Best Practices Report in Outreach and Involvement of Citizens in R&I

Work Package 2 – Deliverable 5.6

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unite! | Widening

Unite!Widening aims to enhance the quality, inclusiveness, and competitiveness of higher education in Europe. It promotes cooperation between EU universities to bridge gaps in research and innovation infrastructure and capabilities.

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Table of Contents

Foreword

The present document is part of the Unite!Widening project, which aims to raise excellence in Research, Science, and Innovation (R&S&I) in Higher Education Institutions (HEIs) for widening countries. To achieve such objectives, evaluating scientific, R&I approaches, and best practices will be crucial.

Unite!Widening is part of, Unite! an alliance of nine prominent European universities, brought together by a common goal of promoting innovation, sustainability, and cross-border cooperation in research, technology, and education. Our collaborative network empowers students, staff, faculty, and industry experts to drive progress and address global challenges. Through our collective efforts, we provide a vibrant platform for international exchange, co-creation, and lifelong learning, with a strong dedication to fostering diversity, inclusivity, and academic excellence. Unite! serves as a gateway to a future where knowledge knows no borders, and collaboration yields impactful solutions.

Along the ambition of creating a truly European University, it is the objective of involving all sectors of the society (in particular citizens) in Research and Innovation activities, and to maximise the impact of the findings associated to it.

Unite!Widening has as main ambition Advancing Scientific Excellence and Collaboration by enhancing excellence in science and knowledge valorisation through strengthened cooperation between universities from Widening and non-Widening countries. From this, six main project SMART objectives are deployed. These objectives and the contributions of D5.6 to them are presented in Table 1.

Table 1 - Six SMART Objectives of the Unite!Widening project and contribution of D5.6 towards each of them

SMART Objectives	**Contribution of D5.6 towards it**
1. Raise and **mainstream excellence in science and in value creation** through deeper and geographically inclusive **cooperation in Alliances of HEI**, and particularly in less research-intensive institutions with focus in Widening countries, achieving long-term collaboration	**Review of coordinated actions** in the past to extract learnings of aspects that went well so to follow them. **Reflection on further possibilities** to work coordinated at the alliance level.
2. **Improve global competitiveness and visibility of Europe's HEI**, creating critical mass in key areas such as the green transition and Horizon Europe mission areas	**Visualisation of relevant HEI practices** as Case Studies, maximising its impact and collecting the lessons learnt.
3. Successful **institutional reform, upgrade and strengthening of HEI capacities in the R&I dimension** (empowerment to be actors of change), through integrated collaboration between institutions and other actors in local ecosystems notably those located in Widening countries	Discussion and conclusions over **knowledge attained at the different participant institutions**, particularly those located in Widening countries to strengthen their capacities and impact.
4. **Modernised research careers in higher education sector**, interoperable with other sectors and improved	Analysis of **results of PhD tracks and different actions**, and analysis of

global competitiveness of research in HEI by strongly increased critical mass in terms of upskilling, knowledge creation and circulation in the green transition and other key European policy areas such as European Missions	potentialities for the alliance and for the Widening countries.
5. Accelerated **digital transition of the R&I dimension** of the higher education sector across the entire ERA	Analysis of **Case Studies that entangle digital technologies**, and its application on the involvement of citizens to R&D.
6. Contribution to implementation of the relevant ERA Policy Agenda actions in higher education sector	Formalisation of a set of specific **policy recommendations** to be followed at the different participant institutions, particularly those located in Widening countries to strengthen their capacities and impact.

In this context, the present deliverable explores the environment and the experiences in the realm of science and society through the review of existing studies, practices, events, policy documents, and roadmaps, among other resources, in the quest for distilling lessons learnt and best practices. Overall, the "D5.6 Best Practices Report in Outreach and involvement of citizens in R&I" serves as a comprehensive guide for institutions seeking to enhance their outreach efforts and involve citizens in research and innovation activities. It provides valuable insights and practical examples that can be replicated and adapted to different contexts to achieve greater societal impact. It also summarizes the conclusions taken from different initiatives and in a University Alliance perspective, so to be capable to provide a set of policy recommendations.

1 | Introduction

The present report focuses on best practices in outreach and the involvement of citizens in research and innovation (R&I) for activities undertaken at Universities Alliances. It highlights the importance of reinforcing cooperation between academia and business to achieve common aims and goals. For this aim, the document is divided into several chapters, each addressing different aspects of outreach and citizen engagement into Research and Innovation activities.

The context analysis, Chapter 2, starts with the study of relevant activities undertaken during the last years in the Unite! university alliance. In particular, it **describes various initiatives carried by the alliance and its members to promote scientific collaboration and citizen engagement in Research, Innovation and associated topics**. To cite some, these include the development of a Research Infrastructure catalogue, the establishment of a Seed Fund to support innovative research projects, organization of matchmaking events and demo-days, and the preparation of a Doctoral school.

For each activity reported, and apart from information about its definition and design (aims and requirements), emphasis is made to encompass the involvement of citizenship by analysing the who, how, what, when, where and why, the results of the experience (including outreach), and the impact and change led by it.

As the aim is to be able to **compare and put into value the best practices for those features of the activities that work especially well**, the present document addresses, in Chapter 3, case studies from different countries, showcasing successful examples of outreach and citizen involvement in R&I. These case studies highlight the diverse approaches and strategies adopted by various institutions to engage citizens and promote collaboration between academia and business. Examples include many different activities, such as those integrated into events like the Start-up & Innovation Day and the CyberTrust Congress.

In Chapter 4 we present a **discussion of the results and impact of the outreach activities**. It emphasizes the importance of promoting open science and innovation, enhancing the quality of research support services, and fostering international collaboration. The report also **provides policy recommendations for further improving outreach and citizen engagement in R&I**, including the need for clear and reliable information, promotion of success stories, and integration of open science competencies in education.

The document ends in Chapter 5, on Conclusions and Lessons Learnt, which also includes recommendations for policy makers.

2 | Context

2.1 | General Context: Reinforcing cooperation between Academia and Business

Industry and Academia have always been close worlds in the contexts of Technical Universities. And this interaction is only going to go further in an increasingly complex context of more accelerated changes. To this regard, **several over-arching concepts have been identified as critical success factors for the accomplishment of the collaboration**.

The first of such concepts is that of **leadership**, which is **essential to respond to challenges that are of special relevance**. It is (and it will be) necessary to focus on what is important and turn it into a common goal. The trends on a global scale and the challenges they are posing are well known and well identified (climate change, ageing of the population, growth of inequalities, digitalisation, mass personalisation, concentration of the population in megacities, etc.). **Only with shared, inclusive, integrative and reflective leadership and with common objectives will it be possible to establish alliances** and frameworks that are stable in the long term, that have an adequate endowment of resources and that can function as true living ecosystems. In science and technology processes it is these long-term relationships that really make the difference: research and technology transfer are not a one-day flower. And collaboration between all these agents will be the key to achieving more sustainable and efficient environments and, ultimately, a better quality of life.

The second key concept, in a world that is constantly changing, will be to **know how to constantly innovate and, specifically for the university environment, to innovate and to make research and training an up-to-date and encouraging experience**. On the one hand, people's concerns are changing, many of the jobs of the future have not yet been invented and, with the acceleration of processes, continuous training is no longer a recommendation, but a permanent necessity. On the other hand, people only really know the things we have done, and everyone's abilities are different. Therefore, **it will be necessary to innovate in training models, to innovate in the research processes** and approaches, and to make them more motivating, more practical, more applicable; in short, to ensure that when graduates face new challenges they can respond with a "yes, I know how to do it, I've done similar things before".

Finally, a third and perhaps a very definitive concept identified is the **promotion, management and empowerment of talent**. It will be necessary to focus on people, on giving them tools so that they can learn, unlearn and learn again. In the new Anthropocene period, it will be necessary to put people at the centre of all processes, because it is people – and not organisations – who do things. **It is people who do research, transfer technology, innovate and help with their knowledge that other people can learn**. It will be necessary to make society see that talent is very important to face everything that is to come, but that it is often very invisible because it works in the trenches. In addition, as not all talents are the same, it will be necessary to make spaces for each one to grow in their own way and do things that in the eyes of others are not of this world ("*she did it because she could get around the impossible*"). And it will also be necessary to know how to **make visible what is invisible**, it will be necessary to give references, break glass ceilings and know how to make people understand that "*possibilities are unlimited*".

For a university, being in contact with other training, science and technology organisations is a very common activity. Science and training know how to meet, whether in a congress or in a scientific publication. But **a great asset for the Science and Research and Innovation processes can be the people (professional or amateur), who study or work in companies or by themselves, with their innovative activities with high added value**. A group of living and involved alumni from the productive sectors can be key. In short, everybody will be needed to pass on their experiences, their concerns and their opportunities to the next generations

2.2 | Context in Unite!

Unite! as a Catalyst for Collaborative Research in the Unite!Widening ecosystem

The R&I dimension in Unite! has mainly been developed in previous European projects, particularly in the Unite!H2020. Attempts have been made to facilitate scientific collaboration, by setting common goals, standardising procedures, promoting discussion and meetings between researchers.

Although most activities are at a systemic level, some practical activities have been set up, directly trying to bring together researchers from different groups of the Alliance, with the aim of encouraging the start of new collaborations and scientific and common scientific activities. The main initiatives in this sense have been:

- **Set up of a "Seed Fund":** this is Unite!'s flagship initiative for the promotion research (as well as education and student activities). The fund provides financial support to innovative, co-creative and collaborative ideas from researchers across the Unite! alliance. One of its three funding lines, "Research and PhD", is specifically designed to stimulate new research projects and forge new research consortia within the alliance. The Unite! Seed Fund significantly boosted researchers' engagement with the Unite! alliance. Between spring 2023 and spring 2024, there were a total 131 applications (all funding lines), 45 of which were successful. For R&I, there was Seed funding for two kinds of collaborative activities within Research and PhD's: a Programme option "Exploring" (for actions in its initial steps, funded with up to 10,000 € per project), and a Programme option "Developing" (for the implementation of Research and PhD actions, funded with up to 80,000 € per project).
- **Organization of Matchmaking events**: Unite! promotes collaborative research activities by organising international matchmaking events, both virtual and in-person. The events offer researchers a platform for networking, exploring and developing ideas, and forging new research consortia. 7 such events have already taken place on different topics or focusing on different EU funding calls. 4 further events are foreseen in the 2026-2028 period in the Unite!Widening project.
- **Doctoral school**: The Unite! Doctoral School (UDS) designs and implements joint doctoral programmes involving two or more Unite! universities as well as industry partners. Its target is to reach co-tutelle agreements leading to double and triple degrees, particularly in the areas of Energy, Artificial Intelligence, and Industry 4.0. By the end of the Unite! ERASMUS+ project (October 2026), at least two cycles of PhD programmes will have been activated, with at least two cohorts of doctoral candidates approaching their European Degrees. There will also be Industrial Doctorates and well-established motivational tracks for Master students wishing to pursue a PhD. In October 2024, a Unite! research school was organized near Grenoble, bringing together PhD students from all partner universities.

- **Research Infrastructures catalogue**: one of the tasks of the H2020 project, continuing into the Unite!Widening project, was to compile a publicly available catalogue of research infrastructure in the alliance, available also to external users. This should allow an extension of the experimental capabilities of research groups from the alliance and promote the start of new collaborations.
- **Agora "notice board"**: a notice board has been set up on the aUPaEU (a university partnership for the acceleration of European Universities [11]) platform "Agora" to promote new collaborations in the Unite! alliance, where research groups can publish "calls for interest" for specific research projects or offering skills/competences to other research groups from the Alliance (https://agora.unite-university.eu/research/proposal).

Detailed information about these activities can be retrieved in Chapter 3.3. Unite! Joint Case Studies.

Best practices for effective mainstreaming of Open Science and Innovation at Universities

One relevant Unite! result regarding the matter of the present study is the reference handbook presenting an overview of key practices and strategies to facilitate to transition from modern science to Open Science [12]. Based on a comparative case study of 70 research teams across 7 European universities in the Unite! Alliance, the handbook exhibits a high impact understanding of the best open science and innovation practices on Unite! research teams and exposes guidelines for the adoption of these practices.

Indeed, the handbook provides a detailed roadmap for universities to adopt best practices that foster an open, collaborative, and innovative research environment and thus shapes a new governance model for the management of open science and innovation in universities in the digital era. To this respect, some of the main recommendations listed encompass the (i) sharing practices, (ii) collaboration practices, and (iii) open innovation practices.

1. Establishing a Clear Vision and Strategy
2. Building Supportive Infrastructure
3. Promoting a Culture of Openness and Collaboration
4. Engaging with Stakeholders
5. Implementing Robust Policies and Guidelines
6. Providing Training and Capacity Building
7. Measuring and Evaluating Impact

The handbook provides many case studies and examples of universities that have successfully mainstreamed Open Science and Innovation. These case studies highlight best practices, challenges, and lessons learned from institutions that have pioneered Open Science initiatives. By showcasing these examples, the handbook offers valuable insights and inspiration for other universities. The results of the described research in Open Science and Open Innovation have been presented in recent times in different events, such as the dedicated Unite!Widening Open Science Policy Forums (10-11th October 2024 in Wrocław, Poland and 23-24th October 2024 in Lisbon, Portugal).

Following to the previous handbook, another relevant Unite! result regarding to the matter of the present study is the Unite! White paper on "A new University Open Science and Innovation Strategic Roadmap for Widening Countries" [13].

In this case, the white paper is a practical tool aimed at the implementation layers of European universities, designed to provide tools to plan and materialise an effective set into action of open science at universities in Widening Countries by 2028.

With this rationale, this white paper provides a set of research evidence-based recommendations in the form of strategic objectives, tactical actions and operational outcomes, which configure a strong framework through Key Performance Indicators (KPIs) for turning university open science and innovation policies and strategies into university open science and innovation action plans. University of Lisboa and Wroclaw Tech are used as a testbed for universities in Widening Countries.

With all these actions, the alliance walks towards building an interconnected Global Open Science System, in which the European Open Science and Innovation Area among Widening and non-Widening Countries can play a major role.

3 | Case studies for the analysis

This chapter aims to provide specific case studies to comprehend Best Practices in Outreach and involvement of citizens in R&I, aiming to reinforce the cooperation between Academia and Business, and more in general, between Academia and Society. In it, many different case studies are filed by the country where the activity took place, starting by non-widening countries and then widening countries. Also, there is a section for activities and case studies generated and conducted in collaboration within the Alliance. Each Case Study aims to provide its definition (what were the aims and requirements) and design together with relevant matters about the involvement of citizenship (who, how, what, when, where and why they were involved).

3.1 | Non-Widening countries

3.1.1 | Austria – TU Graz

Early Christian Altar Stone: Swarm Intelligence to Help with Reconstruction

Researchers from TU Graz and the University of Graz developed an innovative method to reconstruct an early Christian altar stone, used in a large-scale citizen-science experiment that involved several thousand users [d]. The altar slab, which is broken into 139 pieces, was digitalised and made available on the interactive online platform "Open Reassembly." Citizens could work online to piece together the fragments, a task that specialized algorithms have not been able to reliably solve.

The altar slab was discovered in the 1950s in a Church in East Tyrol's Lavant, a significant early Christian monument in Austria. Despite numerous attempts, archaeologists have not been able to fully reconstruct the broken slab. The fragments were largely texture less and partially eroded, making reconstruction extremely difficult.

For the project, the individual pieces of the altar slab were digitized. Around 100 photos were taken of each fragment from different perspectives and combined with geometric data from measurements taken by a stripe light scanner. These digital twins of the fragments can be rotated in all directions on the "Open Reassembly" platform and virtually assembled with the other pieces.

Using the online platform, a large number of interested internet users from the broad public were involved in the reassembly process, they could work together to reconstruct the altar slab. Besides assembling, participants could puzzle themselves and evaluate the adjustments made by other players. The project is also relevant beyond the archaeological puzzle, as it offers approaches for computer-assisted reassemblies in computer science.

In a scientific publication [e], the team of researchers summarized: It was demonstrated that citizen scientists can efficiently solve reassembly problems even if they present non-trivial challenges such as eroded or missing pieces, and lack of surface colour or distinctive geometric features.

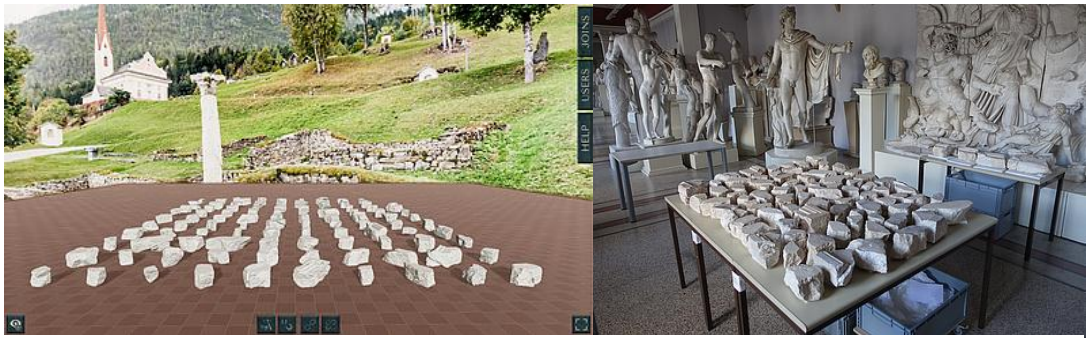

Figure 1 - Left: Screen shot from the virtual space in which users can put the fragments together. The background shows the surroundings of the excavation site at Kirchbichl in Lavant. Image source: CGV - TU Graz. Right: Fragments of the broken altar stone

3.1.2 | Germany – TUDa

Demo day open to other partner Universities

The Technology Transfer Office of TUDa participates in the City Economy Day ("*Tag der Stadtwirtschaft*") every year. At this event, the companies of the City of Science Darmstadt jointly present themselves to the citizens of the municipality. They provide information about their work and products at numerous stands. HIGHEST has a joint booth with the region's start-up ecosystem, with selected start-ups presenting themselves and their products and services [f].

The *Start-up & Innovation Day* is TUDa's flagship event when it comes to presenting its innovation capacities to a wider audience. It aims to foster collaboration among start-ups, innovators, industry professionals, academics, policymakers, and interested citizens. Organised by the university's innovation and start-up centre, HIGHEST, the event serves as a platform to showcase cutting-edge technologies, entrepreneurial concepts, and innovative ideas. Participants have the opportunity to present their projects, engage in networking activities, and attend workshops and keynotes designed to inspire and inform. In recent years the "*Innoday*" has had between 1,400 and 1,600 participants. In 2024, the Start-up & Innovation Day was opened to the Unite! university alliance [g, h], offering booths to start-ups from the entire Unite! ecosystem. For the international participants, this provided an excellent opportunity for exploring the German market and innovation ecosystem.

Figure 2 - InnoDay 2024. Picture credits: HIGHEST/Benjamin Schenk

3.1.3 | Italy – PoliTO

University events organised centrally by the Politecnico di Torino

Thematic/Event series

- *Tempi difficili:* In 2024 the topic was *"Guerra, pace"*: Seminars promoted by *Biennale Tecnologia* and *Istituto dell'Enciclopedia Italiana Treccani* to advance new perspectives on war and peace. In 2021 it took the form of a short course to better understand Covid-19 pandemics crisis.
- Cinque Libri: PoliTO invites experts to be interviewed on five books that they believe to be relevant to PoliTO community and to the citizens in general.
- *Liberi Libri*: Books and authors at Politecnico di Torino: writers from different backgrounds present their books.
- *Theseus Colloquia*: Seminars on technology, its foundations and its social, economic, political, environmental impact. Promoted by PoliTO Theseus study center.
- *Top Experience*: Meet the people -PoliTO Alumni most of the times- who distinguished themselves while working in companies, international organizations, institutions, NGOs and so on: valuable testimonials from the civic and professional perspective, especially for PoliTO students.
- *Grandi Sfide*: 11 introductory lectures from the curricular course "*Grandi Sfide*" (Big Global Challenges), exceptionally offered by PoliTO in the framework of *Biennale Tecnologia* to the general public. The aim is to seek together new answers to the challenges facing humanity in the 21st century.

Prometeo - Tech Cultures

Prometeo is a new cultural content production platform for public engagement at the Politecnico di Torino that focuses on analysing the complex relationship between technology and society.

Nowadays, technology plays an increasingly decisive role in all areas of human and social life: from education to work, from environment to health. For this reason, the Politecnico di Torino intends to intensify its knowledge-sharing initiatives with citizenship, reinforcing with Prometeo the activities of Biennale Tecnologia, the major biennial event that Politecnico has been successfully producing and promoting since 2019.

Prometeo designs and produces different cultural contents: theatrical performances, short films, non-fiction books, educational publications, podcasts, videos, lectures for school and university students, entertainment events, expert dialogues, exhibitions, and social media content, among other things.

Prometeo jointly pursues quality and impact, thanks to the ideas, skills and creativity of a dedicated staff - and of those who work at Politecnico on a daily basis - and the promotion of many collaborations with local, national and international cultural institutions.

PoliTO for Social Impact

PoliTO for Social Impact explores and enhances forms of action-research that, with an intentional transformative approach, are aimed at co-designing new models of equitable, inclusive, and

sustainable social development. The initiative seeks to remove cultural, cognitive, physical, economic, and social barriers that hinder individuals' life projects and their full participation in the community.

PoliTO for Social Impact strongly believes in the principles of inclusion, social cohesion, universal human rights, and the fight against inequalities. It aims to foster transformative collaborations and action-research initiatives to develop products and/or services that promote pathways of technological and social innovation.

The objectives of PoliTo for Social Impact are the following:

- To represent and enhance the University's commitment to social responsibility by valuing the substantial number of social impact initiatives and projects already underway and making them available to the nation, its organizations, and its citizens.
- To promote an active role for the University in fostering equitable and inclusive technological and social development processes aimed at reducing inequalities.
- To develop skills and competencies explicitly oriented towards addressing emerging social challenges.
- To Promote the values of civic responsibility, social cohesion, citizenship, and social justice among future generations of professionals and citizens, including through new educational courses and training pathways.
- To Encourage interdisciplinary and multi-stakeholder co-design on social impact themes across different scales and intervention types, such as:
    - Products, systems, and services.
    - Business models and strategic and operational tools.
    - Data extraction and visualization methodologies.
    - Multidisciplinary and cross-sectoral laboratories.
- To promote the University's participation in Italian and international networks focused on social impact, to expand resources and capacity to act at both local and global scales.

Theseus Center

"PoliTO 4 Impact" Strategic Plan acknowledges interdisciplinarity, humanities and social sciences among the educational values and skills enriching all PoliTO teaching, research and technological transfer activities. Spring 2022 thus saw the birth of THESEUS - Center on Technology, Society and Humanity: an interdisciplinary centre whose mission is to combine applied sciences with human and social studies.

During the current pilot phase, THESEUS will:

- Promote cultural and third mission activities, by organizing seminars and workshops on technology and its social, economic, political and environmental impact.
- Contribute to the whole course catalogue to combine applied sciences - notably engineering - with human and social sciences for what concerns technology, its foundations and its impact.
- Enhance the integration of applied, human and social sciences in research, exploring prominent themes, participating in national and international research projects, and promoting policy-oriented research.

THESEUS activities are aimed at developing crucial solutions and analyses to public policy and policymaking in general, also by publishing policy briefs and position papers, plus promoting and organizing training activities for public and private decision-makers.

Among the very first results, the Master in Technology and Public Policy: a joint programme offered by PoliTO Specializing master's and lifelong learning school and ITCILO International Training Centre.

THESEUS also represents PoliTO within *Scienza Nuova*, the centre launched by Politecnico and Università di Torino to coordinate all the activities regarding social changes emerging in the current technological transition.

Biennale Tecnologia

Biennale Tecnologia is the first international initiative entirely focused on the relationship between technology, humans and society. Since 2019 - with Festival della Tecnologia's "zero edition" - Politecnico di Torino organizes and promotes, together with numerous partners, Biennale Tecnologia's series of events to reflect upon the major challenges nowadays imposed to our technologically-driven society.

Biennale Tecnologia is focused on the decisive role played by technology in all human life aspects - for health to environment, from personal relationships to democracy. It is a recurrent event, alternating and somehow completing *Biennale Democrazia*, which promotes democratic culture and practice in the city of Turin. The aim is to broaden our gaze to the many faces of technology: a human-created tool that ultimately significantly affects everyone's life.

Biennale Tecnologia's last edition was held in presence on November 10-13, 2022. It involved PoliTO community, schools, media, policy makers and all citizens in 130 events: lectures, dialogues, meetings, debates, exhibitions, and performances. The main venues were PoliTO campus and Castello del Valentino, but also Circolo dei lettori - a partner from the very first edition - and Officine Grandi Riparazioni - which entered in 2020 as a prestigious venue thanks to the partnership with OGR Turin and the support of Fondazione CRT.

3.1.4 | Spain – UPC

Citizen science initiative: Measuring trees capacity to absorb CO2 and year-to-year growth

One of the major challenges the EU has proposed is the goal of having 100 cities become carbon neutral by 2030, with the entire continent aiming for carbon neutrality by 2050. A key aspect of this effort is understanding how much CO_2 can be captured by urban trees each year.

The amount of carbon absorbed depends on several factors (such as tree species, age, and water requirements), with weather conditions throughout the year being the most significant. The CO_2 captured by a tree can be estimated using different models. The method and equation proposed by Shadman et al. (2022) have been applied in the Co-Carbon Trees Measurement project, a citizen science initiative developed in the city of Viladecans (with a population of 67,000, located 15 km south of Barcelona).

In this project (Mazon and Jaumà, 2024), more than 700 students measured the diameter and the height of approximately 1,300 trees in one morning. The resulting data allows for an estimation of the carbon captured by the city's 20,000 trees, helping to assess how close the city is to achieving carbon neutrality. The project also proposes repeating this measurement annually, using the same trees that have been located by GPS, to calculate the CO_2 captured each year and to correlate the results with annual meteorological parameters, such as average temperature and precipitation. The project, which is currently projected to some other metropolitan cities of Barcelona, is a project currently involving 3 of the 4-helix ecosystems defined by the EU mission methodology: the academia (the University, UPC), the administration (city council), and organized citizens (students from higher schools along the city).

In addition to its scientific focus on quantifying CO_2 capture by urban trees and examining their relationship with climate factors, the project also aims to engage citizens. It seeks to raise awareness of the importance of urban greenery, the critical role trees play in cities, and, above all, the vital contribution citizens make in co-designing and implementing scientific initiatives. Without citizen participation, these efforts would be impossible to carry out, and it would be challenging for city technicians to directly measure how much carbon a tree captures. The project values the collaboration between citizens, local administrations, and academia.

Several conclusions can be drawn in this activity. First, the simplicity of the activity makes it easily applicable across various sectors, especially for school children. This is because two very simple measuring instruments contribute to the assessment of a complex variable, such as the carbon stored in a tree. These instruments include a tape measure to measure the tree’s height and a mobile app (in some cases, a sixth instrument may be used to calculate the tree's angle of elevation, allowing students to apply elementary trigonometry to determine the tree’s height). Another key aspect of this activity is the development of an understanding of the importance of urban trees. These trees are no longer seen merely as decorative elements, but as vital components aligned with sustainability and climate resilience. They play a crucial role in combating climate change and achieving carbon neutrality in cities.

The activity itself does not require much preparation—only good coordination between the city council, schools, teachers, and universities. In our study case, the preparation began at the end of January, to be carried out on March 14 (Pi Day), and to obtain the data in an Excel file in mid-April. Students were provided with an explanatory text and will need to record their results. The worksheet explains how to conduct the measurement, starting with three measurements, then calculating the average (mean) and standard deviation.

The activity was integrated into the students' training as part of their natural sciences and mathematics curriculum. By measuring the lengths of thousands of logs of different sizes, the students were able to calculate the value of pi for each log. In addition, they learned to measure accurately using both analogue and digital instruments, and to present experimental results by calculating the mean and standard deviation.

This activity complements what is taught in the classroom and, as we have seen, has broader implications beyond mathematics. For these students, a tree will now likely represent much more than just a trunk and branches. More information and details can be found in references [i-k] at the end of the present document.

Connèxia 360: Creation and set-up of a program to connect seamlessly UPC and companies

Connèxia 360 is a Business Partnership Program launched by UPC at the end of year 2023. The reason behind it was to launch a tool that would allow a new form of collaboration between the University and a limited number of companies with which a strategic alliance could be established. These strategic partners receive tailor-made, high-level, proactive and highly professionalized services to help them obtain the maximum value from the UPC in the areas of talent, research, innovation and communication [l].

It is important to note that Connèxia does not replace any existing collaboration between companies and the UPC in any of the existing modalities. It was created because the possibility of obtaining new opportunities for collaboration with medium and large companies is detected if a program of these characteristics is available, which goes a step further in the way that companies currently obtain value with universities and technology centres.

Value proposition

For the UPC's strategic partners, the advantages offered by the partnership program for participating companies are the following:

- Preferential access to the UPC's range of services in all areas:
    - Student talent from all Teaching Centres
    - Talent graduated from the UPC. Alumni.
    - Lifelong learning plans for professional development.
    - Knowledge and R+D generated in the Research Centres
    - UPC network of start-ups, innovation and entrepreneurship
- Access to a specialized Key Account Manager (KAM) who will proactively help the company extract the maximum value from the collaboration
- Brand visibility in the student community
- Actions to promote the partnership jointly
- Collaboration in corporate social responsibility projects
- Networking opportunity with other program partners

The aim of the Programme is to improve the UPC's relationship with strategic partner companies, pursuing the following objectives: Therefore, the Value proposition for the University is the following:

- To Increase the turnover by attracting new client companies, and to get companies that are currently customers to contract more services.
- To solidify the relationship with the companies that are customers to reduce the risk of loss when there are changes in the contact persons (in the company or in the UPC)
- To standardise and improve the different services offered by the Teaching Centres and service units.
- To increase the relationship that some Teaching Centres have with companies, allowing the diversification of Campuses and Centres.
- To position itself in the Catalan university environment as the only university with a service of this level for companies.

Still, the value proposition of the programme comes down to individuals. For example, in the case of for UPC students, they have, through the Programme:

- Access to a network of companies that explicitly recognise the value of the talent generated by the UPC.
- Access to Educational Cooperation Agreements focused on the needs of the company, giving a real business vision to UPC students.
- Access to industrial doctorates that allow students to have a vision of the real research needs of companies that have a strategic relationship with the UPC.
- Access to scholarships and study awards that allow, with the help of private companies, to obtain financing for what interests them most in terms of studies.
- To give UPC Alumni access to jobs that allow them to progress more effectively in their professional projection.

And UPC lecturers have, through the Programme:

- Access to companies that have a strategic relationship with the UPC and that want solutions to new problems and that bring research closer to industrial processes.
- Visibility of their work so that companies in their sectors or sectors not yet recognized by themselves, can know what they do in the field of research.
- Support from KAM oriented to the specific company in the execution of the project and the ongoing relationship with the company.
- Possibility of providing challenges that, together with professionals from the company, are posed to students, with the implication of finding unknown students with interesting skills for research and technology transfer.

Main features of the Collaboration Partnership

The characteristics of participation are:

- The framework of collaboration is defined company by company by a plan of activities. The Activity Plan is made up of a series of services that will allow companies to take advantage of the value that the University can give them. These services are aimed at providing companies with access to talent, knowledge, etc. of all the Schools, Research Groups, and Service Units, and will be carried out by different units of the UPC.
- Each client is assigned a professional management. A personalised collaboration manager who ensures that the agreement is satisfactory for the client and for the UPC. It is the differential figure of the program, as it offers tailor-made service, flexibility and specialized guidance on an ongoing basis.
- In parallel to the activity plan, there is a follow-up plan carried out to monitor and periodically evaluate the progress of the partnership programme with the purpose of evaluating the satisfaction of companies and service provider units.
- A medium/long-term partnership agreement (3 or more years) is defined to ensure that the collaboration generates an impact on the company's innovation strategy.

In the general case, each activity plan for companies contains services from the five main categories in which it is structured the general Connèxia catalogue:

- Talent and training.
- Research and technology transfer
- Innovation and business growth
- Corporate Social Responsibility
- Visibility

Within each category, a series of services are defined (some of them even on purpose). All the UPC units that offer the new services can be included in the deal, namely: Support to R&I services, Support to Innovation Management, Technology, Alumni, Doctoral School, Schools, Culture and Community Area, Communication Services and Fundació Politècnica.

ABLE Spin-off Company from UPC: A company where the users have become relevant stakeholders

ABLE Human Motion [m] is a spin-off of the UPC Biomechanical Engineering Laboratory (BIOMEC) that was born in October 2018 with a clear mission: to improve human independence and mobility through innovative technology. Thus, the Barcelona-based company develops robotic exoskeletons to improve the quality of life of people with physical disabilities, specifically for people with paraplegia due to a spinal cord injury or for stroke survivors.

The main product of the company was the first lightweight, easy-to-use and economical exoskeleton that allowed people with paraplegia to get up from their wheelchair and walk again in a natural and intuitive way. It helps mitigate health problems caused by a sedentary lifestyle, increasing self-confidence and independence in activities of daily living.

One very interesting feature of this Spin-off company is how it has managed to involve all stakeholders in the development of technological solutions and of the company itself. Being born in a research group, it was clear that it was going to embrace universities and technical centers. Also, with the relevant contacts, it was possible to gain international projects funded by public administrations. With that, the company could grow and could integrate hospitals and patients for medical testing. But furthermore, it managed to bring some users to the board of trustees of the company.

3.1.5 | Sweden – KTH

Development of education at KTH by increasing working life connection in existing educational programs and courses

Region Stockholm is the regional public body responsible for healthcare, public transport, and regional planning within Stockholm County in Sweden. In the course *Public Transport Systems, Buses, and Rail* at KTH, Region Stockholm contributes with project assignments and lectures. The region's engagement provides students with knowledge that will benefit them in their future careers.

"The collaboration with the Traffic Administration in Region Stockholm helps ensure that the course addresses areas and issues where there is a need for expertise in the industry. By having people from the Traffic Administration lecture on their areas of specialization, students gain a current and well-

informed insight into how things work in practice," says Erik Jenelius, course coordinator for Public Transport Systems, Buses, and Rail [n]. Erik Jenelius has collaborated with the Traffic Administration in Region Stockholm for many years.

Mobility strategy specialist from Region Stockholm, Siri Brolén, has lectured in the course. She enjoys meeting students and explaining how Region Stockholm's Traffic Administration works and why. She says the students are usually very engaged and curious; in addition, they are likely to be future colleagues and/or partners. Siri Brolén is a KTH alumna and remembers how valuable it was when someone from the industry came and gave lectures, and feels it is her turn to give back. Siri Brolén studied Civil Engineering in Urban Planning with a focus on Traffic Engineering at KTH between 2007 and 2012.

The course includes lectures and exercises but also features a major project assignment where students practice strategic planning for public transport and use an important planning tool, *Visum*.

"Students choose an area to work on and design proposals for expansions or changes in transport services. The project includes using a simple socio-economic analysis to compare the results of different alternatives" explains Erik Jenelius. Strategic planners from the Traffic Administration provide feedback on students' proposals during the course and on the results of the analyses at the end of the course.

From his perspective, collaboration with the region is a great way to ensure that the project and the overall course content are relevant—and feel relevant—to students for their future careers.

"Through the project, students gain practical experience in methods and tools for strategic public transport planning. They learn to analyze problems from multiple perspectives and balance the benefits and costs of different solutions. These are valuable skills for future work in urban and transport planning, whether in a regional or municipal setting, as a consultant, or with a transport company" Erik Jenelius explains.

"I believe it increases students' interest in working with public transport planning in the future. To successfully transition to a sustainable transport system, we need people with both the interest and the knowledge required to move in the right direction" says Erik Jenelius.

"It takes some time and commitment—thinking through what is relevant for students at their stage of education and considering what should be highlighted—but it's worth it. Most of all, it's fun to lecture for students" concludes Siri Brolén.

Reaching out to both private and public sector organizations to increase contact areas and exchange of knowledge between education and the surrounding society, mainly industry and business. It includes guest lectures, external representation in program councils, or project assignments.

One interesting result was the increased quality in education and ensured relevance in education, which led as a relevant impact the exchange of knowledge and meeting the industry´s competence needs.

3.2 | Widening countries

3.2.1. Portugal

Tec Labs Demo Day: Innovation Centre opens its doors and showcases start-ups and innovative ideas

Since 2022, Tec Labs-CIÊNCIAS Innovation Center (a reference space for promoting scientific and technological entrepreneurship in Portugal) has organized Demo Day [o], which aims to present the latest technological innovations created within the Universidade de Lisboa and encourage the exchange of ideas and networking. The 2024 event was attended by national start-ups from various areas, from health to sustainability, including agrotechnology and artificial intelligence, reinforcing the multidisciplinary nature of this incubator. Among the highlighted start-ups are Generosa, Delox (Faculty of Science Spin-Off), RAIZ Vertical Farms, Nevaro (Faculty of Science Spin-Off)) and GranterAI, whose innovative projects have attracted the attention of the national and international technology community. This Event that brought together entrepreneurs, investors and sector experts to learn about the most promising start-ups incubated in the Centre.

Demo Day 2024 had more than 70 external participants, including investors, various entities from the ecosystem, SMEs, colleagues from other ULisboa Schools and beyond, getting involved in the event, discovering the building, our start-ups, spin-offs and innovation projects, and to participate in networking moments. Tec Labs we were able to show the quality of entrepreneurship and innovation that together we have made Science grow.

Prof. Luís Carriço, Dean of the Faculty of Sciences, who performed the opening ceremony said that he "believe that in the future, there will be no universities without companies", highlighting that "Companies produce funds and need knowledge, and universities produce knowledge and need funds". This was followed by a talk by guest speaker Balzhan Orazbayeva, from the University Industry Innovation Network (UIIN) [p], a recognized expert in the field of collaboration between universities and industry, with experience in promoting strategic partnerships that drive innovation and technological development. Her presentation focused on the fundamental role of universities in preparing for the technological future, highlighting international best practices and successful strategies.

Figure 3 - Left: Luís Carriço, dean of the Faculty of Sciences at UL, performing the opening ceremony of the academic year; Right: Guest Speaker Balzan Orazbayeva.

For Jorge Maia Alves, Coordinator of the Executive Committee for Science Innovation and Entrepreneurship, “this intervention demonstrated the added value of the holistic approach to the theme of transferring value to society that we have practiced, promoting training in the area of entrepreneurship for different Science target audiences, namely students, seeking to promote a close connection between our R&D Centres with our incubated companies and with the business sector in general and, also, the creation of spinoffs with a scientific and technological base”.

The session continued with the round table "Beyond the Obvious on Internationalization of Start-ups", moderated by journalist Miguel Magalhães (The Next Big Idea) and which included guests Pedro Silveira (AICEP), Pedro Sacramento (Start-up Portugal) and Jorge Santos (AquaInSilico).

Figure 4 - Round table "Beyond the Obvious” on Internationalization of Start-ups

To conclude, Cecília Rodrigues, Vice-Rector for Research and Innovation at the Universidade de Lisboa, highlighted the exponential growth of entrepreneurship at ULisboa over the decade that followed the merger with the Technical University of Lisboa. Even so, she emphasized the latent potential that still exists to develop in the future.

For Rita Tomé Rocha, Coordinator of the Innovation and Entrepreneurship Area/Tec Labs, “On a day dedicated to showing the innovation and entrepreneurship that flourishes daily in ULisboa Sciences, whether in the space of our Tec Labs incubator, or in the various laboratories and classrooms through of our researchers and students, I think we are all to be congratulated because we were able to bring together several ecosystem partners on this special day and together celebrate the impact we are having in the city, in the country and I dare say in some cases even across borders”.

Next, attendees were invited to venture beyond the auditorium and let their curiosity guide them through Tec Labs. The various start-ups and spin-offs incubated at the Innovation Centre opened the doors to carrying out activities designed to publicize innovative projects developed by SCIENCE students and researchers in a dynamic and creative way. This moment also included fun activities, promoted by the *Circo Matemático* project, a multidisciplinary group of artists that combines science, circus arts and mentalism.

Figure 5 - Various Start-ups incubated presenting their technologies at the Demo Day

The afternoon continued with an informative session on "StartUp and ScaleUp Status Recognition" with João Silva (StartUp Portugal). Finally, to fully round off Demo Day, there was a Sunset with food, drink, entertainment and live music, which allowed guests to share their experiences and network.

Figure 6 - Live music for celebration and networking at the Tech Labs Demo Day

"Breakfast with the CEO"

It is an initiative in which Tec Labs invites a CEO of a Start-up incubated in our Innovation centre to share good practices and insights with another incubated start-ups. More information can be retrieved at [q].

"Meet the Investor"

It is an event, started in 2022, in which Tec Labs invites some national and foreign investors to make a presentation to the incubated start-ups that are interested so that they can find out which verticals the investors invest and the amounts of financing in. After the general presentation, interested start-ups can have one-on-one meetings to present their pitch and raise funding. More information can be retrieved at [r].

Participation in Web Summit Lisboa

Web Summit was founded in Dublin in 2009. It started as a 150-person tech conference in October 2009. Since then, Web Summit has gathered over a million-business people from around the world. Its

flagship event is Web Summit in Lisboa, which takes place every November. During the year, Web Summit also hosts events around the world (Rio de Janeiro, Qatar, Vancouver, Hong Kong).

Web Summit events enable meaningful connections between CEOs, founders, investors, professionals, tech enthusiasts, media, politicians and cultural figureheads, thus contributing to showcase technologically based innovation solutions to very diverse audiences. The event also receives wide national and international media coverage thus reaching, not only the innovation and entrepreneurship ecosystem, but the general public. In 2024, the Web Summit in Lisboa gathered more than 70,000 participants.

Técnico Lisboa

Técnico (ULisboa) has been participating in the event as an exhibitor with researchers, professors, students, alumni, volunteers, and even prototypes and robots showcasing innovative projects developed by research units. The school's participation in the event shows how innovation and entrepreneurship are a pillar for Técnico. In the 2024 edition Técnico stood out as the only higher education institution to have its own exhibition stand. Several members of the Técnico community participated in strategic meetings with potential new partners and welcomed more than three thousand visitors to the Técnico exhibition stand.

Figure 7 - Técnico exhibition stand at Web Summit in Lisboa. Photo credits: Henrique Pereira, IST. Photo and information sources: References [t-x]

On the first day, the presence of Vizzy, the robot designed by researchers at the Institute for Systems and Robotics, captured the visitors' attention. Ricardo Rodrigues, a researcher at ISR-Lisboa answered all visitors' questions. The Técnico alumni José Alexandre Correia, a partner at KPMG (member of Técnico Partner Network), and Joana Pinto, founder of Clynx, shared with visitors how their training at Técnico was essential to their successful careers. The boat built by the Técnico Solar Boat students' organisation was showcased on the second day. Additionally, start-ups created by Técnico alumni such as SurfACTinnov, Medgical and BreastScreening-AI, were also in the spotlight. The highlight of the third day was the Baltasar rocket, built by the AeroTéc-Red team of the Aerospace Engineering Students' Organisation (AeroTéc). Start-ups such as ENGIBOTS, Strata Tech Labs and Scarlet AI, among others, were the protagonists of conversations that strengthened the collaboration between Técnico and the innovation ecosystem. More than forty start-ups created by Técnico alumni attended the event.

Figure 8 - Técnico team at Web Summit in Lisboa. Photo and information sources: references [r-t]

The presence of Técnico had also a significant impact in the media. More than a dozen interviews were conducted and various news in reference general publications were published and/or broadcasted on television and radio.

Técnico Innovation Summit

The first edition of the Técnico Innovation Summit was organized by Técnico (ULisboa) and took place on November 4th and 5th 2024 at Técnico Innovation Centre. This first edition **brought together in the same space a 'Summit' where concrete results of projects with an impact on the economy (RRP Agendas) in which Técnico participates were promoted and demonstrated.** Using totems, samples, catalysers and even a robot dog, the Técnico researchers answered questions about the innovation projects they are working on. The first Técnico Innovation Summit featured 21 RRP Agendas in which Técnico participates.

Figure 9 - A researcher presents an innovation project at Técnico Innovation Summit. Photo credits: Maria Carolina, IST. Photo and information sources: References [t-x]

The initiative is part of the PhD Open Days, an annual event promoted by the Técnico Doctoral School, which increases the potential for Portuguese companies to recruit Técnico's most advanced young talent. To speed up the relationship between students and companies at the event, a special programme was implemented to accelerate the co-creation dynamic with the Técnico Community. This included speed-dating interviews with various companies, to gain insight into societal challenges, different working cultures, and potential career opportunities.

The Técnico Innovation Summit was open to all who wish to observe what is being done in innovation through the relationship between Técnico, companies and their doctoral students and attendance was free. The event was visited by the Portuguese prime Minister and was reported in the media [y].

E.Stories@Tecnico

E.Stories@Tecnico is a series of events organized by the technology transfer office of Técnico (ULisboa) that aims to give participants the opportunity to immerse themselves in the world of entrepreneurship through the stories of entrepreneurs with technical DNA who have decided to challenge the status quo, follow their ideas and shape their future. In these evening meetings, two successful entrepreneurs talk about the path they have travelled and share their difficulties and lessons with the public.

Figure 10 - "Técnico alumni return to Técnico and share their entrepreneurial journeys" (30th October 2024) with Nuno Fonseca, Founder & CEO of SoundParticles, and Diogo Rato, Co-Founder of TestWaves. Photo and information source: reference [z]

In a relaxed atmosphere, they deconstruct entrepreneurship, learn from the experience of the alumni, create contacts and explore options for the future. The target audience are students, Técnico alumni, IST Spin-off community, academic and research staff, start-up founders, technology enthusiasts or those simply curious about entrepreneurship.

Guinness Record for the Largest Computer Programming Lesson

On 12th October 2024, Técnico (ULisboa) hosted the "World's Largest Computer Programming Lesson" with 1668 participants gathered from the general public. The lesson was open to all interested in programming even without previous knowledge and set the Guinness record of the same name.

One of the aims of this event was used to showcase the importance of computer science and programming as key tools for our sustainable growth as a society. The lesson was taught by IST Professors and alumni and sponsored by corporate partners, such as Ana Aeroportos de Portugal, Axians, Deloitte, Galp, Millennium BCP, NOS, NTT Data, Vodafone and Worten. The event also counted with the support of Students' Association of the Instituto Superior Técnico, Lisboa City Council and Unicorn Factory Lisboa. With this event Técnico also aimed at positioning itself as a major centre of

expertise and competence in these areas with close contact to corporate partners. The Guiness record was widely publicized in the media with articles in general publications and/or television broadcasting.

Figure 11 - World's Largest Computer Programming Lesson". Photo credits: Reuters. Source: of photo and information: reference [aa]

Activities co-organised and hosted by LISPOLIS

LISPOLIS IGNITE

LISPOLIS acceleration program [bb] with 2 editions in 2024, "Energy and Sustainability" and "Health Tech" - 50 applications, 32 start-ups, more than 40 mentors participated, 8 days of workshops, talks and visits and 2 demo days, with excellence keynotes, juris and presentations.

These two acceleration programs made it clear that it is difficult to find start-ups, that their on-boarding takes a lot of time. Other observations of from this program show that with no prizes it is very difficult to call attention to the best start-ups, that making the acceleration program in person has a huge impact on creating connections, that bringing mentors from the companies is a plus and that we always need to have a demo day with strong jury and keynotes where the start-ups can show all their ambition

For 2025 LISPOLIS is working on a 3rd edition with general orientations to the participation of the university. One way to look at it is considering just applications from university spin-offs that during the acceleration program would have to work with "partners" from the business world. At this moment LISPOLIS is looking for sponsors and, when we they will be on board, the topic will be chosen.

Challenge IPAM LISPOLIS

In this program [cc], running to its 7 editions, there are students from the university doing marketing and communication programs for LISPOLIS companies. There is a briefing from the companies (usually a CEO) to the students, which can ask questions to the companies. The students are also oriented by the teachers, and the dynamic closes with a presentation of the best works.

The core here is the doctoral school and What if we could have CEOs of start-ups and SMEs developing business models for the researchers and academic spin-offs? Normally it is needed an NDA, alignment between the academic and non-academic participants, and it is a very effective way of shifting the academics interest from the paper to the client and the revenue.

CEO Talks

This activity was started in 2024, at least with this name: a CEO of a LISPOLIS company went to a University, in this case IPAM -Instituto Português de Admnistração e Marketing, to talk to students about how they got where they are today. There were some pre-fixed topics, and the conversation had a moderator who would either ask questions or try to involve the students in the conversation.

This model works well because students (at least most of them) will be applying for a job (in short terms) or they want to be entrepreneurs and have their own business. Also, it is relatively easy to take some CEOs to talk to docs and post doc students about the business world. However, it is not so clear what will be obtained in the future just by the sake of doing it.

One interesting flip to the situation could be to revert it, and instead of having CEO talking to docs and post docs students, having some docs and post doc students presenting to companies what they are working on, or some academic start-ups / spin-offs doing the same.

Anyhow, this event was born from a simple observation: students do not want to be like their teachers and they want to achieve success and be CEOs -even on a very early-stage start-up there is always someone that wants to be the CEO, and it really does not matter what it is already have developed, as far as there is a Minimum Viable Prototype of the product (MVP) or traction (clients).

Seed project

The Seed project is project is going on in partnership with municipality of Lisboa. The goal is to show high school students that working for others isn't the only way. Each 15 days LISPOLIS, and an entrepreneur, go to high schools to interact with students on 1.15 minutes talk -LISPOLIS shares some information about how to be an entrepreneur, and the entrepreneur shares is path. This project has won international prizes [dd].

Some lessons learnt from this project are that entrepreneurs and CEOs are willing to participate and share their experience as a give back; teachers like to participate because, at least in Portugal, they believe that need to present something new to the students to hold their attention; and students if involved in the dynamic always participate, ask questions and really take the most of it -but they just do it if there is a strong push from us because we really need to be able to attract their attention. even if this will be the only contact with entrepreneurship during all high school, will be a first contact at a young age.

Idea contest

The last Idea contest completed was in 2016, in partnership with a tech company. LISPOLIS organised it for 2 editions and then stopped because it was impossible to scale it. Having a good prize is a need, the prize was the MVP of an APP, if the intention is to call the attention of the entrepreneurs.

Another important lesson learnt was about the framework and execution - find the projects, using the network and the ecosystem to choose the best 20, to engage on meetings with all this 20 on (i) business development and (ii) to define the scope of the MVP (if they win), to invite a jury and organize a demo day - it was the jury that selected the winner, and then to deliver the prize, the MVP of an APP.

Hackathons and other events

LISPOLIS is working on promoting 2 hackathons this year, in partnership with 3rd parties. The reason for that is because it is needed to create moments to bring entrepreneurs to LISPOLIS, even when they do not belong to LISPOLIS community, and to involve the LISPOLIS partners in the dynamics of supporting them. They might join in the future, but holding hackathons is a way to create a different day at LISPOLIS, and that is of outmost importance, to share knowledge and to have good moments with prize winners.

Apart from this themes LISPOLIS has other recurrent initiatives, like MEET UPS (events for the ecosystem on entrepreneurship and innovation). The last one of them was on focused on funding start-ups, EXPERIENCES and CELEBRATING DATES (moments to connect and work on the relationship with LISPOLIS community).

One trend seen nowadays is that today "non-professional" events are more and more important because it is only possible to engage people to people if there exists a connection within them. And it is becoming like this because it is possible to learn and work anywhere, which is a huge challenge for entities like tech parks and to start-ups. For this reason, LISPOLIS is trying to deliver a big event in the health sector, which is a topic of strong interest.

3.2.2. Poland

Made in Wroclaw – Conference 2024

The Made in Wroclaw conference is an annual event held at the *Wroclaw Congress Centre*, which focuses on promoting innovation, entrepreneurship and technology developed in the Lower Silesia region. It is a platform for the exchange of knowledge, inspiration and experience. The event is attended by entrepreneurs, innovators, representatives of the academic sector, local government officials, investors and people passionate about new technologies.

The 2024 edition (24th October 2024) [ee] brought together 30 speakers attracted more than 2,000 participants. Parallel to the conference, an EXPO zone-open to all willing to see with their own eyes the innovations of the scientific circles and companies present there-is also organized. The culmination of the event is an evening gala where 5 start-ups can present themselves in front of industry leaders and win the main cash prize.

The aim of the conference is to promote Wrocław as an important centre of innovation and entrepreneurship in Poland and Europe, to build networks among participants - to foster business cooperation, and to inspire participants to take on new challenges and develop their own projects.

During the event, promotional and information activities about the Unite!Widening project took place, which are depicted in Figure 12.

Figure 12 - Promotional and information materials about the Unite!Widening project

During the event, there were discussions with experts about topics such as energy, logistics and digital revolutions that are forming the future of business and cities.

Figure 13 - Tech gala impact at Made in Wrocław 2024

During the evening event accompanying Made in Wroclaw - Tech Gala and Contest, there was a pitching competition for start-ups. The companies that won the different awards were the following:

- 1st place: BangProof who received 30 000 PLN from Przedsiębiorczy Wrocław and Marcin Urban, the Treasurer of the City of Wrocław
- 2nd place: Spectrally who was gifted 15 000 PLN from Start-up Wrocław
- 3rd place: SPINETIME who was awarded 10 000 PLN by Aleksander Widawski, JWW Accounting Office

A special prize from Basck went to BangProof. While the Responsible Business Award from Intel Corporation to SPINETIME

Lessons Learnt and relevant facts from the finalists of Tech Contest Made in Wrocław 2024:

1) BangProof

BangProof is an innovative company dedicated to producing the world's first certified soft helmets for water sports. It specializes in developing personal safety technology, using advanced polymers and composites that provide maximum protection while remaining lightweight and comfortable. BangProof's products are dedicated to both professionals and water sports enthusiasts, offering cutting-edge solutions that minimize the risk of injury without restricting users' freedom of movement. The company places great emphasis on innovation, safety and ergonomics of its products. BangProof helmets are currently used by world champions of many water sports disciplines.

BangProof's mission extends beyond safety; it empowers a cultural shift in sports safety awareness and product design. Their helmets could redefine safety standards in water sports and inspire broader adoption of advanced materials in other industries.

Potential benefits:

- **Sports accessibility:** By making water sports safer, BangProof encourages broader participation, especially for younger athletes and beginners.
- **Cultural shift in safety:** Their innovation could set a precedent for mandatory safety gear in competitions and recreational use, potentially saving countless lives.
- **Economic impact:** Reduced injuries translate into lower healthcare costs and insurance premiums for sports enthusiasts.

Future engagements:

BangProof could work with sports federations, regulatory bodies, and schools to introduce educational campaigns about the importance of head protection. They might also collaborate with athletes to co-design new products and expand into related safety markets, such as skateboarding or cycling.

2) Spectrally

Spectrally is a system for optimizing production processes in the chemical industry and monitoring water quality through the use of real-time optical chemical diagnostics. It relies on proprietary technology to digitize and automate the chemical industry so it can evolve, increase competitiveness and production efficiency, and better care for the environment.

Spectrally's technology could redefine how industries and communities manage critical environmental challenges. Beyond optimizing chemical processes, their focus on real-time optical diagnostics positions them as a key player in water quality management—a priority for public health and urban planning.

Potential benefits:

- **Public health:** Improved water quality directly reduces the prevalence of waterborne diseases and ensures safer drinking water for communities.
- **Industrial responsibility:** By helping industries comply with stricter environmental regulations, Spectrally fosters a culture of corporate responsibility.
- **Climate adaptation:** The technology can support regions facing water scarcity by monitoring and improving water resource management.

Future engagements:

Spectrally could partner with municipalities, NGOs, and consumer advocacy groups to pilot community-based water monitoring systems. They may also collaborate with educational institutions to raise awareness about water conservation and pollution control.

3) SPINETIME

SPINETIME's digital therapeutics (DTx) could revolutionize healthcare accessibility and outcomes, particularly in underserved regions or for chronic conditions. Their AI-driven tools address pressing global health challenges.

The company is focused on the development of HealthTech software in the form of DTx, available both as mobile applications, SDKs and APIs. An interdisciplinary team of medical scientists, researchers and computer scientists of consequence carries out R&D work developing innovative medical software using AI and ML capabilities.

Potential benefits:

- **Accessible healthcare:** DTx solutions allow patients in remote areas to access therapeutic interventions without needing physical facilities.
- **Patient-centric design:** By integrating user feedback, SPINETIME ensures their tools cater to real patient needs, fostering adherence to treatments.
- **Global impact:** Their technology could be adapted to tackle health crises in low-income countries, such as diabetes or mental health issues.

Future engagements:

SPINETIME could collaborate with public health organizations, insurance companies, and governments to roll out subsidized DTx platforms. They might also launch awareness campaigns about the benefits of AI-powered health solutions for chronic diseases.

4) SmartyMeet

SmartyMeet has the potential to redefine fairness and efficiency in recruitment, ensuring that talent—not bias—drives hiring decisions. Their AI recruiter, Boe, could level the playing field for underrepresented groups, especially in competitive industries.

SmartyMeet is a cutting-edge HR technology start-up that is redefining the recruitment landscape. Our platform goes beyond traditional applicant tracking systems (ATS) by integrating with them and offering advanced candidate analytics, personalized feedback and questions for candidates based on detailed analysis. At the heart of our innovation is Boe, our AI recruiter (a virtual member

of the HR team), which not only tags and evaluates candidates, but also moves them to the next stage of the hiring process on their own. Boe will soon be conducting initial phone and video interviews with candidates, providing recruiters with deeper insights and a comprehensive understanding of each candidate.

Key features: Advanced candidate analytics: Gain deep insights into candidate qualifications and fit; Personalized candidate feedback and questions: Provide customized questions and feedback to improve the candidate experience; AI-based verification: Let Boe handle initial interactions (phone and video calls), saving time and resources; Seamless integration with eRecruiter and other ATS platforms: Streamline your recruiting process with our integrations with leading systems. By integrating with eRecruiter and other ATS platforms, we enhance our ability to optimize every step of the recruitment process, making it more efficient and effective for both recruiters and candidates.

Potential benefits:

- **Equal opportunities:** By removing unconscious bias, SmartyMeet ensures all candidates are evaluated solely on their qualifications and potential.
- **Workplace diversity:** Companies using SmartyMeet could achieve more diverse teams, leading to better innovation and business outcomes.
- **Time efficiency:** Automated screening and feedback save significant time for both recruiters and candidates, enabling faster placements and better experiences.

Future engagements:

SmartyMeet could partner with workforce development programs, diversity advocacy groups, and educational institutions to design tools tailored to underprivileged candidates. They could also work with employers to refine job descriptions to attract diverse talent pools.

5) TerraEye

TerraEye's satellite data tools promise to reshape resource management and environmental conservation, creating a more sustainable future for industries and communities alike.

The TerraEye application is an innovative technological tool that uses artificial intelligence to analyze satellite data. It is mainly designed for the mining industry and environmental monitoring. TerraEye integrates satellite images with geological, geophysical and geochemical data, providing users with valuable information to optimize exploration strategies, minimize environmental risks and make decisions faster. The application offers a variety of services such as SaaS (Software as a Service), DaaS (Data as a Service), IaaS (Insights as a Service) and monitoring solutions that are tailored to the needs of the global mining industry.

Potential benefits:

- **Environmental conservation:** By identifying potential ecological risks, TerraEye helps protect biodiversity and manage natural resources more sustainably.
- **Disaster prevention:** Their monitoring capabilities can predict environmental disasters, such as landslides or water contamination, safeguarding communities.

- **Enhanced decision-making:** Governments and NGOs can use TerraEye's insights to make informed policy decisions, balancing development and conservation.

Future engagements:

TerraEye could partner with conservation groups to develop customized tools for endangered ecosystems. They might also collaborate with academic institutions to train the next generation of geospatial data analysts and researchers.

Program for link to enterprise at the Centre of Innovation and Business (Several examples of projects coordinated)

CyberTrust Congress

The CyberTrust Congress [ff] that took place in the Wrocław Tech Congress Center in November 2023 and October 2024 consisted of two days of speeches, debates and lectures on the future of cyber security, the latest technologies and the challenges facing every user of the digital world.

A special feature of the congress was that it was not strictly an academic or business conference, but that it combined the diverse viewpoints of different branches - there were engineers present, representatives of cyber security companies, but also experts in financial security and IT at major banks, managers of healthcare entities (public hospitals) and representatives of local authorities and regulatory institutions. Scientific circles of the University of Technology (such as Wrocław Tech WhiteHats cybersecurity student organization) and students were also important participants, with free admission.

This is an event designed to reach the widest possible circles of society, which is even reflected in the list of honorary patrons - the Minister of Science, the Minister of Digitization, the Office of Electronic Communications, the Central Bureau for Combating Cybercrime (a Police unit), the Marshal of the Lower Silesian Voivodeship, the Rector of Wrocław Tech, the Mayor of Wrocław and the Chairman of the Council of the Western Chamber of Commerce - Employers and Entrepreneurs

Thanks to the cooperation with Wrocław Agglomeration Development Agency, the event was widely promoted in the city, even on the info screens inside city buses and trams. It was done free of charge as the city of Wrocław recognized that overcoming cybersecurity threats is a public interest.

The effect of the congress is to raise awareness of cybersecurity risks and learn how to combat them. The congress was so successful that it would become a cyclical event - the third edition is planned for 2025. CyberTrust is organized by the Centre of Innovation and Business at Wrocław Tech with the help of partners and sponsors but no external event managing companies or PR agencies were involved.

Figure 14 - CyberTust Congress in 2024

VERGOconnect

Another relevant event hosted by Wrocław Tech and organized by the Centre of Innovation and Business with a significant Outreach value (although mostly on the municipal level) was the VERGOconnect Scientific Conference for Sustainable Development and Improved Quality of Life of Wrocław Residents [gg]. It was an initiative to analyse and promote the sustainable development of the city of Wrocław. Organized by Wroclaw Tech, the VERGOcity Association and Wrocław University of Life Sciences, the event focused on the key areas of infrastructure, waste management and the social housing system.

The aim of the conference was to create a platform for discussion, exchange of views and presentation of practical solutions to improve the quality of life of residents and sustainable development of the Wrocław agglomeration. Through lectures, panel discussions and thematic sessions, participants had the opportunity to explore issues related to urban, environmental and social challenges facing the city.

During the conference, in addition to the theoretical dimension, concrete practical activities took place. Among them were the ceremonial establishment of a team for the integrated communication system of Wrocław, the official signing of an interpellation on rainfall standards and a motion to initiate talks with the Government party to implement the Social Housing System.

The VERGOconnect Science Conference was a significant event for the local scientific, business and government communities, bringing together experts, decision makers and practitioners from various fields. By analysing the latest trends and innovative approaches, the conference aimed to inspire action towards building a sustainable future for Wrocław.

One of the main talking points during the event was the theoretical and practical possibility of building the metro system which would revolutionize public transport in Wrocław and was much needed in a city this size. It enabled the creation of a special working group comprising Wrocław Tech engineers, city authorities, and experts from the VERGOcity Association, whose goal would be to develop plans for a metro system in Wrocław. Currently in Poland there is only one system of underground railway - in Warsaw.

Figure 15 - Snapshot of the VERGOConnect event

Project Travelling Innovation Labs and Services (TRAILS)

The TRAILS (Travelling Innovation Labs and Services) [hh] project was developed to foster long-term innovative resources in the Polish-Saxon border region. The ambition was to To increase the efficiency of education using modern technologies and to support the development of local communities and the economy. To this regard, its specific goals included:

1. **Strategic linkage of schools and businesses:** Support for youth and small and medium enterprises (SMEs) in developing innovative skills.
2. **Development of innovative competencies:** Preparing young people for work in the regional economy sector and creating a talent pool for local businesses.
3. **Practical education:** Enhancing teaching methods through concepts like learning-by-doing, design-based learning, and collaborative problem-solving.

The main requirements for implementing such goals were:

- **Technological infrastructure:** Mobile innovation labs in the form of containers equipped with 3D printers, VR glasses, LEGO Mindstorms robots, and 3D pens.
- **Modern working methods:** Implementation of techniques such as design thinking, brainstorming, SWOT analysis, and storytelling.
- **Flexibility and accessibility:** Workshops conducted in various locations near schools or local community centres.

The project was implemented from August 2016 to July 2018 under the INTERREG Poland–Saxony 2014–2020 program with the support of the European Regional Development Fund. The project value was €1,350,688.92. The locations where the border regions of Lower Silesia (Jelenia Góra, Bolesławiec, Zgorzelec) and Saxony (Dresden, Görlitz, Bautzen).

Concerning the civic Engagement, the TRAILS project involved many different interest groups, namely: (i) High school and vocational students: Youth from the border region of Lower Silesia and Saxony, (ii) Entrepreneurs: Representatives of SMEs seeking support in developing products and services, (iii) Local community: Individuals interested in testing new technologies, and (iv) Teachers and trainers: Responsible for conducting the workshops.

The nature of the project was implemented using:

- **Mobile laboratories:** Modern containers placed in local community centres or near schools served as bases for workshops.
- **Education through practice:** Workshops were based on practical approaches to foster skills such as creativity, communication, and collaboration.
- **Interdisciplinarity:** Students worked on tasks in mixed groups, enabling the exchange of knowledge and experience.

The project delivered three kinds of formats, which are the following:

- **Workshops for students:** Focused on developing entrepreneurial and innovative thinking.
- **Workshops for entrepreneurs:** Included techniques for creating business models and product innovations.
- **Networking sessions:** Connected youth with representatives of local businesses, enabling collaborative project work.

The main results and outcomes included improved outreach (the workshops engaged students and entrepreneurs from both urban and rural border regions, and Mobile labs also attracted participants outside the main target groups, increasing awareness of technology in local communities) **and other side effects** (Innovative competencies: Students acquired skills to design and implement innovative solutions, preparing them for future professional work, Technological development of SMEs: Entrepreneurs could experiment with new technologies and develop their products, and Integration: The project connected youth, teachers, and entrepreneurs, creating local collaboration networks).

The main impact and changes lead included the following:

- **Skills development:** Improved problem-solving and teamwork skills in interdisciplinary settings.
- **Educational transformation:** Introduction of innovative teaching methods in high schools and vocational schools, demonstrated how to combine theory with practice, resulting in greater student engagement.
- **Academic-business collaboration:** The project facilitated closer cooperation between academia, schools, and local businesses.
- **Sustainable development:** Established relationships and acquired skills will have a long-lasting impact on the region's economic development.

In summary, the TRAILS project proved to be an effective model for engaging citizens in innovative processes. Through mobile labs and innovative teaching methods, participants gained skills that enable them to better adapt to a dynamically changing economic environment. Collaboration between schools and businesses brought benefits to both the local community and the regional economy.

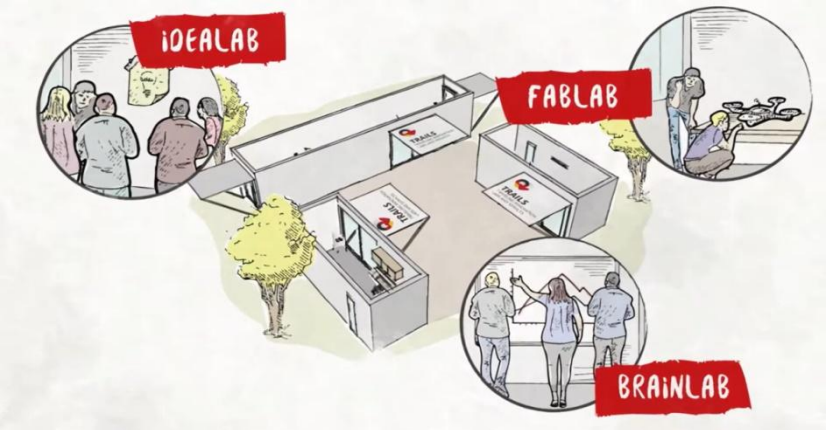

Figure 16 - Scheme of the implementation of Mobile Labs in the project TRAILS

3.3 | Unite! Joint Case Studies

The Unite! university alliance regularly launches joint actions to serve to its strategic mandate. Many interesting initiatives have been reported, such as those regarding the promotion of university social engagement (Organization of 3 collaborative *mapathons* in Lisboa, Darmstadt and Barcelona) [ii], how to tackle the energy poverty (COST action Engager network) [jj], the promotion of science to the general public (European Researcher's nights) [kk, ll], or the application of technology to the day-to-day living (Artificial Intelligence and Smart Cities) [mm].

All these initiatives are very relevant for the Unite!Widening project and members because they set the partners together in a peer-to peer collaboration. The advancement of the institution can be much higher as it is not a monodirectional transfer of knowledge or best practices, but it is setting up and developing a common project.

Within this context, the following sections visit the most relevant and decisive activities in the quest of maximising Outreach and involving all actors in the Science, Research and Innovation field, namely: Unite! Seed Fund initiative, Unite! Network for Infrastructure Research and Innovation Services, and Unite! Doctoral School.

Unite! Seed Fund Initiative

Unite! Seed fund (already cited above) was established to fully leverage the potential of the Unite! alliance by providing financial support for innovative and collaborative projects by students, researchers and teachers. This instrument supports the development of new ideas resulting from collaboration between members of the Unite! community.

The Seed fund initiative aims to provide financial support to innovative, co-creative & collaborative ideas across the Unite! alliance and to support the formation of new academic communities as well as developing the existing ones. Unite! Seed fund enables to carry out cooperation and helps to activate bottom-up collaborations.

Every year, one call is held for proposals for funding initiatives in the areas of research and doctoral studies and teaching and learning. Additionally, two calls for proposals per year are announced for funding student activities. The main requirement for the application is the partnership with the Unite!

member universities. Applications must include at least 3 full Unite! member universities (for student activities: at least 2 full Partners). Partners beyond Unite! can be also involved, but not as beneficiaries.

The allocation is divided into three funding lines:

- **Funding Line: Student activities.** Eligible to apply: under- and postgraduate students, student organisations/associations, units and service centres of Unite! Universities (such as sports unions, language centres etc.).
- **Funding line: Teaching and learning.** Eligible to apply: Teachers (professors, academic staff); teaching & Learning Units
- **Funding line: Research & PhD.** Eligible to apply: Doctoral Researchers, Early Career Researchers, Research Units, Tenured Researchers.

Since the launch of the Seed Fund, 131 applications from the whole Unite! community were submitted. 45 applications got funded: 19 for research & PhD, 16 for teaching and learning, 10 for student activities.

Unite! Seed fund plays a significant role in enhancing the collaboration within Unite! Its support acts as a driving force for inventing innovative projects and new fields of collaboration. Lack of financial sources is always a major barrier in conducting joint activities. Possibility of funding encourages universities and the authorities to make efforts towards obtaining the grant which involves seeking the Partners, proposing the improvements, working out on the new solutions. And the added value are more established contacts within the alliance, exchange of the information and best practices, launching a cooperation in different areas and expanding the stakeholder's database. That happens, regardless of the actual funds received.

Special attention should be paid to the funding of student activities. In this field, Unite! Seed Fund, through its support, promotes an idea of Unite! among the student community. It is important to underline that students may perceive the whole idea of Unite! as vague as well as available and beneficial only for the selected narrow group, particularly for researchers and authorities. The Seed Fund initiative allows to change that view as it offers what is crucial for students: a specific financial support. This tangible benefit proves that participation in the alliance influences the whole community of the university. The requirements of the calls - participation of at least students or student organisations from two Unite! member universities - serve as an incentive for establishing cooperation with the partner university. Setting the goals, planning the activities, assessing the risk – joint work on the proposal with the foreign students is already a value in itself and it may result in improving skills, building up a solid relationship and encouraging in taking part in similar initiatives, not only within Unite!

The seed fund initiative may be vitally important at Wrocław University of Science and Technology (Wrocław Tech), which joined Unite! in 2022. As the relatively new member of alliance, located in a Widening country, Wrocław Tech treats its participation as the great ennoblement as well as the responsibility. Unite! Seed Fund may be a tool which brings the idea of Unite! to every member of the academic community: researchers, academic staff, PhD students as well as students. By getting information about Seed Fund support, the Wrocław Tech society learns about Unite!

Obviously, this initiative is constantly facing challenges. One of the main concerns is finding a partner, particularly problematic for the students' activities. The rules for application are still found as complicated and unclear. Students need support in the process of implementation of the projects and

its proper settlement. They rather seek the possibility to attend the project, not to participate in the process of its building which can be regarded as demanding, requiring time and effort. To prevent these risks, several actions are being taken. Virtual matchmaking events are organised to give the opportunity to present the project ideas. The support of Student Liaison Officers turned out to be crucial in the dissemination and coordination process. Internal regulations at Wrocław Tech require consulting the project with the Student Liaison Officer before submitting the application. This affected positively the quality of the proposals submitted as the application may be checked before the assessment and some corrections can be done. Moreover, students are more likely to engage, if they are assured of support right from the application phase. Improvements implemented in the process are significant in the context of the perception of this tool. If it is regarded as efficient and fair, it will attract more interest and in turn, promote Unite! and its values to the constantly expanding audience.

Unite! Seed fund may seem an internal activity limited mainly to the members of the Unite!, affecting mostly the communities of the Partners universities. However, it also impacts the social and economic environment. Firstly, Partners beyond Unite! are also invited to join the activities. It may be the first step in establishing cooperation with other universities or even alliances. Funded initiatives serve as the best practices and set the basis for the further activities, conducted beyond Unite! or on different partnerships. A wide range of stakeholders – educational institutions, research units, companies – would be willing to use the solutions worked on in the projects or try to implement similar actions on their ground. Success stories, when widely disseminated, show the diversity of the ideas spreading through the alliance and inspire the other entities to act.

What is also worth noting is that many of the projects aim to tackle major challenges of today's world. For instance, Graz University of Technology along with Aalto University and KTH, Royal Institute of Technology works towards g^ªJKreen transition in transportation, concentrating specifically on green innovation, business model adaptation and open collaboration. As shown, this project focuses on exploring new or adapted business models and the role of business model innovation in fostering viable green innovation ecosystems. So, it is definitely not limited to the academic actors but depends heavily on academia & business cooperation. Moreover, the projects' results are intended to affect whole societies, not only for the societies of Unite!, but European citizens and all users of the European Union transportation system. Another unique Seed fund project comes from Spain. Universitat Politècnica de Catalunya collaborates with University of Grenoble-Alpes and Politecnico di Torino on the initiative aimed at reducing the presence of microplastics in aquatic environment. Then, the action, led by TU Graz, investigates the fire risks of large battery electric vehicles, with the aim to redefine the safety landscape of electric mobility for the future. Researchers from all nine Unite! universities had the opportunity to discuss about energy, green transition, and climate, aiming to contribute to a more sustainable future, during the workshop organized by Wrocław Tech in 2023 in Karpacz. Those examples show that although the Seed Fund is addressed to the seemingly restricted recipients, it engages societies, by providing the solutions and raising the issues, crucial to the whole modern world. Additionally, disseminating the information about those success projects in an accessible language draws attention of the public to the current challenges, raises awareness about its relevance and encourages to expand the knowledge on it.

Citizen engagement can be achieved also through the actions planned in the project. Student activities include joint actions as exhibitions, events, excursions, competitions or hackathons. Through these active forms, all interested parties are invited to join the initiative and give their feedback. The significance of student activities here is worth emphasizing, because the thematic scope of the projects is not limited only to the research and innovation area. The ideas can regard sports, career, language,

education, communication as well as outreach. Any promising and interesting concept is welcomed. Wide range of topics possible to finance means that an equally wide audience can get actively involved.

The role of researchers taking part in the Seed Fund projects must be also highlighted. They support civic engagement by sharing the results of their work, organizing workshops, seminars and other events open to the general public or gathering opinions by surveys or consultations. Seed Fund lets them play a notable role in bringing the research and innovation values to the society and by this – incorporating citizens into the Science and Innovation area, also at the international level.

Unite! Network for Infrastructure Research and Innovation Services

IRIS stands for Integrated Research and Innovation Support Services. It is a network bringing together the research support officers of the 9 Unite! universities, with connections to the following staff groups:

- Technology transfer officers
- Human resources managers
- Research infrastructure managers
- Research communication and engagement officers

IRIS is envisioned as a single point of contact for researchers wishing to conduct collaborative projects across the Unite! alliance. By connecting and training administrative staff, IRIS will not only raise the quality of research support services at each partner university but also strengthen the sustainability of the alliance as a whole.

Some Added Value for Research in mid- and long-term brought by IRIS are the following assets:

- Introduction of a one-stop shop for research support services throughout the alliance
    - Enhanced clarity, efficiency, and transparency of administrative processes
- Improved quality of research support services, through the training of administrative staff and the implementation of best practices
    - Comprehensive support for research proposals with a strategic importance for the entire alliance
- Enhanced alliance-wide networking opportunities (see also below: matchmaking events)
    - Map of research group competences
    - Partner search IT tools, including a notice board for publishing expressions of interest

The IRIS Network of the UNITE! Alliance can enhance outreach and foster active citizenship engagement by focusing on targeted, impactful initiatives. Its primary efforts can be directed toward facilitating cross-border collaborations among the nine universities, with an emphasis on small, focused research projects addressing shared societal challenges such as sustainability, digital transformation, or public health.

Citizen participation can be encouraged by integrating community input into research activities, such as localized workshops or surveys. These initiatives provide valuable perspectives while fostering collaboration and engagement between researchers and citizens.

Outreach and education efforts can take the form of webinars or workshops where researchers share their work in accessible language, helping bridge the gap between academia and the public.

Additionally, producing concise, clear summaries of research findings can make academic insights more relatable and widely understood.

Collaboration between the research support services at member universities can also be strengthened, ensuring a unified approach to outreach. Sharing best practices and developing standardized templates for engagement activities can streamline efforts and foster consistency across the network.

By focusing on these targeted and achievable actions, the IRIS Network can effectively contribute to outreach and citizenship engagement, creating a foundation for deeper collaboration and connection with society.

Though IRIS has the potential of becoming the bedrock of Unite!'s research support services, all its activities are still in a pilot phase. For operating in a sustainable manner, IRIS requires dedicated resources at each partner university.

Unite! Doctoral School

The Unite! Doctoral School (UDS) has been set up for designing and implementing joint doctoral education and as a model for a European Doctoral School pulling together the expertise of Unite! Partners. The overall aim is to create a common space for multidisciplinary training and knowledge transfer among European regions for enhancing the quality and attractiveness of European doctoral education and boosting cooperation among institutions and their students and staff.

By the end of the Unite! ERASMUS+ project (October 2026), at least two cycles of PhD programmes will have been activated, with at least two cohorts of doctoral candidates approaching their European Degrees. There will also be Industrial PhD projects in collaboration with enterprises and well-established motivational tracks for master's students wishing to pursue a PhD.

The added Value for the Unite! Doctoral students and the European Research Area are:

- Unite! Doctoral candidates can benefit from the expertise of several excellent universities (as well as industry partners); the UDS integrates training and research by developing doctoral programmes that capitalize on the collaboration among scientists and thematic communities across nine partner Universities.
- Unite! Doctoral candidates familiarise themselves with international collaboration from the very beginning of their research career, developing competences such as: Multilingualism, intercultural awareness, knowledge of different research and education systems across the EU
- Graduates of the Unite! Doctoral School are highly attractive to the labour market, both in academia and the private sector
- There is a higher likelihood of further Unite! research collaborations – attracting external funding – during and after the PhD phase
- Motivational tracks for master's students will bridge the gap between student activities and research projects.

The benefits that the Unite! Doctoral School can bring to ensure the outreach of research results and citizenships engagement are multiple:

1. The UDS plays a pivotal role in enhancing outreach and citizen engagement by fostering the connection between cutting-edge research and societal needs. The three priority areas for the UDS Programmes are Artificial Intelligence (AI), Industry 4.0, and Sustainable Energy. These

Programmes are the triple threat driver for achieving sustainable development goals (SDGs) and are directly linked to the targets of the European Green Deal. First off, they're transversal, meaning they cut across various sectors and have a broad impact not only within the entire ecosystem of the Unite! Partners, but on the European society in a deeper way. In a nutshell, by prioritizing research in AI, Industry 4.0, and Energy, Europe is essentially investing in the pillars of a sustainable and technologically advanced future. It's a strategic move that addresses multiple challenges at once and sets the stage for a more balanced, eco-conscious, and prosperous society.

2. The UDS is based on international and interdisciplinary networks, allowing doctoral candidates to address complex global challenges with diverse perspectives. Doctoral students will communicate their findings to the public, bridging the gap between academia and society. By engaging with citizens through workshops and events, the UDS will make research findings more accessible, inspiring trust in science and innovation. Moreover, such engagement can empower citizens to foster a sense of ownership and collaboration in tackling issues like climate change, public health, and technology ethics. In turn, this builds stronger, knowledge-based societies and enhances the societal relevance of academic research.

As joint PhD programmes are being developed, there is still hardly any joint PhD funding supplied by the Unite! universities. This uncertainty poses an obstacle to the evolution of the Unite! Doctoral School, that will have to be overcome with the willingness and strategical vision of the participating entities. However, the PhD grants included in the Unite!Widening programme, with one supervisor from a Widening country and another from a non-Widening country guarantee a complementary mean that helps supervening the timeframe required for launching the Unite! Doctoral School.

4 | Results and Discussion

Citizen science consists of the participation of society in general in the activities of research and innovation that could be undertaken for example in universities, research centres, or even technical units of many different entities. The involvement of citizens is not restricted to basic research, as they can also intervene in technological research and in social studies as well.

For the reason of its nature, Citizen science brings science closer to public, and to the reality, and in some way, it makes it possible to enter in contact with whom is aimed to be the recipient of the scientific development itself. The research results and the knowledge produced acquires then a final impact that it is difficult to achieve with other standard research approaches.

Moreover, Citizen science makes it easier to involve large amounts of people, that have the capability to acquire or generate large data sets, that would be very difficult to achieve via other conventional methods or in the lab. Also, it is a very interesting way to disseminate the science methods and results while they are still being undertaken. In this manner it complements the more abstract research with new opportunities and close contact to the first-hand opinions.

Open science can also be envisaged as fitting under the umbrella of making scientific research, its data and its dissemination to be Findable, Accessible, Interoperable and Reusable (FAIR) at all levels of a knowledge society, being it at a professional on beginner's level. However, in the Widening countries, the idea of Open Science is still not very common. The system of research assessment, insufficient and often imprecise regulations, and – most importantly - lack of awareness of benefits of open science may also be the factors that additionally hamper its development. That causes that achieving citizen engagement in this very specific topic can be regarded as a challenge and even pose the question whether it is really necessary.

Also, the requirements of the Open Science impose **many times that the researchers follow procedures that have not been so common until now**. Therefore, its accomplishment can be seen as an added difficulty to the research process, and it **should be enforced via a strategic commitment**.

However, to change the awareness and feelings of the general public, Open science ideas must be widely promoted, even among the groups who seem to not be directly involved in its implementation. **Promoting the general concept and its benefits among the society and familiarizing citizens with its basic assumptions will already be a success**.

One fundamental initiative in promoting such idea in the Unite!Widening project has been the conduction of Open Science Policy Forums. The concept involved organizing two consistent hybrid events in the Widening countries of the present project - Poland and Portugal - in cooperation with Aalto University. All the discussions, speeches and co-creation sessions held in Wrocław and Lisboa during both events aimed to answer the question: what redesigns, actions and incentives need to be implemented for adopting open science practices in Polish and Portuguese universities?

In particular, the Open Science Policy Forum in Wrocław took place on 10-11th October 2024. The main goal of the event was to enable Wrocław Tech to progress towards the development of open science strategies, programmes, and incentives for becoming Unite! Hubs of Excellence on Open Science and Innovation Management. **The conclusions drawn up from the Forum were used to create an adapted**

version of "White Paper", suited to the needs of Widening countries which will become a support to university managers, policymakers, and funders in these countries in developing European Open Science and Innovation Universities.

The form of the forum was **hybrid, enabling people to join the event onsite or online**. On the first day 98 participants attended the forum (including 74 online participants), on the second day – 75 participants (including 54 participants online). This helped **maximising participation from the different target groups**. For example, the first day of the forum was aimed at **researchers and students**, and the second to a more general audience. This led to a **brilliant combination of attendees and interested parties** (PhD students, researchers, representatives of the different universities forming the alliance, academic staff, librarians, research units and even brought in person active representatives of the Wrocław Tech society).

Regarding the promotion of Open Science, another important takeaway from the different initiatives identified has been the **powerful outcomes when having a shared vision and every entity working together pushing common objectives**. For example, the recommendations from *Unite! White paper: A new University open science and innovation governance model and policy for a sustainable world* about (2) Reforming the university reward systems of science and innovation for a sustainable world and the (5) interoperability of university digital infrastructures and accessibility of physical infrastructures for a peaceful humanity, were **followed with excitement and deeper results could be achieved**.

Regarding the experiences had around the **Unite! Seed Fund initiative**, it seems clear that it should be promoted on every partner university by all available dissemination channels. The emphasis should be placed by the wide range of activities financed, **available funds, and the opportunity to work in a multinational team**. Every group eligible to apply should be provided with clear and reliable information about the procedure and its requirements. In particular, **students should be encouraged to present their ideas and be offered help at the stage of application**.

Also, it is important to note that Seed Fund projects draw attention of the public to the problems of the modern world. As their initiators are seeking the solutions, the society becomes more aware of today's challenges, especially concerning environment protection, green transition, energy and cutting-edge technologies. Implementing such projects integrates the international communities working towards a common goal. Those actions prove that despite some natural differences, those mixed teams can cooperate smoothly, and the impact of their activities crosses borders.

Another interesting reflection that can be extracted from all the activities performed and analysed is that **the different actors can bring intrinsic motivation to contribute to the overall**. For example **Entrepreneurs and CEOs** have demonstrated to be willing to participate in many initiatives, and also to share their experience as a give back; **teachers like to participate because provide a meaningful purpose to their duties**; and **students understand that their contributions are fully taken into account**, so they, in relative terms, contribute more, ask more questions and really take the most of it. In many activities, still *interaction happens people-to-people*, and so *physical events* remain important to *make magic happen*.

Within this context and reviewing the many different case studies analysed in the present document, the synthesis of the Best Practices and the Qualitative Benefits that can be identified are contained in the Table 2.

Table 2 - Synthesis of Best Practices and the Qualitative Benefits extracted from the different case studies and initiatives analysed

Best Practices Identified	Qualitative Benefits
Demo days: Engagement with diverse stakeholders (students, companies, public)	Increased interaction between students, start-ups, and investors; improved innovation visibility.
Fairs, Challenges, Summits: Stimulating entrepreneurship from high school to doctoral level	Boosted visibility of university research; public exposure to innovation projects.
Doctoral research results dissemination: Focusing on visibility, networking, and societal impact	Promoted collaboration between doctoral researchers and industry; facilitated tech transfer dialogue.
Expos and Start-up competitions: Strong link between universities and regional innovation ecosystem	Strengthened ecosystem visibility, inspired collaboration between academia and business.
Unite! Seed Fund as a financing mean and as a dissemination window: Public access EXPO zones and pitch competitions	The Seed Fund supported creative, co-creative, and collaborative ideas by researchers, students, and teachers across the Unite! Alliance. It stimulated grassroots cooperation and encouraged a culture of innovation and inclusion.
Large-scale innovation events: In particular from Unite! Ecosystem.	Enhanced collaboration among start-ups, academia, and policymakers; inspired community participation, exploring German market by international participants
Citizen science in high-schools: Case study on Climate and Environment	This activity connected science, schools, and sustainability by empowering students to measure carbon storage in urban trees. It enhanced environmental awareness and engagement across the city.
Video storytelling for outreach: Sessions with students and teachers, with video submissions from all partners	Fostered transnational student collaboration on societal issues; encouraged creative problem solving.

5 | Conclusions and Lessons Learnt

5.1 | Alliance level and Activity level

Following the presented study and analysis, different conclusions can be drawn at two different levels: namely, at the Alliance level and at the Activity level.

Starting at the **Alliance level**, it has been identified that:

(1) **Each University has several areas in which is more successful and specialised**. Those areas act as the **flagships and leading horses** that pull the scientific and technological development at each institution. Such champion specialisations **have the most potential to traction the involvement of citizens in research and innovation** thanks to, and, at the same time because of, they are generating the most impactful and broader outreach at all different levels: both at a professional and at amateur public.

(2) The Unite! alliance of universities have defined areas of specialisation after the determination of the topics in which the members are more active, and in which it is foreseen a wider development and further work in the future. Those **areas identified** in the present time, as well as the others that might come in the future, are **important because reflect on a specialisation which is not only happening in one location or country but also in several of them at the same time**.

(3) As a mirror of the areas in which the alliance is more active**, the different repositories and dissemination strategies used**, such as the websites, intranets, public presentations, demo cases, profiles in social media and tailor-made solutions (Agora, uShare) contain much information of those areas. They are **both a good indicator of the state of the art of the development of each of them and a dissemination mean that can bring to almost real time the communication of the results. In the cases where citizens are involved**, this can come even at the time when they are being generated.

(4) **The specialisation areas identified do not need to be strong focus of development in all the notes of the alliance**. However, it is interesting to see that the relative work in each of them, and the relationship of the crossed work between different nodes **can help mapping the hot connections between different locations**. This information can be used for the present means, and as well for identifying possible new collaborations in the future. In that case, it could be used to **plan strategic actions to foster new interesting collaborations and even proposing funding schemas to make them become a reality**.

(5) Another interesting curiosity is that **ecosystems cannot be duplicated. However, lessons learned from one node can of course be applied two others.** With this in mind, and at a different level from having clear hot scientific connections between nodes, also other hot connections can be created between hubs as points of collaboration in innovation, entrepreneurship, or technology transfer. And in this case, the different **hubs can be collaborators either because they are a different phases of a same value chain, or maybe even if they are in the same one but with distinctive and complementary features**.

(6) Finally, from an alliance perspective it is important to understand that **an area of work will be better when they can fit better expertise and market needs**. This brings back the nature of the citizen science, and the importance of reaching the real recipient of the technology to be

developed. Anyhow, the better the solutions and innovation are known by the potential users, the better well developed and the easier adoption will happen.

Then, from a procedural point of view, several features can be identified from successful activities analysed. Thus, some interesting conclusions can be formalised from the **Activity level**, which are the following:

(1) The dissemination activities conducted by the universities should be carefully planned to focus on topics and contents affordable to the general public, to attract the widest audience possible. The consideration of societal groups can led to the inclusion of more context-specific and culturally responsive practices, stronger community ownership of the project outcomes, and the emergence of collaborative networks between academic researchers and local art practitioners.
(2) Sharing the best practices from more experienced Partners may be very inspiring and help to understand how the concept and recommendations are used in practice. Presenting the rules, assumptions and recommendations itself will undoubtedly broaden the knowledge of the participants, but it may not be enough to gain the interest and engagement of the wider public.
(3) **Hybrid events**, with the possibility to attend in-person and/or online, have become more common in recent times. This form **enables more participants to attend** the event as they have the possibility to connect online. It also covers international coverage and reach which will not be possible without the online transmission, **both for the speakers and for the attendees**.
(4) **The activities which involve participants' engagement are** still, however, **more effective in the on-site formula**. Participants who attend in person are more eager to ask questions, share their opinions and doubts and actively take part in the workshops. **Co-creation sessions and workshops are normally conducted with the audience physically present**.
(5) Showcasing Citizen Science success cases have a double cross-fertilisation effect: It increases the impact of the findings and helps to engage potential (citizen) researchers into new research initiatives. Success stories are the best tool to stimulate activity, both beneficiaries and citizens. Its record and descriptors should be regularly presented also in the university channels to broaden the knowledge and stimulate the activity of the various recipients.

Finally, from a Unite!Widening project perspective, it is important to recognise the conduction of such lessons learnt in the upcoming collaboration activities will endorse achieving the following **Medium-Term impacts**:

- ✓ **Increased Science and Innovation Capacity for All Actors in Widening Countries:** by implementing the best practices, sharing resources (physical, human, managerial), and effectively collaborating at regional level as well as a pan-European level.
- ✓ **Structural Changes and Modernized R&I Systems:** Once best practices are identified, and policies recommended, strategies can be deployed to act in the critical success factors at each level (regional and alliance).
- ✓ **Stronger Academia-Business Links and Career Permeability:** In particular for those leading sectors in each context, but also in the sectors that can benefit from cross-collaboration. Very noticeable the actions with "*co-tutelle*" such as the Doctorate School in which Industry and Academia have a seamless vertebration relationship for common aims.
- ✓ **Mobilisation national and EU resources for strategic investment:** Clearly because having a larger critical mass, but also gaining in the "*savoir-faire*" collectively.

- ✓ **Strengthened role of Higher Education in R&I:** With the development of research-based teaching, making the learning experience much more vivid and fostering new vocations and the ingenuity of the participants.
- ✓ **Higher Participation in Horizon Europe and Leadership Roles:** Again, from the empowerment of widening countries, the best way to achieve a raise in the excellence is simply to work at the same level of the non-widening which can only be achieved by effective collaboration.

5.2 | Policy Recommendations

Taking into consideration all this identification, several policies can be recommended for a greater involvement of different stakeholders in the activities for Research and Innovation, as well as for the maximization of the outreach of such activities, which are the following:

i. **Make accessible and evident a Research Infrastructure & Capabilities Catalogue:** The creation of a publicly available catalogue of research infrastructure within the alliance, which is accessible to external users, helps extend the experimental capabilities of research groups and promotes new collaboration.

ii. **Provide spaces for interaction** (such as Matchmaking Events). Unite! promotes collaborative research activities by organizing international matchmaking events, both virtual and in-person. These events offer researchers a platform for networking, exploring and developing ideas, and forging new research consortia.

iii. **Use the student vector to attain citizen Engagement through Student Activities**. Student activities, including joint actions like exhibitions, events, excursions, competitions, or hackathons, to engage citizens and gather their feedback.

iv. **Provide References: Promote Success Stories.** Success cases are a very interesting tool to stimulate activity among beneficiaries and citizens. Regularly presenting these stories in university channels can broaden knowledge and stimulate activity among various recipients. Make descriptions and objectives specific enough but also comprehensive enough for different target audiences.

v. **Use Open Science principles.** These are crucial to the development of every university, scientific institution and research unit. It involves sharing knowledge, research data, experiences and as a result it supports establishing and strengthening cooperation at the international level, regardless of the scientific discipline.

vi. **Use platforms such as the Industrial Doctoral School to align the interests of the different stakeholders**. The Unite! Doctoral School designs and implements joint doctoral programs involving multiple Unite! universities and industry partners. This initiative aims to reach co-tutelle agreements leading to double and triple degrees, particularly in areas like Energy, Artificial Intelligence, and Industry 4.0.

vii. **Promote active collaboration across similar ecosystems as well as between complementary ones.** Technology transfer is a function that may have a local-base design to respond to the needs of the close environment. But, in particular when it is highly specialised, it can help to address challenges in other ecosystems, being similar or very different.

viii. **Increase involvement of alumni** to stimulate an increase in Academia – Industry cooperation. Facilitate moments for sharing lessons learnt, and for providing advice by former graduates.

ix. **Increase initiatives to foster start-ups spinning-off from academia**, by students and faculty. Society can benefit from their involvement and co-creation gaining, besides ownership, visibility, access to research platforms, and recognition of their knowledge and practices.

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