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DELIVERABLE D4.2

REPORT ON THE OUTCOMES OF THE ENTREPRENEURSHIP COURSES AND RELATED WORKSHOPS

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Abstract	This deliverable reports on the results of the work carried out to strengthen the relations with the socio-economic stakeholders in the regions of the EDUC-SHARE members and to increase knowledge of two selected TT ecosystems (on cybersecurity and culture and heritage). The deliverable analyses the existing entrepreneurship courses at EDUC-SHARE partners – their objectives, characteristics, and outcomes – and draws perspectives on the directions that the EDUC Alliance could take to further develop its entrepreneurial education, leveraging the current assets and the EDUC network. The deliverable also includes a description of the work carried out in the two pilots 'Cybersecurity and AI' and 'Culture and Heritage' to deepen cooperation on innovation and technology transfer.
Keywords	Entrepreneurship, training, best practice

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General Introduction

One of the objectives of the EDUC-SHARE project is to create an open and inclusive environment linking the research and innovation ecosystems of the Alliance universities. The project aims to accelerate knowledge and technology transfer. It also aims to strengthen relations with socio-economic stakeholders within the EDUC Alliance ecosystems. This process has been carried out along with the development of the EDUC long-term research agenda which has identified several strategic research areas, taking into account the partners' regional Research & Innovation smart specialisation strategies (RIS3), the universities' research strategies and the specific interests of the researchers. The focus has been placed on the topics of "Cyber Security and Artificial Intelligence" and "Culture and Heritage", two of the seven research priorities identified in the Erasmus+ EDUC pilot.

In order to meet its objective of strengthening the relationship with socio-economic stakeholders in the member regions, EDUC-SHARE deployed its WP4 Knowledge and Technology Transfer and achieved three main outputs:

- A mapping of the TT ecosystems in EDUC, leading to the production of a specific deliverable[1].
- On top of this mapping, and in order to deepen collaborations and foster new ones, EDUC-SHARE implemented two pilots. The work carried out included:
    - Mapping the Innovation and Technology Transfer ecosystems of "Cybersecurity and Artificial Intelligence" and "Culture and Heritage", identifying the stakeholders involved in those specific TT ecosystems;
    - Organising knowledge exchange through workshops on these topics involving researchers and PhD candidates of the EDUC-SHARE partners;
    - Establishing the TT ecosystems of the two pilots on the OpenUp platform, resulting in an emerging community of practice involving researchers from the EDUC partners. A detailed presentation of the work carried out is provided in the Annex of this document, with a particular focus on the Cybersecurity pilot;

[1] D4.1 Inventory of TT ecosystems

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- Completing an inventory of already existing entrepreneurship courses offered by the Alliance members, with the aim of sharing best practices and contributing to a better professional integration of young researchers. The available courses were organised in a catalogue, which was displayed on the OpenUp platform. The main part of this deliverable is dedicated to this action.

Objectives

Deliverable "D4.2 Report on the outcomes of the entrepreneurship courses and related workshop" and the corresponding tasks (T4.2 Cybersecurity Technology Transfer ecosystem; T4.3 Culture and Heritage Technology Transfer Ecosystem; T4.4 Entrepreneurial mindset to spur knowledge and Technology Transfer) pursue the overall Objective 1[2] of the EDUC-SHARE Document of Actions (DoA) to speed up knowledge and technology transfer and to strengthen relations with socio-economics stakeholders within the eco-systems of the EDUC members.

The main goals of this deliverable are to map the state of the art of entrepreneurship courses at the EDUC Alliance level, share, and exchange best practices.

The Task Leader is the University of Cagliari and the document has been prepared with the contribution of the whole EDUC-SHARE partners. The Task Leader representative for UNICA is Maria Chiara di Guardo, a professor expert on these issues and director of the CREA (*Centro servizi d'Ateneo per l'innovazione e l'imprenditorialità*) that is the Service Center for Innovation and Entrepreneurship of the University of Cagliari.

Methodology

The activity of the task started in January 2023.

As a first step, UNICA elaborated a template with key parameters, asking partners for information about entrepreneurship courses delivered in each university.

The template also asked partners to upload data and information about their courses on the OpenUp platform as shown below.

[2] *Objective 1: Jointly develop pilot tools and methodologies to enhance multidisciplinary collaborative research, speed up technology transfer and promote sustainable career development in an Open Science oriented approach*

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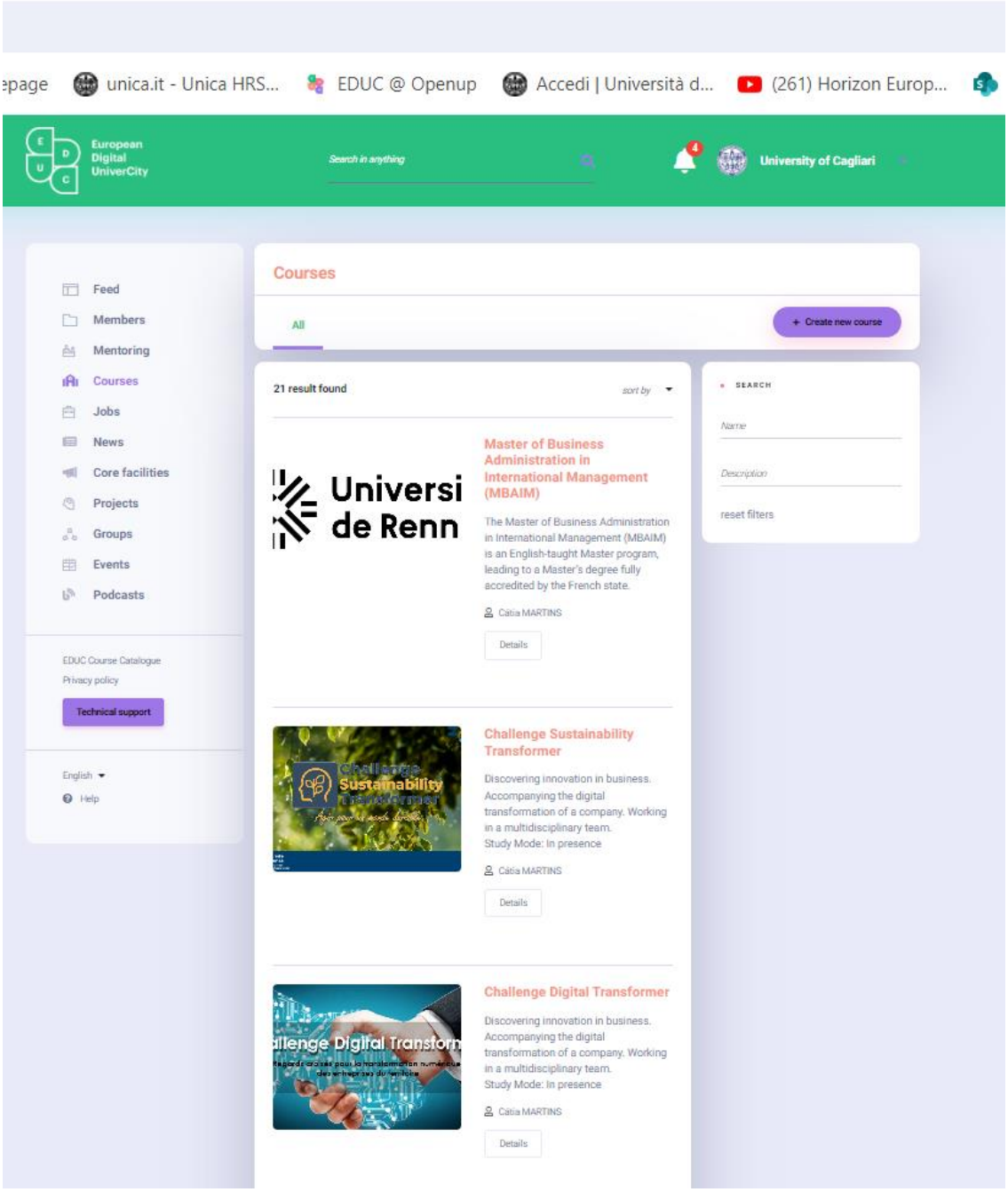

Once all the information had been collected, the working group analysed the main characteristics of the courses included in the inventory. The objectives of the analysis was to:

a) Compare the entrepreneurship programmes of each university;

b) Identify critical issues/strengths and weaknesses, similarities, and opportunities;

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c) Create an integrated training session focusing on entrepreneurship issues;

d) Offer Entrepreneurship Support: provide support and resources to entrepreneurs and start-ups, including mentorship, access to finance, and guidance in navigating the regulatory framework. This can be done through dedicated business incubators, accelerators, and entrepreneurship training programmes.

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Outcomes of the entrepreneurship courses catalogue analysis

Overview

We observed, at the time of this study, the following main features of the existing entrepreneurship courses at the EDUC Alliance level:

- **Diverse objectives**

  Falling mainly in 2 categories:

  - To boost the creation of new businesses whatever the type: from low-tech companies to deep-tech startups;
  - To boost the creation of companies resulting from research (deep-tech startups) from a research valorization perspective.

- **Diverse target populations**

  From Bachelor's Students, Master's degree students to Ph.D. students.

- **Diverse target skill levels**

  Covering the full spectrum:

  - Awareness-raising;
  - Understanding of concepts with the ability to apply them to simple cases;
  - Real practical/operational skills, to make them autonomous/operational.

- **Diverse duration**

  The offer is quite varied and it is strictly linked to the training approaches (class lessons, workshops, laboratories, etc.).

- **Primarily in-person attendance**

  Almost all courses in the catalogue request a presence attendance. This is due to various reasons. Entrepreneurship courses are:

  - Strictly related to the socioeconomic context;
  - Strictly linked to the topic that, most of the time, is also related to the socioeconomic context;
  - Interactive classes that often required in-person attendance. This is also an important step also to creating the team;
  - Meeting place to promote the creation of a team and to meet financing institutions.

- **Diverse target stages of the entrepreneurial path**

Each course differs because it addresses specific stages of the entrepreneurship path: from the ideation phase, through market and competitor analysis, to legal forms and finance.

- **Diverse languages**

  Courses are delivered primarily in local languages (French, Italian, Hungarian, German, Czech).

- **Different training approaches**
  - Theoretical or practical lessons;
  - Laboratories, learning by doing workshops.

Critical Issues/Strengths and Weaknesses

Strengths

The EDUC-SHARE project, a collaborative initiative involving six partner universities, is committed to fostering entrepreneurship education. Each university brings its unique strengths to the table, contributing to a rich and diverse entrepreneurial ecosystem. These strengths not only reflect the individual capabilities of each university but also highlight the collective power of the Alliance in promoting entrepreneurship and innovation. The strengths of these partner universities are manifold and worth exploring in detail:

- **Diverse Course Offerings:** Each institution within the EDUC-SHARE project offers a wide variety of entrepreneurship courses, workshops, and programmes. These offerings cover a broad spectrum of topics, from the generation of business ideas and entrepreneurial finance to social innovation and beyond. This diversity in course offerings ensures that students are exposed to a wide array of entrepreneurial concepts and practices. It also allows for a more comprehensive understanding of entrepreneurship, as students can explore different facets of the field. This diversity is a significant strength as it caters to the varied interests and needs of students, providing them with a well-rounded education in entrepreneurship.
- **Practical Learning Experiences:** Many of the courses and programmes offered by the partner universities are designed to provide students with hands-on experience. This is achieved through workshops, challenges, and opportunities for students to work on their business ideas. Such practical experiences allow students to apply theoretical knowledge in real-world contexts, which is crucial for understanding the practical implications of theoretical concepts. This experiential learning approach not only enhances students' understanding of entrepreneurship but also equips them with the skills necessary to navigate the entrepreneurial landscape successfully.

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- **Experienced Instructors:** The partner universities bring in experienced business consultants, coaches, or professors with expertise in entrepreneurship to teach their courses. This ensures that students receive high-quality instruction from individuals who have a deep understanding of the entrepreneurial landscape. These instructors bring a wealth of knowledge and experience to the classroom, providing students with insights into the realities of entrepreneurship. This direct exposure to experienced professionals is a significant strength as it allows students to learn from those who have firsthand experience in the field.
- **Interdisciplinary Approach:** Some universities, notably the University of Cagliari and the University of Potsdam, adopt an interdisciplinary approach in their programmes. These programmes aim to strengthen entrepreneurial personality and foster a broad entrepreneurial mindset among students. By integrating knowledge and perspectives from various disciplines, these programmes provide a more holistic understanding of entrepreneurship. This interdisciplinary approach is a significant strength as it allows students to see the bigger picture and understand how different fields intersect and influence entrepreneurship.
- **Internship Opportunities:** Some universities inside the Alliance provide internship opportunities, offering students practical experience and a chance to apply what they've learned in a real-world setting. These internships help students with the opportunity to work in a professional environment, where they can apply the skills and knowledge they've acquired in the classroom. This real-world experience is invaluable as it provides students with a deeper understanding of the entrepreneurial landscape and the challenges and opportunities it presents.

In conclusion, the strengths of the partner universities in the EDUC-SHARE project lie in their diverse course offerings, emphasis on practical learning experiences, quality of instruction, interdisciplinary approach, and provision of internship opportunities. These strengths not only enhance the quality of entrepreneurship education provided by each university but also contribute to the creation of a vibrant and dynamic entrepreneurial ecosystem within the EDUC Alliance. The shared commitment to fostering entrepreneurship and innovation among these universities is a testament to the potential of the Alliance in shaping the future of entrepreneurship education. This collective effort is a promising step toward nurturing the next generation of entrepreneurs and innovators.

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Weaknesses

The partner universities in the EDUC-SHARE project have made significant strides in fostering entrepreneurship education, demonstrating a strong commitment to nurturing an entrepreneurial mindset among their students. However, as with any ambitious initiative, some areas present challenges. These weaknesses, which are common across the partner universities, underscore the complexities of providing entrepreneurship education in a diverse and international context. They highlight the need for continuous improvement and adaptation to ensure the effectiveness and inclusivity of the entrepreneurship programmes offered by the universities.

- **Language Limitations:** Many of the courses and programmes are offered only in the local language (German, Italian, Czech, Hungarian or French). This could potentially limit the accessibility of these courses to international students who may not be proficient in these languages. It could also hinder the exchange of knowledge and best practices among the partner universities if the course materials are not available in a commonly understood language. Furthermore, in an increasingly globalized world, the ability to communicate and conduct business in English is often seen as a crucial skill. The lack of English-taught entrepreneurship courses could therefore limit the students' preparation for the international business environment.
- **Physical Attendance Requirement**: Another challenge is the requirement for physical attendance in some courses. This might limit accessibility for remote or international students, particularly in the current global context, where remote learning has become more prevalent due to the COVID-19 pandemic. This requirement could exclude students who are unable to travel or prefer to learn remotely. It could also limit the ability of the universities to expand their student base beyond their geographical location. Moreover, the requirement for physical attendance could pose challenges for students who are balancing their studies with other commitments, such as work or family responsibilities. This calls for a more flexible approach to course delivery, possibly through the adoption of hybrid or fully online models.
- **Limited Accessibility:** Some programmes or workshops, like the one at the University of Potsdam, are offered only upon request. This could limit their accessibility as students might not be aware of these opportunities unless they specifically ask for them. It could also lead to inconsistencies in the availability of these programmes if they are dependent on the request volume. Furthermore, the need to request these programmes could create an additional barrier for students who may be hesitant or unsure about their interest in entrepreneurship. This highlights the need for more proactive communication and promotion of these opportunities to ensure that all interested students are aware of and can access them.

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- **National Policy and Regulatory Frameworks**: The national policy and regulatory frameworks in the countries where the partner universities are located (Germany, Italy, France, Hungary, and the Czech Republic) can have a significant impact on entrepreneurship education. These frameworks can influence the ease of starting a business, the availability of funding for startups, the level of support for entrepreneurship education, and the recognition of entrepreneurship as a viable career path. However, these frameworks can also present challenges if they are not conducive to entrepreneurship or if they impose burdensome regulations or bureaucratic hurdles for startups. The differences in these frameworks across the partner countries could also lead to inconsistencies in the entrepreneurship education offered by the universities. This underscores the need for advocacy and engagement with policy-makers to create more supportive policy and regulatory environments for entrepreneurship.

While the partner universities have made significant strides in promoting entrepreneurship education, these challenges underscore the need for continuous improvement and adaptation of what exists and also call for the development of complementary offerings to address important objectives. Addressing these weaknesses will be crucial in enhancing the quality of entrepreneurship education and in fostering a more inclusive and dynamic entrepreneurial ecosystem within the EDUC Alliance. This will involve not only individual efforts by each university but also collective action and collaboration among the partners. By working together to overcome these challenges, the partner universities can ensure that their entrepreneurship programmes are accessible, effective, and beneficial to a broader range of students, thereby contributing to the development of a vibrant entrepreneurial culture within and beyond the EDUC Alliance.

Similarities and opportunities

The shared characteristics of the EDUC-SHARE project partners highlight their collective commitment to fostering entrepreneurial skills and mindset among students. These shared characteristics provide a solid foundation for future collaboration and knowledge exchange:

- **Interdisciplinary Approach:** All partner universities have integrated diverse disciplines into their entrepreneurship courses and programmes. This broad approach fosters creativity and innovation by encouraging the cross-pollination of ideas across different fields of study. The interdisciplinary approach not only enriches the learning experience but also equips students with a broader perspective and a more

comprehensive understanding of entrepreneurship. By exposing students to a variety of disciplines, the universities are preparing them to navigate the complex and multifaceted world of entrepreneurship, where solutions often require a blend of knowledge and skills from different fields. This approach also encourages students to think outside the box and to approach problems from multiple angles, enhancing their problem-solving skills and their ability to innovate.

- **Student Selection:** Each partner institution has a consistent approach to student selection, focusing on students' interest in entrepreneurship and their proficiency in English. The selection criteria and the profile of the participating students, including their level of study and field of training, were agreed upon by all partners. This shared approach to student selection ensures that the entrepreneurship courses and programmes are accessible to a diverse group of students, fostering inclusivity and diversity in entrepreneurship education. It also ensures that the students who participate in these courses and programmes are well-equipped to benefit from them, enhancing the overall effectiveness of the entrepreneurship education provided by the universities. This approach also ensures that the universities are attracting students who are genuinely interested in entrepreneurship, which can enhance the quality of the learning experience and the outcomes of the entrepreneurship courses and programmes.
- **Practical and Experiential Learning:** All partners emphasize hands-on learning through workshops, laboratories, and "learning by doing" methodologies. This approach allows students to apply theoretical knowledge in real-world settings, enhancing the relevance and practicality of their learning. By providing students with opportunities to apply what they have learned in a practical context, the universities are helping them to develop essential entrepreneurial skills, such as problem-solving, decision-making, and risk management. This practical and experiential learning approach is a key strength of the entrepreneurship education provided by the partner universities, as it prepares students for the realities of entrepreneurial practice and enhances their readiness to launch their ventures. It also fosters a deeper understanding of the entrepreneurial process, as students can see first-hand how the concepts and theories, they learn in class are applied in practice.
- **Engagement with External Stakeholders:** Each university collaborates with external stakeholders, such as business coaches, incubators, and entrepreneurs. This engagement provides students with real-world insights and networking opportunities, bridging the gap between academia and industry. By engaging with external stakeholders, the universities are enriching the learning experience for students, providing them with valuable insights into the entrepreneurial landscape, and helping them to build networks that could support their entrepreneurial journey. This engagement with external stakeholders is a key strength of the entrepreneurship education provided by the partner universities, as it enhances the relevance and

practicality of the courses and programmes and fosters stronger ties between the universities and the entrepreneurial community. It also provides students with opportunities to learn from successful entrepreneurs and industry experts, enhancing their understanding of the entrepreneurial process and the challenges and opportunities in the entrepreneurial landscape.

- **Language of Instruction:** Courses are offered in local languages and English, accommodating both local and international students and fostering a multicultural learning environment. This multilingual approach not only enhances the accessibility of entrepreneurship courses and programmes but also enriches the learning experience by fostering cultural diversity and intercultural communication. By offering courses in multiple languages, the universities are preparing students to operate in a globalized business environment, where the ability to communicate effectively in different languages is a valuable asset. This approach also fosters a more inclusive learning environment, as it ensures that students from different linguistic backgrounds can participate in entrepreneurship courses and programmes.

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Future perspectives

Leveraging the assets identified above, the network of the EDUC partners offers several opportunities to further improve the quality and completeness of our entrepreneurial education offering:

- **EDUC as an opportunity to continuously improve the existing educational offering:** As for other EDUC-SHARE activities, the partners network offers multiple ways to share practices, courses, and pedagogical resources, notably within specialized teachers' communities of practice, all of these being ways to continuously improve the current courses offered at partner universities.
- **EDUC as an opportunity to cover missing parts in our entrepreneurial educational offering:** The EDUC Alliance regroups a whole lot of expertise that can be leveraged to co-design, co-develop, and/or co-deliver new educational offerings covering new needs, to be distributed and used across the network. Such new educational offerings may encompass new courses, and new pedagogical resources, to be used as a toolbox, as well as entrepreneurial events across the EDUC network.
- **EDUC as an opportunity to offer students a more realistic view of the European entrepreneurial landscape:** Thanks to our European network covering 7 member-states, we can offer a more realistic vision of the European entrepreneurial and business landscape, not hiding the fundamental European heterogeneity. This is indeed a way to give students – and their businesses – more resilience to thrive in this European landscape.

Together with the shared characteristics identified above, these opportunities offered by the EDUC Alliance present several opportunities for further collaboration, innovation, and enhancement of the entrepreneurial ecosystem:

- **Development of a new training offering addressing needs not covered so far:** Despite their overall quality, the state of the art of entrepreneurial education, in the EDUC partners network, does not pretend to cover all needs of our socio-economical ecosystem. In particular, two largely recognized needs have now emerged, where an EDUC partner response could be developed, building on their current assets and the opportunities offered by the EDUC network:
    - The need to better prepare doctoral candidates for careers outside of academia: it is a well-known fact that a vast majority of Ph.D. students quit academia at the end of their Ph.D. Thesis and join companies or other players in the socio-economic world. In this circumstance, allowing them to develop an

understanding of the socio-economical world, appreciate the value of their skills and assets in this context, and acquire fundamental transverse skills, notably entrepreneurial skills, becomes key.

- The need to give students entrepreneurial skills as transverse skills that are sought by all companies: companies of all sizes are more and more organized and managed in ways that give a great deal of autonomy to engineers and professionals in all areas. These new forms of organization mobilize entrepreneurial skills that are now highly necessary to ensure the proper integration of our students in the socio-economical world.

- **Increased Collaboration:** The shared approach to entrepreneurship education among the partner universities provides a strong basis for increased collaboration. This could take the form of joint courses, teachers' communities of practice, faculty, and student exchange programmes, shared resources, or collaborative research projects. Such collaborations could enhance the overall quality and reach of entrepreneurship education, fostering a more integrated and cohesive entrepreneurial ecosystem across the partner universities. Increased collaboration could also lead to the development of new and innovative entrepreneurship courses and programmes, as the universities can draw on each other's strengths and expertise. Furthermore, collaboration could enhance the sharing of best practices and the exchange of knowledge and ideas, contributing to the continuous improvement of entrepreneurship education.

- **Best Practice Sharing:** The similarities in the partner universities' entrepreneurship courses and programmes present a significant opportunity for the exchange of best practices. By learning from each other's experiences, the universities can continually improve their course design, teaching methodologies, student engagement strategies, and support services. This could lead to more effective and impactful entrepreneurship education, benefiting students, faculty, and the broader entrepreneurial ecosystem. The sharing of best practices could also foster a culture of continuous improvement and innovation, as the universities are encouraged to learn from each other and strive for excellence in their entrepreneurship education.

- **Expanded Course Offerings:** The shared use of English and local languages in the entrepreneurship courses offers an opportunity for the universities to expand their course offerings to a wider range of students. By offering more courses in English or other languages, the universities could attract more international students, fostering a more diverse and multicultural learning environment. This could enhance the richness of the learning experience and prepare students for the globalized world of entrepreneurship. Expanded

course offerings could also increase the accessibility of entrepreneurship education, as students who are not proficient in the local language can still participate in entrepreneurship courses and programmes.

- **Policy Advocacy:** The collective influence of the partner universities could be leveraged to advocate for more favourable policy and regulatory frameworks for entrepreneurship in their respective countries. By working together, the universities could exert a more substantial influence on policy-making processes, potentially leading to changes that create a more supportive environment for budding entrepreneurs and enhance the entrepreneurship education landscape. Policy advocacy could also contribute to the recognition of entrepreneurship as a viable and valuable career path, encouraging more students to consider entrepreneurship as a career option.

- **Digital Learning:** The rise of remote learning and digital technologies presents an opportunity for universities of the Alliance to develop online versions of their entrepreneurship courses. This could increase the accessibility of these courses for students who cannot attend in person due to geographical, financial, or other constraints. By embracing digital learning, universities could broaden the reach of their entrepreneurship education programmes and make them more inclusive and flexible. Digital learning could also enhance the learning experience, as it allows for more personalized and self-paced learning. This will be further developed in EDUC II.

- **Entrepreneurship Research:** The shared commitment to entrepreneurship education among the partner universities opens up opportunities for collaborative research in this field. By pooling their resources and expertise, the universities could conduct more comprehensive and impactful research, contributing to the academic literature on entrepreneurship education and providing evidence-based insights for policy and practice. Collaborative research could also lead to the development of new and innovative teaching methodologies, enhancing the effectiveness of entrepreneurship education.

- **Community Engagement:** The partner universities' engagement with external stakeholders, such as business coaches, incubators, and entrepreneurs, presents an opportunity to strengthen their ties with the local entrepreneurial community. By fostering closer relationships with these stakeholders, the universities could enhance the relevance and practicality of their entrepreneurship education, provide more networking opportunities for students, and contribute to the vitality of the local entrepreneurial ecosystem.

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These opportunities, if leveraged effectively, could significantly enhance the impact of the EDUC-SHARE project, and contribute to the development of a vibrant, compelling, and inclusive entrepreneurship education ecosystem across the partner universities. They could also pave the way for future collaborations and initiatives aimed at fostering entrepreneurship and innovation in higher education. The shared commitment to fostering entrepreneurial skills and mindset among students, combined with the opportunities for collaboration and innovation, underscores the potential of the EDUC-SHARE project to make a significant contribution to entrepreneurship education in Europe.

Common recommendations

Challenges at the Alliance level should be:

- The creation of a training course destined for doctoral students and aiming at developing (1) their entrepreneurial skills and spirit; (2) an understanding of the European socio-economic landscape and (3) an understanding of their assets in this landscape.

- The creation of an integrated training suite encompassing the different phases of the entrepreneurship path: each University would be responsible for one of the stages/phases of business creation and its life cycle: i.e. Business idea generation, access funds, and financing, etc.

- The creation of an integrated training programme focusing on the entrepreneurship pathway: each university would be responsible for one of the stages/phases of business creation and its life cycle: i.e. business idea generation, access to funds and financing, etc.

- Entrepreneurial Support: Leverage and network the partner's assets to provide support and resources to entrepreneurs and startups, including mentorship.

- Create networking platforms and online communities where stakeholders from academia, and industry can connect, share knowledge, and collaborate. These platforms can facilitate training sessions, discussions, idea exchange, and the formation of partnerships. The first step should be OpenUp.

- Encourage EDUC project owners/supervisors/scientific referents to access entrepreneurial-support structures (incubators) across the EDUC network by funding mobilities.

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Information sheets/Comments about entrepreneurship courses

Information sheet University of Cagliari

The University of Cagliari plays a crucial and proactive role in the development of entrepreneurial culture in terms of creativity, originality, and social impact. In particular, UNICA creates strong linkages with regional, national, and international actors in the global entrepreneurial ecosystem.

Through its CREA (University Service Center for Innovation and Entrepreneurship), UNICA implements training activities to develop and integrate managerial, entrepreneurial, and scientific knowledge, and enhance management and problem-solving skills, especially related to teamwork.

UNICA's entrepreneurship education programmes are constantly seeking opportunities to join forces with institutions and organizations internationally to pursue collaborations that can address issues of *glocal* significance that require large-scale, interdisciplinary collaboration.

Entrepreneurial education projects

Contamination Lab

Participants: Students, recent graduates, and doctoral candidates

The Contamination Lab promotes the culture of entrepreneurship and innovation by actively involving participants in the path of development and management of a business idea. They will have to generate a start-up capable of attracting private funding.

Skills acquired: integrate managerial and scientific knowledge; develop problem-solving and management skills, especially linked to teamwork; analyze entrepreneurial and market opportunities linked to specific scientific and technological knowledge and business ideas; acquire relational skills and use innovative tools for the presentation of ideas, according to internationally established standards (such as the "elevator pitch").

The goals are to promote the culture of entrepreneurship, sustainability, innovation, and doing, as well as new learning models, such as to reduce the gap between the academic world and innovation. The CLabUniCa is configured as an Entrepreneurship Education programme aimed at increasing students' awareness of their own professional skills and orientations (awareness) and taking the main steps to the establishment of a business (start-up approach).

Contamination PLUS+ UNICA

Participants: Students, recent graduates, and doctoral candidates

From the experience gained through the ContaminationLab was born the Contamination PLUS+, an interdisciplinary course of entrepreneurial education entirely dedicated to Social Innovation The CPLUS+ UNICA aims to encourage processes of ideation and prototyping of entrepreneurial ideas capable of generating social impact.

Create Communication

Participants: Companies and Researchers

The project involved over 30 researchers from the University of Cagliari belonging to different departments, but also researchers from the universities of the Italian Contamination Lab network and local and national entrepreneurs to encourage the exchange of opinions to open innovation.

The goals are to facilitate contact between companies and the university to make Sardinian and non-Sardinian companies aware of the research activities of the University of Cagliari and vice versa, making UNICA researchers aware of the needs of local and non-local companies.

Contamination Bootcamp

Participants: Businesses, Researchers, Startuppers

The entrepreneurs indicate their objectives and describe their innovative needs.

The researchers provide specific knowledge and skills acquired in the university environment.

Startuppers contribute to the innovation process with creativity, thanks to the analysis of today's problems with alternative tools, in step with time.

Skills acquired: Team Building; Learning by doing: learning through practice by dedicating only 30% of the time to theory; Lean Thinking: increases efficiency and flexibility of production and decision-making processes, eliminating any waste thanks to the contribution of all the people involved.

A cup of innovation

Participants: Entrepreneurs and aspiring entrepreneurs

The project foresees short online talks, lasting around 30 minutes, organized by the CREA UNICA (University Service Center for Innovation and Entrepreneurship). During the talks, participants will try to understand better how research, particularly the research work of the University of Cagliari, can help to face the changes and challenges that the market presents.

Information sheet University of Rennes

The University of Rennes is very committed to developing cross-disciplinary training courses for PhD students, particularly in the field of entrepreneurship.

4 levels of training are available to PhD students in Rennes, as well as to Masters 2 students and engineers.

Some of these courses are already available in English and French in 'MOOC' format, while others could be opened up to other PhD students from the EDUC Alliance with a few adjustments.

Level 1: Awareness-raising initiatives to discover the world of entrepreneurship and business

For example: The "*Une idée pour mon territoire*" (An idea for my region) event allows doctoral students to work (for 1 day) in multidisciplinary teams on a problem in the Rennes metropolitan area and to propose a fictitious project to develop a product or service to address it.

Inspirational lectures are also available, as well as communication events on business creation.

Level 2: Training activities

The existing activities were inventoried as part of the EDUC-SHARE project and the existing resources have been made available online in English on the Open Up platform.

In this context, it should be noted that the University of Rennes is participating in the construction of a training block entitled "Raising awareness of the business world and entrepreneurship" for all PhD students.

Innovation concerns all PhD specialities and to meet the major challenges of tomorrow, it is essential to develop multidisciplinary approaches.

The objectives of this training block are:

- to improve communication between PhD students and companies (partnership, professional integration);

- raise PhD students' awareness of entrepreneurship;

- highlight the entrepreneurial skills of PhD students.

This block of training consists of 5 modules:

Module 1 "*Connaissance de l'entreprise*" (Business knowledge): providing keys to understanding socio-economic organisations. Gain a better understanding of companies, so that you can better integrate and project yourself within them. PhDs have many transferable skills, similar to those of entrepreneurs. They must be aware of their assets and the many career paths available to them.

This module, originally produced in French, has been translated into English as part of the EDUC-SHARE project. The translation of this module has enabled the sharing of online resources in English that will be made available and used by PhD students and young researchers from partner universities in the EDUC Alliance.

Module 2 "*Valorise ta recherche*" (Add value to your research): Identifying the resources that can be developed within a laboratory and knowing the intellectual property rules that apply.

Module 3 "*Le droit à l'erreur*" (The right to make mistakes): Understanding failure, its real consequences and the powerful driving force behind its development.

Module 4 "Design thinking": Explore the philosophy of design thinking and its methodology for meeting the major challenges of tomorrow.

Module 5 "*La mise en action en présentiel donne tout son sens à la formation*" (Hands-on experience gives the course its full meaning): Work in multidisciplinary teams to identify a socio-economic application arising from their research. Gaining skills and becoming an entrepreneur (pitch competition). The action must be chosen from among several labelled by the training block. To validate the training Block "Raising awareness of the business world and entrepreneurship", PhD students have to participate in the event "*Starthèse*" or another event of "learning by doing" among those labelled.

Level 3: Learning by doing

The "*Starthèse*" event brings together PhD students, Masters 2 students and engineers in multi-disciplinary teams to devise a socio-economic application based on their research work.

The "Digital Transformer" is also accredited to 'put into action' the "Raising awareness of the business world and entrepreneurship" training block. The aim is to work in multidisciplinary teams on complex digital transformation

problems posed by companies. This is accessible to English speakers and open to masters, engineering schools and PhD students.

The “Sustainability Transformer Challenge” in Rennes aims to work in multidisciplinary teams on complex problems posed by companies to reduce their environmental impact. This is accessible to English speakers and open to masters, engineering schools and PhD students.

The "*ActinSpace*" challenge that will take place in Rennes in 2024 is organised by Le Poool and the University of Rennes with the support of Caïlabs, Scalian, PEPITE Bretagne, ESA BIC Nord France, the physics institute of Rennes and the Brittany Region. The objective of this initiative is to promote entrepreneurship, encourage the creation of start-ups and highlight the use of space data and technologies to change people's lives, boost employment and protect our planet.

Level 4: Full support

PhD students can also apply for national “student-entrepreneur" status (SNEE) for new projects or ideas that need to be developed.

After projects have been selected by a panel of judges, students can benefit from full support, a dedicated *Pépite Bretagne* advisor, a professional mentor and an academic advisor. They will have access to courses depending on how far advanced their project is offices, course facilities, work placement and free consultations with experts.

For young graduates, the “Student-Entrepreneur” university degree allows them to acquire the basics of business creation.

Information sheet University of Potsdam

The University of Potsdam takes a decentralised approach and offers students throughout all study cycles the opportunity to develop and enhance entrepreneurial skills. Certain that the development of entrepreneurial culture is central to its region, the university and its partners foster connections in the form of coaching, internships or targeted mentoring with regional companies and institutions as well as international partners.

The main actor at the University of Potsdam is **Potsdam Transfer**, a central service of the university offering a startup Service, guiding for founders, EXIST Funding Programmes, International Startup Consultancy, Partnerships and Entrepreneurial education. To help students tap entrepreneurial potential, Potsdam Transfer offers diverse qualification formats and further education opportunities intending to equip students not only with basic knowledge of business administration and techniques but also with methodological skills to develop innovative products and business models.

Potsdam Transfer has developed diverse formats for those interested in starting a business. While several programmes or events focus on students, targeted training explicitly includes alumni and researchers at the University of Potsdam, as well as interested parties from business and society.

A particularity is offered via the EXIST Funding Programmes (EXIST Business Start-up Grant and EXIST Transfer of Research) by which Potsdam Transfer fosters potential for international cooperation and a global work market.

Like the other EDUC partners, Potsdam University's Transfer unit seeks opportunities to work together with other institutions internationally and pursues collaborations that add to an international offer with strong foundations in various local environments.

Entrepreneurial education and awareness-building events in Potsdam, mostly organised by Potsdam Transfer:

- **From Lab2Net**
  - Participants: Young researchers, doctoral candidates
- **International Entrepreneurship Lab**
  - Participants: researchers, students – first editions starting (2024)
- **IP @UP**
  - Participants: all members of the university
- **Rooftop Pitch Potsdam**
  - Participants: all members of the university, external partners
- **Sciencepreneurship - Creating Impact with your Research**
  - Participants: researchers – first edition in 2024 (cooperation UP-UJI)
- **Startup Story Night**
  - Participants: all members of the university, external partners, general public

- **Transfer Breakfasts**
    - Participants: researchers, transfer office and units

In addition to the training and short courses or events offered by Potsdam Transfer, the University of Potsdam holds two chairs with key relevance to entrepreneurial education: The **chair of innovation management**, offering bachelor and master courses (one offer per semester in English) as well as the **chair for transfer**.

In addition to study offers regularly provided via the faculty of economics and the transfer chair, the University of Potsdam teams up with the **Hasso Plattner Institute's School of Entrepreneurship** to offer students of their joint Digital Engineering Faculty the opportunity to receive entrepreneurial education.

Information sheet University of Pècs

The University of Pécs established its entrepreneurship centre in 2010. based at the Faculty of Business and Economics. This Centre named after Mr. Charles Simonyi the inventor of the Excel spreadsheet software and one of the first space tourists serves the entire university with its diverse entrepreneurial, incubation, and knowledge transfer programmes. The Simonyi BEDC Entrepreneurship Centre is an integral part of the Centre for Applied Learning (CAL, hereafter) unit of the Faculty of Business and Economics that also serves the entire university with its programmes that focus on educational activities that are based on experiential learning methods. For further details on the activities and yearly metrics of the CAL please see the annual report of the Centre here (https://cal.ktk.pte.hu/sites/cal.ktk.pte.hu/files/uploads/news-file/CAL_2021_2022_final.pdf).

Simonyi BEDC is a self-sustaining, university-driven entrepreneurship ecosystem that exists to expand and develop the entrepreneurial skills and abilities of students to explore, promote and market multidisciplinary innovations. The centre also aims to achieve the expansion and development of entrepreneurial and innovation capacity through the institutionalized, continuous and effective participation of the actors of the scientific and business spheres. In achieving these goals, the organization strives for cross-border, international collaborations, thereby broadening the opportunities and space for marketing;

domestic innovations and innovations, as well as providing impulses, information and knowledge to innovators who generate innovations or innovate.

The Simonyi BEDC Entrepreneurship Centre offers programmes in three distinct cycles to all students of the University of Pécs. In the fall and in the spring, to raise the entrepreneurial spirit awareness of all students the Centre runs idea hackathons both in English and in Hungarian. The English one is organised in a remote, online mode allowing international partners to join the event. This version of the hackathon gives the experience an intensive international experience beyond the multidisciplinary feature which is secured by the fact that students come from 10 faculties of the University of Pécs. In the past, the event pulled together students from Croatia, India, Germany, Austria, Slovenia, Botswana, Bosnia-Hercegovina, Italy, and Finland. The Hungarian version of the hackathon also hosts students from all faculties of the University.

International online hackathon:

A hackathon is an event where creative, open-minded, entrepreneurial people from different disciplines meet - in an intensive business development sprint - to work together to find a solution to a specific industry or technology problem or challenge. The goal is to create an MVP - which is a demo version of the product/service, NOT a prototype - during the event, thus supporting the viability of the idea. In many cases, teams continue to work on the MVP, either out of self-interest or after a hackathon, until a final, marketable solution is found. The hackathon is a challenge-based complex learning framework. The learning process is as follows:

1st day:

14:00-14:45	Welcome and pitch training
14:45-15:45	Challenge description, motivational speech
15:45-16:00	Schedule and description of daily tasks
16:00-17:00	Teamwork: Problem finding (bug list)
17:00-18:00	Teamwork: Problem selection/refinement

2nd day:

8:30-8:35	Welcome, update tasks

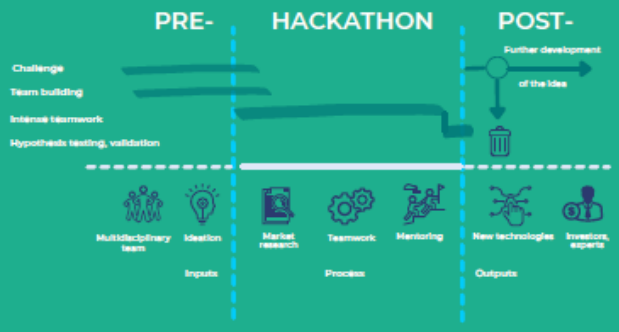
8:35-9:30	Teamwork: Creating a sketch of solution concepts
9:30-10:15	Teamwork: Refining the solutions
10:15-10:45	Teamwork: Making MVP sketches
10:45-11:45	Teamwork: MVP creation
11:45-12:30	Lunch break
12:30-13:30	Expert validation I.
13:30-14:30	Expert validation II.
14:30-15:30	Teamwork: Preparing for the pitch
15:30-18:30	Pitch presentations
18:30-19:00	Jury decision + Announcement of results

The following infographics display and explain the process of the event along with the steps of the process.

Hackathon

A COMPLEX TEACHING METHOD

A hackathon is an event where creative, open-minded, entrepreneurial people from different disciplines meet together - in an intensive business development sprint - to work together to find a solution to a specific industry or technology problem or challenge. The goal is to create an MVP - which is a demo version of the product / service, NOT a prototype - during the event, thus supporting the viability of the idea. In many cases, teams continue to work on the MVP, either out of self-interest or after a hackathon, until a final, marketable solution is found. In fact, the hackathon is a challenge-based complex learning framework.



PRE- HACKATHON

The pre-Hackathon phase also plays a very important role in the smooth operation of the Hackathon and the birth of quality projects. This phase begins approximately 1 week before the Hackathon, during which participants will be assigned to multidisciplinary teams according to a team-building methodology and will have the opportunity to delve into the topic around the challenge and related technologies. It's actually a preparatory phase that embeds intensive business development and makes workflows more efficient.

POST - HACKATHON

The main goal of the post-Hackathon phase is to keep the projects created during the Hackathon alive, for teams to engage in additional talent management, and for extra future opportunities. Various experts, and in some cases investors, may be involved at this stage, focusing on the market entry of viable ideas, and there is a hidden goal of starting a business, which is one of the most important outputs of experiential learning in the process.

HTTPS://HACKATHON.OPENUP.EDUCATION/

Hackathon

A COMPLEX TEACHING METHOD

SECTION 1
PROBLEM - SOLUTION

The problems that fit the challenge are collected, selected, and a solution outline is prepared at this stage.

SECTION 2
THE TARGET GROUP

To accurately select the target group, a minimum of 3 personas will be created in this section to select the most detailed target group.

SECTION 3
MARKET RESEARCH

Mapping competitors is an important task and knowing their strengths and weaknesses. At this stage, in addition to mapping competitors, and a mature value proposition will be formulated.

SECTION 4
MVP PLANNING, BUILDING

In connection with the "draft solution", the concrete implementation will be the focus at this stage. Creating a minimal viable product or service (MVP) is the main task.

SECTION 5
EXPERT VALIDATION

External, experts on the topic of the challenge will come at this stage, and the projects will have to be validated and feedback collected, the hypotheses set up will be tested.

SECTION 6
PITCH

At this stage, the finished projects will be presented to a jury and the goal of the pitch will be emphasized at the end of the presentation.

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Simonyi Summer Social Entrepreneurship Programme:

The "Simonyi Summer School" is a two-week programme that offers an intellectually vibrant, interactive, and interesting 2-week professional work programme where Hungarian, American, and European students, companies, and researchers work together on entrepreneurial projects that could mean a breakthrough for the South Transdanubian region due to their innovative nature, with sustainability, and resilience focus. During the Simonyi Summer School, the project development teams hold personal consultations with project owners, brainstorm possible implementation directions, and seek real locations and utilization in close collaboration with the city and regional stakeholders, all in English.

The two-week-long programme starts with team building every year, where students and senior trainers get to know each other and form teams. The daily eight-hour work is supported by senior trainers who provide professional support to the teams. The "Daily Stand Up" meetings allow teams to report to each other on project development and seek the opinions and assistance of other teams if they get stuck on anything. This is how joint learning and co-creation happen! Continuous client meetings and informal socializing further facilitate the professional progress and networking of teams until they reach the Pre-Pitch, where they can try how to communicate the project to the target market. This trial is followed by fine-tuning presentations and then Final Presentations, where the completed projects are presented to a wider audience, after the challenge is completed and excitement is over, we relax and conclude the two-week intensive work with a Closing Banquet event. Simonyi Summer Social Entrepreneurship Program | PTE-KTK CAL

In the fall and spring terms, those students whose entrepreneurial spirit is elevated to a level where they want to explore opportunities further have the opportunity to participate in the incubation programmes of the Centre, where they expand their ideas into viable business models. This process requires students to get acquainted with business modelling, financial planning, marketing, etc. The process is highly experiential and practice-oriented implying high intensity of interaction with outside experts. The Centre, using its professional and alumni network involves these experts in its mentor programme to provide the base for validation for the student projects. Within the framework of the validation process, the ecosystem of the University strengthens as cooperations emerge between the local economy and the internal stakeholders of the University.

The development of entrepreneurial capabilities of faculty members doctoral students, and post-docs are developed by the Tech transfer office of the University in collaboration with the Simonyi BEDC Centre.

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Information sheet University of Paris Nanterre

Training for Ph.D. and Junior doctors in the field of *Entrepreneurial Mindset Development* and *Career diversification*

Thinking about career development - 2 Days – 1st Year PhD Candidates

Training context: A personal and realistic career plan must be in line with the candidates' skills and aspirations, as well as market expectations. This double aspect requires carrying on multiple reflections: „what you can do", „what you want to do" and finally „what the market expects from you".

Goals: 1. Furnish a basic understanding of the job market. 2. Outline a sustainable professional project by finding the best solutions for researchers' future.

Training: Discover the variety of careers / Finalize your career plan / Identify your personal aspirations and professional expectations

Personal & interpersonal skills development - 1 Day – PhD Candidates and Junior doctors

Training context: Developing good behavioural skills required for professional practices and attitudes. The notion of skills plays a key role during the recruitment process, indeed it is essential to improve personal and intimate skills.

Goals: 1. Develop your personal and interpersonal skills. 2. Identify your skills. 3. Highlight your skills.

Training: Understand the concept of skill / Identify your professional "majors" through knowledge, know-how, and interpersonal skills / Express and promote your skills.

Getting started on your job search - 2 Days – 3rd year PhD Candidates

Training context: To be effective, you need to build and plan your job search process by using several tools. This training course is conceived to offer an overview of recruitment processes as well as of powerful strategies for convincing recruiters.

Goals: 1. Make the most visible and valuable your skills with recruiters. 2. Learn how to master the recruitment process. 3. Improve your job search.

Training: PhD's career opportunities and skills development / The tools for job searching / The job search process.

Building & activating a research and professional network – 2 Days – 1st Year PhD Candidates

Training context: 70% to 75% of French professionals find a job by activating their research, professional and personal networks. If you mobilize your network, you can multiply the chances of finding the right position in response to your academic background and expectations.

Goals: 1. Understanding the efficacy of the network as a powerful tool within professional contexts. 2. Use and activate your network for job search.

Training: Discover the network approach to job search / Understand the efficacy of the network approach during your job search.

Preparing your international mobility / and or career - 2 Days – PhD Candidates

Training context: The University of Paris Nanterre opens up many professional possibilities for PhD Candidates in the field of international careers and professional development. The perspectives deployed during the training focus on international networks, acquiring and valorizing transferable skills, learning from other cultures and multicultural integration

Goals: 1. Help participants to share and enrich their thinking on international mobility challenges and conditions 2. Give support during the construction of their mobility project and action plan.

Training: What should I expect for my career path? / What « does it mean » to activate an international mobility experience?

Discovering and gaining access to the national civil services and institutions outside higher education and research 1,5 Days – PhD Candidates

Training context: At the beginning of their studies, 70% of doctoral students say they want to pursue their career in the research and higher education environment. After graduation and a complex training trajectory, only 33% are part of the academic field. It is indeed essential to understand this peculiar professional ecosystem to prepare your candidacy as successful.

Goals: 1. Understanding the academic research landscape. 2. Successfully preparing your candidacy.

Training: Understand the socio-economic and political relevance of higher education and research / Learn how research assessment and system of funding work / Learn about careers framework within academic research and higher education, as well as recruitment methods.

Built your business start-up project - 2 Days – PhD Candidates and Junior Doctors

Training context: After graduating, only 3% of PhD graduates succeed in setting up a company, even if during their research studies, they acquired the appropriate skills to become successful entrepreneurs. It would be important for Junior Doctors to mobilize their professional skills for building innovative entrepreneurial projects and using the most original results of their research to create their own company.

Goals: 1. Understand and acquire methodologies for business creation and development. 2. Check the feasibility of your project. 3. Get ready to create, develop and sustain your future business.

Training: Conducting a market survey / Funding your business & research project / Establishing legal status and administrative formalities.

Asserting yourself as a professional trainer – 2 Days – PhD Candidates and Junior Doctors

Training context: *Lifelong learning* is a crucial point in the context of career diversification. Technical, economic, legal and societal changes are occurring at an ever-increasing pace, and professional scopes and functions are constantly evolving. UPN is putting forward the creation of an *activity account process*, which would support PhD Candidates and Junior Doctors in any step of their career development and diversification.

Goals: 1. Understand the outlook for the employment market of training, education and instruction. 2. Understand the needs of educational structures and trainees. 3. Anticipating developments and emerging needs of this peculiar sector. 4. Equip yourself with the training tools used in the educational sector. 5. Know how to formalize a coherent and adapted training offer.

Training: The job market in training, education, and instruction. / Expectations of practitioners within training, education, and instruction context / Funding your business & research project / Exploit a wide variety of pedagogical tools.

A PhD in H&S: developing your skills outside the academic sector – 2 Days – 1st Year PhD Candidates

Training context: After obtaining their PhD, the H&S junior researchers need to face a turning point in their career. While they feel far from institutions and companies outside higher education and research, on the contrary, H&S junior researchers can discover and employ a real talent by contributing to a wide typology of professional organisms and institutions.

Goals: 1. Understand the challenges facing your future employers and introduce yourself through a performative agency. 2. Use this understanding to build your communication strategy.

Training: Identify the variety of careers and professional environments to introduce yourself efficiently / Solving business problems / Take full advantage of your skills by creating a portfolio

Improvisation techniques and public speaking 2 Days – PhD Candidates

Training context: This training course is exclusively based on theatrical improvisation techniques for developing your self-confidence and facing public speaking. You will learn how to correctly employ your qualities for managing any situation in front of an audience: team spirit, letting go, spontaneity, listening and fear management.

Goals: 1. Discover and learn the techniques of theatrical improvisation (developing emotions; work on listening, team spirit, etc.). 2. Learn how to express yourself confidently in public (posture, voice, breathing, etc.). 3. Make yourself « better heard & better understood».

Training: Discover the art of improvisation / Public speaking exercises / Presenting your PhD topic.

Methods and tools for public speaking 6h – PhD Candidates

Training context: This workshop aims to let junior researchers acquire the tools and techniques for public speaking as well as for conveying their message to the target public and/or audience.

Goals: 1. Acquire the tools for public speaking. 2. Improve self-confidence (awareness, self-expression & asserting oneself). 3. Adapt your speech to your audience.

Training: Introducing and setting up your objectives / Physical posture: body and presence – Technique: voice and breathing/dissemination of scientific and technical knowledge.

Methods and tools for professional conflict Management 1 Day – Junior PhD Candidates

Training context: Doctoral students often face conflicts either latent, open or sometimes even violent. It is crucial to succeed in managing positively these communication problems. This one-day training course aims to provide the right keys to manage conflictual interactions and relationships.

Goals: 1. Discover your professional profile and analyze your interpersonal behaviours; discover colleagues' attitudes and logos to smartly understand a conflictual context and manage it with professional and empowering skills. 2. Learn how to communicate with people more positively. 3. By listening to other people's needs and perspectives, adapt yourself to working contexts more effectively. 4. Find the right answers to professional and research queries by sharing your intimate experiences.

Training: Numerous improvisation acting exercises / Learn how to choose and use the right vocabulary and expressions / Handling conflictual situations at work.

Academic and Business Public Speaking 14h – English-speaking PhD Candidates

Training context: Discover the techniques from American universities. We offer personalized training adapted to all kinds of public speaking presentations: university projects, thesis defences, corporate meetings, or conference presentations.

Goals: 1. Learn how to prepare a presentation for numerous professional occasions. 2. Learn to express yourself with integrity, to argue your speech, and to convince your audience. 3. Get the skills for successful communication and videoconferencing.

Training: Work on your body gestures, and your voice and learn how to prepare the framework of your speech / Manage stress and stage fright / Present and expose your thesis/topic to peers and get feedback.

Information sheet Masaryk University

Masaryk University is already running courses aimed at supporting the development of students' entrepreneurship and enterprise (or employees), e.g. in the form of course offerings, including towards non-economics students' disciplines.

Each faculty at Masaryk University (10 in total) offers its students the opportunity to gain an overview and knowledge in the field of entrepreneurship, entrepreneurship and orientation in basic economic and legal concepts related to the development and promotion of business ideas. The level of this offer is related to the disciplinary focus of individual faculties. In many cases, these courses are intended only for students of the parent faculty and eventually limited to a specific field of study.

An exception is the so-called university-wide courses, intended primarily for students of master's programmes, but they are also suitable for bachelor and doctoral students across the whole of Masaryk University.

In some cases, this teaching takes the form of work involving the initiation of students' ideas and learning the basic steps of working with these ideas, especially in a team. The aim is to broaden students' entrepreneurial competence, which could then be used in their future careers – not only for employers but especially in the case of their businesses. The implementation of these activities is carried out either by the universities themselves or

with the help of regional Innovation Centres, other agencies, and individuals, or through an appropriate combination of available options.

Masaryk University works closely with the South Moravian Innovation Centre (JIC) situated in Brno. JIC offers a range of courses, workshops, seminars, and consultancy in this area to support entrepreneurial minds with good ideas – from their start-up beginnings to the global market.

An example of such cooperation with the JIC is the implementation of the course *From Idea to Entrepreneurship*, in which the professional workers of the Centre for Technology Transfer of Masaryk University participate.

The course aims to introduce students to modern methods of working with ideas. By applying the Design Thinking method, students come up with their business ideas and learn practical information in the areas of law, financing, and marketing. In a safe environment, they experience the first steps of developing a business idea and learn the entrepreneurial way of thinking. The course also includes presentations on principles of research plan realization, protection of intellectual property, and methods of transfer of technologies and knowledge from the university environment. Experienced business consultants teach the whole course. Moreover, there is an inspirational part in the form of discussions with Brno entrepreneurs.

With the same aim, other university-wide courses are organized by individual faculties with more or less professional orientation related to their profiles (for example: Faculty of Informatics, Faculty of Education, Faculty of Economics or Faculty of Arts).

Masaryk University is aware that in today's dynamically changing economy, it is increasingly important to perceive entrepreneurship and acquired competency skills as key competencies for the employability of graduates and their successful career and personal growth.

Supporting this need is the implementation of a regular primary-oriented course for doctoral students to develop transferable skills and help them to be prepared for job applications in any field. An example in the field of life science is a course called *BIOTOP (BIOtech Talks tO PhD).* It aims to bridge the gap between academia and industry and present various career options in the field of life sciences. These seminars are meant to help doctoral students but also master students or postdocs, understand what job opportunities exist in the Biotech/Industry space, how they can transition, and how they should be using their time to develop skills or improve their CV. Guests are scientists who worked in academia but then decided to continue their research career in private sector companies either in the Czech Republic or abroad. Students will get a real insight into the biotech industry as an optional career choice. They will understand the broader context of intellectual property protection, some

aspects of technology transfer and entrepreneurship. Students can strengthen their skills and networks for potential industry career pathways.

By fostering entrepreneurship and entrepreneurial competencies in students, Masaryk University is interested in nurturing a new generation of innovators, problem solvers and job creators who can contribute to economic growth, social development, and positive social change.

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Outcomes of the tasks related to the topic of Cybersecurity and Culture and Heritage

Cybersecurity Technology Transfer Ecosystem and related workshop

Cybersecurity, as one of the priority collaboration areas of EDUC, was selected for exploration of technology transfer landscapes under the WP4 Knowledge and Technology transfer - Task 4.2 Cybersecurity TT ecosystem. The three EDUC universities (UR, MUNI, UNICA) that have very well-established track records of research, innovation, and intersectoral collaboration in cybersecurity, have described their systems and environments of technology transfer – these are listed as the first part of the report attached to this deliverable as Annex 1.

To delve deeper into the motivations of researchers, the involved stakeholders, and potential and target areas for cybersecurity technology transfer landscapes, we have undertaken a questionnaire survey among all EDUC universities, including the two universities (Jaume I University and the University of South-Eastern Norway) that entered the Alliance after the EDUC-SHARE project started and are therefore not beneficiaries of the project.

A workshop on Cybersecurity TT Landscapes organized as part of the Cyberspace conference at MUNI in Brno on 26 November 2022 facilitated discussions on the contents and format of the survey. Data was collected from mid-March to May 2nd, 2023.

On June 5th-6th, 2023, the University of Cagliari hosted the “Workshop on the Cybersecurity Technology Transfer Ecosystems Questionnaire's results” that concluded the survey analysis. This workshop was organized under the EDUC-SHARE project framework by UNICA and Masaryk University.

During the workshop, researchers and experts from EDUC Alliance discussed and analyzed the outcomes of a survey on "Cybersecurity Technology Transfer Ecosystems". They shared best practices and experiences in knowledge and technology transfer related to Cybersecurity.

The first day of the workshop was mainly dedicated to analyzing the survey results on the TTE ecosystem within the EDUC Alliance, carried out by Masaryk University. On the second day, the experts discussed and analyzed the outcomes of the survey and shared their best practices and experiences in Cybersecurity knowledge and technology transfer.

A comprehensive summary of the survey on "Cybersecurity Technology Transfer Ecosystems" is included as the second part of the report attached to this deliverable as Annex 1.

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Culture and Heritage Technology Transfer Ecosystem and related workshop

Crossing the *Cultural and Heritage* topic, on November 29-30th 2023, the University of Paris Nanterre organized a Scientific Conference focusing on the testimonial value of scientific archives which specifically help historians of science to retrace science's history, its place in society, past and future.

The research investigation of the Conference was conceived to exploit and observe both the direct value assigned to old scientific archives and the crucial role they play in producing new scientific results in different disciplines.

Also, it sought to explore how scientific archives can inform new artistic or societal works and how they can bring new knowledge about technological innovations in the digital era. By focusing on reuses of scientific material for both generating innovative outcomes and drafting new research trajectories linked to the market needs, a workshop-like time took place during the Conference. It was dedicated to the analysis of practical examples in which the appropriation and restitution of the scientific archives correspond to a fresh pioneering projection of the work on catalogues of sciences.

Through a «cooperative exercise» of reflection, during the workshop, we tackled methodologies for sharing scientific knowledge, employing software dedicated to research corpora management, and finally developing an effective interdisciplinary approach. Moreover, a focus on balances between Western and « other cultures » approaches to Science has led to the pin of possible reconstruction of a multi-perspective History. While asserting the possibility of generating new fields of scientific comprehension and mastery, the theoretical instances proposed by the different speakers in the field of Humanities management and training became powerful sources of inspiration. They supported the debate around how to smartly manipulate heritage objects, how to disseminate and exhibit the results of their employment, and how to make them useful for entrepreneurial projects.

Indeed, a lot of interest needs to be accorded to the presentations of Pascal Vallet as the chief member of the *Pasam* research start-up; the media-communication expert Ákos Gocsál; and the digital researching Equipe *Corpucit,* led by Christophe Parisse and Driss Sadoun. All of them highlighted conceptual instances and proposed practical tools for better-managing heritage institutions as well as networking and *handling* the collective heritage across the multiple global transitions.

1. Pascal Vallet, Professor of Sociology at the University of Paris Nanterre, told about *Pasam*, a tool for exploring film corpora that he conceived as digital and analytic software. It can be used to encode, explore and analyse large corpora of films or moving images by associating film segments with words, shapes or dynamics. Also, the tool

offers the possibility of putting into context discursive statements, motifs and movements. The results of these explorations are informed in concordance with charts, graphs and histograms, as well as animated factor maps and film montages adjusted by statistical calculation. The tool is currently used to produce statically scripted films, the rapid de-rushing of audiovisual interviews and the exploration of social networks (Instagram), but it was originally designed to explore audiovisual archives.

2. Ákos Gocsál, Linguistic and Educational Science Professor in the Faculty of Music and Visual Arts of the University of Pécs, illustrated the case of the *Hungarian Newsreel Archive* used in Linguistic Studies. He explained how modern-day media archives digital repositories of radio and television programmes, newsreels, movies, and other similar content. The *Newsreel Archive of Hungary*, containing newsreels made between 1913 and 1991, is one of these repositories. It is available online (www.filmhiradokonline.hu) and can be used for educational and research purposes for free. This archive can support research in social sciences, with a focus on linguistics and provides a unique insight into the life of the people who lived decades or even a century ago. A systematic analysis of the newsreels made in 1931 and 1932, carried out by Ákos Gocsál, revealed that those newsreels did not only report on political events, but showed several aspects of everyday life, such as work, holidays, or traditional events. Further analysis of those news stories may be a valuable addition to current research on that period. Also, because in 1931 sound newsreels appeared, this element allows the analysis of the spoken language of those days. This may be a contribution to a better understanding of longitudinal changes in the language and the link between archives and History. Furthermore, a sociolinguistic analysis of the recordings may even help us better understand social relationships in that period. Again, research revealed that the early sound newsreels did not only include oral readings by announcers, but many other speaking styles, even conversations in spontaneous situations, not recorded and observable otherwise. It would be a great support for drafting a political and social overview of that historical moment. With this presentation results in this peculiar field have been discussed, also by illustrating news stories, research methods and future academic directions as well.

3. Christophe Parisse, a research fellow at the CNRS-Paris Nanterre University, and Driss Sadoun, a research fellow at INALCO (Research Institute France), cooperated to create *CORPUCIT*, is a software providing a set of tools to facilitate the citation of corpora or extracts from corpora. Because languages of corpora are widely used in scientific research, they become essentially very deep objects of the research and sources of emblematic data within the use of a particular scientific language. Referring to an existing corpus is quite easy and is very similar to the academic citation practices of scientific references. On the contrary, the citation of a particular extract or example of a given corpus is not an easy task for researchers and archives matters analysis. Indeed, corpora do not have page or line numbers as printed texts and books have. Yet the content of the citation of an extract is very important in a research

process to allow scientific control and reproducibility. The CORLI consortium is currently developing a methodology and several tools that would allow us to generate “examples extracted from a corpus”. They come with information and specific support such that they can be controlled, used, reused, and findable by archiving and searching tools. These three presentations offered to the Alliance public, and the partners related and invited in the initiative, are valuable keys for implementing research about digital archives management. In conclusion, during the UPN meeting, we could discuss how digital resources can be made available and most profitable for EDUC goals crossing transfer technology and virtual research in the cloud. Also, by involving entrepreneurship, trainers and researchers in this peculiar field, we can finally state the emergence and the necessity of a research network for developing the re-use and the valorisation of scientific materials, stored within new interactive archives of sciences.

The question of reuse of scientific archives is timely and concerns all researchers at a time when opening research data becomes a European requirement. The possible reuses of such data justify the effort of rendering research data available beyond the narrow sphere of local collaborations. Thus, following the conference on the reuses of scientific archives co-organised by EDUC and the MSH Mondes on the 29-30th of November 2023, several proposals of further actions around scientific archives that involve colleagues from the EDUC universities have emerged. Meanwhile we underlined the possibility to link universities’ research infrastructure that hold scientific archives to research initiatives coming from EDUC partner universities that could make use of their university facilities and expertise in joint collaborations. The initiatives were confronted with the funding opportunities within the EDUC-WIDE project (cluster on Open Science and Cluster on Research Infrastructures) and with the other European funding schemes around the opening of research data

The needs expressed by researchers were for:

- a discussion on Open Research Data, domain by domain
- a need for relating different domains/categories of archives
- the need to get behind the scenes and get interested in the management of archives before envisaging the reuse of archives – necessary link to archives centers (in Nanterre for instance this would naturally involve MSH Mondes and La Contemporaine)
- the need for methodology, technical help and multidisciplinary vision before putting individual research archives in online access
- send feedback from the opening of archives experience to law experts, so that they enrich or adjust legal frameworks.

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Two subthemes linked to digitalization emerged: the management of scientific archives that are born as digital objects and the ecological issues linked to digital archiving. They would be the subject of workshops before further development.

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List of annexes

Cybersecurity Technology Transfer

Report

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Introduction

This report describes cybersecurity technology transfer ecosystems explored within the Task 4.2 of the EDUC-SHARE project. The report starts with a comprehensive description of cybersecurity technology transfer landscapes at three universities from the consortium that provided us with the outline of these landscapes: the University of Cagliari, Masaryk University, and the University of Rennes. This description brings valuable insights into each university's contexts and key stakeholders concerning technology transfer.

The next part of this report is dedicated to the results of a survey among the EDUC universities: University of Cagliari, Masaryk University, University of Rennes, University of Postdam, Jaume I University, University Paris Nanterre, University of Pecs, and University of South-Eastern Norway. The survey aimed to identify the non-academic stakeholders involved in cybersecurity research and applications. The survey results have provided valuable insights into current opportunities and challenges faced in the cybersecurity technology transfer from the point of surveyed stakeholders. The survey focused on several areas, including awareness about technology transfer, potential and experience with practical applications of achieved scientific results, their attitudes towards results applicability, and education and support for practical applications of achieved results, also considering specifics related to technology transfer in cybersecurity. The full text of the survey questionnaire is in the Appendix. The report concludes by emphasizing identified areas for improvement.

Cybersecurity Technology Transfer Ecosystem

This section describes the cybersecurity technology transfer ecosystem centered around three universities from consortium that provided its cybersecurity technology transfer descriptions, their key players and namely crucial external stakeholders. We also include brief descriptions of pivotal events and assessment of the purposes of the engagement of the external partners in the ecosystem.

University of Cagliari

Academic research on cybersecurity at the **University of Cagliari** involves two departments: the **Department of Electrical and Electronic Engineering (DIEE)** and the **Department of Mathematics and Computer Science (DMI)**. The main research topics at DIEE are in the fields of Machine Learning Approaches to Cybersecurity, Security of Machine Learning, Malware Analysis, Malware Detection and Classification, Network Security, Computer Forensics, Data Protection, Cyber Risk Management, Biometrics, Deep Fake Detection, Video Surveillance, Person Re-identification and Security of Industrial Control Systems. The majority of activities on cybersecurity at DIEE are carried out within the **PRALab** (https://sites.unica.it/pralab) and the **Net4U** (https://sites.unica.it/net4u/) research groups. The main research topics at DMI are in the areas of Cryptography, Data privacy, Blockchain and Distributed Ledgers, Smart Contracts, that are carried out within the **Trustworthy Computational Societies** (https://tcs.unica.it/), the **Blockchain** (https://blockchain.unica.it), and the **Agile** (https://www.agile-group.org/en/) research groups. More than forty people work on these topics including faculty members, post-docs, PhD students and research associates.

Academic research on cybersecurity at the University of Cagliari started at the beginning of the new millennium as a key topic of mutual interest between the University and the new companies in the IT sector that were founded in the region of Sardinia. One of these IT companies was established as a joint initiative between a bank and an oil refinery. Both were interested in the development in the IT sector, and cybersecurity was a key enabling factor. As part of the budget of the new company was allocated to research initiatives, the University of Cagliari was involved to figure out relevant research topics with high industrial impact. This early experience opened the way not only to join the national and international scientific community in cybersecurity, but also to start cooperation with other companies.

Cagliari has been a pioneer in the developing WWW market in the ‘90s, **leading to the establishment of Tiscali, one of the first Italian ISPs, in Cagliari**. Collaborations with the University of Cagliari started soon, and cybersecurity was one of the common research topics. Tiscali funded some PhD positions, co-organised two national workshops on cybersecurity held in Cagliari and carried out two research and development projects with the University of Cagliari funded at the national and EU level, respectively.

These early initiatives had two main goals. On one hand, they allowed the University of Cagliari to start a new research topic on cybersecurity, publish papers on relevant venues, and establish a network of academic relationships. On the other hand, researchers acknowledged that results from cybersecurity research should be put into practice for the safe deployment of computer and Internet services. The one-day workshops organised in 2007 and 2008 targeted small and medium enterprises to raise their awareness and stimulate them to bring security-

by-design approaches in their activities to be prepared to an increase in the impact of cyber related incidents.

It turns out that research in cybersecurity at the University of Cagliari was focused on technology transfer since the early days due to the strong connection with local companies, later expanded to national and international companies. These activities allowed the University of Cagliari to build the CyberRoad consortium that was one of the beneficiaries of EU funding under a CSA call. The **CyberRoad project** (https://www.cyberroad-project.eu), coordinated by the University of Cagliari, was carried out **between 2014 and 2016 and involved 20 partners including research entities, public and private companies**. This action further strengthened the technology transfer approach in cybersecurity, thanks to the local events organised in Cagliari, such as the **Italian Security Summit in 2015**. During the past decade, local companies had the opportunity to carry out research and development projects with the University of Cagliari thanks to local fundings that allowed provision of training to small and medium companies on relevant cybersecurity tools and best practice. Strong connections with local and national companies have been established in terms of internships related to the Master thesis projects, co-funding of PhD positions, and participation in competitive calls for industrial R&D project proposals.

In the past decade the local ecosystem of companies in the ICT sector, such as service providers, software developers, and cybersecurity consultants, has grown and expanded, thanks to the pioneer initiatives at the end of the '90s, and thanks to the MSc and PhD programs at the University of Cagliari that provided for the expertise needed by the local companies to stay competitive in the national and European market. Not only the number of companies increased, but also their interest and activities in cybersecurity that is now regarded as a key element for providing products and services to the market.

The establishment of the **MSc program in Computer Engineering, Cybersecurity and Artificial Intelligence** in 2018 had the effect of providing many opportunities for us to participate in technological transfer thanks to the increased number of alumni students working in local companies. They had the opportunity to learn about the competitive advantage in partnering with the University to offer improved services based on strong methodological basis. Local companies are also funding or co-funding PhD positions with the aim to co-develop with the University innovative methodologies and tools that can have significant positive impact on their operations.

Since 2019 the University of Cagliari is **one of the Italian centres for the Cyberchallenge**[1] **training and competition program**. This training program is organised at the national level by the **National Cybersecurity Lab**[2] of the Italian Consortium for Informatics (CINI). Each year 20 students aged 16-24 are selected to participate in the 3-months training program. A final attack-defence competition between the participating universities allow participants to learn how to cope with cyber-attacks and respond. Local companies are involved though sponsorships and the presentation of their activities to students, thus providing an additional opportunity for the University to networking with companies.

[1] Cyberchallenge.it
[2] Cybersecnatlab.it

In the past ten years, two spin-off companies of the University of Cagliari have been also established on cybersecurity related topics with the aim of transferring knowledge and competencies in the market. These companies bring the methodological rigor of academic research with the need to provide impact to the market. Their presence in the local ecosystem further nurtures the possibility for the University to transfer the technology.

Since the beginning of the activities on cybersecurity, **strong connections have also been made with the Regional Administration and Police and Military forces**. This collaboration is another pillar of the local ecosystem, as the posture on cybersecurity of the regional administration also depends on the local availability of research and development initiatives, both for direct collaboration between the University and the administration, but also with local companies that represent the operational bodies that carry out most of the activities.

All the above actions are supported by the University of Cagliari through the **Division for Research and Regional Relations** (https://www.unica.it/it/ateneo/organizzazione/organo-di-gestione/direzioni-coordinamenti-e-settori/direzione-ricerca-e) **and its Liaison Office**, and the **CREA centre** (https://crea.unica.it/). In the past few years, technology transfer has also benefited from national fundings that allows companies to co-fund PhD positions on topics of their interest. PhD candidates applying for these positions will work on joint research and development projects between the University and a company. **The Regional Administration of Sardinia through the "Sardinia Research" agency provides funding for joint actions** of the University and local companies, including the attraction of new companies and the support to start-up companies.

Masaryk University

Technology Transfer Office of Masaryk University (TTO MUNI: https://www.ctt.muni.cz/en) embodies an institutional platform for the application of research results at Masaryk University and provides support and overall conditions for the transfer of knowledge and technology into practical use. It manages the whole intellectual property of Masaryk University, cooperates in its identification, protection and commercial exploitation (license provision, establishing spinoffs, consulting for application, contract research) in accordance with Masaryk University rules and standards.

TTO MUNI is an **integral part of the regional framework**. Entrepreneurial activities, development of technology and start-up companies, business incubation and courses and training for innovative entrepreneurship are implemented **in close cooperation with the Innovation Centre of the South Moravian Region**. TTO MUNI helps transfer technology and know-how from academia to business and industry including entering into licensing agreements, setting up start-ups or collaborating with established companies.

TTO MUNI also supports the transfer of knowledge into practice through direct financial support. It allocates resources for the industrial and legal protection of selected inventions (e.g. by patenting) and introduces incentive rules for rewarding originators. Along with modern trends, it supports promising technologies in an early stage of development by securing appropriate financial resources necessary for the development or verification of the functionality of these technologies (a.k.a. Proof of Concept). **Masaryk University has set up all the internal processes to support establishing spin-offs**. This activity is centralised and provided by the MUNI TTO and external collaborators.

One of the most successful spin-off companies in which Masaryk University had a stake is Flowmon Networks a.s., a successful IT company developing technologies for computer network management and security, founded in 2007 as a university spin-off. During its existence, the company has earned a strong position in the field of information technology thanks to quality of its products, has become attractive to investors and has begun to take steps towards global expansion. The sale of the company in 2020 then proved to be one of the possible, and ultimately the most strategically advantageous, paths to help the company expand into the US. The company was bought by Kemp Technologies, an American company that wants to further develop Flowmon Networks' innovative products not only in the US and continues to work with academia.

Currently, **Masaryk University is a member of a working group within the Innovation Strategy 2019–2030 The Country for the Future** (Pillar III - National start-up and spin-off environment) governed by the CzechInvest agency and the Ministry of Industry and Trade. This working group strives to create a motivating environment for establishing spin-offs. In view of the current discussion, Masaryk University is changing its approach to the process of establishment and functioning of the spin-offs, including the possibility of entry of potential investors or direct involvement of the scientists.

Also, TTO MUNI organises Business Research Forum (https://www.ctt.muni.cz/en/services/business-research-forum-2023) usually every two years.

The aim of the event is to connect the university environment with the application sphere and to present Masaryk University's readiness for mutual cooperation.

TTO MUNI is involved in defining the ethical aspects of cybersecurity research and works with regulators and lawyers to ensure compliance with relevant laws and standards. TTO MUNI brings academia together with industry and government to jointly address cybersecurity threats and challenges. This can lead to greater synergy and better coordination in the fight against cyber threats.

Association of Industrial Partners FI MU

The Association of Industrial Partners (SPP FI MU) (https://www.fi.muni.cz/for-partners/index.html.en) has a long tradition at the Faculty of Informatics, Masaryk University. Since 2007 it has been supporting companies' cooperation to achieve the best possible results in the field of computer science and information technology.

The Association of Industrial Partners in 2022 worked with **30 companies** in three categories of cooperation (Strategic partner, Partner, and SME partner), connects scientists with students in the field of research, teaching, supports PhD students and engages in further related activities. **Cybersecurity** has been one of the core topics for the industry-academic collaboration, with the following companies involved (in 2022):

Strategic Partners (out of 4 in total):
- InvaSys a.s.
- LEXICAL COMPUTING CZ s.r.o.
- Red Hat Czech, s.r.o.

Partners (out of 8 in total):
- Honeywell, spol. s r.o.
- MONET+, a.s.
- Oracle Czech s.r.o.
- Y Soft Corporation, a.s.

SME Partners (out of 18 in total):
- NXP Semiconductors Czech Republic s.r.o.
- Progress
- Safetica Services, s.r.o.
- Setco Technology Solutions, s.r.o.

Mutual cooperation of faculty with companies is realized, among others, in the form of setting **thesis topics** and co-supervision. The number of successfully defended theses has become one of proved indicators of the intensity of cooperation between the faculty and the industrial partners. Nearly 100 theses co-supervised with industry partners are successfully defended annually. Part of this activity is the **Competition for the best final theses in the field of IT security**, in which winners receive scholarships supported by the industrial partners.

Furthermore, the **Day with Industrial Partners** is a one-day interactive event (held twice a year) allowing attendees to learn more about the cooperation of the Faculty of Informatics,

Masaryk University with industry partners under the auspices of the Association of Industrial Partners (SPP). They get a chance to learn about the possibilities for getting involved in the offered activities via talks, panel discussions, presentation at booths and workshops for students.

Another area that has seen a recent increase in the Faculty of Informatics, Masaryk University cooperation with companies are **internships**. Over a half of the internship placements within the study programmes, namely 96 internships, have recently been internships with SPP partners. Internships are a mandatory part of 4 study programs at the Faculty of Informatics, Masaryk University – 2 at Bachelor and 2 at Master level.

CERIT FI MU

CERIT (https://cerit.fi.muni.cz) at the Faculty of Informatics, Masaryk University is an IT education, research and innovation centre focused on building a resilient digital society in cooperation with the public sector and industry **within the framework of the CyberCampus^{cz}** (https://www.cybercampus.cz). It coordinates, among others, **National cybersecurity competence centre NC3** (https://nc3.cz) and activities with the **CyberSecurityHub^{cz}** (https://www.cybersecurityhub.cz/en), and provides access and services within **CERIT Science Parks I and II** (https://www.cybercampus.cz/en/be-part-of-it/cerit-science-parks/).

The **CyberCampus^{cz}** aims to build a cooperative community in the field of cybersecurity, taking advantage of the **strategic location of Brno, which is home to**

- **key companies** (among others clustered and supported by the **Brno Regional Chamber of Commerce** (https://rhkbrno.cz/en/)),
- **public institutions** (e.g. the National Office for Cyber and Information Security (https://www.nukib.cz/en/), the Czech Army and its National Cyber Defence Centre (https://www.ncko.cz/), the Constitutional Court of the Czech Republic, the Supreme Court of the Czech Republic, the Supreme Administrative Court of the Czech Republic, the Office for Personal Data Protection (https://uoou.gov.cz/en), the Office for the Protection of Competition (https://www.uohs.cz/en/homepage.html) etc.) **and**
- **research, education and innovation institutions** (Masaryk University (https://www.muni.cz/en), Brno University of Technology (https://www.vut.cz/en/), University of Defence (https://ud.unob.cz/), Mendel University in Brno (https://mendelu.cz/en/) etc.).

National cybersecurity competence centre NC3 is a cooperative research centre implementing sub-projects focused on the application of key research results into practice. It is a centre composed of research organisations (Masaryk University, Brno University of Technology and Czech Technical University in Prague (https://www.cvut.cz/en)) and companies operating in the field of cybersecurity. These partners carry out applied research projects, for example in the fields of energy, healthcare or education, in order to implement innovations in cybersecurity.

CyberSecurityHub[cz] was established by three Czech universities leading in the area of cybersecurity (Masaryk University, Brno University of Technology, Czech Technical University in Prague) to promote cooperation between the research and application spheres. It is:

- a **National Coordination Centre within the European Cybersecurity Competence Centre network** (https://cybersecurity-centre.europa.eu/index_en),
- a **European Digital Innovation Hub in the field of Cybersecurity** (https://european-digital-innovation-hubs.ec.europa.eu/edih-catalogue/cih-0),
- a **future Conformity Assessment Body within the European Cybersecurity Certification Scheme** (https://certification.enisa.europa.eu/) and
- a coordinator of research cooperation between the founding universities (Masaryk University, Brno University of Technology, Czech Technical University in Prague).

CERIT Science Parks I and II offer a total area of 20,000 m^2 of office space for innovative companies and IT start-ups with a focus on cybersecurity that are interested in cooperating with the research community under the auspices of the CyberCampus[cz] initiative. The parks are home to branches of world-renowned companies such as AT&T or Red Hat, but also to promising startups that receive support in the park for their start-up and branding.

University of Rennes

Technology transfer in cybersecurity in Rennes is facilitated through various organizations and initiatives that focus on bridging the gap between research and practical application. These efforts aim to transfer innovative cybersecurity technologies and knowledge from research institutions to industry and society. Here are some key aspects of technology transfer in cybersecurity in Rennes:

- **Technology Transfer Offices:** Research institutions and universities in Rennes have technology transfer offices that support researchers in commercializing their innovations. These offices assist in patenting, licensing, and spin-off creation, ensuring that cybersecurity technologies developed in academia can be effectively transferred to the market. Ouest Valorisation (https://www.ouest-valorisation.fr/) is the technology transfer organization put in place by the French Government, specifically covering the regions of Brittany and Pays de la Loire.

- **R&D Centres and Laboratories:** Rennes is home to renowned research centres and laboratories, such as IRISA/Inria (https://www.irisa.fr/en) and IRMAR (https://irmar.univ-rennes.fr/en), which conduct cutting-edge research in cybersecurity. These institutions collaborate with industry partners and facilitate technology transfer by sharing their expertise, findings, and developed technologies.

- **Innovation Hubs:** Rennes has innovation hubs, such as Images & Réseaux (https://www.images-et-reseaux.com/), which actively promote technology transfer in various domains, including cybersecurity. These hubs facilitate collaboration between startups, research organizations, and industry players, providing resources, mentorship, and networking opportunities to accelerate the transfer of cybersecurity technologies.

- **Incubators and Accelerators:** Rennes hosts incubators and accelerators, such as Le Village by CA (https://www.villagebyca35.com/) and Rennes Atalante (http://www.rennes-atalante.fr/), that specifically focus on supporting technology startups. These programs provide a supportive ecosystem, mentorship, funding, and access to networks, fostering the transfer of cybersecurity technologies from early-stage research to viable commercial products.

- **Collaborative Projects and Funding:** Collaborative projects funded by public organizations, such as the National Research Agency (ANR) and the European Union, play a crucial role in promoting technology transfer in cybersecurity. These projects bring together academic researchers, industry partners and end-users, enabling the practical application and validation of cybersecurity technologies.

Overall, Rennes benefits from a vibrant ecosystem that promotes technology transfer in cybersecurity. Through collaboration, support programs, and funding opportunities, the cybersecurity ecosystem facilitates the transformation of research advancements into real-world solutions, strengthening the cybersecurity landscape locally and beyond. Here are some examples:

- **Pôle d'Excellence Cyber (PEC)** (https://www.pole-excellence-cyber.org/): The PEC brings together regional stakeholders, including companies, research laboratories, and public institutions, to promote excellence in cybersecurity. It aims to strengthen skills, research, innovation, and cooperation in the field of cybersecurity.

- **Bretagne Développement Innovation (BDI)** (https://www.bdi.fr/fr/accueil/): BDI is an economic development agency that provides support to companies and innovative projects in Brittany, including cybersecurity. BDI facilitates access to funding, encourages collaboration among ecosystem actors, and promotes the growth of cybersecurity in the region.

- **Le POool** (https://lepoool.tech/) is an organization based in Rennes that supports and accelerates innovative projects in various sectors, including cybersecurity under **CyberBooster Programme** (https://lepoool.tech/cyber-booster/). It acts as an intermediary between startups, research laboratories, and companies, helping them to develop and commercialize their products and services. Le POool provides mentoring, expertise, networking opportunities, and access to funding to help startups and entrepreneurs in their journey.

These structures, along with other initiatives and actors, contribute to supporting the development of cybersecurity in Rennes by promoting research, innovation, cooperation, and awareness in this critical field.

Cybersecurity Technology Transfer Ecosystem Questionnaire

To better understand stakeholders involved in cybersecurity research and its applications and to explore the related ecosystems, we surveyed universities from the consortium. The survey was designed jointly by the EDUC-SHARE T4.2 team. A **workshop on Cybersecurity TT Landscapes** organized as part of the Cyberspace conference at MUNI in Brno on 26 November 2022 facilitated discussions on the contents and format of the survey. The final questionnaire included the following topics (the complete questionnaire is in Appendix):

- **Demography and background**
- **Awareness about cybersecurity TT at a selected institution**
- **Potential and experience with practical applications**
- **Attitudes towards practical use**
- **Education and support for practical applications**
- **Cybersecurity TT specifics**

Relevant stakeholders were invited to participate in the survey. The survey was **anonymous and confidential**, and the questionnaire contained no personal information (except for the first five questions, which helped contextualize the data). The data from the questionnaire were used for the purposes of the survey only. Participants spent **around 20 minutes to fill in** the questionnaire. Data were **collected from mid-March to May 2nd 2023**.

In total, **149 participants indicated the intention to complete the survey**. However, 34 of them did not complete the filling in of the questionnaire, so their data were excluded from the analysis. We achieved **complete answers from 115 participants**. More details are shown in **Table 1**. Due to the low number of participants from the University of Potsdam, Jaume I University, University Paris Nanterre, University of South-Eastern Norway and University of Pecs, we merged the data from these universities into one group („**Others**“) and compared the answers from this group with feedback from the **Masaryk University** (41 filled-in questionnaires), the **University of Rennes** (22 filled-in questionnaires) and **University of Cagliari** (26 filled questionnaires), since we achieved higher numbers from these three universities. **All the results in the following text are presented for these four groups.**

The conclusions from the survey were again jointly discussed by the EDUC-SHARE T4.2 team at the “**Workshop on Cybersecurity Technology Transfer Ecosystems Questionnaire’s results**” hosted by University of Cagliari on 5-6 June 2023. The workshop wrapped up the survey results and strengthened the emerging links within the EDUC cybersecurity research community through personal engagement.

Table 1: Number of participants

		ALL CASES - PASSES THROUGH THE QUESTIONNAIRE		***CASES FINISHED AT LEAST 1/4 OF THE QUESTIONNAIRE***		
University		Frequency	Percent	Frequency	Percent	Dropped
MU	Masaryk University	54	36.2	41	35.7	13
UP	University of Potsdam	1	0.7	1	0.9	0
UJI	Jaume I University	5	3.4	3	2.6	2
UPN	University Paris Nanterre	4	2.7	2	1.7	2
UR1	University of Rennes	28	18.8	22	19.1	6
PTE	University of Pecs	16	10.7	13	11.3	3
UniCa	University of Cagliari	32	21.5	26	22.6	6
USN	University of South-Eastern Norway	9	6.0	7	6.1	2
	Total	149	100.0	115	100.0	34

Demography and background

To better understand the context of collected answers, some demographic data regarding gender and age were collected about the participants. Regarding gender, male participants to the questionnaire were prominent in **Masaryk University** (MU), **University of Rennes** (UR1) and **University of Cagliari** (UniCa), making up 82-85%. However, the gender distribution was different by the participants from the remaining universities (**Others**), with only 50% participants indicating male gender. Regarding age, the **mean age ranged from 36.5 to 42 years**. See **Table 2** for more details. With the standard deviation marked as SD.

As for their background, participants **worked on average for about 10 to 15 years in research or other positions at their university.** More details are provided in **Table 3**.

Table 2: Gender and age distribution.

Gender	Males	Females	Others	Missing
MU	N=35 (85%)	N=6 (15%)	0	0
UR1	N=18 (82%)	N=4 (18%)	0	0
UniCa	N=22 (85%)	N=4 (15%)	0	0
Others	N=13 (50%)	N=11 (42%)	1 (4%)	1 (4%)

Age	Mean	SD	Min	Max
MU	36.5	8.6	25	57
UR1	42	10.8	24	61
UniCa	39	12.7	24	62
Others	42	12.1	22	64

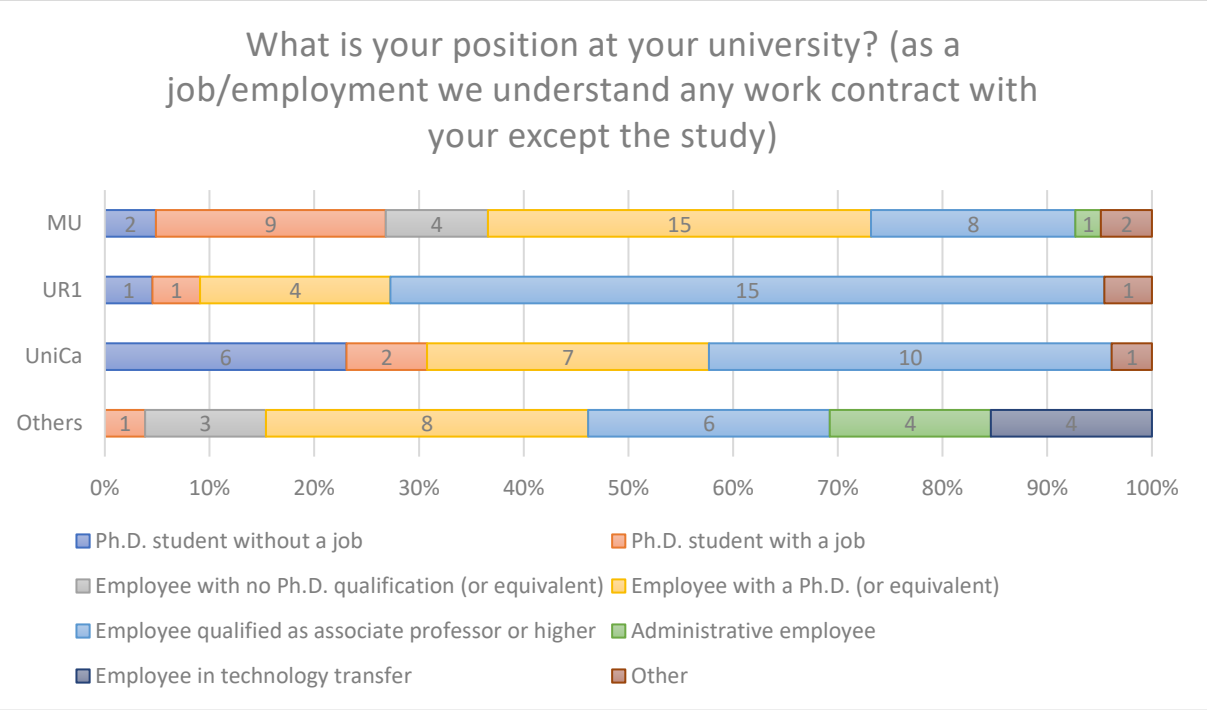
Table 3: Length of working at university.

Lenght of working	Mean	SD
MU	10	8.6
UR1	14	10.8
UniCa	12	10.6
Others	15	9.2

Regarding university positions, most participants were employees with a PhD degree or higher. Masaryk University and University of Cagliari had a similarly significant number of PhD students responding to the survey in contrast to University of Rennes and the remaining universities, where only a few PhD students responded.

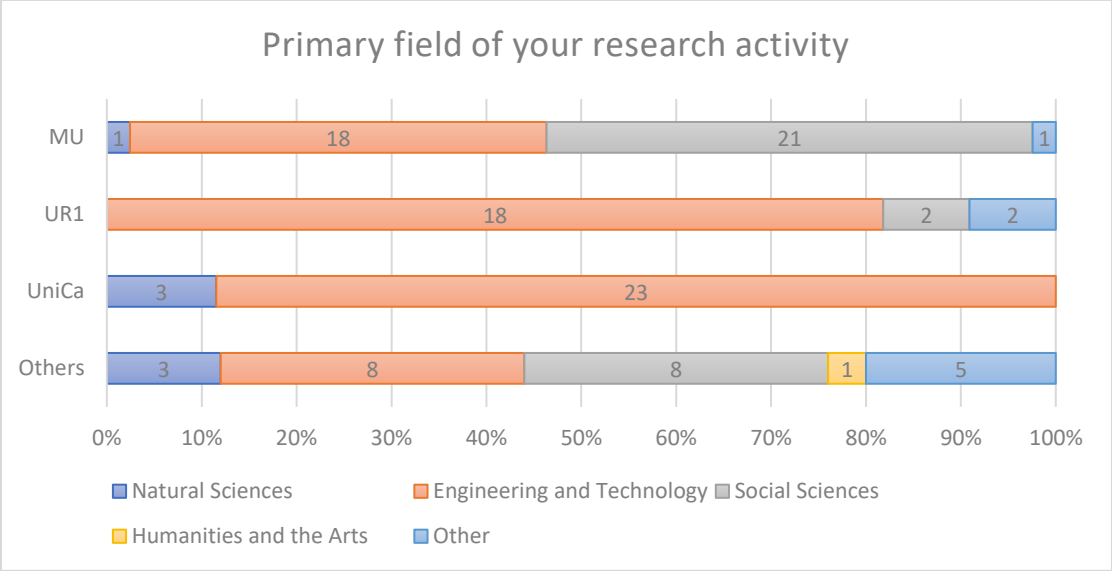
Most of the participants who finished the questionnaire at the remaining universities were from administrative and technology transfer departments, which differs from the more comprehensive Masaryk University, University of Rennes and University of Cagliari results. See **Figure 1** for more details.

Figure 1: Positions at universities.



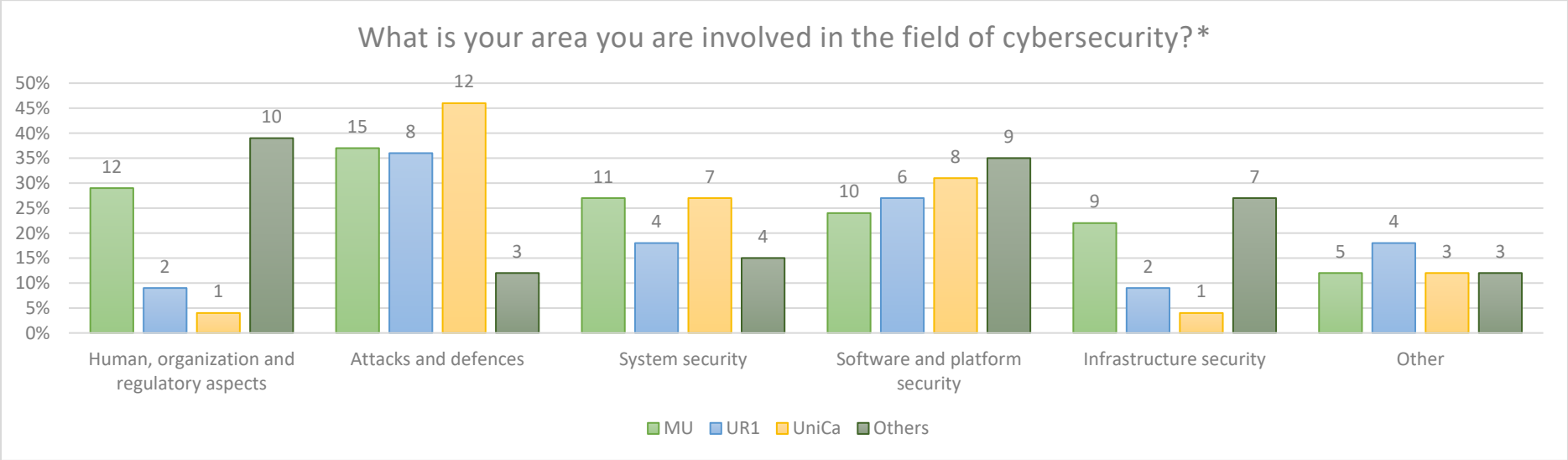
Overall most of the participants (especially at University of Rennes and University of Cagliari) focus their research activities on engineering and technology. At Masaryk University (as well as the remaining universities, which is, however, likely given the different composition of respondents as to their position at the university) participants with focus on social sciences were significantly represented. Most participant did not focus on natural sciences, humanities/arts or other fields of research. See **Figure 2** for more details.

Figure 2: Primary filed of research activity.



Majority of the respondents from Masaryk University, University of Rennes and University of Cagliari are involved in **attacks and defences**, **software and platform security** or **system security** areas of cybersecurity. At Masaryk University, a number of respondents, who filled-in the questionnaire also deal with **human, organisational and regulatory aspects** or **infrastructure security.** As for the remaining universities, most of their responses came from personnel focused in cybersecurity on **human, organisational and regulatory aspects, software and platform security** or **infrastructure security**. The participants could also specify another area that does not fall under the listed categories, and two other areas were reported: some participants from Masaryk University and University of Rennes focus on cryptography in cybersecurity and some from University of Cagliari on artificial intelligence and cybersecurity. See **Figure 3** for more details.

Figure 3: Focus in the field of cybersecurity.



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Awareness about cybersecurity TT at a selected institution

The aim of this section of the questionnaire was to determine the respondents' knowledge of forms of technology transfer in general. This section is part of the measurement of the link between the level of familiarity with infrastructure and the actual activity.

Regarding awareness, more than half of the overall participants heard about their university sites which deal with intellectual property protection or technology and knowledge transfer. The particularly high percentage of positive answers from the remaining universities can come from the disproportionately higher participation of persons with role in the administration or technology transfer offices, as compared to Masaryk University, University of Rennes or University of Cagliari composition of respondents. See **Figure 4** for more details.
Also, in each group, more than half of the respondents are aware about the scope of activity of the office of knowledge and technology transfer. Similarly to the previous question, the composition of the respondents who filled-in the complete questionnaire should be considered. See **Figure 5** for more details.
The awareness about the cybersecurity technology transfer in particular was significantly lower; three groups exceeded 20 % positive response (not in case of University of Rennes with only 2 respondents out of 22 being aware of such activity), but only at University of Cagliari did the positive answers make more than 30%. See **Figure 6** for more details.

Figure 4: Awareness about university knowledge and technology transfer sites.

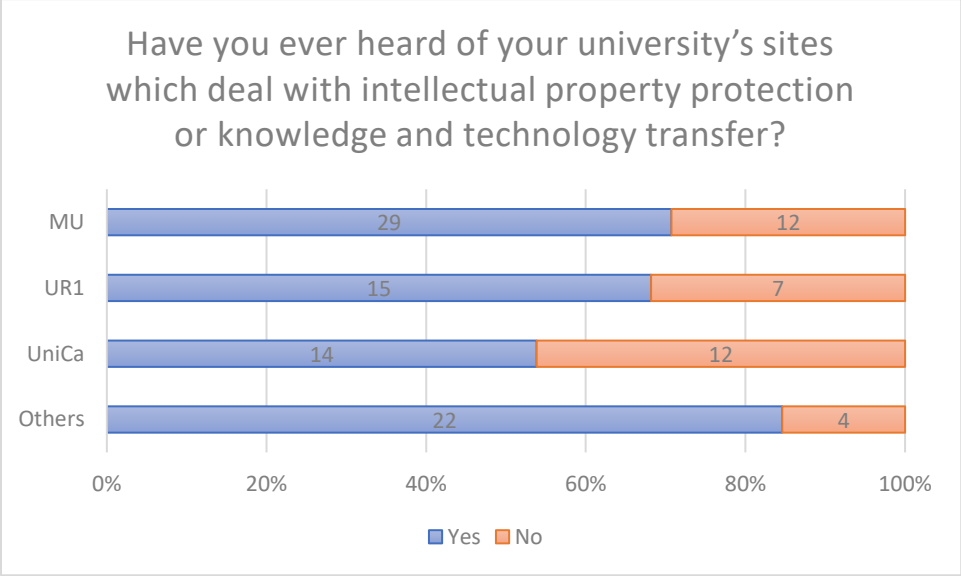

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Figure 5: Awareness about scope of activity of knowledge and technology transfer offices.

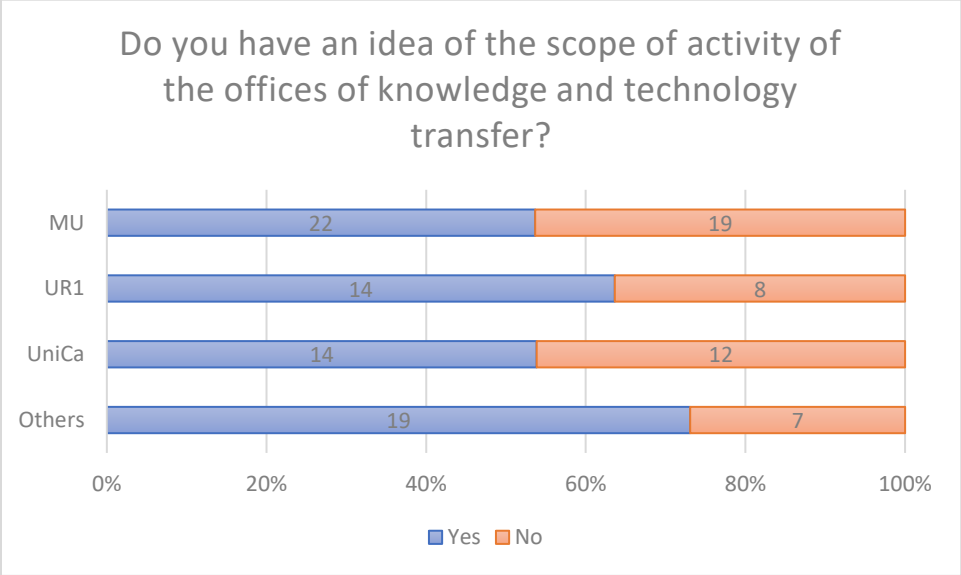
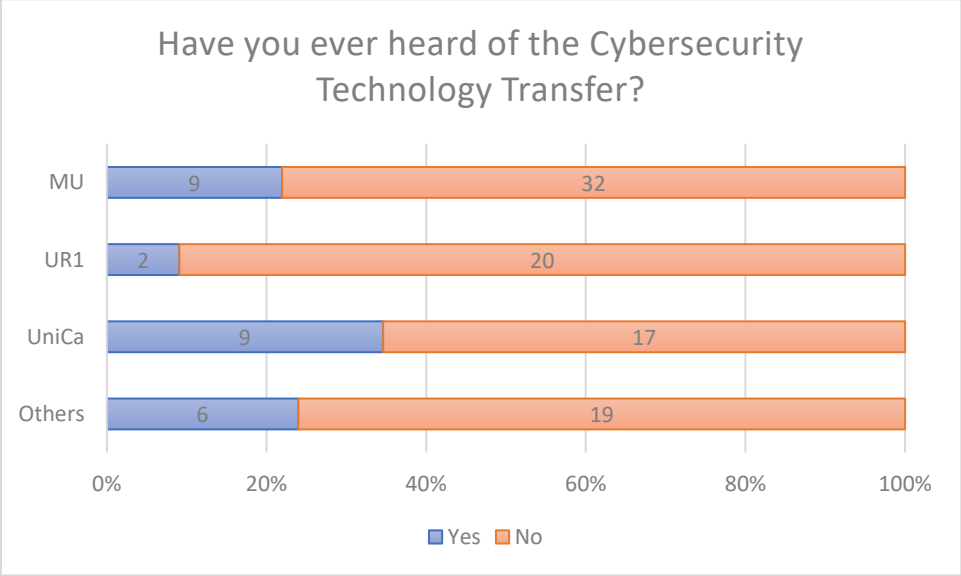


Figure 6: Awareness about Cybersecurity Technology Transfer.



Even though there is awareness about technology transfer across the universities participating in the survey, there seems to be significantly less awareness about specifically technology transfer in the field of cybersecurity. There also seems to be less available support in this regard compared to technology transfer in general. Participants often reported that they struggle with cybersecurity technology transfer because of its difficulty and time-consumption of the process. There also seems to be often no university coordinator for cybersecurity technology transfer.

Here are provided selected examples of what participants reported they missed within the offer of the various offices for the transfer of technologies and knowledge at their university to support cybersecurity applied research or collaboration:

- *"Its propagation to junior academics (incl. PhD students)…"*
- *"...guided teamwork / monetary increments."*
- *"Resources for implementing prototype (people/skills/money)."*
- *"... the performance metrics, the incentive system, the too high teaching load, the lack of recognition of transfer activity.."*
- *"Efficiency. Clarity."*
- *"Simplicity and responsiveness."*
- *"Project management and coordination between university and partner."*

Potential and experience with practical applications

This section of the questionnaire aimed to determine the potential and opportunities of practical applications and respondents' experience with practical applications. It starts with mapping the extent of tasks within participants' university activities to understand better how participants perceive applied research next to other university activities. Then, the application possibilities of cybersecurity research results are explored. This is followed by actual results applicability and vision of such application. Since some participants could experience the practical application of their results, the way their results were used in practice is explored as well. This section concludes with a description of the application into practice, usually done via collaboration with other entities.

We focused on the following university activities:

- **basic research** or research where the results are not directed towards immediate application (**Figure 7**),
- **applied research** where the results are practically utilized and the authors have at least information about this use (**Figure 8**),
- **teaching** (**Figure 9**) and
- **other activities** (**Figure 10**).

Overall, the participants who filled-in the questionnaire seem to spend their time with all of the above-listed activities (sometimes to often), with no great differences between the four groups. Regarding the extent of tasks within a participant's university activities, there were differences between the time they currently spent with the activities and the extent they were willing to spend with them. Participants would like to spend more (or at least the same) time with basic and applied research and less time (or at least the same) with teaching and other activities.

The following figures provide detailed mapping of the activities distribution by the participants and their preferences.

Figure 7: Extent of tasks within basic research: the first graph shows the current devotion to basic research and the second preferred devotion to basic research.

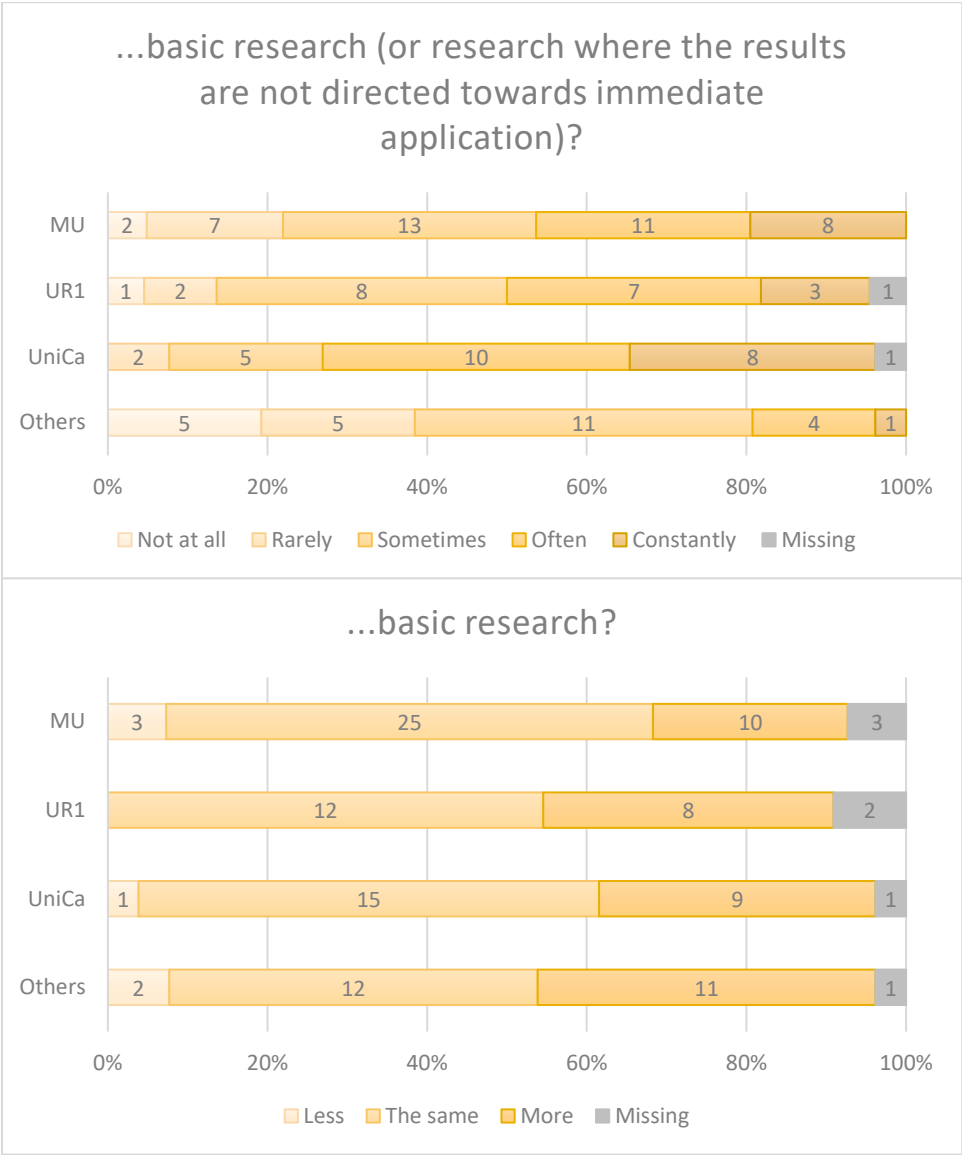

...basic research (or research where the results are not directed towards immediate application)?
MU
UR1
UniCa
Others
2
7
13
11
8
1
2
8
7
3
1
2
5
10
8
1
5
5
11
4
1
0%
20%
40%
60%
80%
100%
Not at all
Rarely
Sometimes
Often
Constantly
Missing
...basic research?
MU
UR1
UniCa
Others
3
25
10
3
12
8
2
1
15
9
1
2
12
11
1
0%
20%
40%
60%
80%
100%
Less
The same
More
Missing

Figure 8: Extent of tasks within applied research: the first graph shows the current devotion to applied research and the second preferred devotion to applied research.

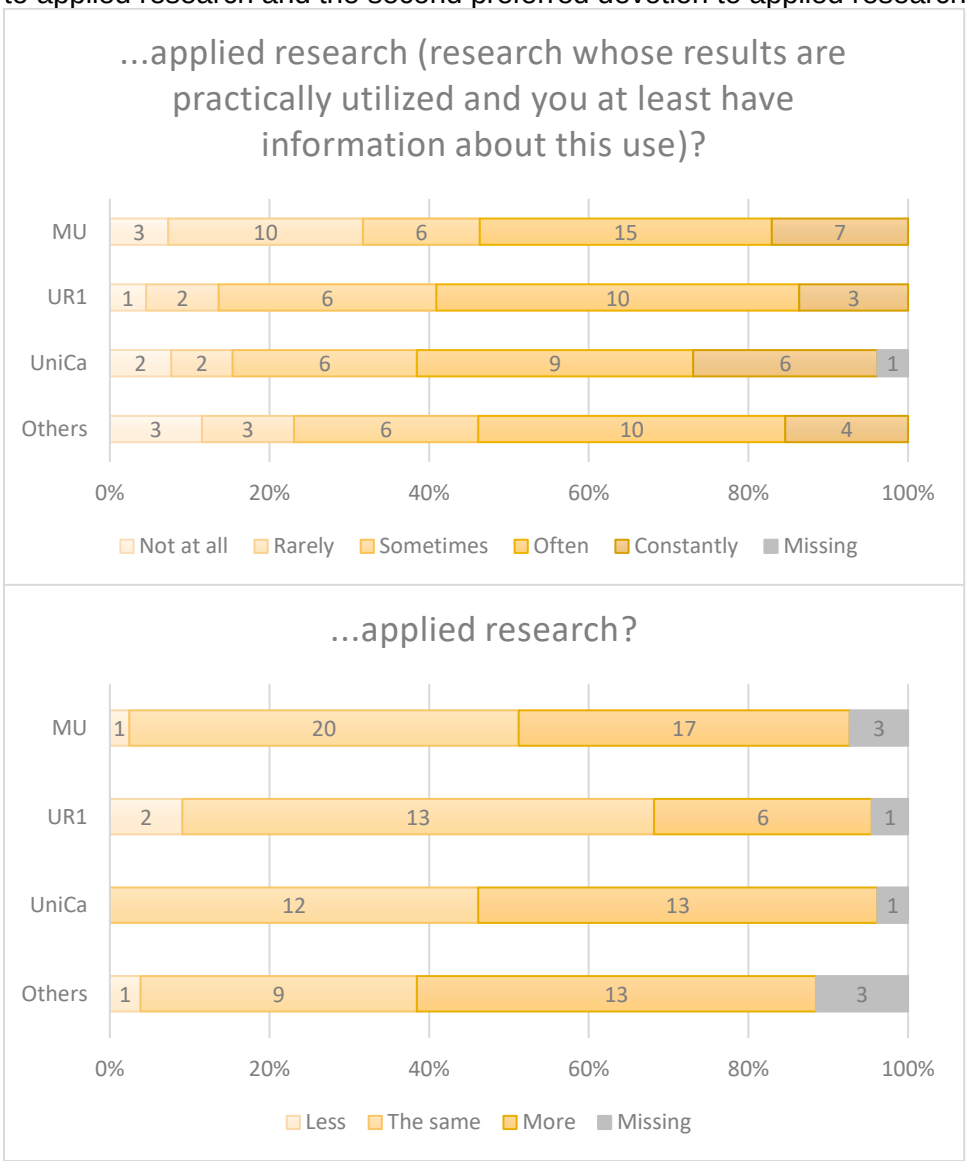


Figure 9: Extent of tasks within teaching: the first graph shows the current devotion to teaching and the second preferred devotion to teaching.

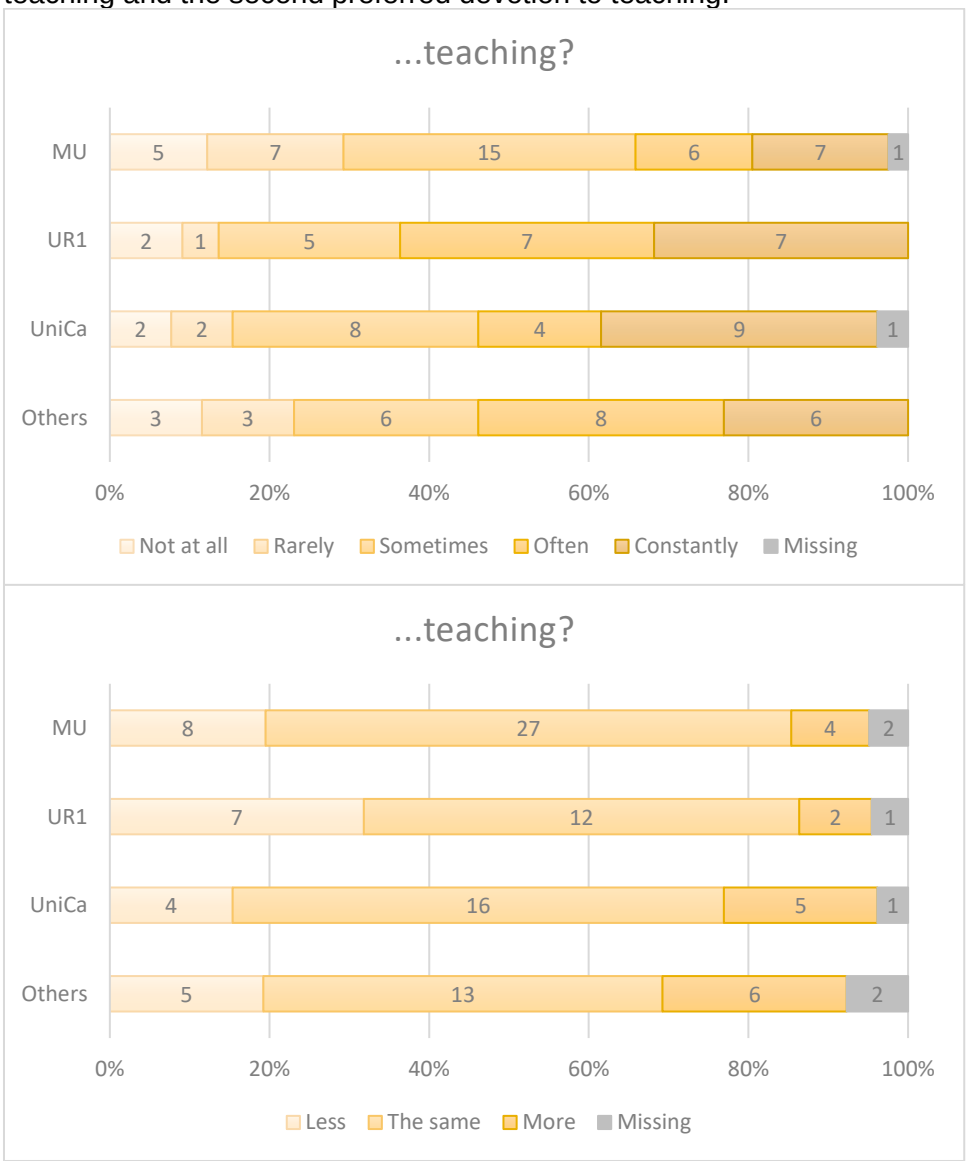
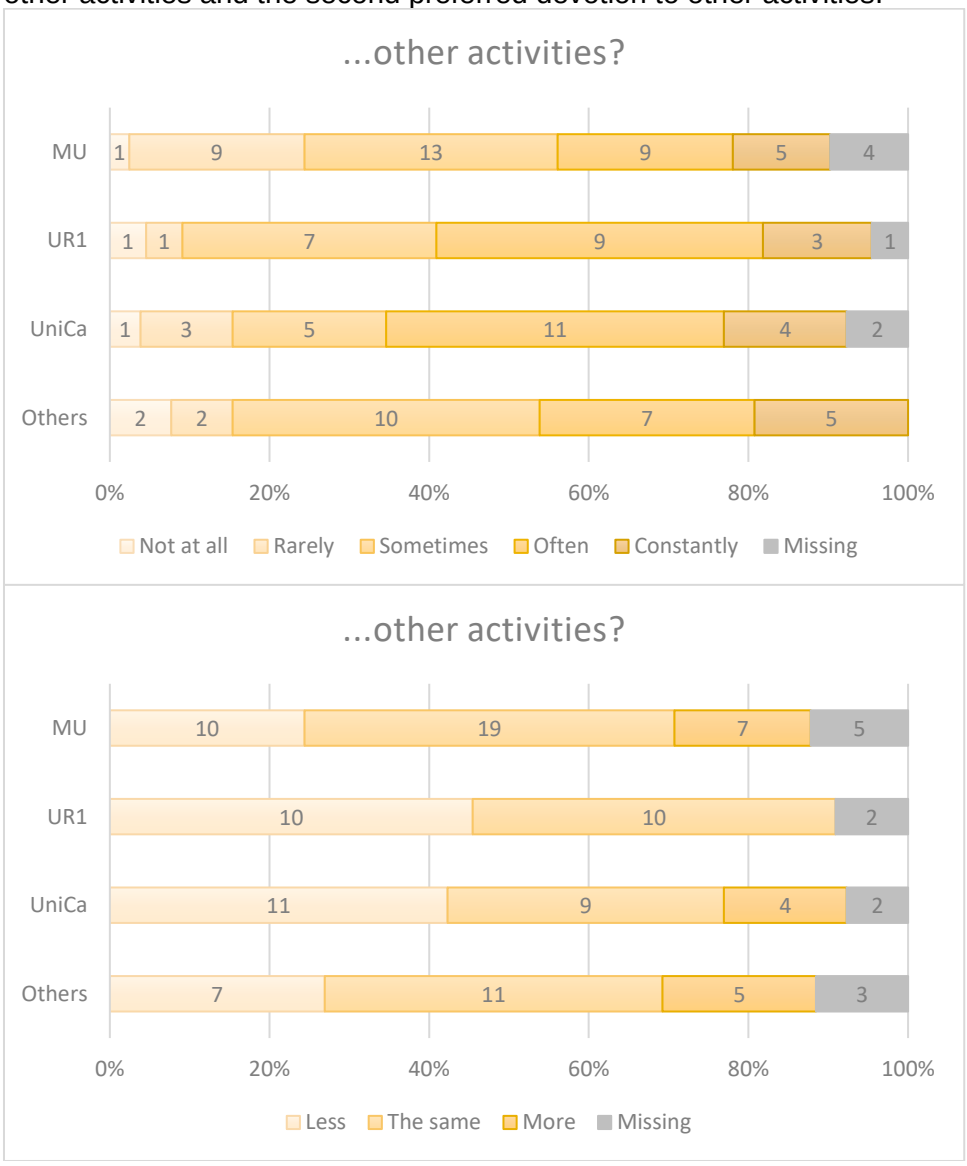
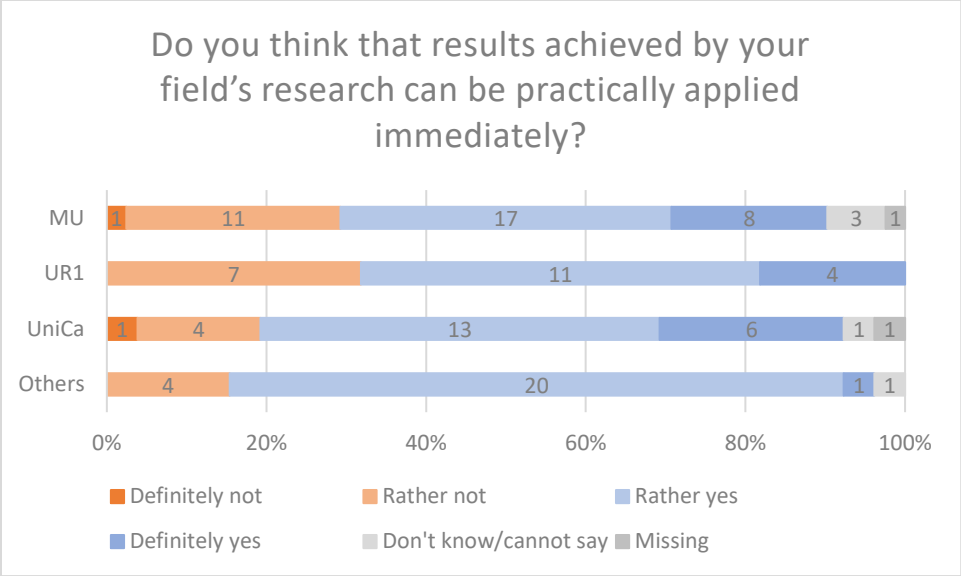


Figure 10: Extent of tasks within other activities: the first graph shows the current devotion to other activities and the second preferred devotion to other activities.



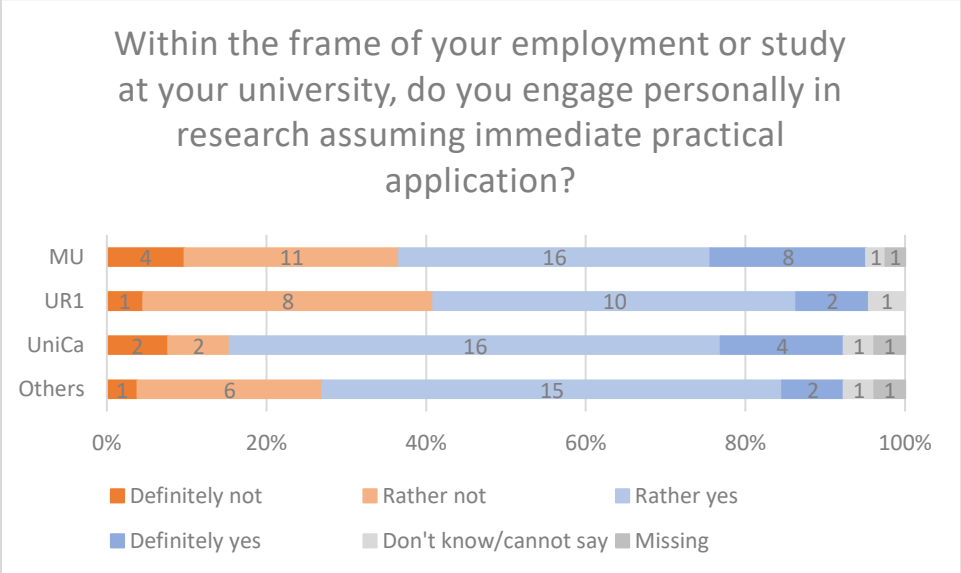
Regarding application possibilities of cybersecurity research results, most of the participants believed that result that fall within their field of research can include such that can be immediately practically applied, as shown in **Figure 11.**

Figure 11: Immediate applicability of results achieved in participants' field.



Since participants perceived positively the possibility to achieve results that would be immediately applicable in their field of research, they also reported rather positive personal engagement in research assuming immediate practical applications, as shown in **Figure 12**. In this case, participants from University of Cagliari reported especially high view of personal engagement in research with immediate application potential.

Figure 11: Personal engagement in research assuming immediate practical application.

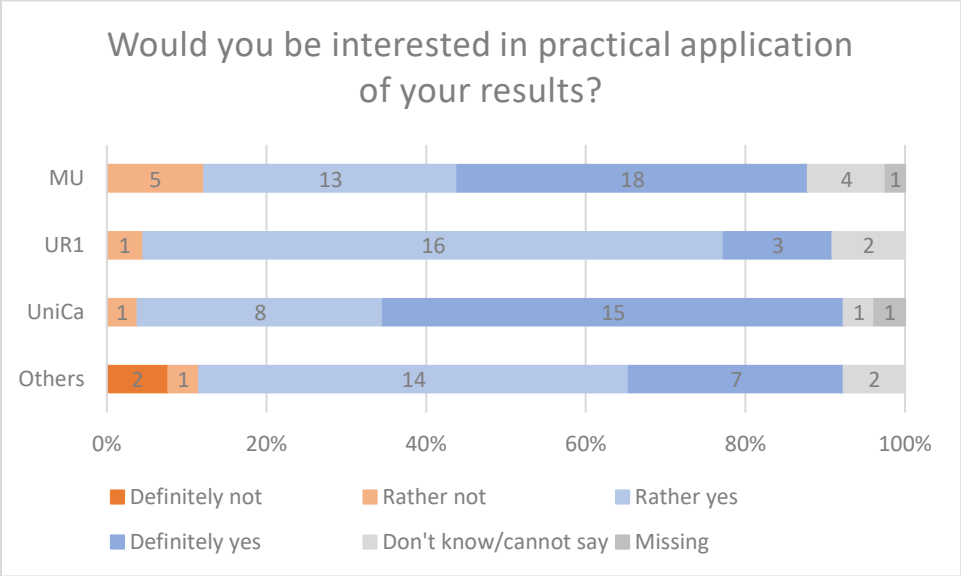


Participants are generally interested in finding a practical application for their results (see **Figure 12**), which aligns with their perspective on personal engagement in research assuming immediate practical application. However, ten participants across all investigated consortium universities are not interested in the applicability of their results. This lack of interest is due to

time and effort difficulties connected to the process. There are a few quotes from these participants:

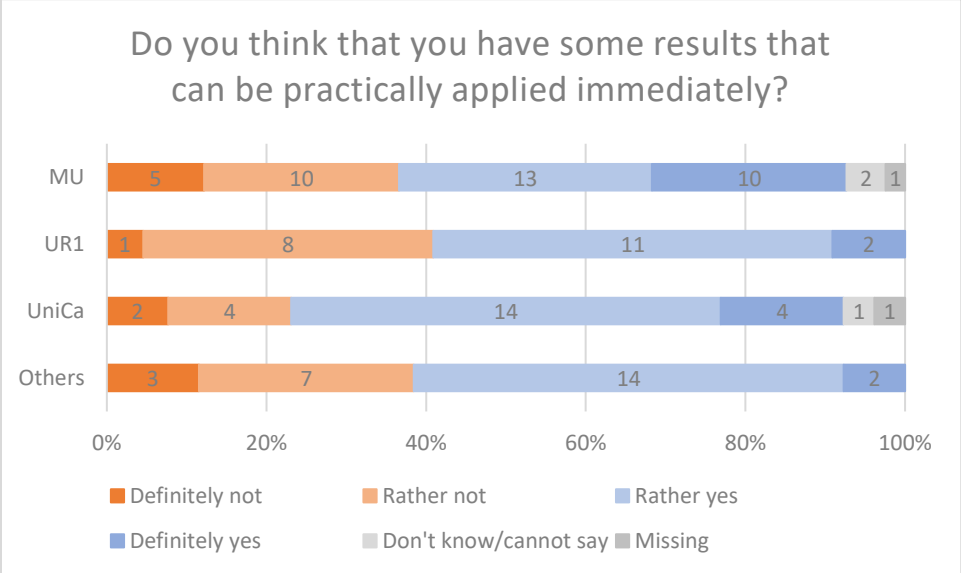
- *"Because I am interested in research, not policy."*
- *"It takes too long to take care of this."*
- *"Too much work and very few benefits."*

Figure 12: Interest in practical application of results.



Importantly, participants in a significant portion across the groups believe that they have some suitable result for immediate application, as shown in **Figure 13.**

Figure 13: Achievement of results that can be immediately practically applied.



Participants who perceived their research as immediately practically applicable or engaged in directly practically applicable research believed that the results of their research could be applied in multiple areas, as shown in **Table 4.** These areas included the **development of methodology/procedure**, **product development**, **practical application of information gained from research as mediation to the general professional public**, **popularising results for the general public**, and **projection into public administration or politics and government forces**. The distributions are available in detail in **Figure 14**.

Figure 14: Distribution of areas of applicability.

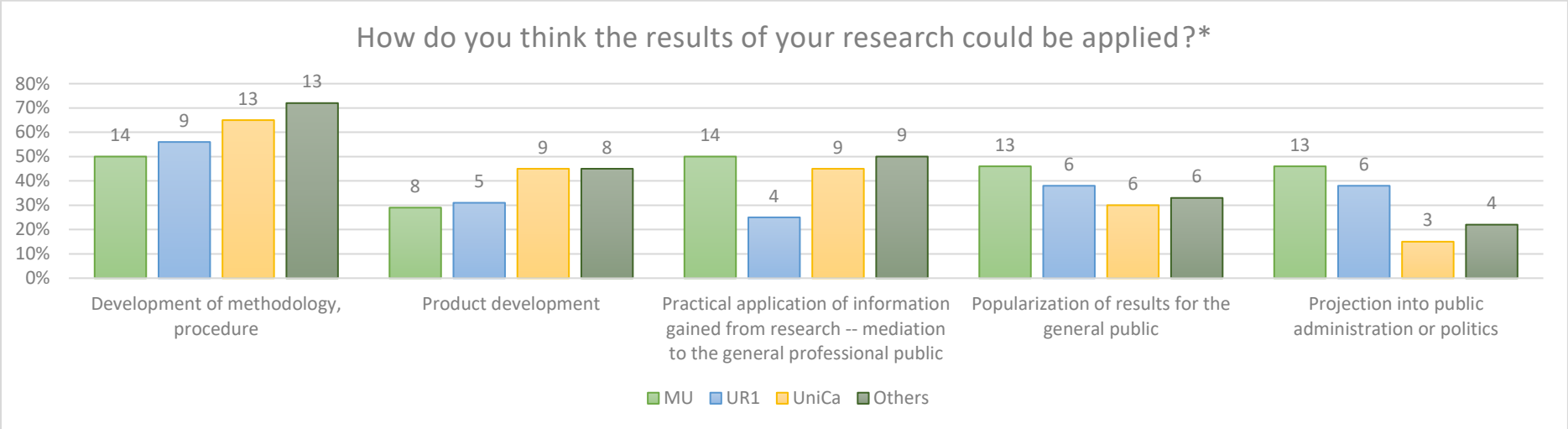


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Table 4: Count of areas which were chosen simultaneously for possible results applicability.

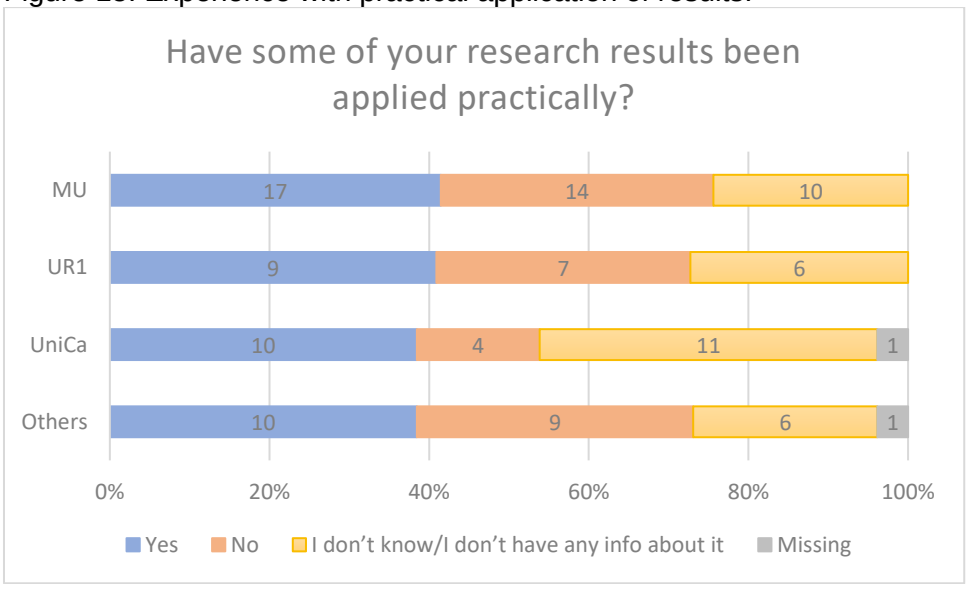
Counts of areas	MU (N=28)	UR1 (N=16)	UniCa (N=20)	Others (N=18)
0	0%	6%	0%	6%
1	**21%**	**44%**	**30%**	**28%**
2	**46%**	13%	**50%**	**28%**
3	**21%**	**31%**	**15%**	**28%**
4	11%	6%	0%	0%
5	0%	0%	5%	11%

Some of the respondents also shared in the questionnaire their more specific vision of how the results of their research could be applied in practice. Most often, participants would like to see the deployment of their results in public administration and/or for commercial use. They would also appreciate seeing validation of their results. There are a few quotes from these participants:

- *"Proposed analytical methods used by other cybersecurity professionals or adapted by commercial vendors."*
- *"I wish I had the time to unpile all the on-going works so that I can actually focus on the transition from theoretical results to their deployment."*
- *"Yes, ideally they should be applicable by companies and public administrations to improve their security."*
- *"Be the basis for further research by someone else."*

Sizable portion (circa 40%) of the participants across all groups had experience with the practical application of the results they achieved. On top of that there is a significant number of respondents, who were uncertain, if such application happened in the case of their research results, especially at University of Cagliari this answer represented more than 40% responses. Details are provided in **Figure 15**.

Figure 15: Experience with practical application of results.



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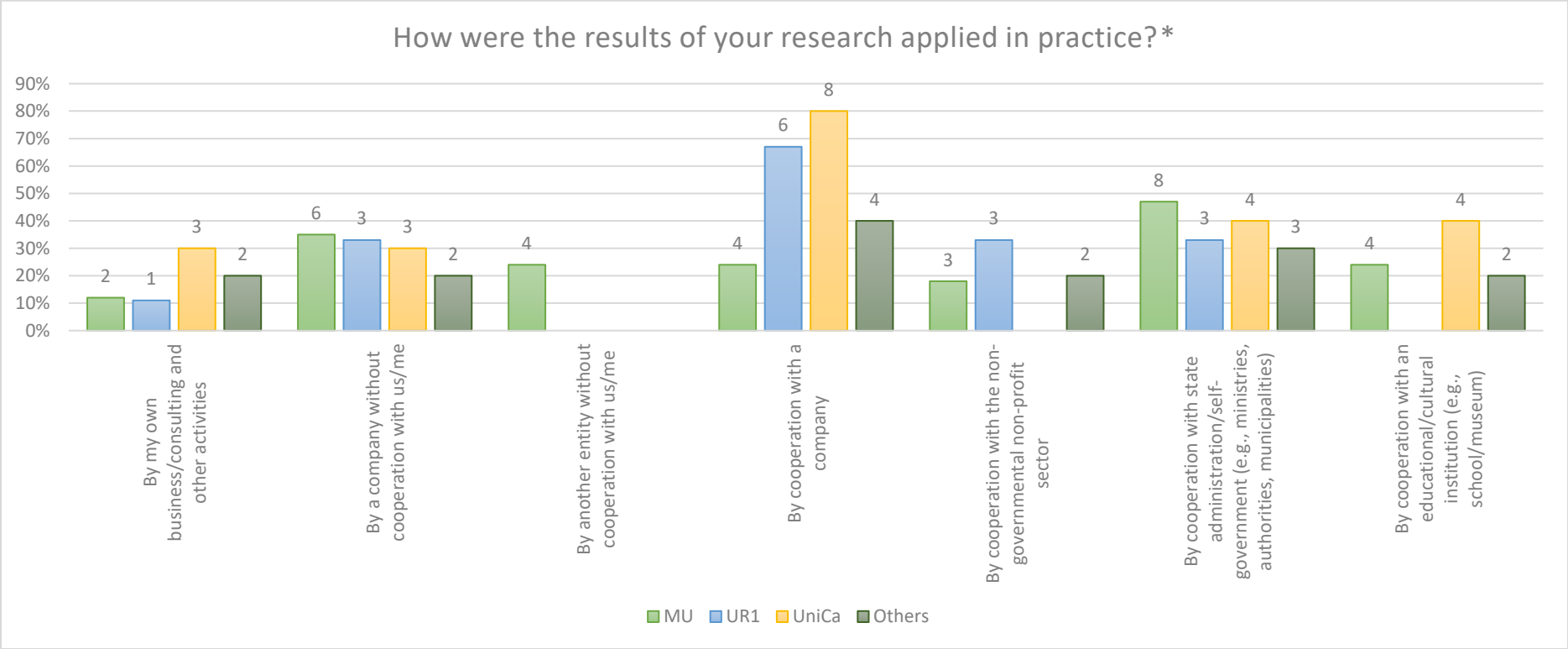
The respondents reported a varied spectrum of ways, how their research results were applied in practice. These included **participants' own company/consulting**, **a company without cooperation with participants**, **another entity without collaboration with participants**, **cooperation with a company**, **cooperation with the non-governmental/non-profit sector**, **cooperation with state administration/self-government** (e.g., ministries, authorities, municipalities), or **cooperation with an educational/cultural institution** (e.g. school or museum). Results were applied mainly by a company with or without collaboration with academia and by cooperation with the state administration. In case of one participant, the research results were further used through European projects. More details are shown in **Figure 16**.

Figure 16: Experienced ways with practical application of results.



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Most participants who have experience with practical application of their research results via cooperation with a company, performed it as a part of their job at their university. Three participants undertook it as part of their other job. These are non-academic stakeholders to which a separate results section is devoted after the result description. Networking and industrial partners were reported as another way to collaborate with a company to apply research results. More details are in **Figure 17**. As is obvious from some of the more detailed responses by the participants, there are various reasons to collaborate with a private company within the frame of employment at the participants' university. The reasons generally include existing relationships, available resources (technology, knowledge and money) and resulting practical impact. Here are few quotes on this from the participants:

- *"No particular reason, I am part of the team that has a long-term collaboration with one company."*
- *"Access to interesting technology."*
- *"Because I wanted my research to be applied. There were some direct consequence on the security of multiple widespread products, that needed to be patched."*
- *"Companies provide money (e.g. CIFRE), (sometimes) nice data and interesting use cases."*
- *"Because the tasks were small enough to be formalized as "conto terzi" contracts."*
- *"Public funding opportunities that fostered the cooperation between private companies and the University."*
- *"To know the company, how they work and enlarge knowledge and results, applying Cybersecurity to the field of the company."*

Practical application of participants' results via cooperation with a company could be performed in several ways. The participants were offered a list of collaboration categories that cover the most prominent. These collaboration categories include **research and development in general**, **custom analysis**, **measuring and results processing**, **marketing strategies/research**, **education/lectures** and **consulting**. From the questionnaire results is obvious, that in the group of participants who responded to the survey, the collaboration is dominantly related to research and development. More details are in **Figure 18**.

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Figure 17. Performance of collaboration with a company.

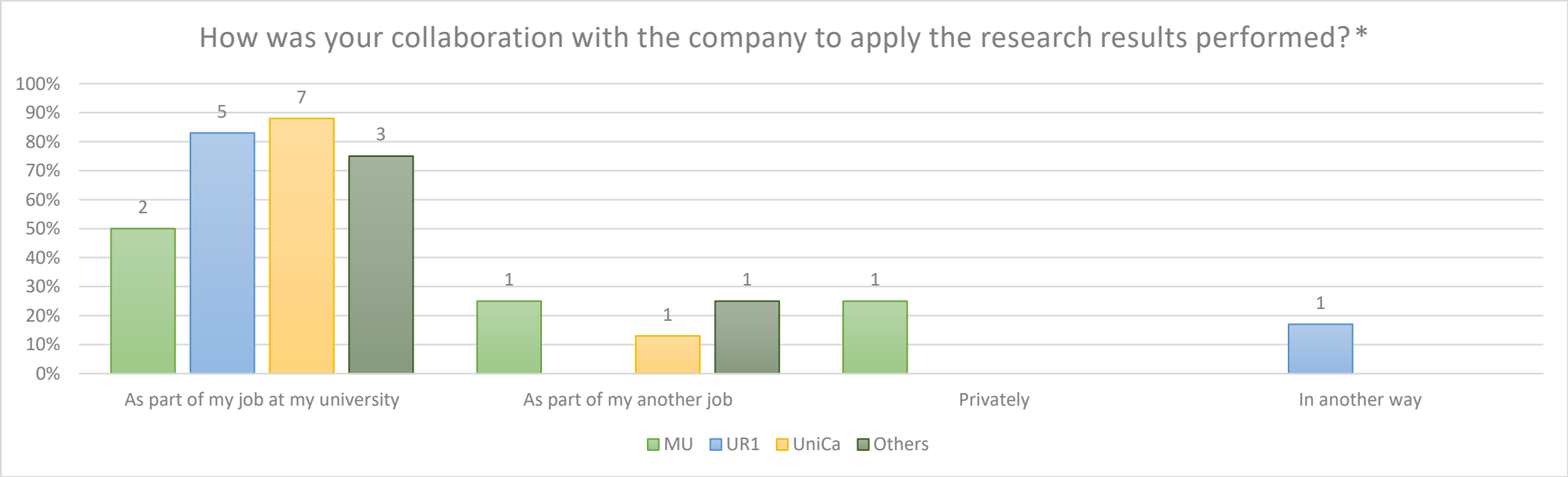

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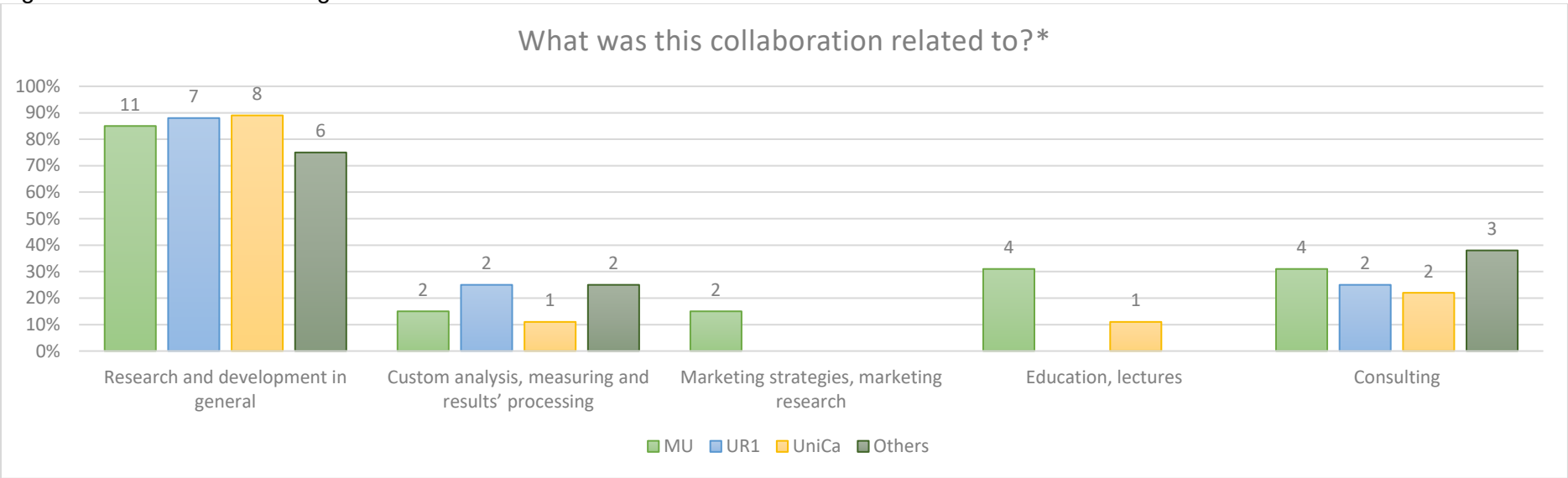
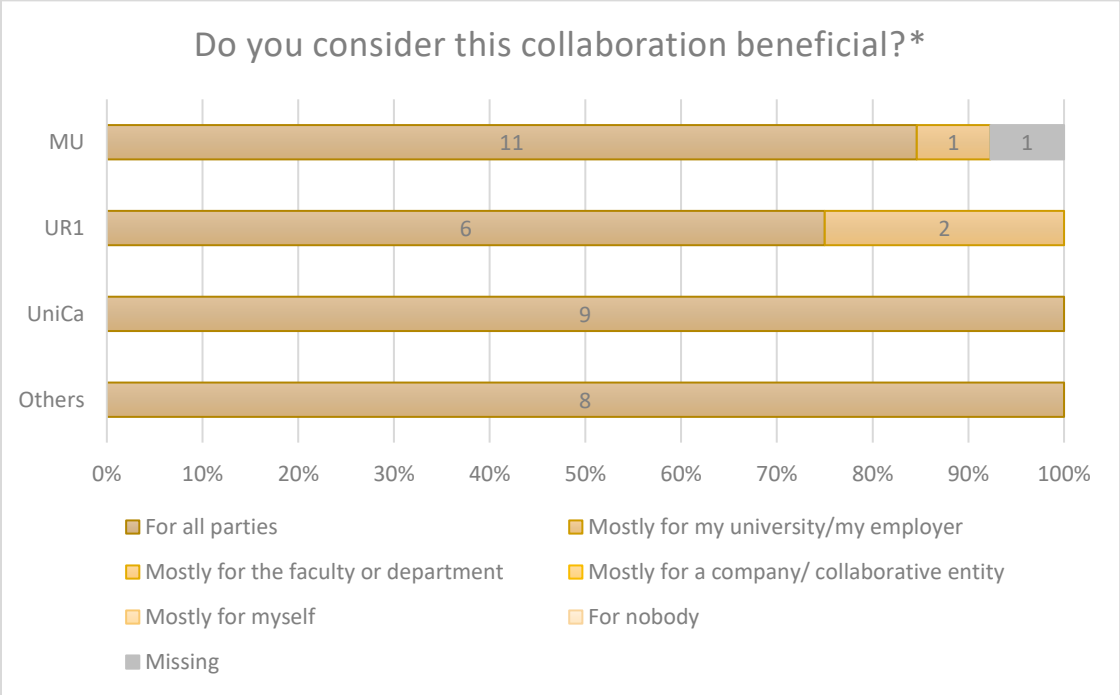
Figure 18: Collaboration categories.



When considering participants whose research results have been applied practically by cooperation with any entity, not only through a company, they dominantly considered any such collaboration as beneficial for all parties involved, and all participants would agree to such collaboration again. More details are in **Figure 19**.

Figure 19: Collaboration benefits.



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Attitudes toward practical use

This section of the questionnaire aimed to determine the attitude towards practical applications of the research results. In this section we mapped participants' attitudes about the collaboration of their university with other entities. Firstly, opinions about university and practice cooperation are explored. Then, subjective barriers to such collaboration, together with possible obstructions from the university, are identified. The section is concluded by collaborating on establishing participants' own companies to engage in research knowledge application in practice in the area of cybersecurity.

Regarding **opinions on the collaboration of participants' universities with other entities concerning the practical application of their research in the area of cybersecurity**, the participants of the survey broadly expressed interest in such cooperation. **Majority of participants across all groups agreed that such cooperation is promising** (if missing responses are discounted, see **Figure 20**) and **helps utilize scientific knowledge** (see **Figure 21**).

Figure 20: Opinions on collaboration: promising.

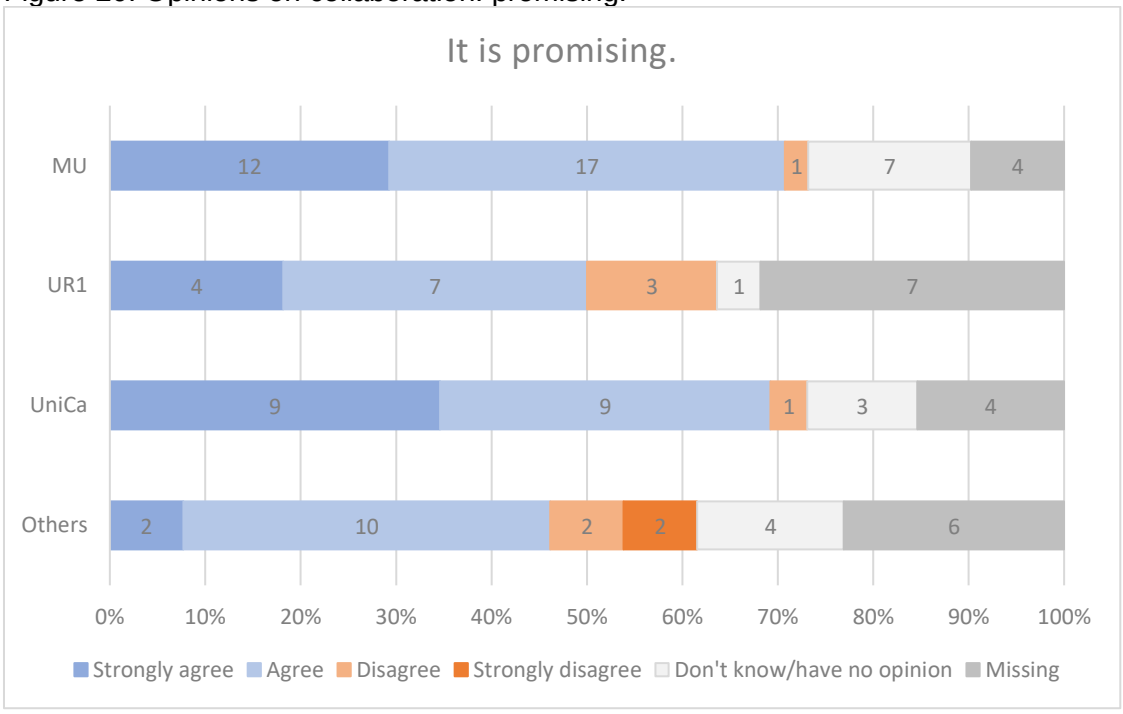
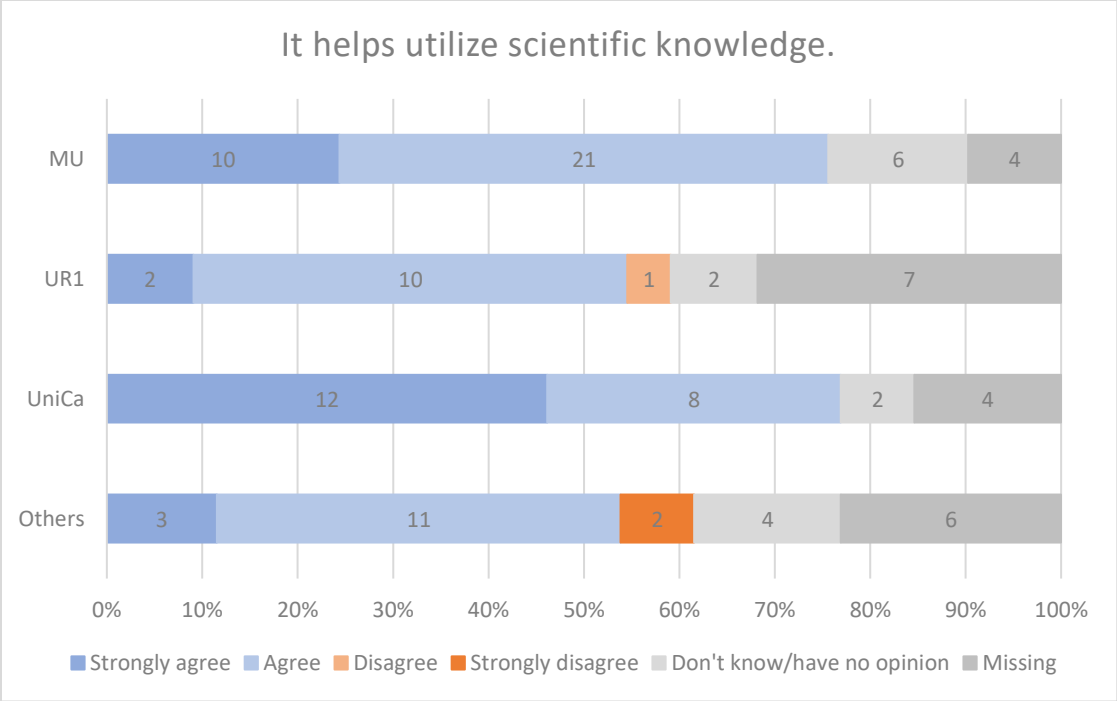


Figure 21: Opinions on collaboration: helping utilize scientific knowledge.



Of those who expressed their opinion, they also predominantly **considered the cooperation sufficiently supported by their university** (see **Figure 22**). In case of Masaryk University and University of Cagliari there is a broad opinion that the university does not impede such collaboration. However, in case of University of Rennes and the remaining universities the opinion was much less positive, with the respondents significantly more pessimistic about the role of their universities (see **Figure 23**).

Figure 22: Opinions on collaboration: sufficiently supported by university.

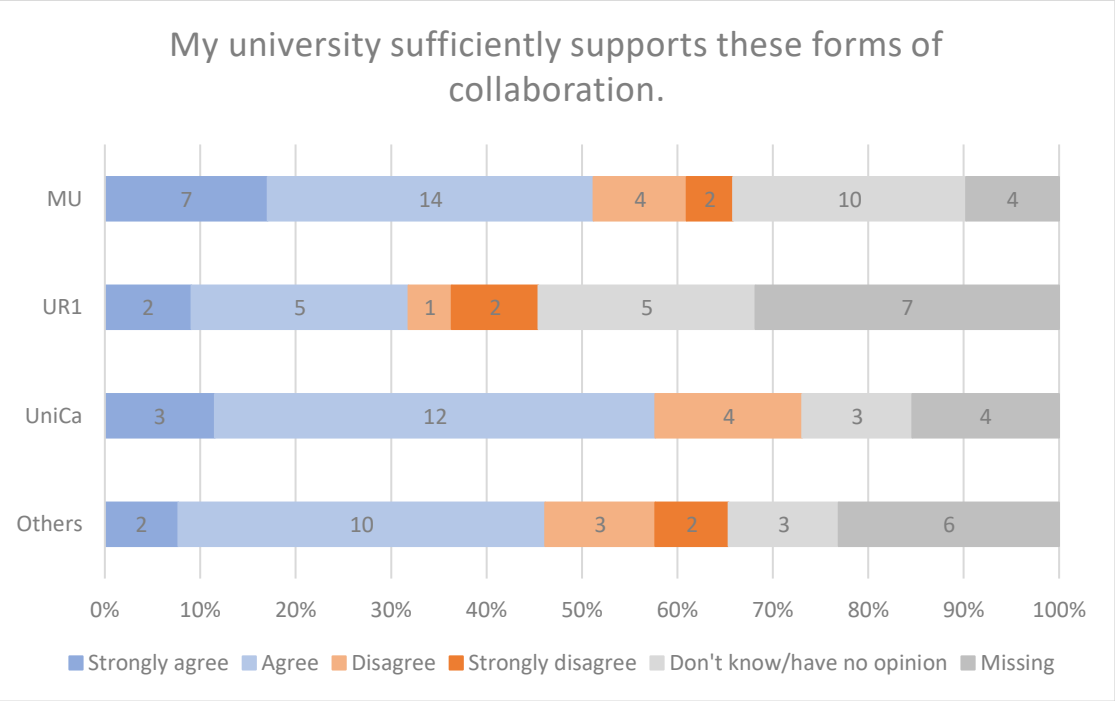
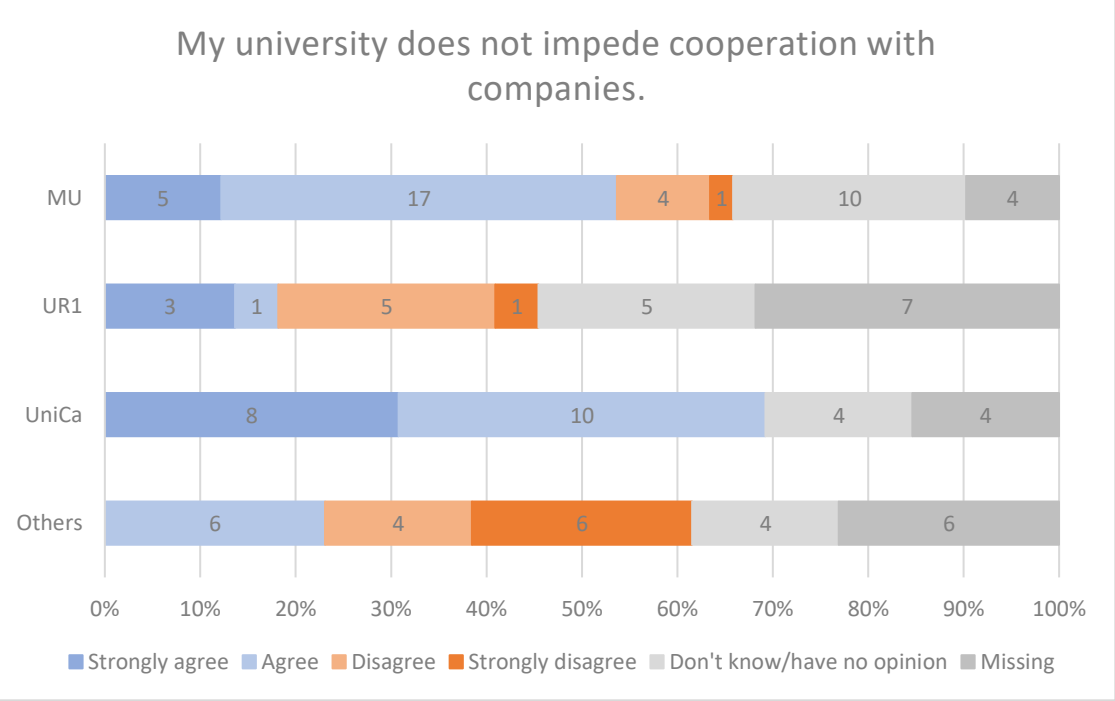


Figure 23: Opinions on collaboration: university does not impede cooperation.



Overall the respondents from all groups strongly disagreed that companies (see **Figure 24**) or non-profit entities (see **Figure 25**) are not interested in cooperating with their universities.

However, it is essential to note that, as is obvious from all the Figures 20 to 25, this section about opinions of the respondents achieved **a high proportion of missing or indecisive answers**, as often the participants did not have or did not want to share their opinion on the matter. This is especially obvious in the answers on attitudes toward companies (Figure 24) and non-profit entities (Figure 25).

Figure 24: Opinions on collaboration: companies' interests.

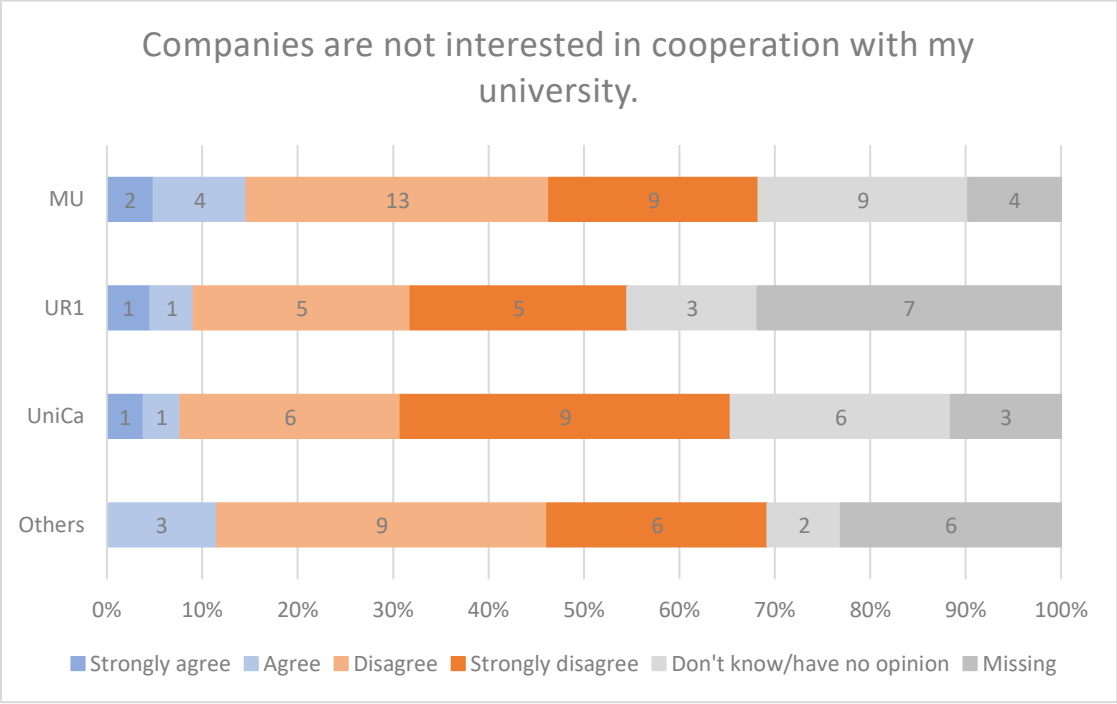
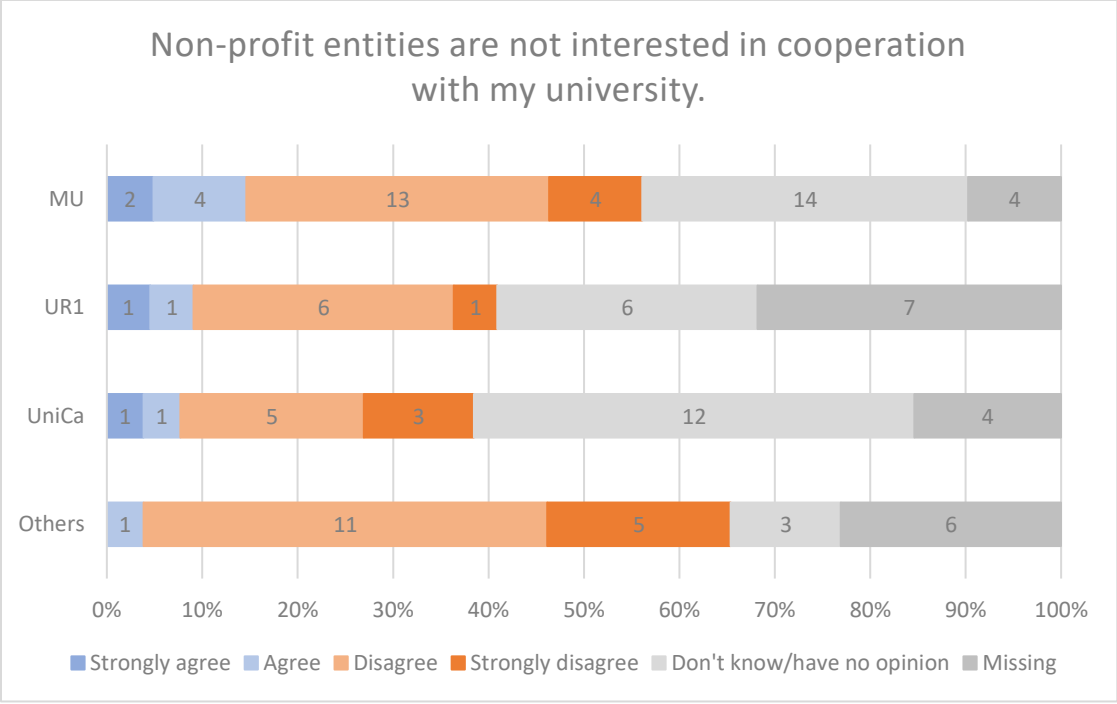


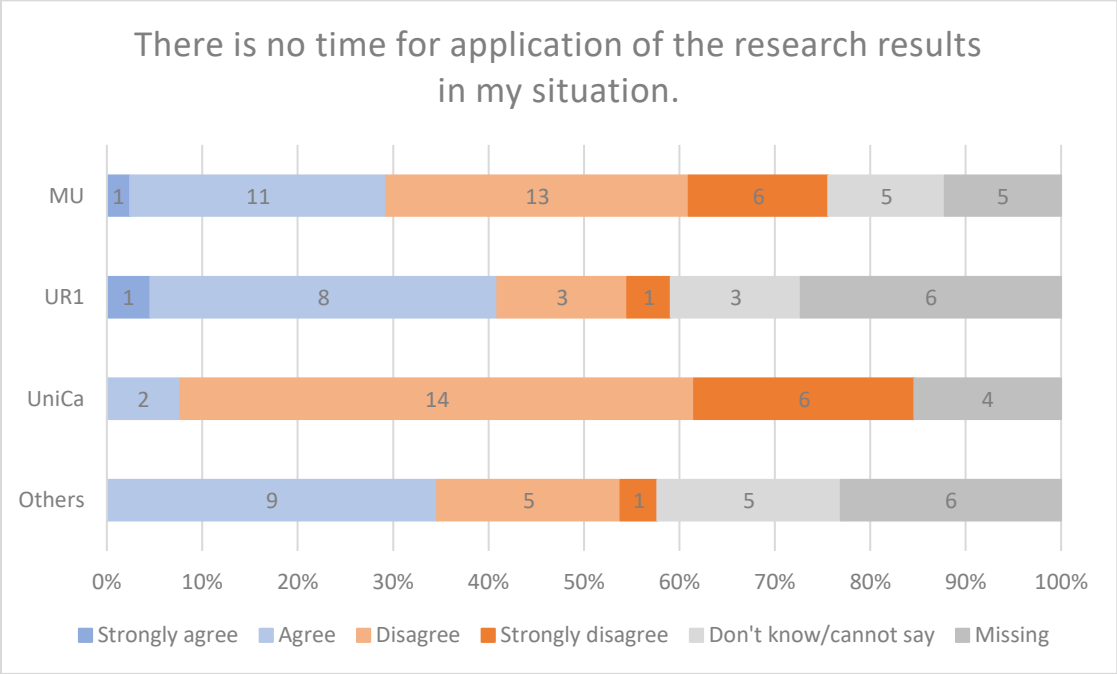
Figure 25: Opinions on collaboration: non-profit entities' interests.



After mapping opinions about university and practice collaboration, subjective barriers to such cooperation were attempted to be identified. Aspects such as **resources** (i.e., time and finances), **process difficulties**, **possible misuse causing harm**, and **lack of information and support** were considered. Overall, time, finances and evaluation of applied results seem to be a rather problematic.

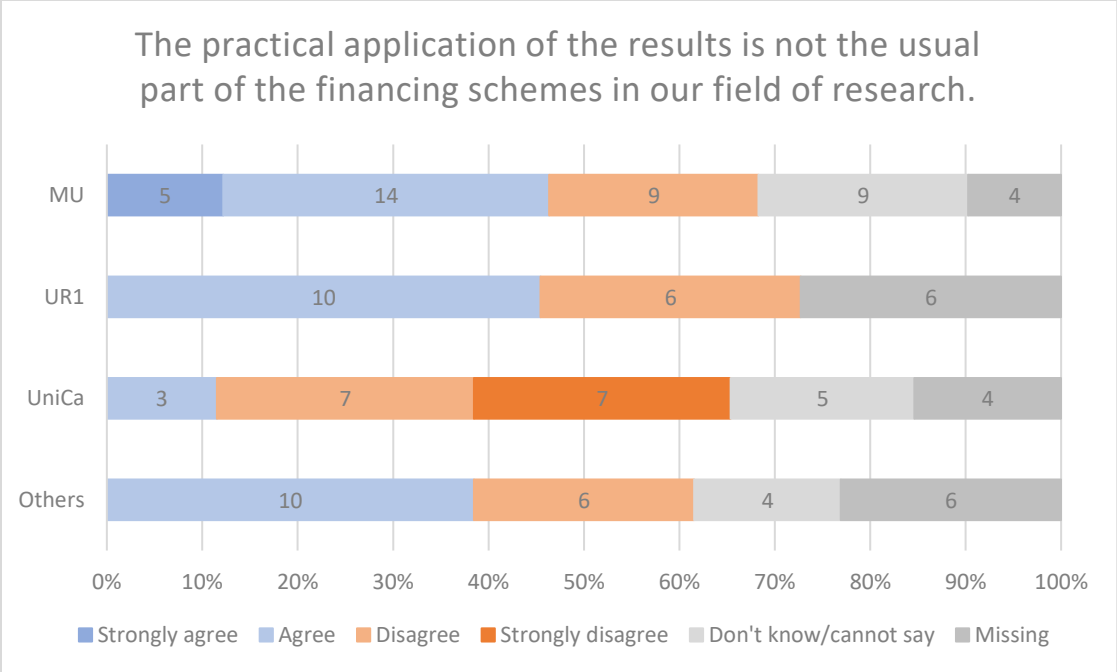
Regarding time constraints, participants from University of Cagliari most significantly disagreed that there was no time for application of the research results in their situation, whereas other participants reported such difficulties more often. More details are in **Figure 26**.

Figure 26: Subjective barriers: time.



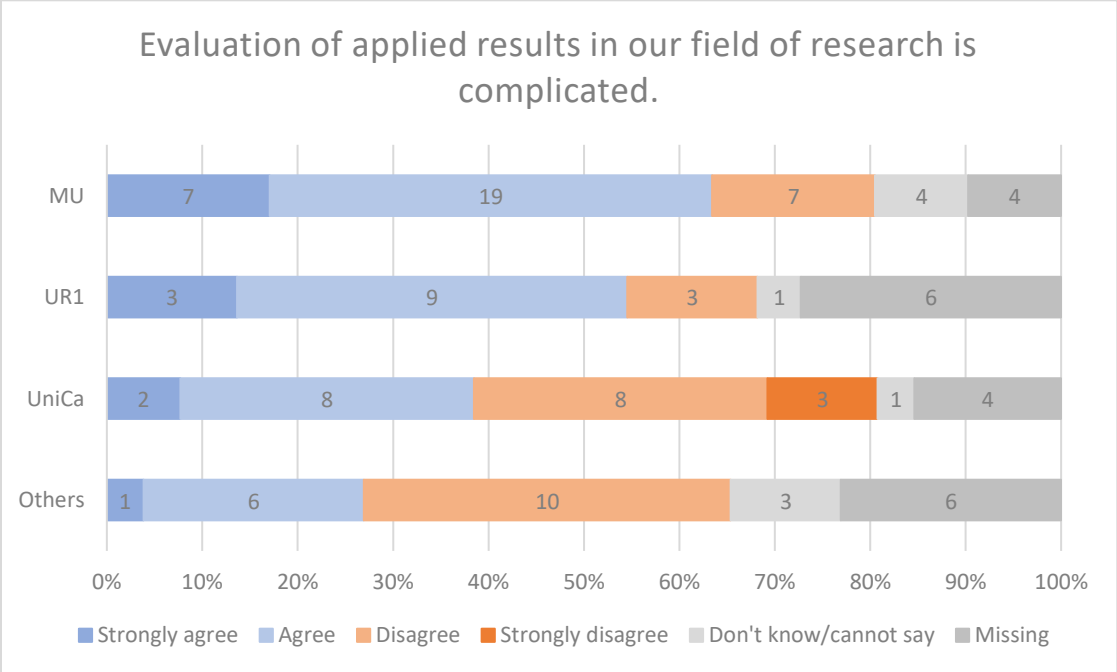
Furthermore, University of Cagliari participants stand out with their responses to limits by the finance schemes. Compared to the other participating universities, it seems that in the case of respondents from University of Cagliari the practical application of the results is usual part of the financing schemes in their field of research (see **Figure 27**).

Figure 27: Subjective barriers: finance schemes.



Regarding the barrier in the form of complicated evaluation of the applied results, respondents from Masaryk University and University of Rennes often perceived it as significant obstacle, whereas this was much less the case for respondents from University of Cagliari and the remaining universities. More details are in **Figure 28**.

Figure 28: Subjective barriers: complicated evaluation of applied results.



However, respondents from all universities **disagreed that the practical application of their research results would be very complicated** (see **Figure 29**), and **they also disagreed that they do not know who could practically use their research results** (see **Figure 30**).

Figure 29: Subjective barriers: complicated practical application of results.

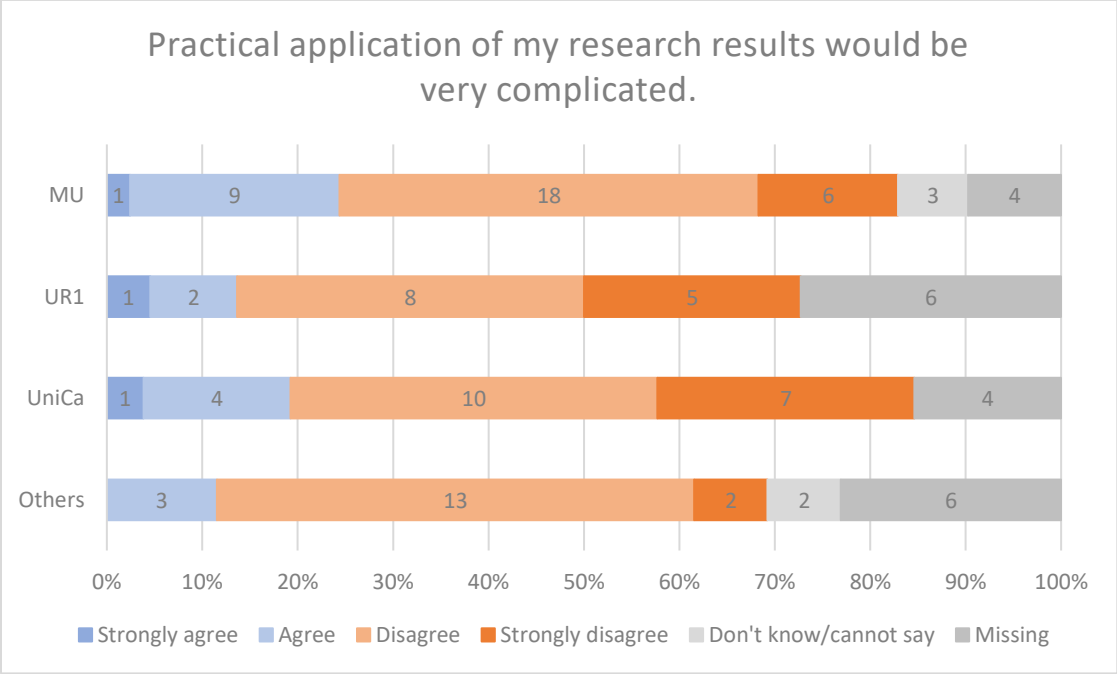
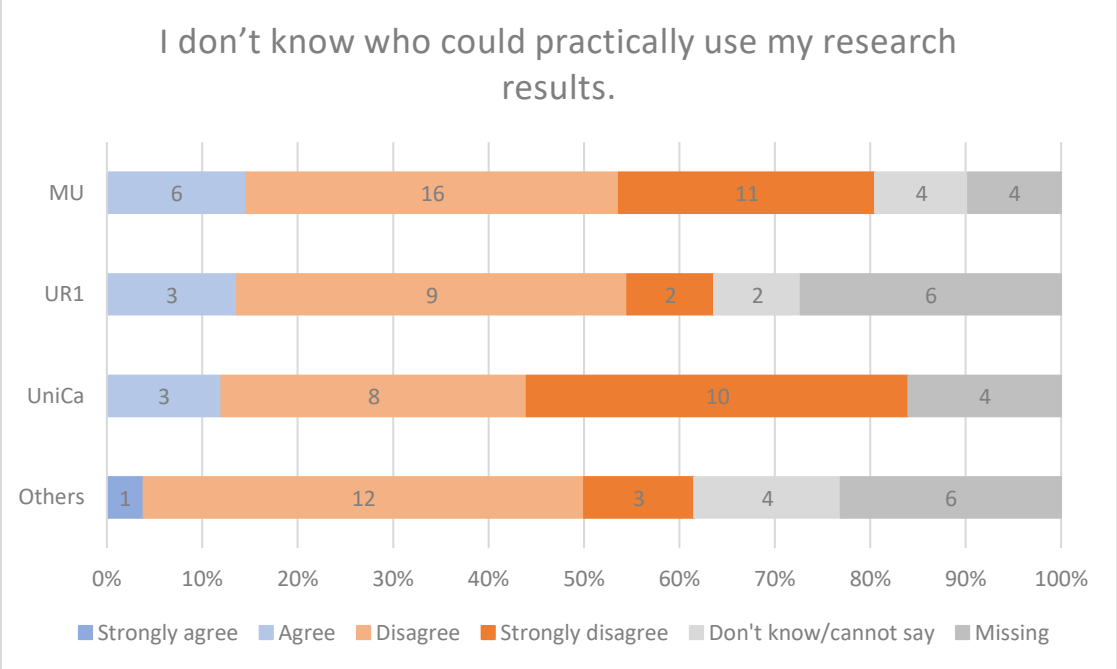
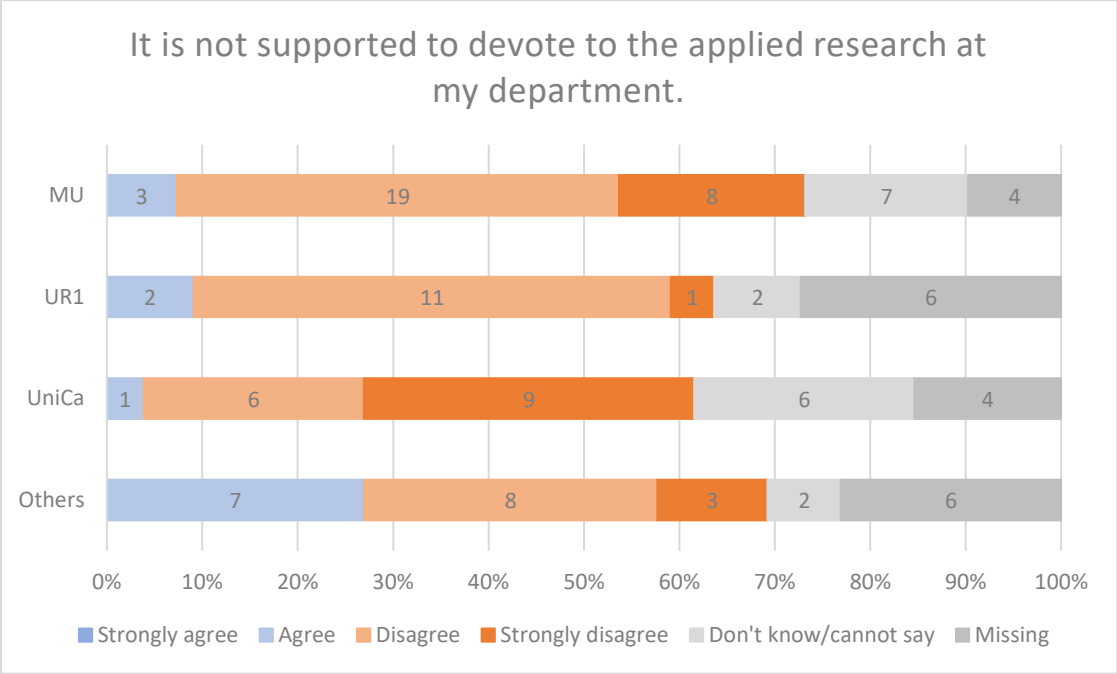


Figure 30: Subjective barriers: lack of information about possible application entity.



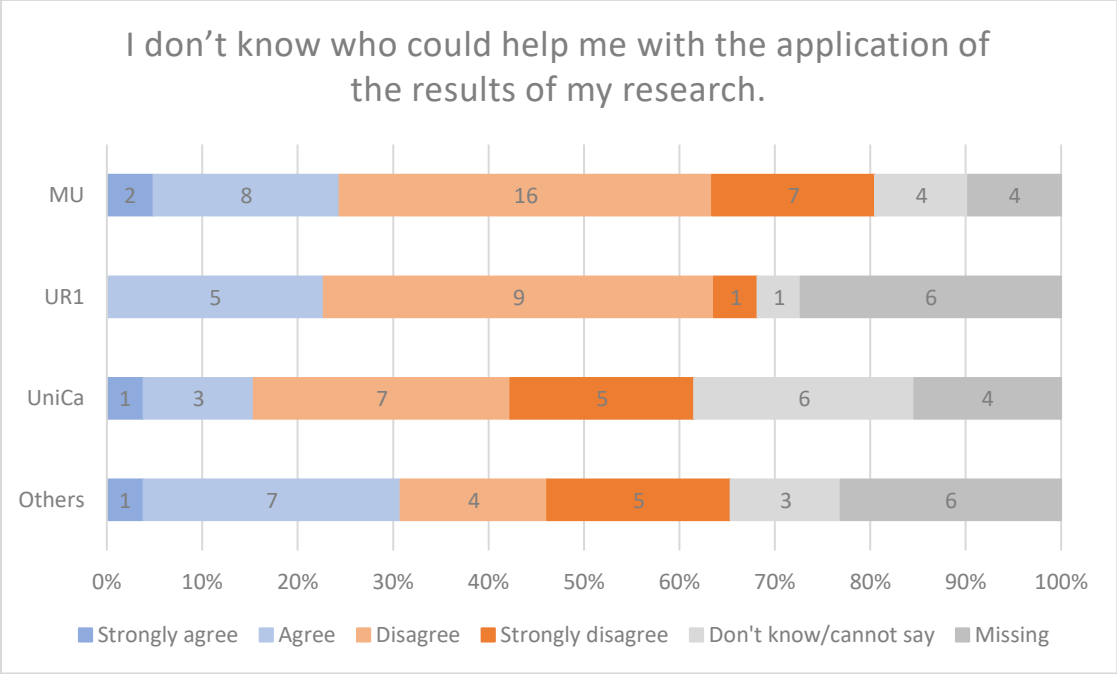
Regarding personal obstacles in the form of available support to do applied research, participants from Masaryk University, University of Rennes and University of Cagliari predominantly indicated that it is not the case at their department. The situation at the remaining universities is less conclusive, but the number of responses and the background of respondents from these universities should be taken into consideration before inferring any conclusion from this result. More details are in **Figure 31**.

Figure 31: Subjective barriers: support to devotion to applied research.



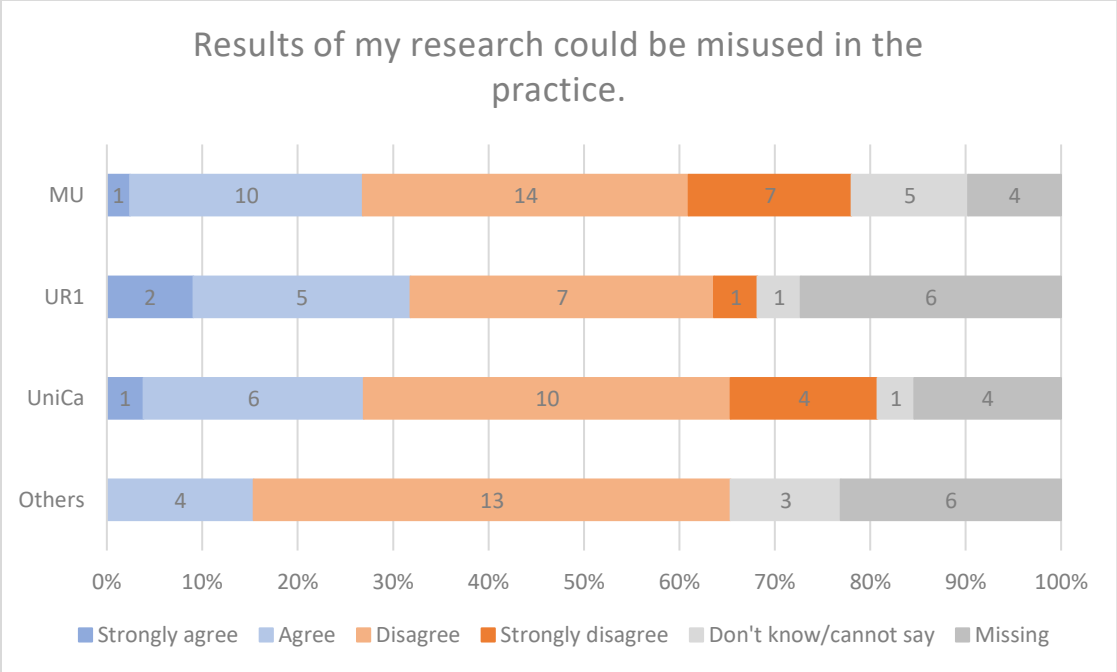
As a positive outcome should be seen that many participants across the universities seem to know who could help them with the application of the results of their research (see **Figure 32**).

Figure 32: Subjective barriers: lack of information where to get help.



Since our survey focuses on cybersecurity, the participants were further asked, if they are worried about misuse of their research results. In case of all groups, some are, however, it was not a majority of those who answered, as shown in **Figure 33**. Nevertheless, here the focus and nature of the research of the particular researcher may be most indicative of the response, making any generalisation problematic.

Figure 33: Subjective barriers: misuse.



Also, university obstructions can be considered barriers to the practical applicability of achieved results. Some participants experienced that the university obstructs their collaboration with private companies in the field. The obstructions were regarding resources (e.g., time, capacity, capabilities), bureaucracy and lack of support. There are a few quotes from these participants:

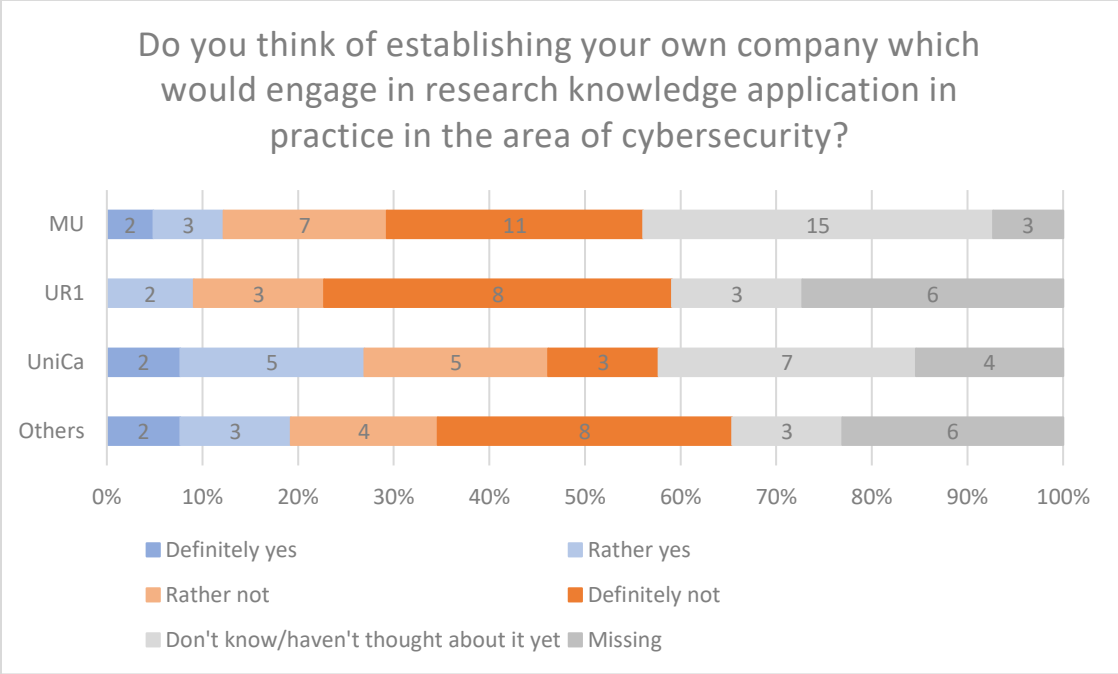
- *"Not from the university, the limiting factor is the lack of time, capacity, and capabilities in my research team."*
- *"the inability to develop partnership agreements quickly and efficiently. The complexity of all the procedures."*
- *"Not enough support for engineering, testing, packaging, commercial actions."*
- *"SATT is a pain in the A**. The rest is unhelpful at best."*

Since there are some barriers to research knowledge application, establishing one's own company may seem like a possible solution to overcome the obstacles. However, participants from all groups mostly seem not keen on establish their own companies that would engage in research knowledge application in practice in cybersecurity, as shown in **Figure 34**.

Nevertheless, a few participants considered establishing their own company to improve cybersecurity and overcome the difficulties of their research results applicability into practice. There are few quotes from these participants about their reasons for these thoughts:

- *"Passion for cybersecurity and coming up with solutions to many problems within the IT industry."*
- *"No simple scheme for collaborating with industry. Avoid SATT at all costs."*
- *"Personal ambition and will."*
- *"Cross the boundary between academia and practitioners."*

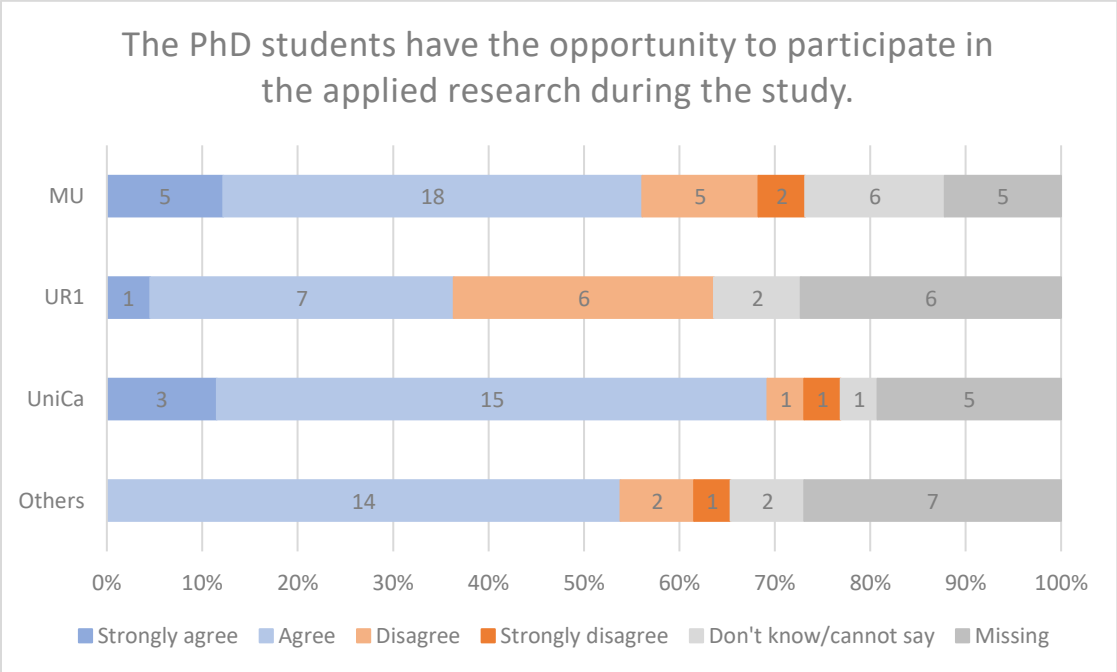
Figure 34: Intention to establish own company.



Education and support for practical applications

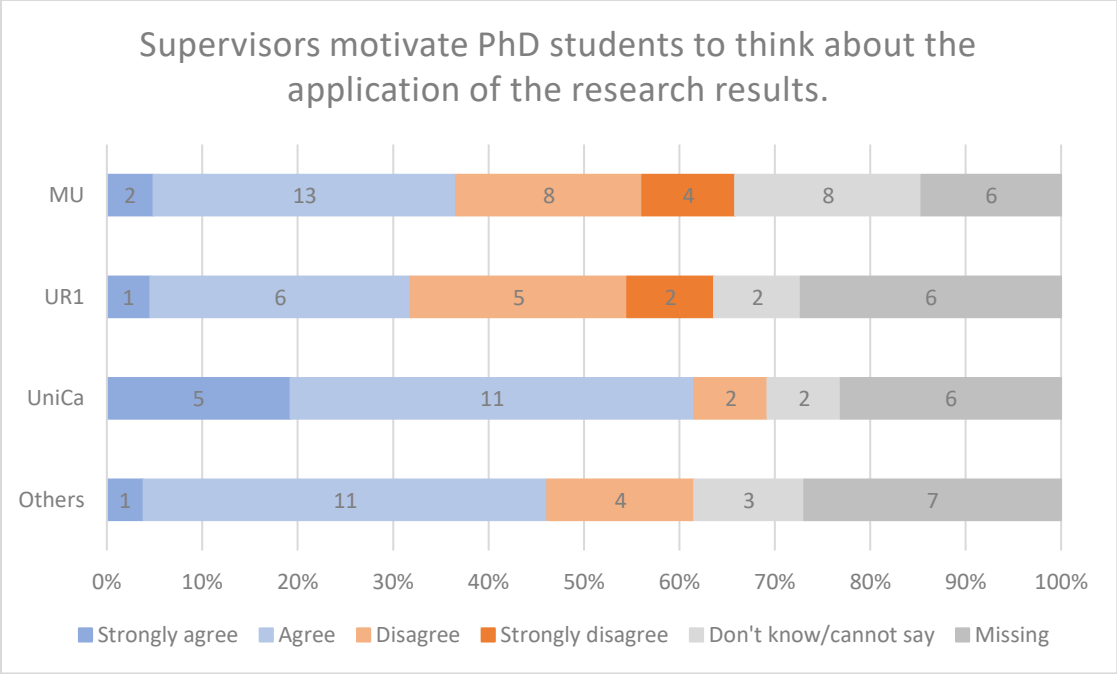
This section of the questionnaire aimed to determine different ways of support for technology transfer and examine education basics concerning technology transfer, focusing on PhD students. Opinions on the issue of scientific result application as part of the professional PhD training were mixed. It is perceived that PhD students usually have the opportunity to participate in applied research during the study, even though the responses from University of Rennes were less positive than from the other groups (see **Figure 35**).

Figure 35: Opportunity for PhD students to apply their results.



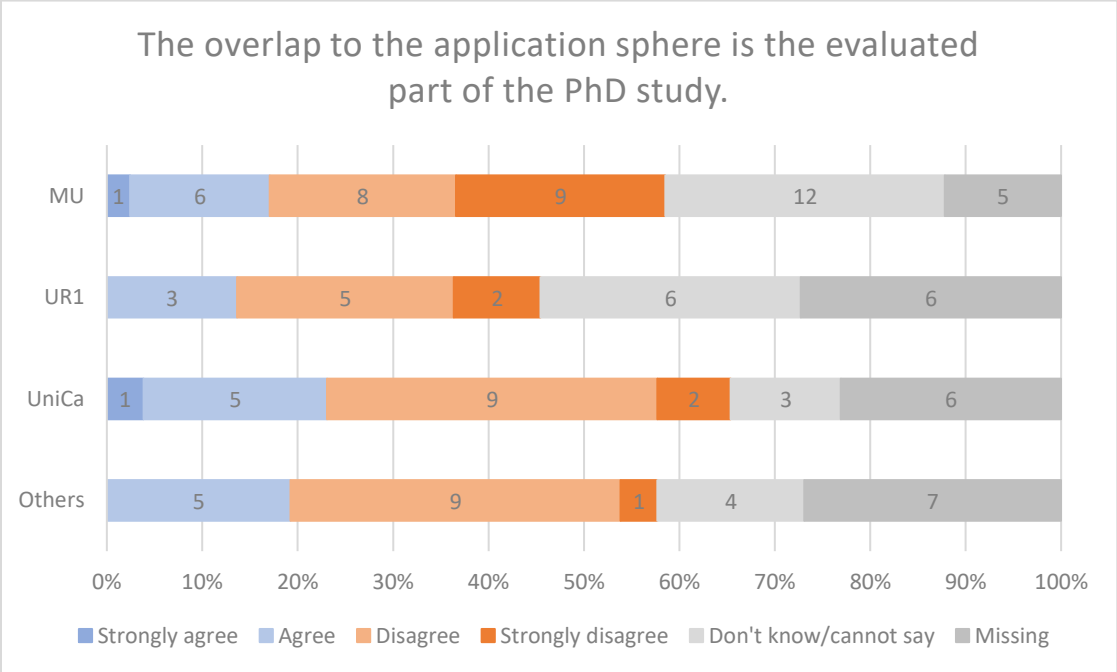
When asked whether the supervisors motivate PhD students to apply their results, the feedback was mostly positive; in particular from University of Cagliari and the remaining universities. However, in case of Masaryk University and University of Rennes significant portion of the respondents sees room for improvement. Generalisation from these results should, however, be avoided, as they are unavoidably based on very personal relationships and experiences. More details are in **Figure 36**.

Figure 36: Supervisors motivating PhD students to apply their results.



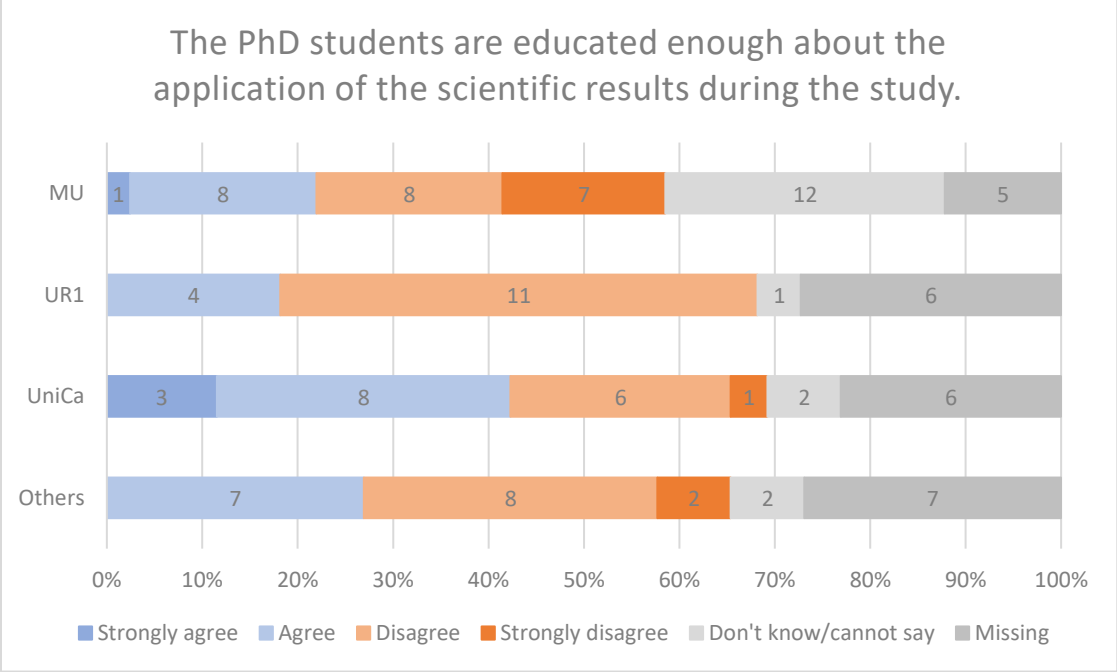
Even though PhD students have the opportunity to participate in applied research, and some are motivated by their supervisors to do that, this overlap of their research study to the application sphere seems to be rarely evaluated as part of their PhD study (see **Figure 37**).

Figure 37: Application of results as part of PhD students' evaluation.



The previous observation could be connected to insufficient information provided to the students about the possibility and options how to apply their research results during their study. The results differ significantly among the groups. The respondents from Masaryk University were most uncertain how to answer and also most negative, signalling some potential area for improvement in the information provided to them. The respondents from University of Rennes were also predominantly negative, showing possible lack of information about their options. Those from University of Cagliari were much more positive, indicating in majority enough information and education about how to apply their results. In case of the remaining universities, the results are rather inconclusive, with more negative than positive feedback, but due to the fragmentation of this group of respondents among five universities, there is limited information that can be derived from this. For more details see **Figure 38**. To conclude, **lack of education about scientific result application and lack of evaluation of such application as part of the PhD study are areas for improvement, together with better motivating students to do so**.

Figure 38: Educating PhD students to apply their results.



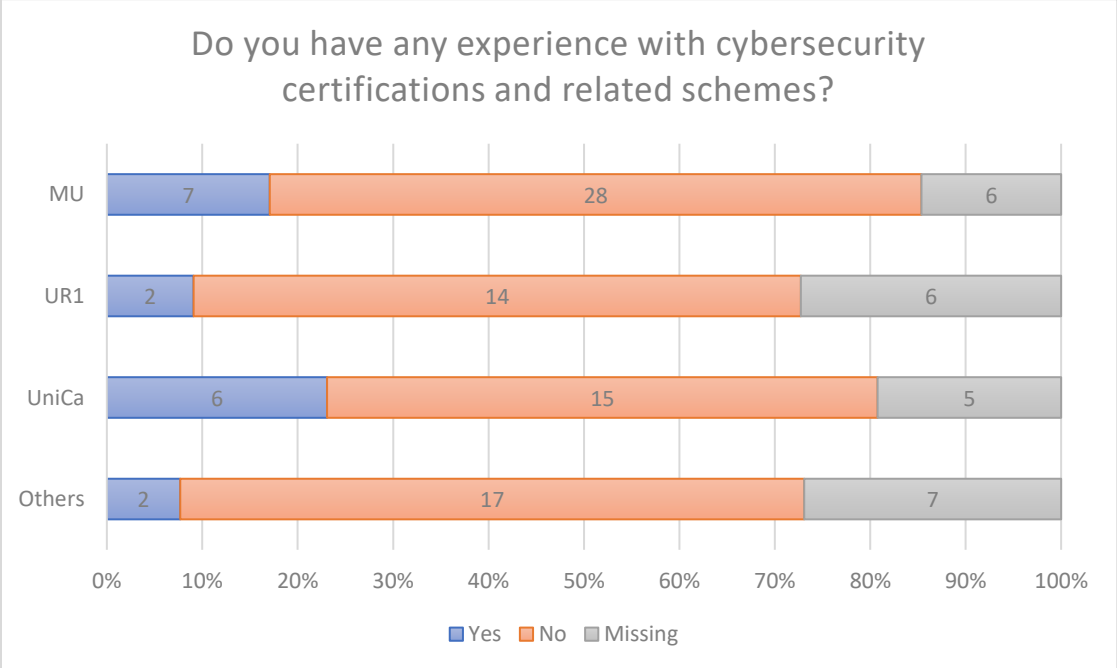
Cybersecurity TT specifics

This section of the questionnaire aimed to identify positions and awareness of several cybersecurity-specific topics relevant to technology transfer, including **cybersecurity certification experience**, **classified information** and **specific support**.

Regarding cybersecurity certification and related schemes, only a minority of participants reported any experience with it (see **Figure 39**). For those who had some experience, this experience varied across various certifications. Here are few quotes from these participants:

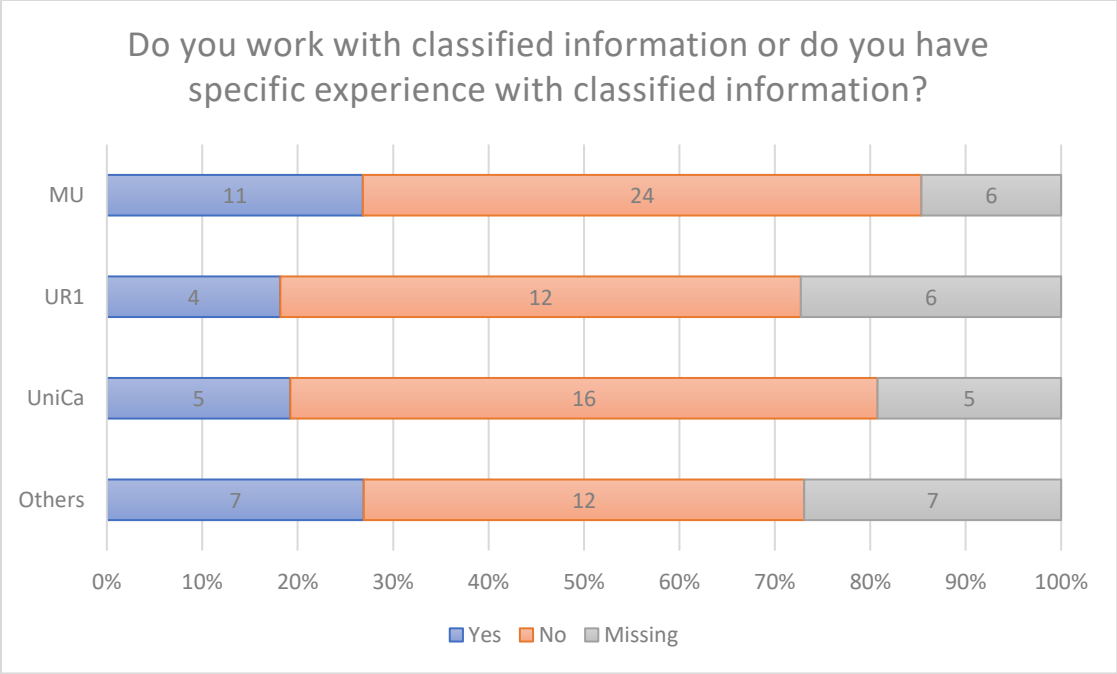
- *"**CISSP**."*
- *"I have concluded a cybersecurity diploma before joining the university and have sat for **OSCP**."*
- *"I participated in cybersecurity certification process (evaluator)."*
- *"Few exams involving some schemes and certifications."*
- *"I am certified as a **Lead Auditor for ISO 27001:2022**."*
- *"I know the different types of Cybersecurity certifications and I had one about the **SIMARGL European project**."*
- *"**PALO ALTO CYBERSECURITY**."*

Figure 39: Experience with cybersecurity certifications and related schemes.



Stakeholders can work with classified information, especially in the cybersecurity domain. More than 15% in each group of respondents work with classified data or have specific experience with classified information, as shown in **Figure 40**.

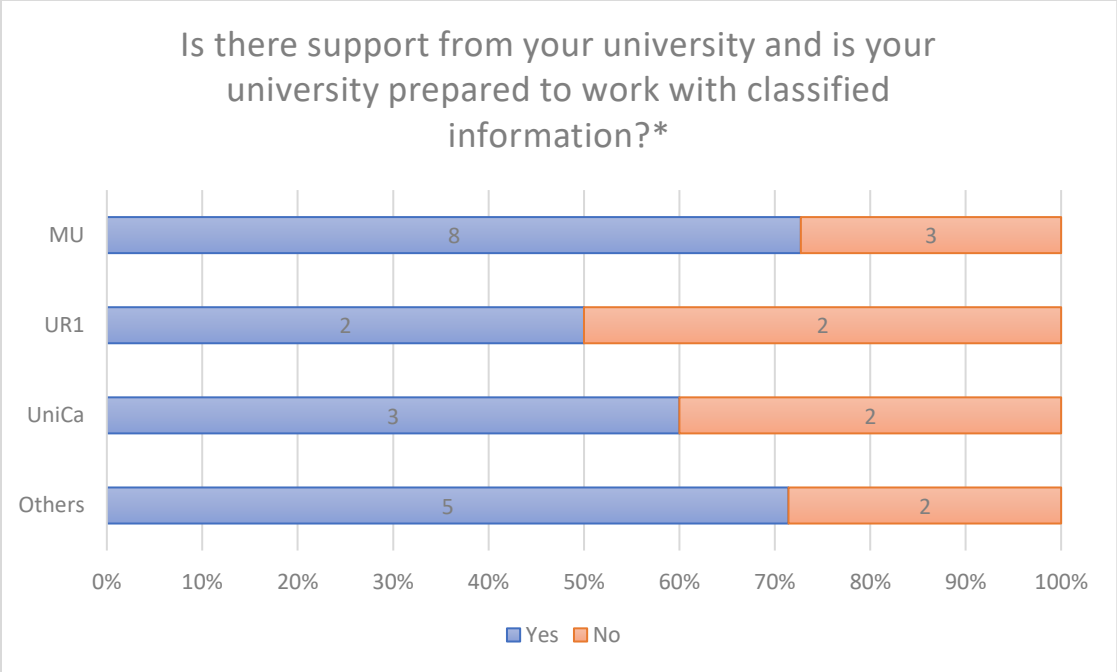
Figure 40: Experience with classified data.



Those who indicated that work with such data mostly have an opportunity to embrace support from the university since the results indicate that universities in all groups of respondents are to some degree prepared to work with classified information, as shown in **Figure 41**. The support that participants could receive from their university was various – it could be **technical support**, **administrative support** (e.g., contracts), or **establishing a system for classified information or restricted areas**. Here are few quotes from these participants:

- *"I experienced the support rather in technical areas, such as encrypted communication, storage of the documents in question etc."*
- *"Security Director is able to prepare necessary materials."*
- *"There is a well established system to deal with classified information - exchange of documents, access to certified computers."*
- *"Existence of a Restricted Area for sensible research on Cybersecurity. But we don't have "Secret defense" mechanisms."*

Figure 41: University support for work with classified data.



Non-academic stakeholders and their specifics

This section is devoted to the perception of technology transfer from the point of view of non-academic stakeholders. This is a summary of their perception across all aspects of the whole questionnaire. We achieved **responses from only three non-academic stakeholders**, so we leave validation of our findings for future studies. We also do not report all the results because, in some cases, they are the same as the perception of academic stakeholders, so we emphasize the differences and main findings.

In general, all non-academic stakeholders heard about technology and knowledge transfer sites, all have an idea about the scope of activity of the offices of knowledge and technology transfer, and two heard about cybersecurity technology transfer, which indicates that non-academic stakeholders (at least those, who were inclined to respond to the request) may be more familiar with technology and knowledge transfer than stakeholders from academia.

Regarding the extent of tasks within a participants' university activities, they are not as involved in basic research (one not at all, one rarely, and one often) as their academic counterparts. They are satisfied with that, but they want to be more involved in teaching than they currently are (which is sometimes), which is in contrast to academic stakeholders.

Regarding application possibilities of cybersecurity research results, all (rather) believe that they have immediately applicable research results and are (rather) personally engaged in research assuming immediate practical application. There is more potential for application of research results into practice.

All of our non-academic stakeholders have experience with practical application of their research results. In contrast to academic counterparts, none of them experienced results application by cooperation with state administration or government. Also, similar to respondents from University of Rennes but in comparison to those from the other academia stakeholders, they did not apply their results via collaboration within education or lectures.

Like the overall sample available to us, these non-academic stakeholders have rather mixed opinions about university and practice collaboration. All agreed that one of the barriers to university and practice collaboration is that their research results could be misused in practice, which differs from other participants. Also, in contrast to the overall sample, they know who could help them apply their research results, and two of them were more open to considering establishing their own company.

For PhD student training about the application of their research results into practice, two of them were optimistic about PhD students' education (and one was negative about it), but they were more sceptical about supervisors motivating the PhD students to think about the application their scientific results (one was really optimistic that motivation is happening, but two were really unsure about it). Nevertheless, these opinions are unavoidably limited in their relevance given the background of these respondents.

Regarding specifics of cybersecurity technology transfer, two non-academic stakeholders had some experience with classified information, and one did not have such experience.

Other comments and feedback

All participants – academic and non-academic stakeholders – could leave a comment of their choice at the end of the questionnaire. Here are few concluding quotes from these participants indicating that technology transfer is a crucial topic:

- *I would love to see my results applied in practice and have seen some make it, but the career in academia is demanding on its own and any transfer of knowledge makes it even harder. I do not have any business or financial skills and do not want to pursue them. What works in my team is that researchers do basic research, them transfer them to developers/practitioners within the same team, who implement it, and only after that we can transfer it to industry or other sectors. Direct communication between researcher and company typically fails."*
- *"Look at the US model. There is no SATT at Stanford. But Professors are allowed to work freely with industry and get directly paid by industry for that."*
- *"Thank you for the opportunity. I think the questions very extremely relevant and to the point."*
- *"Thanks for this! More cooperation throughout science fields is always needed - especially in cybersecurity (cooperation between technical and social-science fields) - it would be great to do as much as possible to enhance this cooperation."*

Conclusions

The results of the questionnaire have provided a valuable snapshot of the situation in current opportunities and challenges faced in the cybersecurity technology transfer.

At the outset, it should be noted that the general awareness of institutions/offices for technology transfer is not very high in general (see in particular Figure 4 and 5), while in the area of cybersecurity it is even more pronounced (see Figure 6), which indicates the need for more awareness of these activities in general, and specifically in the area of cybersecurity.

An important insight provided by the participants, showing the relevance of this effort was highlighted in Figure 13, which showed that a significant portion of them across the participating universities believe that they have some suitable result for immediate application.

The respondents also reported a varied spectrum of ways how their research results were already applied in practice. These included participants' own company/consulting, a company without cooperation with participants, another entity without collaboration with participants, cooperation with a company, cooperation with the non-governmental/non-profit sector, cooperation with state administration/self-government (e.g., ministries, authorities, municipalities), or cooperation with an educational/cultural institution (e.g. school or museum). As shown in Figure 16, the general expectation that the research results can be best transferred into practical application by a company with or without collaboration with academia or through cooperation with the state administration was solidly confirmed.

A positive conclusion can be reached from results presented in Figures 29 and 30, which indicate that majority of the respondents from across the participating universities do not see the practical application of their research results as very complicated and also do predominantly seem to have a good idea about how their research results could be practically used. Another positive outcome of the survey is that many participants across the universities seem to know who could help them with the application of the results of their research, as highlighted by Figure 32 – however, there is still room for improvement, which is evident in at least some of the negative responses. Also, this implies that the support with the application of the results is considered useful for the respondents and related services are seen as decent.

There were some important observations obtained about the limits for PhD student to aim for application of their research in practice. As was shown in detail in Figures 35 to 38, the lack of education about scientific result application and lack of evaluation of such application as part of the PhD study are areas for possible improvement, together with searching for ways how to better motivate students to do so. For more junior respondents it is thus important to offer directly the possibilities how they can transfer the research further through relevant guidelines or similar supportive materials.

As a strong motivation for the further pursuit of this research one should consider the voluntary comments by some participants, who highlighted the importance of technology transfer in the field of cybersecurity and confirmed our conviction about relevance of asking questions like these and mapping this area further in depth in the future.

Appendix
TT Cybersecurity - SURVEY

Start of Block: Data about the respondent

Q1 **Thank you for opening the questionnaire "Cybersecurity Technology Transfer Ecosystems Questionnaire" held under EDUC-SHARE task T4.2 (Horizon 2020). By filling the questionnaire, you will help whole EDUC-SHARE consortium to better understand stakeholders involved in cybersecurity research and its applications, and explore the related ecosystem(s). This survey is anonymous and confidential, and the questionnaire does not contain any personal information except the first five questions, which help us to contextualize the data. The data from this questionnaire will be used for the purposes of the survey only. You should need no more than 20 minutes to fill in this questionnaire. Please start by indicating your university.**

Selection of university.

Q2 **Your gender**
(*single choice*)

- Male (1)
- Female (2)
- Other _____ (3)

Q3 **What is your age?**
_____ (years)

Q4 **What is your position at your university?** (as a job/employment we understand any work contract with your except the study)
(*single choice*)

- Ph.D. student without a job (1)
- Ph.D. student with a job (2)
- Employee with no Ph.D. qualification (or equivalent) (3)
- Employee with a Ph.D. (or equivalent) (4)
- Employee qualified as associate professor or higher (5)
- Administrative employee (6)
- Employee in technology transfer (7)
- Other - please specify (8)
  _____

Q5 **Length of your work experience in years:**
(please specify the time you work in research or other position at your university)

_____ (months/years)

Q6 **Primary field of your research activity:**
(*single choice*)

- Natural Sciences (1)
- Engineering and Technology (2)
- Social Sciences (3)
- Humanities and the Arts (4)
- Other: _____ (5)

End of Block: Data about the respondent

Start of Block: Awareness

Q7 **Let us start with a few questions about technology and knowledge transfer sites:**

	yes (1)	no (2)
Have you ever heard of your university's sites which deal with intellectual property protection or knowledge and technology transfer? (1)	•	•
Do you have an idea of the scope of activity of the offices of knowledge and technology transfer? (2)	•	•
Have you ever heard of the Cybersecurity Technology Transfer? (3)	•	•
	•	•

End of Block: Awareness

Start of Block: Potential and experience with practical application

Q8 **In this question, please indicate what extent the following tasks occupy within your university activities** related to cybersecurity (We are concerned about your subjective view of the proportion of your activity at your university devoted to science, applications and teaching in the field. In the right part of the matrix, please indicate the ideal state)

	How intensely do you devote yourself					How would you like to devote yourself?		
	not at all (1)	rarely (2)	sometimes (3)	often (4)	constantly (5)	less (1)	the same (2)	more (3)

Basic research (or research where the results are not directed towards immediate application) (1)	•	•	•	•	•	•	•	•
Applied research (research whose results are practically utilized and you at least have information about this use (2)	•	•	•	•	•	•	•	•
Teaching (3)	•	•	•	•	•	•	•	•
Other Activities (4)	•	•	•	•	•	•	•	•

Q9 **How do you perceive the application possibilities of cybersecurity research results?** (please mark the answer in each line that describes your opinion)

	definitely yes (1)	rather yes (2)	rather not (3)	definitely not (4)	don't know, cannot say (5)
Do you think that results achieved by your field's research can be practically applied immediately? (1)	•	•	•	•	•
Within the frame of your employment or study at your university, do you engage personally in research assuming immediate practical application? (2)	•	•	•	•	•
Do you think that you have some results that can be practically applied immediately? (3)	•	•	•	•	•
Would you be interested in practical application of your results? (4)	•	•	•	•	•

Skip To: End of Block If How do you perceive the possibilities of practical use of the research results? (please mark the answer in each line... [definitely not] (Count) = 4

Display This Question:

If How do you perceive the application possibilities of research results? (please mark the answers in each row... = Would you be interested in practical application of your results? [rather no]

Or How do you perceive the application possibilities of research results? (please mark the answers in each row... = Would you be interested in practical application of your results? [definitely not]

Q10 **Why are you not interested in results' application?**

_____

Display This Question:

If How do you perceive the application possibilities of research results? (please mark the answers in each row... = Within the frame of your employment or study at your university, do you engage personally in research assuming immediate practical application? [definitely yes]

Or How do you perceive the application possibilities of research results? (please mark the answers in each row... = Within the frame of your employment or study at your university, do you engage personally in research assuming immediate practical application? [rather yes]

Or How do you perceive the application possibilities of research results? (please mark the answer in each line... = Do you think that you have some results that can be practically applied immediately? [definitely yes]

Or How do you perceive the application possibilities of research results? (please mark the answers in each row... = Do you think that you have some results that can be practically applied immediately? [rather yes]

X→

Q11 **How do you think the results of your research could be applied:**
(*multiple choice*)

- Development of methodology, procedure (1)
- Product development (2)
- Practical application of information gained from research - mediation to the general professional public (3)
- Popularization of results for the general public (4)
- Projection into public administration or politics (5)
- Other - please specify (6)
  _____

Display This Question:

If How do you perceive the application possibilities of research results? (Please indicate the answer in each line... != Would you be interested in practical application of your results? [rather no]

And How do you perceive the application possibilities of research results? (Please mark the answers in each line... != Would you be interested in practical application of your results? [definitely not]

Q12 **Do you have an ideal vision, a dream, of how the results of your research could be applied in practice?**

_____

Q13 **Have some of your research results been applied practically?**
(*single choice*)

- Yes (1)
- No (2)
- I don't know, I don't have any information about it (3)

Display This Question:

If Have some of your research results been applied practically? = Yes

Q14 **How were the results of your research applied in practice?** (you can choose more options - these are the applications you directly know about)
(*multiple choice*)

- By my own business / consulting and other activities (1)
- By a company without cooperation with us / me (2)
- By another entity without cooperation with us / me (3)
- By cooperation with a company (4)
- By cooperation with the non-governmental non-profit sector (5)
- By cooperation with state administration / self-government (e.g. ministries, authorities, municipalities) (6)
- By cooperation with an educational / cultural institution (e.g. school / museum) (7)
- In another way - please specify (8)
  _____

Display This Question:

If How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperating with the company

X→

Q15 **How was your collaboration with the company to apply the research results performed?**
(*single choice*)

- As part of my job at my university (1)
- As part of my another job (2)
- Privately (3)
- In another way - please specify: (4) _____

Display This Question:

If How was your collaboration with the company to apply the research results performed? = Privately

Q16 **For how long is your cooperation with companies focused on cybersecurity?**

_____ (no. of years / months)

Q17 **Please if you will, indicate why you chose to collaborate with the company privately.**

_____

Display This Question:

If How was your collaboration with the company to apply the research results performed? = As part of my job at my university

Q18 **Why did you decide to collaborate with a private company within the frame of employment at your university?**

_____

Display This Question:

If How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with a company

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with the non-governmental non-profit sector

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with state administration / self-government (e.g. ministries, authorities, municipalities)

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with an educational / cultural institution (e.g. primary school / museum)

X→

Q19 **What was this collaboration related to?**
(*multiple choice*)

- Research and development in general (1)
- Custom analysis, measuring and results' processing (2)
- Marketing strategies, marketing research (3)
- Education, lectures (4)
- Consulting (5)
- Others – please specify: (6) _____

Display This Question:

If How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with a company

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with the non-governmental non-profit sector

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with state administration / self-government (e.g. ministries, authorities, municipalities)

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with an educational / cultural institution (e.g. primary school / museum)

X→

Q20 **Do you consider this collaboration beneficial:**
(*single choice*)

- for all parties (1)
- for my university / my employer (2)
- for the faculty or department (3)
- for a company/ collaborative entity (4)
- for myself (5)
- for nobody (6)

Display This Question:

If How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with a company

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with the non-governmental non-profit sector

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with state administration / self-government (e.g. ministries, authorities, municipalities)

Or How were the results of your research applied in practice? (you can mark more possibilites - jd... = By cooperation with an educational / cultural institution (e.g. primary school / museum)

X→

Q21 **If another opportunity comes, will you agree to such collaboration again?**
(*single choice*)

- Yes (1)
- No (2)

Display This Question:

If If another opportunity comes, will you agree to such collaboration again? = No

Q22 **Why would you not agree with similar collaboration?**

_____

Display This Question:

If

How do you perceive the application possibilities of research results? (Please indicate the answer in each line... != Would you be interested in practical application of your results? [rather no]

How do you perceive the application possibilities of research results? (Please indicate the answer in each line... != Would you be interested in practical application of your results? [Definitely no]

Q23 **Within the frame of your work in your university, what types of cooperation are you interested in the field of cybersecurity?**
(*multiple choice*)

- commercial sphere (1)
- contracted research and development (2)
- providing requested service for companies (3)
- independent business activity (4)
- public administration (5)
- educational and cultural institutions (6)
- non-profit sector (7)
- other: (8) _____
- none (9)

End of Block: Potential and experience with practical application

Start of Block: Attitudes towards practical use

Q24 **What is your opinion on the collaboration of your university with other entities with respect to practical application of research in the area of cybersecurity?**

	Strongly agree (1)	Agree (2)	Disagree (3)	Strongly disagree (4)	Don't know/have no opinion (5)
It is promising. (1)	•	•	•	•	•
It helps utilize scientific knowledge. (2)	•	•	•	•	•
My university sufficiently supports these forms of collaboration. (3)	•	•	•	•	•
Companies are not interested in cooperation with my university. (4)	•	•	•	•	•
Non-profit entities are not interested in cooperation with my university. (5)	•	•	•	•	•
My university does not impede cooperation with companies. (6)	•	•	•	•	•

Q25 **To what extent do you agree with these statements?**

	Strongly agree (1)	Agree (2)	Disagree (3)	Strongly disagree (4)	Don't know/cannot say (5)
There is no time for application of the research results in my situation. (1)	•	•	•	•	•
The practical application of the results is not the usual part of the financing schemes in our field of research. (2)	•	•	•	•	•
Scientific evaluation of applied results in our field of research is complicated. (3)	•	•	•	•	•
Practical application of my research results would be very complicated. (4)	•	•	•	•	•
Results of my research could be misused in the practice. (5)	•	•	•	•	•

I don't know who could practically use my research results. (6)	•	•	•	•	•
It is not supported to devote to the applied research at my department. (7)	•	•	•	•	•
I don't know who could help me with the application of the results of my research. (8)	•	•	•	•	•

Display This Question:

If What is your opinion on the collaboration of your university with other entities with respect to practical application of research in the area of cybersecurity?= My university does not impede cooperation with companies. [I rather disagree]

Or What is your opinion on the collaboration of your university with other entities with respect to practical application of research in the area of cybersecurity?= My university does not impede cooperation with companies. [I strongly disagree]

Q26 **You stated that your university obstructs your collaboration with private companies in the field. What kind of obstructions are these?**

_____

Q27 **Do you think of establishing your own company which would engage in research knowledge application in practice in the area of cybersecurity?**
(*single choice*)

- Definitely yes (1)
- Rather yes (2)
- Rather not (3)
- Definitely not (4)
- Don't know/haven't thought about it yet (5)

Display This Question:

If Do you think of establishing your own company which would engage in research knowledge application in practice in the area of cybersecurity?... = Definitely yes

Or Do you think of establishing your own company which would engage in research knowledge application in practice in the area of cybersecurity?... = Rather yes

Q28 **What leads you to do that?**

_____

End of Block: Attitudes towards practical use

Start of Block: TT cybersecurity experience and evaluation

Q29 **Generally speaking, is there anything you miss within the offer of the various offices for the transfer of technologies and knowledge to support cybersecurity applied research or collaboration?**

_____

End of Block: TT cybersecurity experience and evaluation

Start of Block: Education and support for practical application

Q30 **To what extent is the issue of scientific result application included in your professional training?**

	Strongly agree (1)	Agree (2)	Disagree (3)	Strongly disagree (4)	Don't know/cannot say (5)
We are educated about the application of the scientific results during the study. (1)	•	•	•	•	•
We have the opportunity to participate in the applied research during the study. (2)	•	•	•	•	•
The overlap to the application sphere is the evaluated part of the studies. (3)	•	•	•	•	•
My supervisor/superior motivates me to think about the application of the research results. (4)	•	•	•	•	•

Display This Question:

*If **What is your position at the your university? (as a job/employment we understand any work contract with your except the study)** = Employee with no Ph.D. qualification (or equivalent)*

Or What is your position at the your university? (as a job/employment we understand any work contract with your except the study) = Employee with a Ph.D. (or equivalent)

Or What is your position at the your university? (as a job/employment we understand any work contract with your except the study) = Employee qualified as associate professor or

Q31 **What is your opinion on the issue of scientific result application as part of the professional training?**

	Strongly agree (1)	Agree (2)	Disagree (3)	Strongly disagree (4)	Don't know/cannot say (5)
The PhD students are educated enough about the application of the scientific results during the study. (1)	•	•	•	•	•
The PhD students have the opportunity to participate in the applied research during the study. (2)	•	•	•	•	•
The overlap to the application sphere is the evaluated part of the PhD study. (3)	•	•	•	•	•
Supervisors motivate PhD students to think about the application of the research results. (4)	•	•	•	•	•

Q32 **Do you have any experience with cybersecurity certifications and related schemes?** (*single choice*)

- Yes (1)
- No (2)

Q33 **If yes, please describe your experience and explain in which aspect you have experience with cybersecurity certifications.**

_____

Q34 **Do you work with classified information or do you have specific experience with classified information?** (*single choice*)

- Yes (1)
- No (2)

Q35 **If so, is there support from your university and is your university prepared to work with such specific information?** (*single choice*)

- Yes (1)
- No (2)

Q36 **If such support exists, please elaborate on the specifics, organizational aspects, internal regulations, etc.**

_____

Q37 **What is your area you are involved in the field of cybersecurity?** (*multiple choice*)

- Human, organization and regulatory aspects (1)
- Attacks and defenses (2)
- Systems security (3)
- Software and platform security (4)
- Infrastructure security (5)
- Other: _____ (6)

Q38 **We are at the end of the questionnaire! Before you press the last arrow to submit your responses, you can leave any message for us if you want to:**

_____

End of Block: Education and support for practical application

University of Rennes
2, rue du Thabor
35 000 Rennes
France

Annex 2 Culture and Heritage Conference report

"The future of science: scientific archives and new research"

Conference The future of science: scientific archives and new research

29-30th of November 2023

Amphithéâtre Max Weber/ Salle du Conseil de la MSH Mondes

Coorganisers: Ghislaine Glasson-Deschaumes (MSH Mondes) and Monica Heintz (University of Paris Nanterre)

The testimonial value of scientific archives cannot be denied: archives help historians and particularly historians of science retrace science's history, its place in society, past and future. But what other direct value could be assigned to old scientific archives? Could scientific archives be used for producing new scientific results, either in their discipline or in another? Could they be used for informing new artistic or societal work or bring about technological innovations? This conference aims to consider examples of reuses of scientific material for producing new results.

WEDNESDAY 29TH OF NOVEMBER, Amphitheater Max Weber, Building Max Weber ground floor, Nanterre campus

10:00 Welcome and introduction— Ghislaine Glasson-Deschaumes (director MSH Mondes) and Monica Heintz (codirector EDUC Nanterre)

10:20-11:20 Panel 1: Reuses of anthropological archives

10:20 Victor Stoichita (CNRS/ Univ Paris Nanterre) — (provisional title) *Reuses of ethnological sound archives*

10:50 Monica Heintz (Univ Paris Nanterre) — *Potential reuses of the scientific archives of the Dakar Djibouti expedition 1931-33 in a global open data environment.*

11:20- 11:40 Coffee break

11:40-13:00 Panel 2: Reuses of naturalistic archives

Hadi Sridhar (KLI, Vienna) —*An Elephant in the Room? The place of science and scientists in conservation decision-making in India*

Thomas Drouin (Univ Paris Nanterre) — *When an 18th-century herbarium and palm-leaf manuscripts meet, what are they talking about?*

13-14 LUNCH

14:00-15:20 Panel 3: Reuses of media archives

Akos Gocsal (Univ of Pecs) — *Media Archives in Present-day Research: The Case of the Hungarian Newsreel Archive used in Linguistic Studies*

Pascal Vallet (Univ Paris Nanterre) — Pasam*, a tool for exploring film corpora*

15:20-15:40 Coffee break

15:35-17:00 Panel 4: Reuses of 'outdated' archives

Roland Schmuck (Univ of Pecs) — *Reusing previous scientific results by redeveloping technologically outdated business simulation games*

Marco F. Lutzu (Univ of Cagliari) (online) — (provisional title) *Scientific archives as local heritage*

THURSDAY 30TH OF NOVEMBER, Salle de Conseil of the MSH Mondes, 4th floor

10-11:20 Panel 5: Reuses of SSH scientific archives (archeology)

Alfonso Ramírez Galicia (Univ Paris Nanterre) Re-using the excavation archives of Pincevent (France): Contributions to current research in archaeology and the history of sciences

Caroline Carrier (BNF, Paris)- The renewal of antic numismatics in the digital era

11:20-11:40 Coffee break

11:40-13:00 Panel 6: Reuses of human rights archives

Murtaza Mohiqi (USN) and Marzie Moheqqi (USN) — *Archival Narratives in the Digital Age: Bridging Human Rights Advocacy, Memory Preservation, and Technological Innovation*

Pascale Laborier (Univ Paris Nanterre) — *Archiving and Deep Mapping on High skilled Migration in the Digital Age: Bridging Knowledge and Advocating for Scholars at Risk*

13-14:00 LUNCH

14:00-15:40 Panel 7 : Reuses of academic archives

Marta Erdos (Univ of Pecs) — *Explorations on academic identity in the 21st century*

Francesca Pinna (U. of Cagliari) – *Today records' management for tomorrow's scientific research: the university archives*

15:40- 16:00 Coffee break

16:00-17:00 Final discussion

PARTICIPANTS

Dr. Caroline Carrier: After a PhD in ancient archaeology, she worked on several open access databases projects in ancient numismatics such as OPAL (Oxford Paris Alexander project), ARCH (Ancient Coinages as Related Cultural Heritage), SILVER (about movements of silver in Antiquity) and Trouvailles monétaires. She is currently in charge of documentary information systems at the Evry University Library, and works in particular on open science.

Co-author **Dr. Ludovic Trommenschlager** is project manager of « Trouvailles monétaires » at the Bibliothèque nationale de France, département des Monnaies, médailles et antiques. He holds a PhD in Roman Archaeology and has specialized in the field of coin finds and hoards with French archaeological units. He is currently working on setting up an online database of hoards.

Dr. Hari Sridhar is a fellow of the Konrad Lorenz Institute, Austria and an oral history programme manager of the Archives at NCBS (National Centre for Biological Sciences), India. Hari is involved in oral history projects examining the contemporary history of conservation in India, especially the intersection of ecological knowledge and conservation practice. Over the last seven years, Hari has also led another interview-project with authors of landmark papers in ecology and evolution (https://reflectionsonpaperspast.wordpress.com/). Hari's other major research interest is heterospecific sociality in animals, a topic he has researched during his PhD and post-doctoral years at the Indian Institute of Science, Bangalore.

Dr. Ákos Gocsál, dr. habil. is a Senior Lecturer of Education at the University of Pécs, Faculty of Music and Visual Arts, Hungary, and is a Research Fellow of the HUN-REN Hungarian Research Centre for Linguistics, Budapest. His main field of research is related to extralinguistic aspects of speech communication, with an emphasis on social perception based on speech. He is also involved in creating a database of metadata that supports research of early sound newsreels. Another research area he is interested in is transfer of music learning, i.e. non-musical outcomes of music learning.

Francesca Pinna holds a Bachelor in literature from the University of Cagliari and a master's degree in Archival and Library Sciences from the University of Florence, during which she participated in the Excellence program of the SAGAS department. Since November 2022 she is a Phd researcher at University of Cagliari, with the project: "The Forgotten Archive": Governing and Shaping the Document Flows of University Deposit Archives", with a focus on the pre-historical archive in universities and its workflow.

Dr. Roland Schmuck is Associate Professor at the University of Pécs Faculty of Business and Economics. He is the president of the Quality Development Committee of the University and the quality assurance director of the

Faculty. His teaching and research topics include quality management, strategic management, and business simulation games. He has experience in teaching using business simulation games for nearly 20 years. He participates in the EDUC project in the redevelopment of an old business game. As a social status, he is a city councilman and the president of the Economic and Budgeting Committee of the City of Pécs.

Dr. Marta B. Erdos is an Associate Professor at the Department of Social and Community Studies, Faculty of Humanities and Social Sciences, University of Pécs. She obtained her MA degree in Mental Health and then earned her PhD in Social Communication. Between 2016 and 2019 she was Vice Dean for Education at the Faculty of Humanities, UP. She is leader and founder of Social Innovation Evaluation Research Centre at the University of Pécs, affiliated with Social and Health Evaluation International. Her main area of research interest is identity, including the development of professional identity.

Prof. Murtaza Mohiqi is a law lecturer, legal columnist, and human rights researcher, possessing experience in both human rights and private law at both domestic and international levels. Murtaza's extensive research efforts focus on comprehensively examining multifaceted human rights aspects related to diverse demographic groups, including women, children, minorities, immigrants, and individuals with disabilities. He is also a volunteer teacher, teaching human rights and civil law online to girls in Afghanistan, providing them with access to education and helping them understand their rights as citizens. Additionally, Prof. Mohiqi is an expert in the field of Human Rights and Diverse Societies, as well as Artificial Intelligence and Human Rights. Co-author **Marzie Moheqqi** is a dedicated advocate for human rights and a passionate educational activist focused on empowering Afghan girls. She has authored numerous articles in support of human rights and has shared her insights at various international conferences. Additionally, Marzie possesses advanced expertise in Landscape engineering, showcasing a strong skill set in this field.

Dr. Alfonso Ramírez Galicia is a prehistorian and historian of Science, affiliated to the UMR TEMPS (CNRS/ UPN). He wrote a thesis (2014) about the construction of prehistoric archaeology in Mexico at the end of the XIXth and the beginning of the XXth centuries. Since 2015, Ie has collaborated with the laboratory Ethnologie préhistorique analyzing the excavation archives of the school of André Leroi-Gourhan. His main subject of research is the social history of scientific techniques, specially excavation techniques and technological analysis in French prehistory, from 1945 onward.

Pascal Vallet is Professor of Sociology at the University of Paris Nanterre. His research bears on cultural reception, artistic and cultural practices, the feeling of insecurity and industrial risks and sociological archives.

Pascale Laborier is Professor of Political Science at the University of Paris Nanterre and fellow of the institute Confluences Migrations. She has extensively researched and written about the case of scientists in exile and has coordinated the PAUSE programme at the University of Paris Nanterre that welcomes exiled scientists.

Victor Stoichita is CNRS researcher in ethnomusicology at the Laboratoire d'ethnologie et de sociologie Comparative (CNRS/ University of Paris Nanterre), specialized in the anthropology of music of Eastern and Southern Europe and digital interfaces for ethnomusicology.

Thomas Drouin is doctoral student at the Laboratoire d'ethnologie et de sociologie Comparative (CNRS/ University of Paris Nanterre) within the LabEx Pasts in the Present. He prepares a biography of the Tranquebar herbier and works on environmental memories, placing the herbier in dialogue with manuscripts from South India.

Marco Lutzu is Associate Professor in Ethnomusicology at the University of Cagliari and responsible for the Labimus Archive of the University of Cagliari, together with Prof. Ignazio Macchiarella. The archive contains historical recordings of ethnomusicological interest coming from private funds and related to Sardinian multipart singing, improvised poetry, instrumental music and religious songs are collected in the Archives.

Monica Heintz is Professor of Anthropology at the University of Paris Nanterre. A specialist of Eastern Europe and visual anthropologist, she has been engaged in several projects on heritage making in sensitive memorial contexts (post-socialist, post-apartheid, postcolonial) in the recent years. She has published on the anthropology of morality, citizenship, historical transitions and work and pays particular attention to the methodology of anthropological research in the digital era.

Ghislaine Glasson Deschaumes is a research engineer at the University of Paris Nanterre and director of the MSH Mondes. She is an associate member of the Institute for Social Sciences of Politics. Her research interests include cultural translation, issues of language and translation in heritage institutions (museums, archives, libraries), and conditions for knowledge production and circulation, notably from the perspective of the center-periphery relationship.