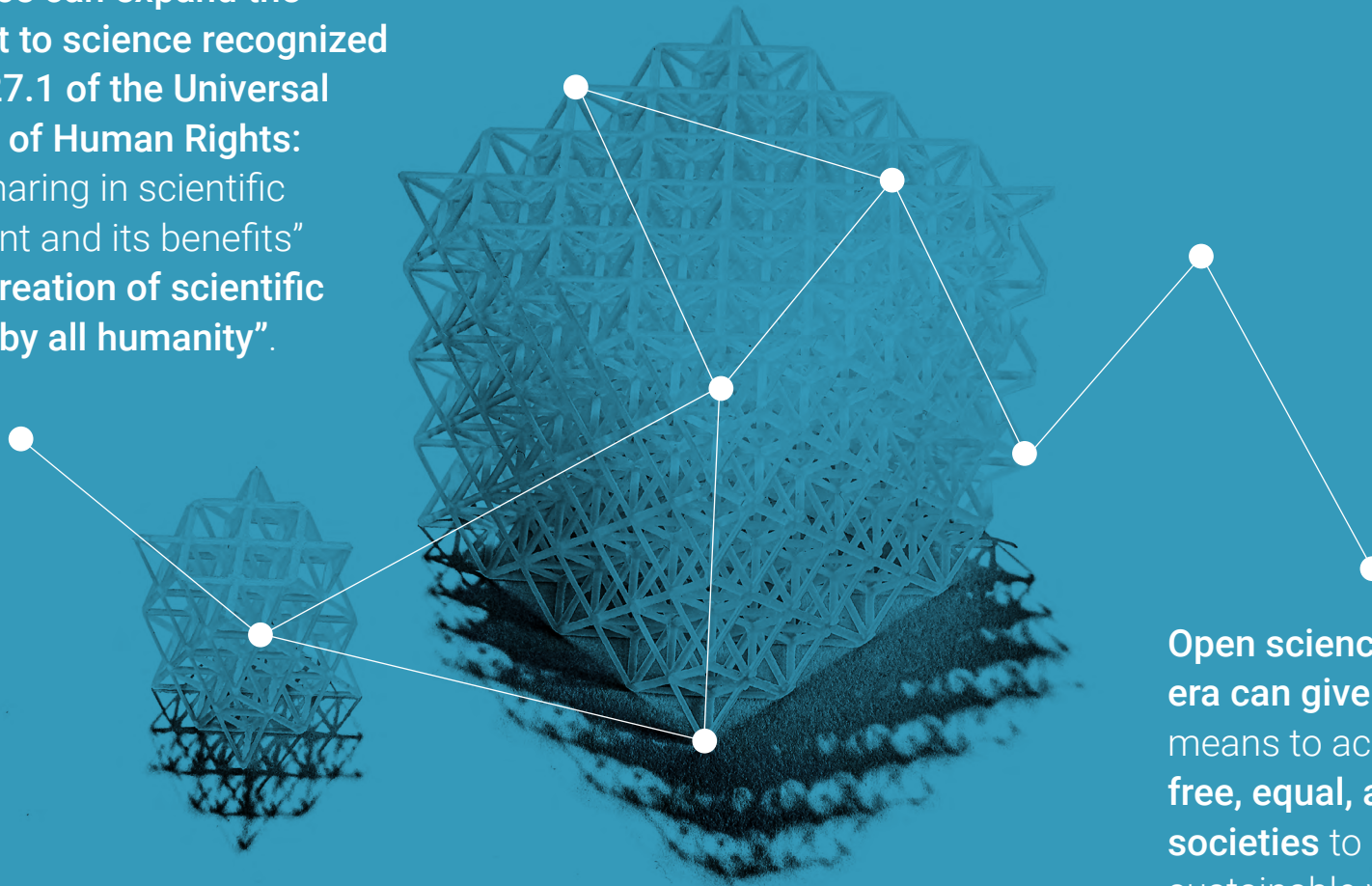# Unite! white paper

A new University open science and innovation governance model and policy for a sustainable world

Open science can expand the human right to science recognized in the Art. 27.1 of the Universal Declaration of Human Rights: "from the sharing in scientific advancement and its benefits" to **"the co-creation of scientific knowledge by all humanity"**.

Open science in the digital era can give humanity a means to achieving **peaceful, free, equal, and diverse societies** to enhance a sustainable world.

| Structure

01

Introduction | P.04

From modern science to open science

- Our vision: inspiring an EU Open Science Recommendation
- Our mission: shaping a new policy for open science and innovation management in universities
- Our commitment: advancing a new university open science and innovation governance model

02

Why open science and innovation for a sustainable world? | P.06

03

Methodology and Data | P.09

Unite! Alliance as a testbed for universities and EUAs

- Unite! open science policy forums for expanding open science and innovation in universities and EUAs
- Unite! H2020-WP6 as a spearhead platform for building a global open science system

04

Building up a European open science and innovation university | P.12

4.1. A new university R & I governance model for a sustainable world
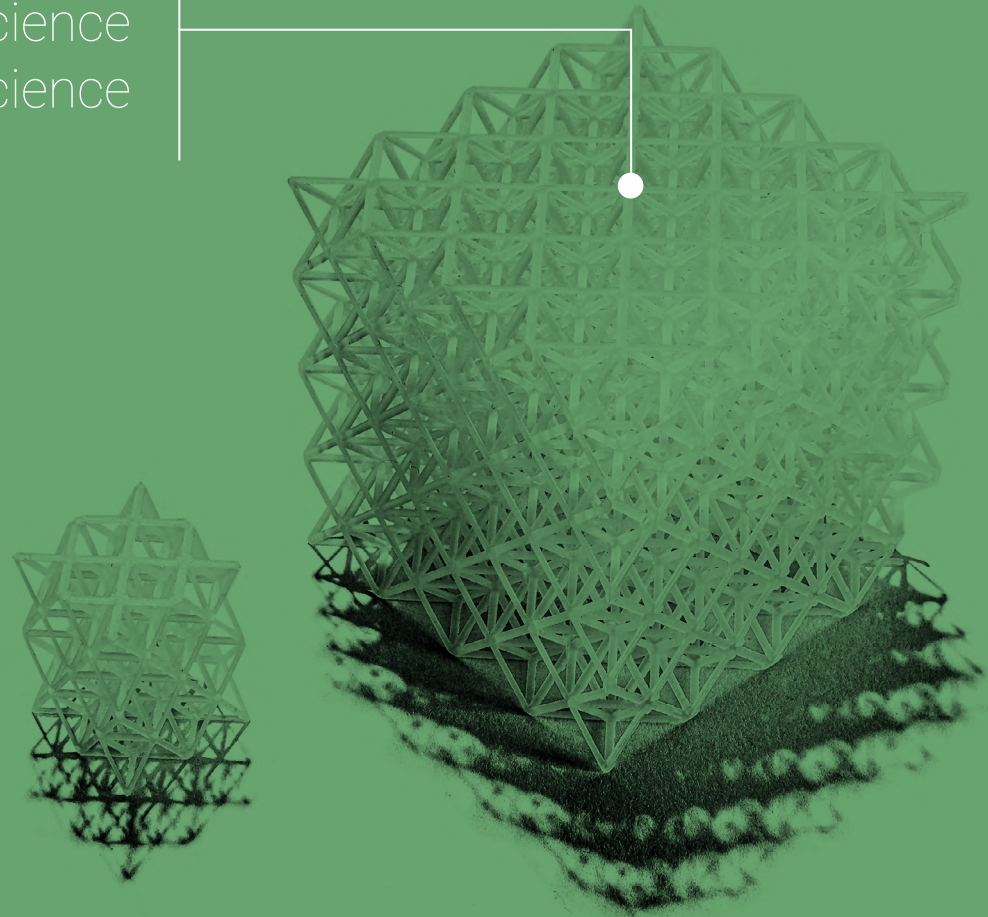
4.2. A new university R & I policy for a sustainable world

05

Summary | P.23

Towards an EU Open Science Recommendation

Introduction
From modern science
to open science

01

Our vision
Inspiring an EU Open
Science Recommendation

This white paper is a practical tool aimed at contributing to the transition from modern science to open science in universities and European Universities Alliances (EUAs) by 2030. This white paper provides evidence-based policy guidelines for university managers, policymakers, and funders to enhance efficient open science and innovation management at universities.

Our mission
Shaping a new policy
for open science and innovation
management in universities

This white paper sheds light on a set of policy recommendations for guiding university managers, policymakers, and funders to drive the institutional changes required for renewing university research and innovation governance models for a sustainable world.

Our commitment
Advancing a new university
open science and innovation
governance model

Through this white paper, we present a new university open science and innovation governance model for advancing a sustainable economy, technology, society, and environment.

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 05

02

Why open science and innovation for a sustainable world?

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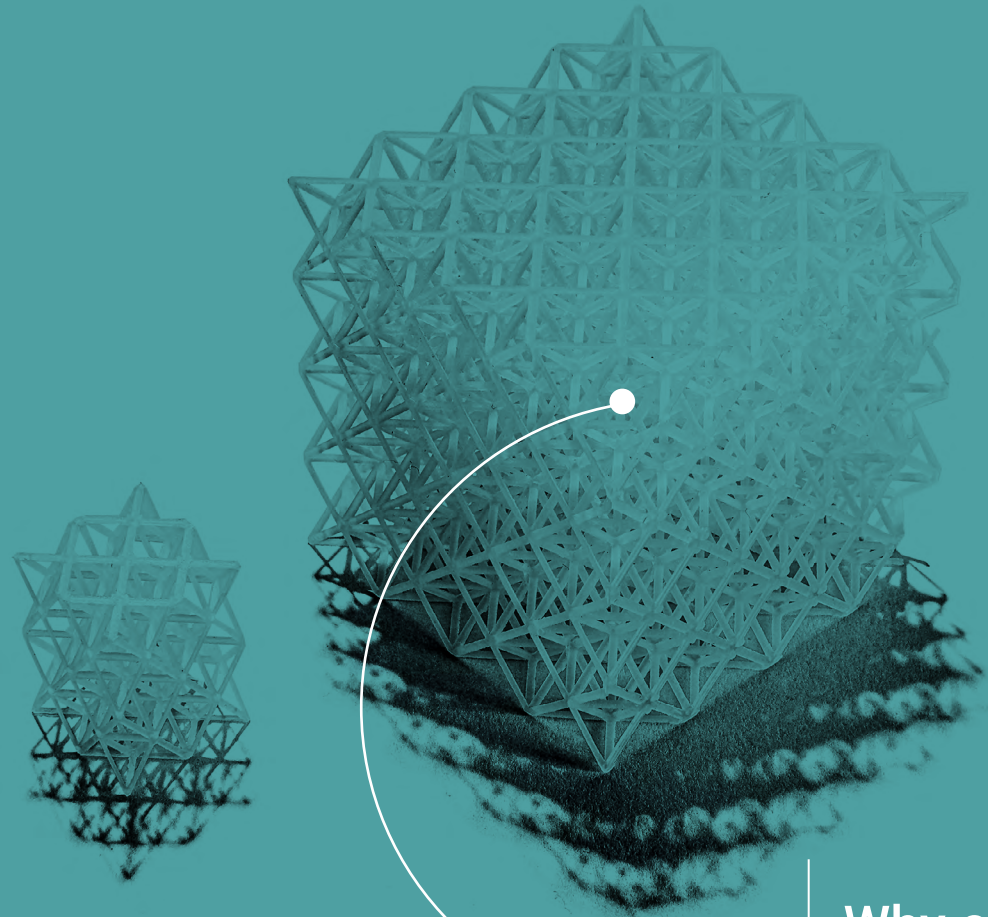
Science is being reshaped by advances in digital technologies and tools, artificial intelligence, big data, the Internet of Things, 3D printing, and quantum computing, along with open digital and physical infrastructures. These digital and physical infrastructures include open labs, open libraries, cultural heritage, digital knowledge bases, diamond open-access journals and open university campuses. Together with EU, national, and university-level open science initiatives and policies, these technologies and infrastructures have, in turn, allowed researchers to experiment with, develop, and adopt new open science practices, principles, and goals for tackling grand societal challenges.

Open science is transparent and accessible knowledge that is shared and developed through collaborative networks (Vicente-Saez and Martinez-Fuentes, 2018)[1]. It involves sharing ideas, data, methods, prototypes, reviews, and results with local, national, regional, and global collaborative networks of research participants. Moreover, open science expands this to encompass the scientific knowledge produced and used by these collaborative networks.

Open science aims to increase scientific collaboration and sharing of information for the benefits of science and society; to make multilingual scientific knowledge openly available, accessible, and reusable for everyone; and to open the processes of scientific knowledge creation, evaluation, and communication to societal actors beyond the traditional scientific community (UNESCO, 2021)[2] .

In the digital era, open science follows two dynamics. The first is openness in the sharing of scientific knowledge, based on the principles of transparency and accessibility. The second is openness in the production of scientific knowledge, ingrained in the principles of the participation and legitimacy of new collaborative networks of participants in research (Vicente-Saez et alt., 2020)[3]. According to these two dynamics of open science, we distinguish two categories of open science practices taken up by researchers: open sharing and collaborative practices.

Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal and external innovation (adapted from Chesbrough et al., 2006; Chesbrough and Bogers, 2014)[4]. Novel open science practices for the sharing and production of knowledge have created extraordinary possibilities for a new knowledge creation and transfer process. These practices are expanding not only the ethos of science, but also the ethos of innovation in universities. Open science practices are transforming science and innovation practices in universities. Novel open innovation practices are emerging: novel inbound and outbound open exploration practices.

The grand societal challenges we are facing for a sustainable world can only be tackled through new ideas and humanistic ideals, new levels of integration, new science and innovation practices and mechanisms of global collaboration among research communities of researchers, students, staff, faculty, citizens, companies, municipalities, citizens and international organisations (e.g., European Commission, the United Nations, and the World Bank).

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1   Vicente-Saez, R., Martinez-Fuentes, C. (2018). Open Science now: A systematic literature review for an integrated definition. Journal of Business Research 88, 428–43
2   UNESCO Recommendation on Open Science (2021)
3   Vicente-Saez, R., Gustafsson, R., Van den Brande, L. (2020). The dawn of an open exploration era: Emergent principles and practices of open science and innovation of university research teams in a digital world. Techno- logical Forecasting and Social Change 156, 120037
4   Chesbrough, H., Vanhaverbeke, W., West, J. (2006). Open innovation: Researching a new paradigm. Oxford University Press on Demand Chesbrough, H., Bogers, M. (2014). Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. In: Chesbrough, H., Vanhaverbeke, W., West, J. (Eds.), New frontiers in open innovation. Oxford: Oxford University Press, pp. 3–28

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 07

The adoption of open science and exploration practices, principles and goals can improve the quality both internal (academic) and external (societal) processes of learning and creation of new knowledge, increasing trust in science, nurturing innovative and entrepreneurial people, and accelerating research and innovation processes aimed at finding solutions to the achievement of the Sustainable Development Goals (SDG2030).

Open science can empower local, regional, national, and global knowledge communities and raise the welfare level of each.

Open science can expand the human right to science recognised in the Art. 27.1 of the Universal Declaration of Human Rights – from *"the sharing in scientific advancement and its benefits"* to the sharing and production: **the co-creation of scientific knowledge by all humanity.**
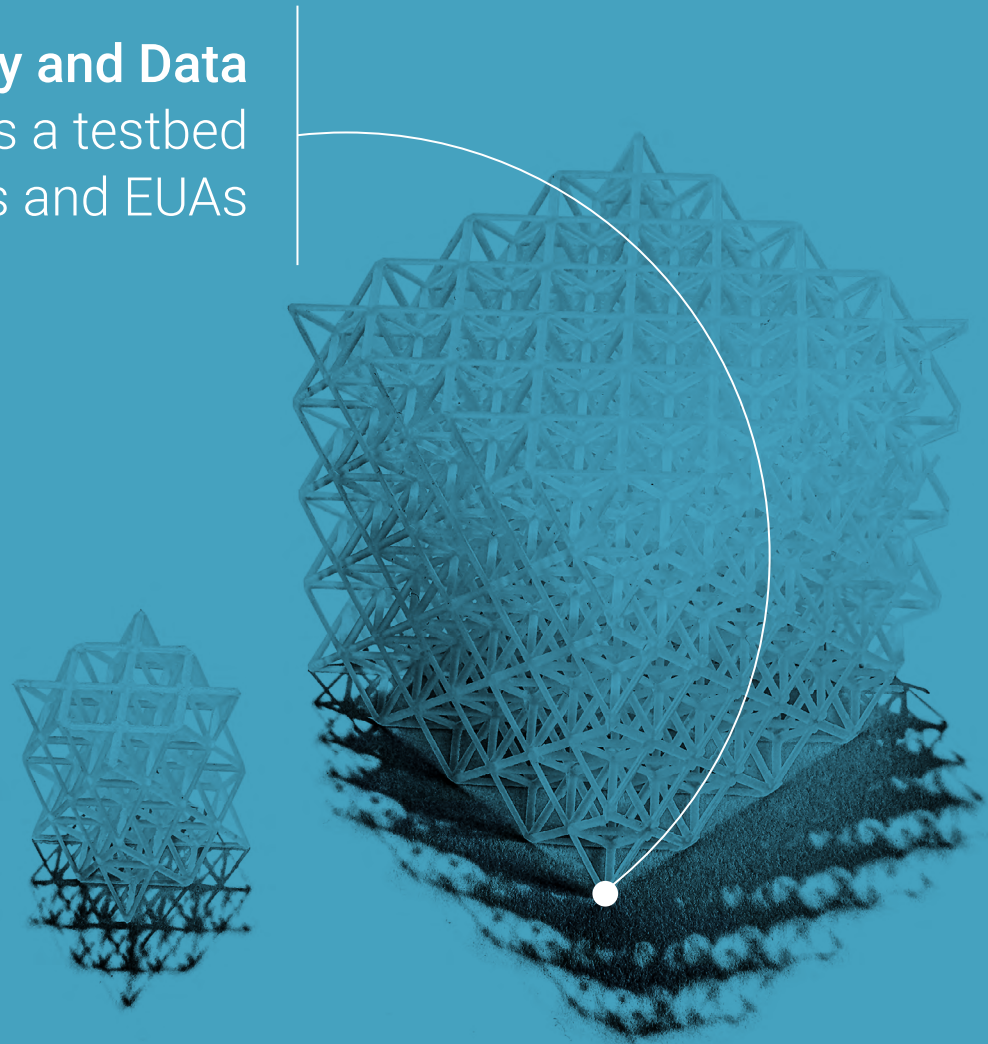
Open science in the digital era can give humanity a means to achieve **peaceful, free, equal, and diverse societies** for enhancing a sustainable world.

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 08

Methodology and Data
Unite! Alliance as a testbed
for universities and EUAs

03

Unite! Open science policy forum
for expanding open science and
innovation in universities and EUAs

This white paper builds on the application of the research forum (Thomas et al, 2021)[1] as a methodological framework for co-creating public policy among the Unite! communities of researchers, university managers, policymakers, staff, faculty, and partners.

We organised five Unite! Open science policy forums to understand what policy actions, redesigns, and incentives university managers, policymakers, and funders should promote at university, regional, national, and European levels to implement the proposed university open science and innovation governance model for a sustainable world. The forums were carried out from September 2022 to October 2023 and led by eight European universities in Unite! Alliance: Aalto University in Finland (Aalto), Darmstadt Technical University in Germany (TUDa), Graz University of Technology (TU Graz), INP-University Grenoble Alpes in France (UGA), KTH Royal Institute of Technology in Sweden (KTH), the Polytechnic University of Catalonia in Spain (UPC), the Polytechnic University of Turin in Italy (Polito), and the University of Lisbon in Portugal (ULisboa).

This white paper provides directions for updating Unite! Open science and innovation strategic roadmap from 2024 onwards and develops future Unite! Open science and innovation implementation plans and program evaluations. Moreover, it contributes to fostering the new European Research Area and sets in motion and expands the international framework for policy and practice set up by the UNESCO Recommendation on how to boost open science.

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1   Thomas, S., Scheller, D. & Schröder, S. Co-creation in citizen social science: the research forum as a methodological foundation for communication and participation. *Humanit Soc Sci Commun* 8, 244 (2021)

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 10

Unite!H2020-WP6 as a spearhead platform for building a global open science system

Unite! Open science policy forum is a transdisciplinary research tool for learning, sharing, and co-creating policy ideas, actions, and indicators among the collaborative network of Unite! researchers, university managers, policymakers, and staff.

Each forum was focused on the deconstruction of a strategic objective of Unite! Open science and innovation roadmap (2021)[2]:

- The first forum, led by Polito and Aalto, centred on the analysis of the state of art of open science support services across Unite! members.

- The second forum, led by UGA and ULisboa, explored how open science can be fostered in careers by analysing the gaps in research assessment and presenting the possible pathways to overcoming them.

- The third forum, led by KTH and Aalto, pivoted on improving open science competencies across Unite! students, staff, and researchers.

- The fourth, led by TUDa, TU Graz, and UPC, was focused on the current Unite! developments for the opening up of digital and physical infrastructures for its members.

- Finally, in the fifth Unite! Open science forum led by Aalto, the collaborative network of Unite! researchers, university managers, policymakers, and staff co-created a new set of policy recommendations for guiding university managers, policymakers, and funders in the development of comprehensive public science and innovation policies at university, regional, national, and European levels for the implementation of the new university governance open science and innovation model.

This white paper contributes to advancing the role of universities and EUAs in building a global open science system.

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2 https://www.unite-university.eu/media/pu_deliverable-6-1-unite-open-science-and-innovation-roadmap.pdf
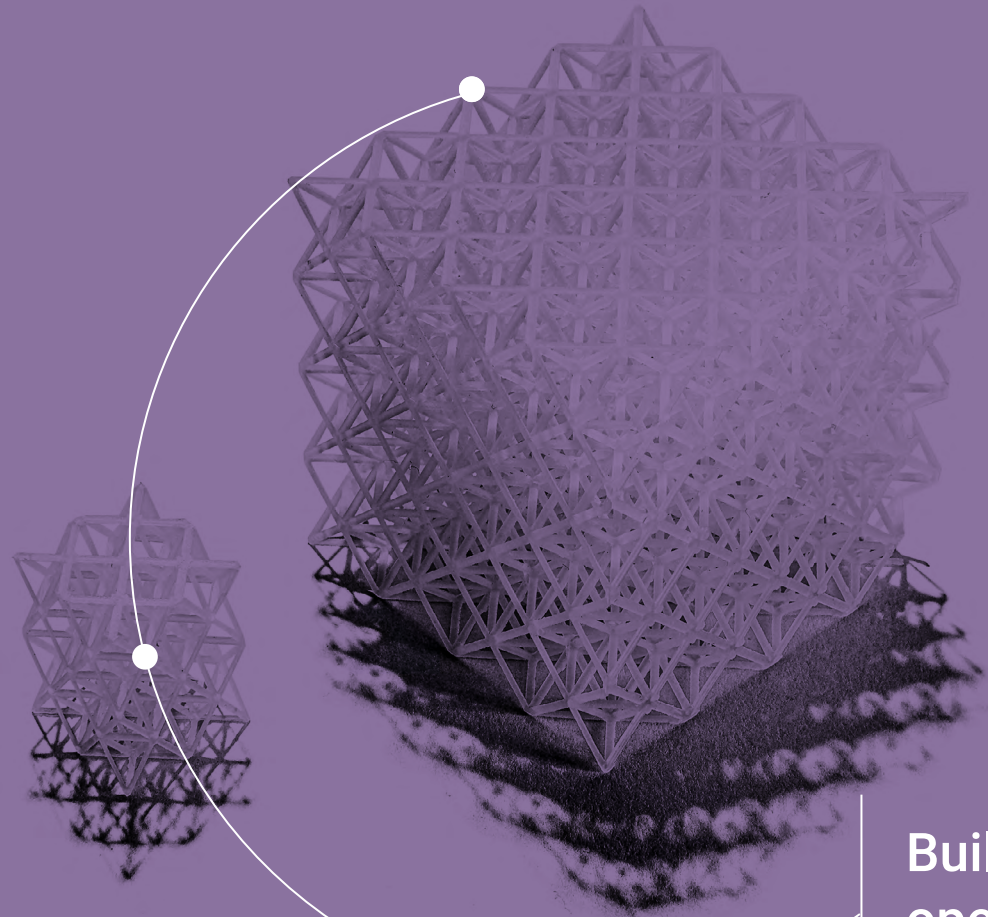
Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 11

04
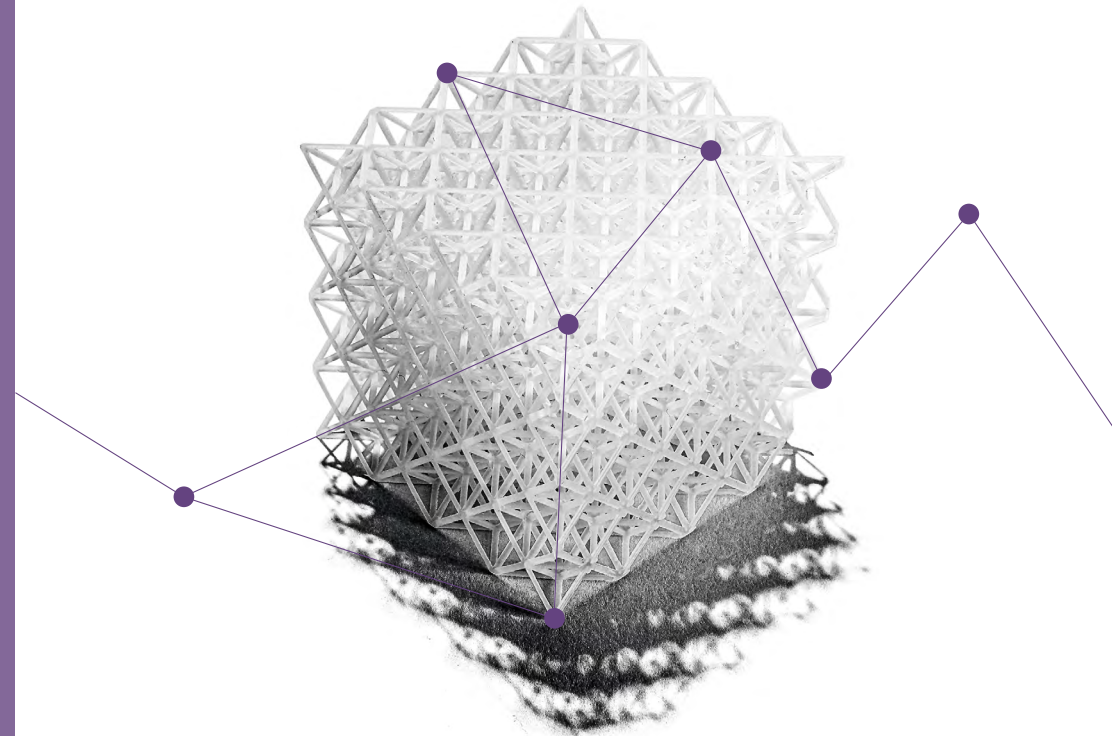
**Building up a European
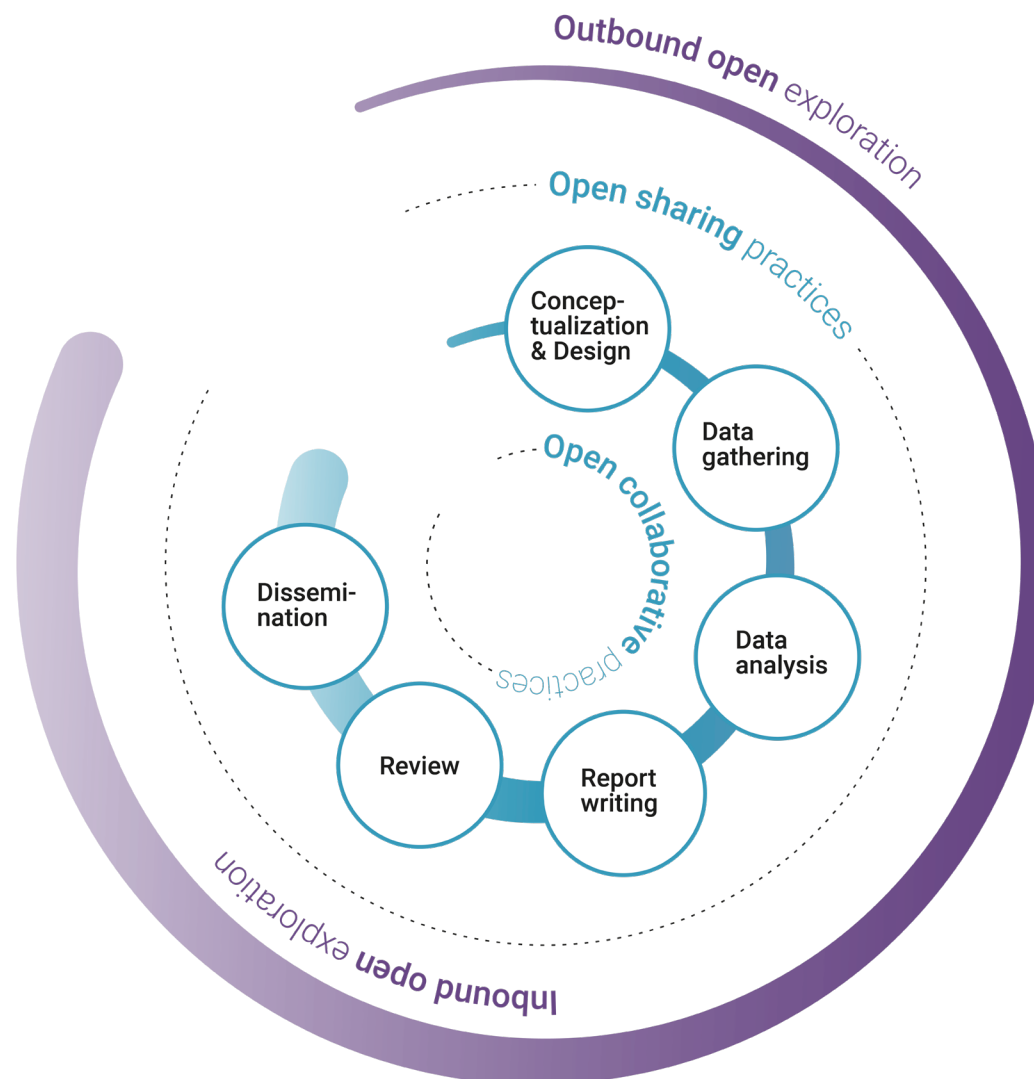open science
and innovation university**

4.1

A new university R&I governance model
for a sustainable world

We present a new governance model for the management of open science and innovation in universities in the digital era by drawing on the findings of the comparative case study of 70 Unite! research teams conducted across 7 European universities in Unite! Alliance (Aalto, TUDa, UGA, KTH, UPC, Polito, and ULisboa). These research teams span all the disciplines of science, business, design, engineering, technology, architecture, and humanities at Unite! Universities.

Unite! white paper. **A new University open science and innovation governance model and policy** for a sustainable world

P. 13

unite!

Open science
practices

Novel open innovation
practices

Outbound open exploration

Open sharing practices

Open collaborative practices

Inbound open exploration

Conceptualization & Design

Data gathering

Data analysis

Report writing

Review

Dissemination

Open sharing
practices

- Open protocol sharing
- Open data sharing
- Open source research software sharing
- Open access publishing
- Open multimedia sharing

Open collaborative
practices

- Interdisciplinary research practice
- Transdisciplinary research practice with emerging academics
- Transdisciplinary research practice with citizens
- Transdisciplinary research practice with professionals
- Recombining open science outputs

GRAPH 1: A new university open science and innovation governance model in the digital era

We provide a comprehensive taxonomy of the open science and innovation practices encountered in the Unite! research teams
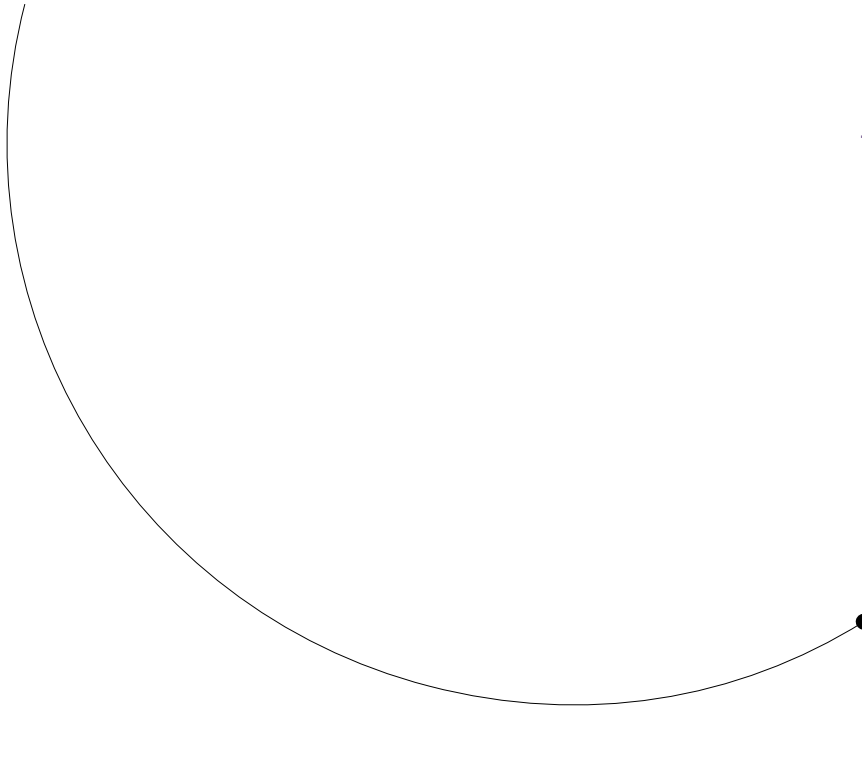
First

We consider emerging open sharing and collaborative practices. We identify that Unite! research teams pursue openness in the sharing of scientific knowledge by adopting open protocol sharing, open data sharing, open-access publishing, open-source research software sharing, and open multimedia sharing. We identify that openness in the production of scientific knowledge is carried out by adopting interdisciplinary research practice, transdisciplinary research practices with emerging academics, professionals, and citizens, and by recombining open science outputs.

Second

We find that Unite! research teams' adoption of open science practices for the sharing and production of knowledge is expanding the rationales of knowledge valorisation, transfer, and IP at universities. We identify two novel inbound and outbound approaches, which can be considered two novel open innovation practices: open inbound exploration and open outbound exploration. Based on our findings, we shape a new university open science and innovation governance model.

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 15

unite!

This governance model is a practical tool for leading institutional transformations in universities in the digital era

First

It illustrates how university researchers can administrate, organise, and conduct open science and innovation in their research teams.

Second

This model can also provide guidance on designing and setting up open science and innovation support services for the adoption of these practices at universities.

Third

The model can support university managers to develop university- and school-level actions, redesigns, and incentives for the effective administration of open science and innovation in universities.

To sum up, this model lays the foundations for building up high-impact European open science and innovation universities and inspiring new comprehensive policies for open science and innovation management in universities.

4.2

A new university R&I policy
for a sustainable world

To support the implementation of the new university open science and innovation governance model for fostering the co-creation and transfer of new scientific knowledge in universities, we suggest five policy recommendations to guide university managers, policymakers, and funders in the development of comprehensive public science and innovation policies at university, regional, national, and European levels. These policy recommendations enhance transitioning from modern science to open science in universities and EUAs for a sustainable world by 2030.

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 17
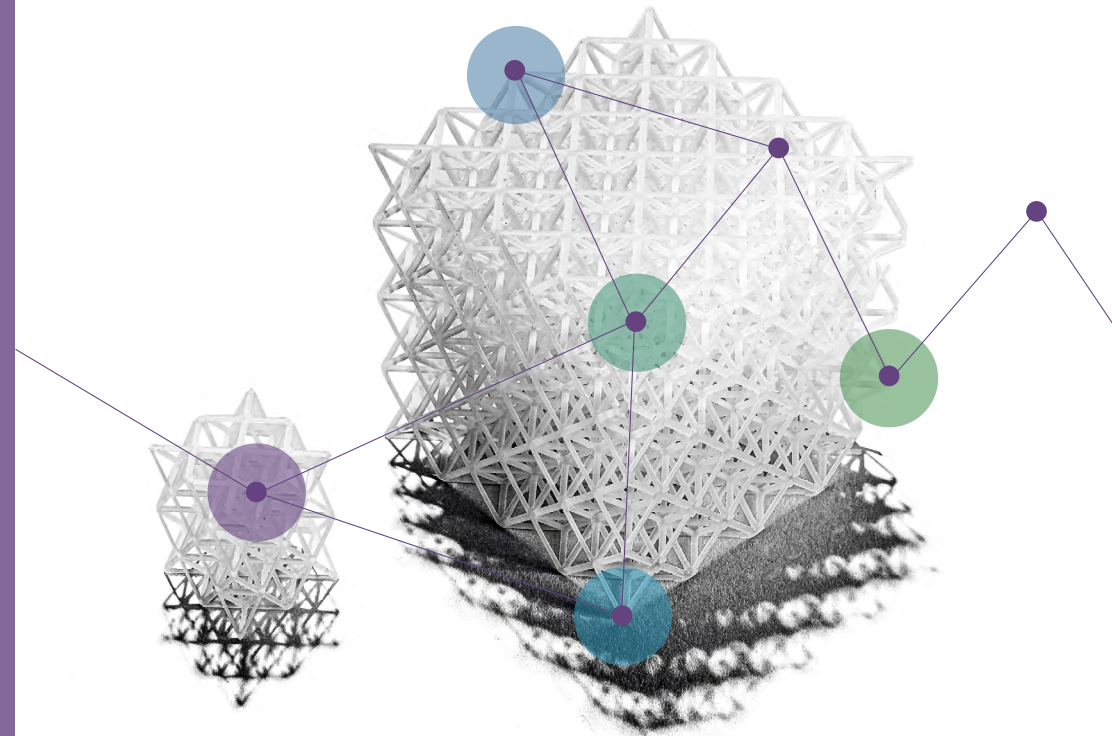
Recommendation 1

Renewing university open science and innovation policies and developing school open science strategies, implementation, and evaluation plans for the co-creation of global knowledge
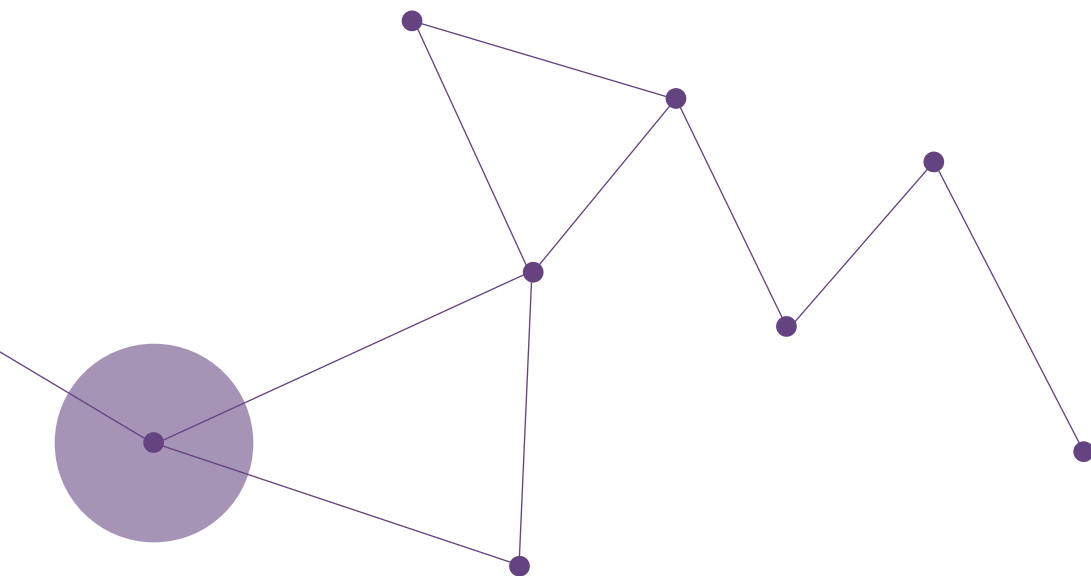
First

Universities should renew their open science and innovation policies to boost the co-creation and transfer of effective knowledge, building on the UNESCO Recommendation on open science and their regional, national, and EU policies, strategies, or programmes. University open science policies are still mostly oriented towards the adoption of open data sharing and open-access publishing. These policies should be expanded by taking into consideration the diversity of open science practices. University open science policies should support and incentivise the adoption of open sharing and collaborative practices.

Second

Universities should acknowledge that open science practices are transforming innovation practices in universities, expanding the traditional open innovation approaches to the exploitation and exploration of scientific knowledge. University open innovation policies should therefore include this new open innovation approach and incentivise the adoption of novel open exploration practices.

Third

Universities should develop school-level open science living strategies, considering the diversity of each research area, for the operationalisation of open science. These living strategies should be put into effect through the development of implementation plans as well as program evaluation that will annually monitor the advances in the adoption of open science practices.

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Recommendation 2

Reforming the university reward systems of science and innovation for a sustainable world
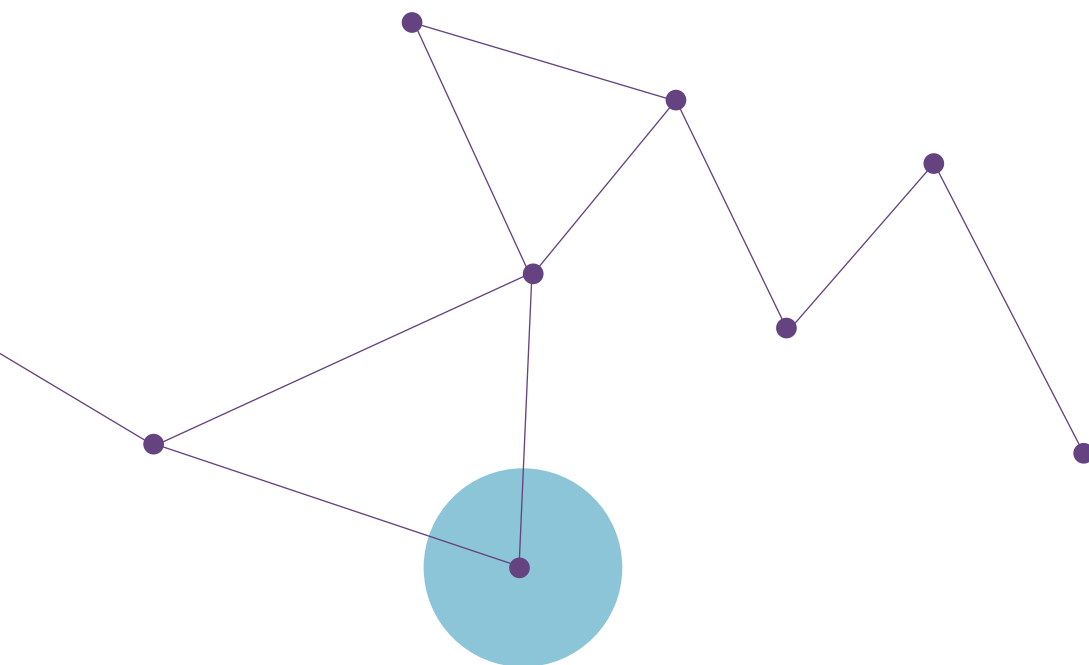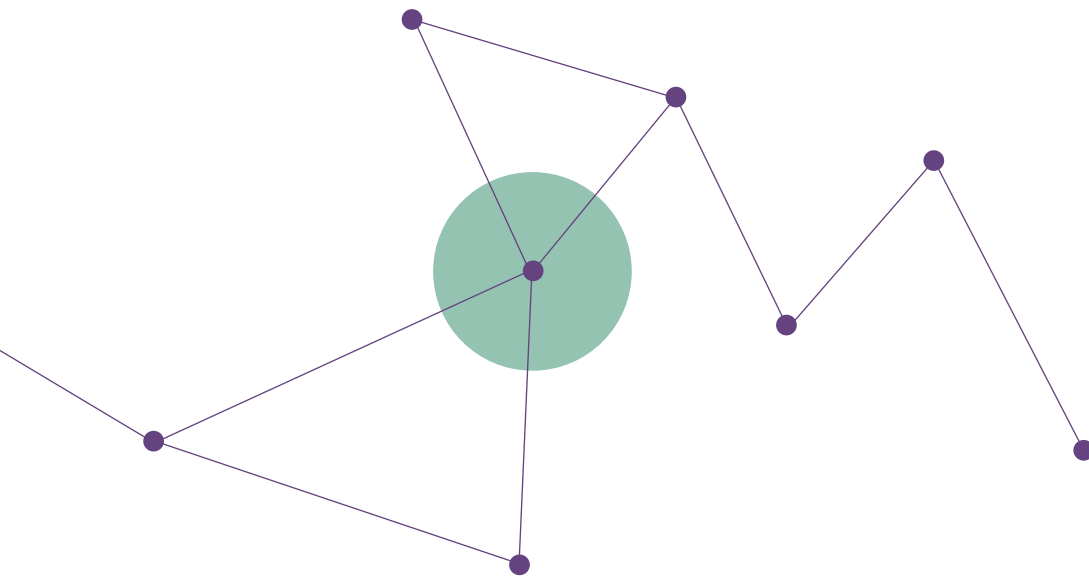
First

Universities should advocate the review of their regional and national research career evaluation systems to align them with the adoption of open science practices, principles, and goals. Universities should follow and participate in the COARA coalition framework to reform research assessment and advance a new university reward system that recognises researchers for the co-creation of knowledge among collaborative networks of research participants.

Second

Universities should encourage a rethinking of their regional and national knowledge transfer systems and mechanisms. If the process of open science is managed adequately, open science and exploration practices achieve knowledge transfer from the first steps of the research process by including participants in the informed and extended knowledge co-creation process. Building on the example of COARA, universities should promote and participate in a global coalition that explores the update of university reward systems of innovation for a sustainable world.

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 19

Recommendation 3

Promoting transdisciplinary open science support services for an efficient openness in the sharing and production of knowledge and its transfer
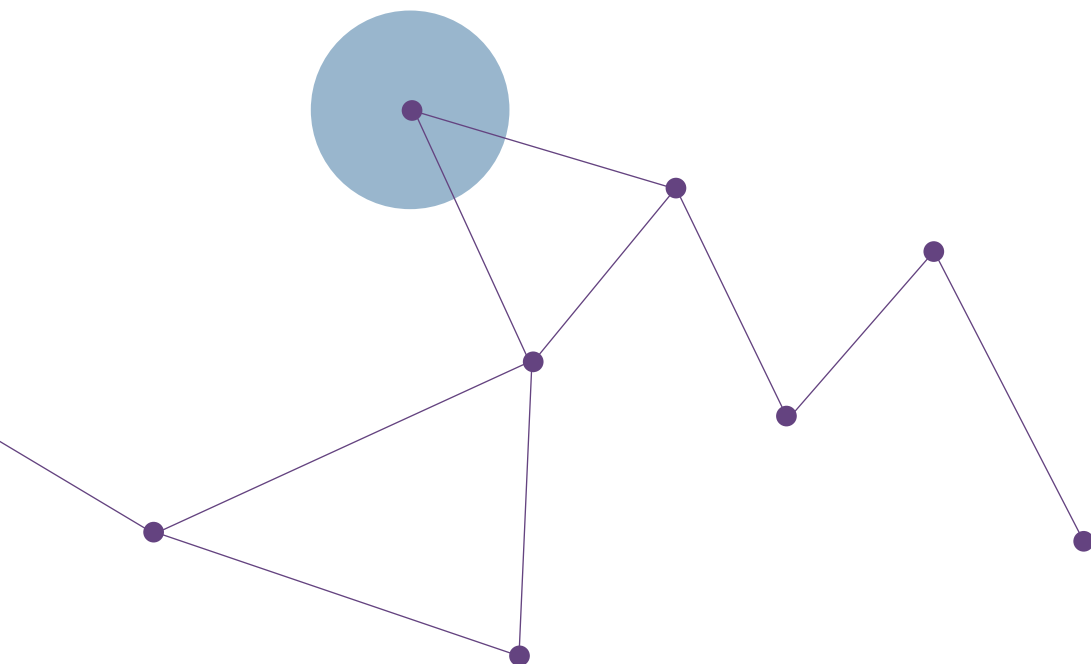
First

Universities should take into consideration that the adoption of open science practices along the different stages of the research process requires the expertise of multiple specialists of university learning, research, and innovation services. Universities should promote transdisciplinary open science support units at the university level that provide seed funding, training, and assistance among their research communities.

Second

Universities should promote the role of open science specialists in sharing and collaborative practices at the school level. These specialists should provide technical assistance regarding the specificities of each discipline of knowledge, promote the co-creation of knowledge among their research communities, and be responsible for the deployment of the school open science implementation plan and program evaluation.

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 20

Recommendation 4

Incorporating open science competencies in university bachelors, masters, and doctorate levels of education to foster global citizenship

First

Universities should incorporate open science principles and competencies across all education levels to foster a global citizenship mindset. Universities play a pivotal role in shaping the educational landscape and by infusing open science principles throughout the curriculum, they can empower students with essential skills for a rapidly evolving interconnected world.

Second

At the university bachelor level, students should be introduced to the concepts of open science, highlighting transparency, collaboration, ethical considerations, and reproducibility in research practices, which should be achieved through courses or integrated modules within existing programs. A master's level education should build upon open science competencies by providing more in-depth training on open sharing and collaborative practices for data gathering and data analysis. At the doctoral level, comprehensive integration of open science competencies should be embedded in research training programs. Doctoral candidates should be guided in implementing open sharing and collaborative practices, principles, and goals in research.

Third

Universities should contribute to developing globally conscious researchers who prioritise the values of openness, inclusivity, and responsible behaviour in research and contribute to developing responsible and globally aware citizens.

Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 21

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Recommendation 5

Enhancing interoperability of university digital infrastructures and accessibility of physical infrastructures for a peaceful humanity
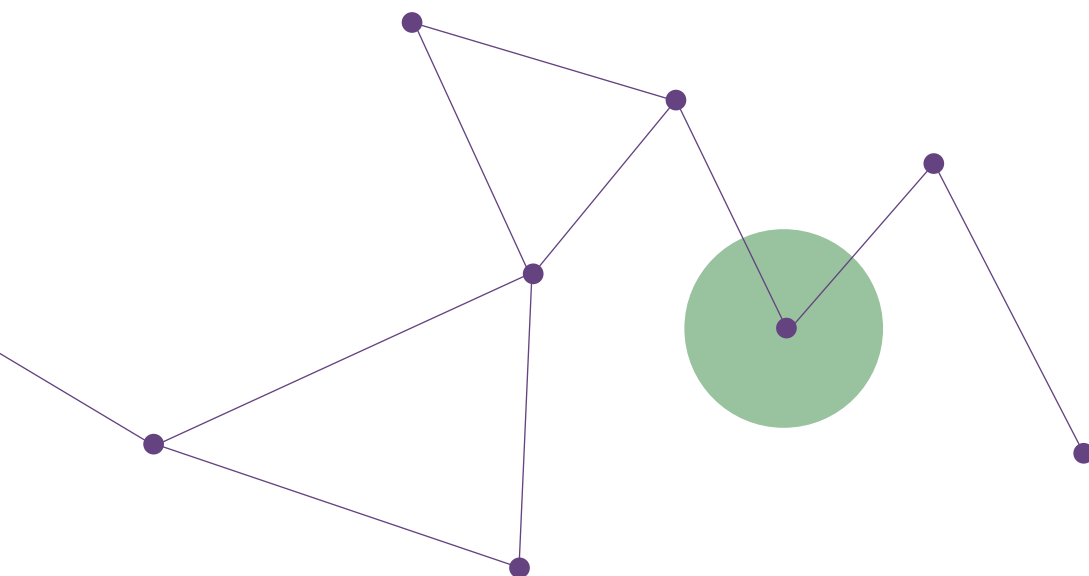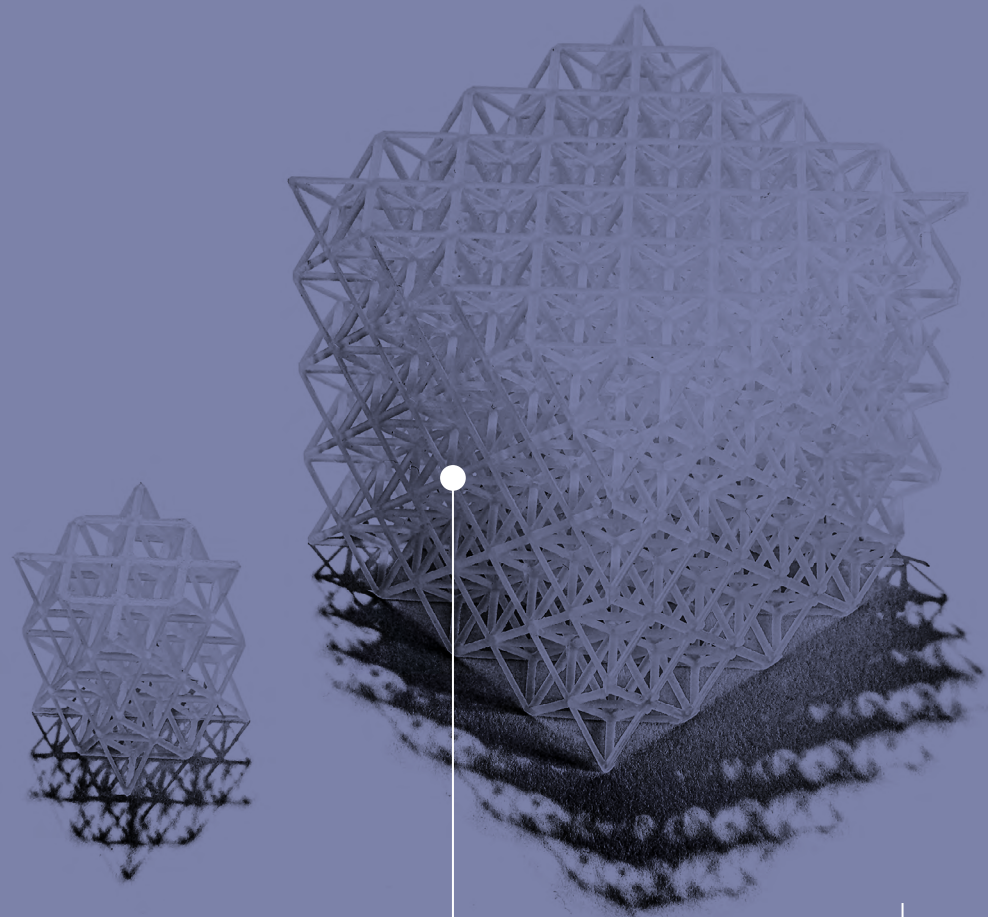
First

Universities should promote equal access to their digital and physical infrastructures regardless of users' previous experience by developing user-friendly, accessible, safe, and secure interfaces. Universities should enhance a European gate search function that both facilitates the findability of existing infrastructures and provides clear information on the terms of use for those infrastructures in a standardised machine-readable format.
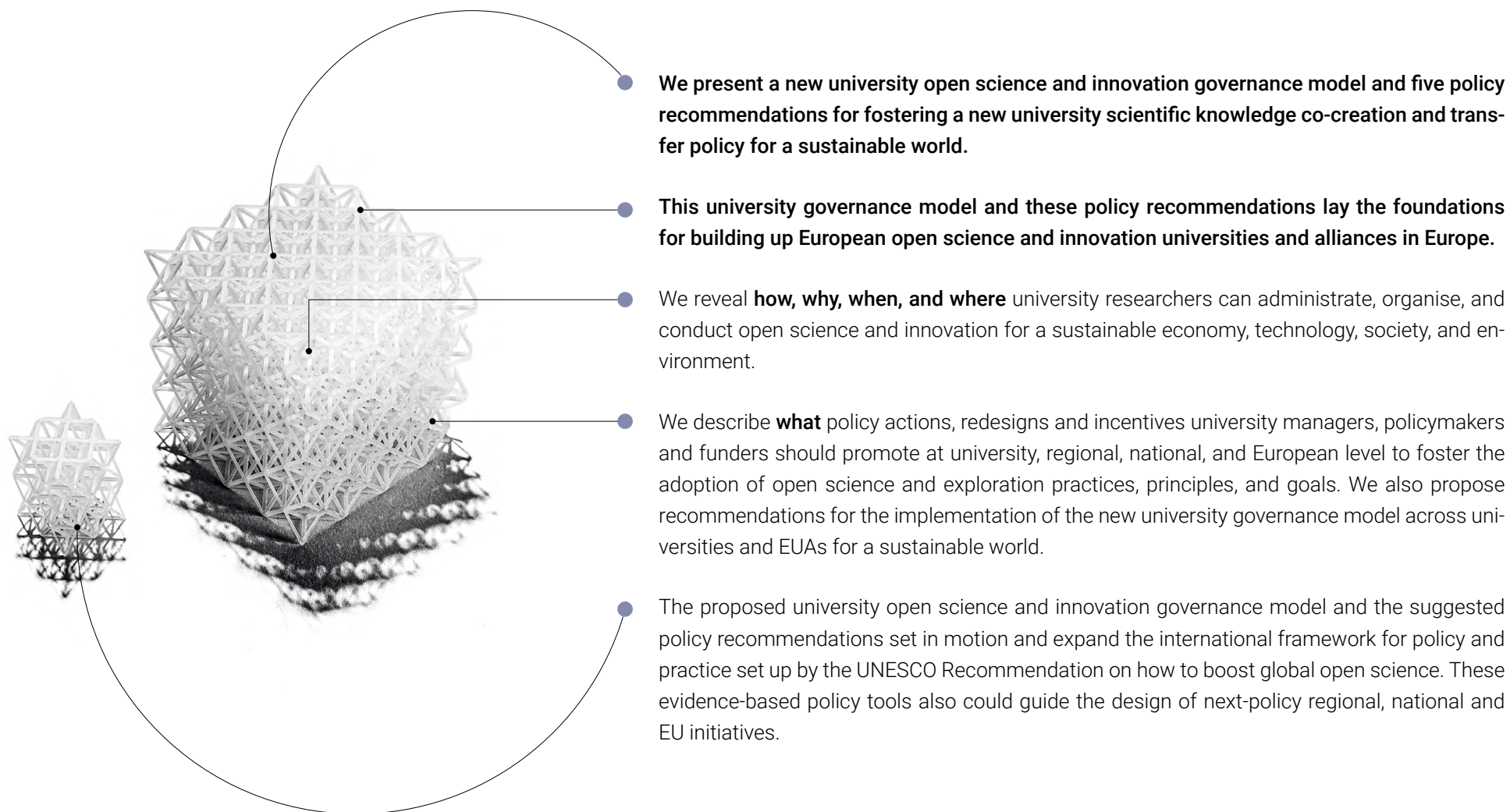
Second

Universities should co-design their digital and physical infrastructures together with their users by adopting participatory approaches that collect and merge their scientific needs. Universities should create guidelines about these infrastructures, access policies, training requirements, and operation of the tools and instruments to enable collaboration as well as the use of infrastructures within and between different collaborative networks of research participants and with the public society on a global scale for a peaceful humanity.

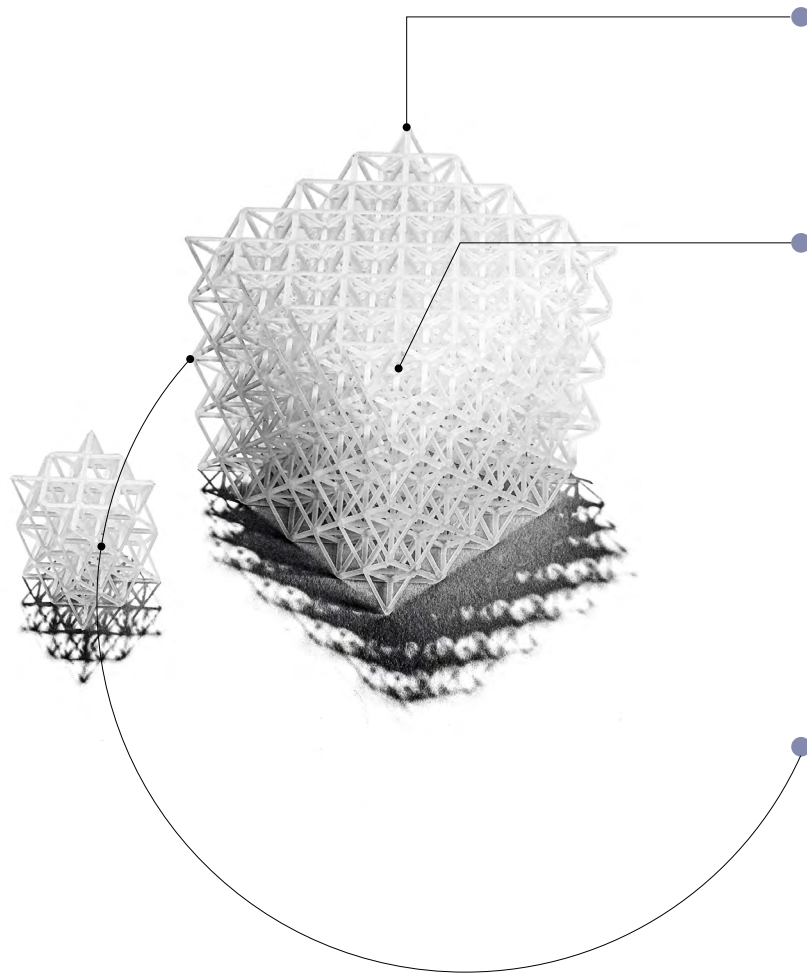Unite! white paper. A new University open science and innovation governance model and policy for a sustainable world

P. 22

unite! | University Network for Innovation, Technology and Engineering

Summary
Towards an EU Open
Science Recommendation

We present a new university open science and innovation governance model and five policy recommendations for fostering a new university scientific knowledge co-creation and transfer policy for a sustainable world.

This university governance model and these policy recommendations lay the foundations for building up European open science and innovation universities and alliances in Europe.

We reveal **how, why, when, and where** university researchers can administrate, organise, and conduct open science and innovation for a sustainable economy, technology, society, and environment.

We describe **what** policy actions, redesigns and incentives university managers, policymakers and funders should promote at university, regional, national, and European level to foster the adoption of open science and exploration practices, principles, and goals. We also propose recommendations for the implementation of the new university governance model across universities and EUAs for a sustainable world.

The proposed university open science and innovation governance model and the suggested policy recommendations set in motion and expand the international framework for policy and practice set up by the UNESCO Recommendation on how to boost global open science. These evidence-based policy tools also could guide the design of next-policy regional, national and EU initiatives.

From a university and EUA perspective, with these policy tools, we aim to contribute to outlining the subsequent policy actions for the next period (from 2025 onwards) of the European Research Area Policy Agenda and to support developments toward advancing a future EU Open Science Recommendation to help constitute Europe as an engine of open science and innovation by 2030.

Although the open science movement is gaining ground within European universities, the current landscape is still characterised by fragmentation and variations across institutions, regions, and nations. Indeed, we observe variance between regional, national, and institutional policies, and institutional support organisations. To address these challenges, **we believe that EUAs may emerge as pivotal solutions.** As exemplified by the methodologies used in this white paper and the Unite! Handbook on open science and innovation, EUAs may be used to identify and mainstream best open science and innovation practices, co-design and organise research support services, and guide the renewal of university governance models. By leveraging the potential of EUAs, we envision a harmonious European open science ecosystem that transcends boundaries and thrives on collaboration, innovation, and accessibility. The potential of EUAs to develop open science and innovation management within European universities should be further investigated.

The new university governance model and policy recommendations contribute to fulfilling and expanding the human right to science recognized in the Art. 27.1 of the Universal Declaration of Human Rights: *"from the sharing in scientific advancement and its benefits"* to **"the co-creation of scientific knowledge by all humanity".**

Authors' Contributions

Ruben Vicente-Saez led the conceptualisation and design of all Unite! Open science policy forums; all data gathering at Unite! Alliance; the data analysis; and the original draft writing and final review of the white paper. Ruben Vicente-Saez was also responsible for supervising the research and managing the project.

Antti Rousi participated in the conceptualisation and design of the first and third forums, all data gathering at Aalto, and the data analysis and contributed to the original draft writing and final review of the white paper.

Maria H Ribeiro participated in the conceptualisation and design of the second forum, all data gathering at ULisboa, and the data analysis and contributed to the original draft writing and final review of the white paper.

Rosa Lönneborg participated in all data gathering at KTH, the data analysis and contributed to the original draft writing of the handbook and final review of the white paper.

Anna Rovira Fernandez participated in the conceptualisation and design of the fourth forum, all data gathering at UPC, and the data analysis.

Maxence Larrieu supported data gathering at UGA, participated in the data analysis and contributed to the final review of the white paper.

Konrad Löbcke supported data gathering at TUDa and participated in the data analysis.

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We thank **Federica Cappelutti** and **Shalini Kurapati** for participating in the conceptualisation and design of the first forum, **Cecilia Rodrigues** and **Arnaud Legrand** for participating in the conceptualisation and design of the second forum, **Jürgen Windeck** and **Ilire Hasani-Mavriq**i for participating in the conceptualization and design of the fourth forum.

We thank **Elia Ambrosio, Erja Ämmalahti, Luis Correia, Valeria di Caro, Enrico Glerean, Christine Guenter, Kristin Halverson, Mikko Mikkola, Mauro Paschetta, Ioannis Parissis, Beatriz Silva, Pierre-Nicolas Timsit, Meritxell Vinyas,** and **Essi Viitanen** for supporting data gathering in the forums.

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We thank chatGPT language model for supporting data analysis in one co-creation workshop in the final forum.

Credits

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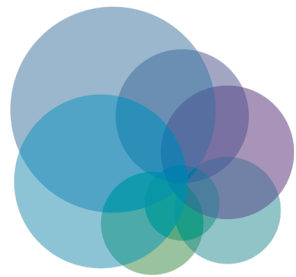
unite! | University Network for Innovation, Technology and Engineering

Unite!H2020-WP6: Creating a High-Impact European Open Science and Innovation University