



TRANSFORMING OPEN RESPONSIBLE RESEARCH AND INNOVATION THROUGH CHARM
TORCH

DELIVERABLE D5.1– TORCH: CONTEXT AND STRATEGIES ANALYSIS ON HOW ALLIANCE’S PARTNERS ASSOCIATE WITH NON-ACADEMIC ACTORS

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GLOSSARY OF KEY INITIALS, ABBREVIATIONS AND ACRONYMS

AEI: State Research Agency (Spain)
 AGAUR: The Agency for Management of Universities and Research Grants (Spain)
 AMUE: Agence de Mutualisation des Universités et des Etablissements d'enseignement supérieur et de recherche (France)
 ANECA: National Agency for Quality Evaluation and Accreditation (Spain)
 AWTI: The Consultative Council for Scientific and Technologic Policy (Adviesraad voor het Wetenschaps- en Technologiebeleid)
 BIM: Booster Innovation Montpellier
 CCITUB: Scientific and Technological Centres of the University of Barcelona
 CH: Central Hungary
 CIFRE: Conventions Industrielles de Formation par la Recherche (Industrial doctorates, France)
 CSIC: Consejo Superior de Investigaciones Científicas (Spanish National Research Council)
 DJEI: Department of Business, Enterprise, and Innovation (Ireland)
 DTIF: The Disruptive Technologies Innovation (Ireland)
 EBU: Economic Board Utrecht
 ECAT 2020: Catalonia Strategy 2020
 EDP: Entrepreneurial Discovery Process
 EI: Enterprise Ireland
 EIC: European Innovation Council
 EIT: European Institute of Innovation and Technology
 ERDF: European Regional Development Fund
 EU: European Union
 F2I: The Fund for the Promotion of Innovation (UB)
 FBG: Fundació Bosch i Gimpera
 H2020: Horizon 2020
 HAS: Hungarian Academic of Sciences
 HEA: Higher Education Authority
 HEI: Higher Education Institutes
 ICT: Information and Communication Technologies
 IDA: Industrial Development Authority (Ireland)
 IP: Intellectual Property
 ITN: Innovative Training Networks
 KDP: Cooperative Doctoral Programme (Hungary)
 KIC: Knowledge and Innovation Community
 KNAW: The Royal Netherlands Academy of Arts and Sciences (Koninklijke Nederlandse Akademie van Wetenschappen)
 KTI: Knowledge Transfer Ireland
 LERU: League of European Research Universities
 MNE: Multi-National Enterprises
 NRA: National Research Agency
 MUSE: Montpellier University of Excellence
 NDP: National Development Plan (Ireland)
 NKFI Fund: National Research, Development and Innovation Fund (Hungary)
 NKIB: National Research Infrastructure Committee (Hungary)
 NRIO: National Research, Development and Innovation Office (Hungary)
 NWA: The Dutch Research Agenda
 NWO: Dutch Research Council
 NWO-I: Netherlands Foundation of Scientific Research Institutes
 RD or R&D: Research and Development
 RDI: Research, Development and Innovation

RI or R&I: Research and Innovation
 RIs: Research Infrastructures
 RIS3: Research and Innovation Strategy for Smart Specialisation of Central Hungary
 RIS3CAT: The research and innovation strategy for the smart specialisation of Catalonia
 RISE: Research and Innovation Staff Exchanges
 RPO: Research Performing Organization
 RSO: Research Support Office
 RVO: Netherland Enterprise Agency (Rijksdienst voor Ondernemend Nederland)
 S3: National Smart Specialisation Strategy (Hungary)
 SATT: Société d'Accélération de Transfert de Technologies (France)
 SFI: Science Foundation Ireland
 SMB: Small and Medium Business
 SME: Small and Medium Enterprises
 TKI: Top sectors Alliance for Knowledge and Innovation (Netherland)
 TIP: Territorial Innovation Platform (Hungary)
 TRI: Technology Research Institutes
 TRI: Trinity Research and Innovation
 TNO: The Netherland Organisation
 TRL: Technology Readiness Level
 TT: Technology Transfer
 TTEC: Trinity Technology and Enterprise Centre College
 TTO: Technology Transfer Office
 TTSI: Technology Transfer Strengthening Initiative
 UMC: University Medical Center Utrecht
 VEKOP: Competitive Central Hungary Operative Programme
 WP: Work Package
 WRR: The Scientific Council for Governmental Policy (Netherland)
Universities
 ELTE: Eötvös Loránd University
 UB: University of Barcelona
 UM: University of Montpellier
 UU: Utrecht University
 TCD: Trinity College of Dublin

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EXECUTIVE SUMMARY: CONTEXT AND STRATEGIES ANALYSIS ON HOW ALLIANCE' PARTNERS ASSOCIATE WITH NON-ACADEMIC ACTORS

TORCH Work Package 5, “*Strengthening cooperation between universities and enterprises*” focusses on understanding strategies and procedures universities have adopted to cooperate with enterprises and societal stakeholders of the innovation ecosystem in the full-spectrum of their activities, and their engagement to develop an entrepreneurship culture inside their institutions, especially among researchers and students. By enterprises, we include all type of for-profit business organisations and social enterprises. By societal stakeholders, we include key actors of the innovation community, for instance national and local public institutions, research centres, agencies, clusters, incubators, foundations and more.

This work package seeks to identify practices in each university to develop and support research and technology transfer partnerships with enterprises and societal stakeholders to detect innovation inside the research units, and strategies implemented to develop, encourage and support researchers and students’ entrepreneurship with the creation of academic spin-off and students’ start-ups. Collaboration with enterprises and societal stakeholders for research, technology transfer and spin-off creation participate in developing applied scientific research with concrete economic and societal applications to answer current global challenges and end-users needs and expectations.

As the first step in this process, Deliverable 5.1 “Context and strategies analysis on how alliance’s partners associate with non-academic actors” aims at drawing a landscape report for our institutions. The analysis is based on a qualitative survey developed by the WP5 leaders and filled out by representative of each of the partner institutions and on interviews with appropriate actors involved in partnerships between universities, enterprises and societal actors, with a focus on academic-industry partnerships: research and partnerships support offices, representative of enterprises, researchers, industrial PhD students, projects managers.

Deliverable 5.1 firstly presents the Alliance’ national and local contexts on Research and Innovation in which each university is situated, with a focus on strategies, policies and stakeholders involved in developing and supporting partnerships between universities and enterprises, with the support of national and local societal stakeholders of the innovation ecosystem. Those first sections allow us to contextualise the research and analysis lead in WP5 and to understand the strategies and practices implemented by each university in the light of the innovation ecosystem in which the institutions are evolving. The work package focuses on industrial partnerships with private business and social enterprises, but also considers societal stakeholders across the community involved in co-creation of knowledge to take into account end-users needs when creating value for issued from association between public research and enterprises.

Then, the report focuses on introducing common strategies and practices implemented by the whole or a majority of the Alliance’s partners to develop and support partnerships with enterprises, with the support of societal stakeholders, in different areas. Those areas are education and training, support to calls for projects proposals, collaborative research, knowledge and technology transfer,

sectoral mobility of researchers, industrial PhD and business development. For each of these areas, incentives and disincentives at systemic, enterprise, university and individual levels have been detected. Those (dis)incentives appear in objective data, collected through the survey, but have also been expressed during interviews, based on the subjective personal experience of stakeholders involved in collaborations with enterprises. In addition, preliminary recommendations have emerged from the interviews, for national authorities, universities, enterprises and societal stakeholders to better support partnerships between the latter two actors.

Eventually, Deliverable 5.1 introduces noteworthy initiatives that have been implemented in each institution to foster partnerships with enterprises and societal stakeholders in different areas of their activities.

We found that all countries have strong RI policies with a focus on developing open innovation ecosystem and supporting collaboration between universities and enterprises, for instance with financial and tax incentives, with specific mechanisms, and/or by encouraging sectoral mobility of researchers towards enterprises. All universities have implemented strategies in the full spectrum of their activities to develop partnerships with enterprises in collaboration with societal stakeholders and boost collaborative research and knowledge and technology transfer. RSO and TTOs work on providing researchers with administrative and legal support to conclude partnerships with enterprises and answer collaborative calls for projects involving partner enterprises. Those offices negotiate contracts, legal tools used to frame the collaboration, based on IP policy developed by each university.

In some universities, joint laboratories, implemented with the support of national mechanisms, are positively experienced by both researchers and enterprises as an impactful and exciting way to conduct collaborative research.

To foster collaboration between universities and enterprises, national policies provide facilities and pathways for researchers to be involved in the life of enterprises, for instance through participation in executive bodies, having shares in the company or providing scientific consultancy. In addition, national authorities have implemented facilities and incentives to develop industrial doctorates, some for a long time already, while other are still early at adopting those. Most researchers, enterprises and industrial PhD students reported the importance of developing industrial doctorates as one of the best ways to conduct collaborative research and create links between universities and enterprises.

In addition, four of the five universities of the Alliance have recently opened business developer positions to support the development of partnerships between universities and enterprises and to embed better internal knowledge of technologies and resources within research units.

The main challenge for universities remains that of finding solutions to simplify administrative procedures that are currently perceived as being too complex, opaque and slow by partner enterprises and researchers. In addition, partners' institutions should provide incentives to reduce

staff turnover in their administrative offices in order to facilitate the monitoring of partnerships files and to build expert teams.

Moreover, universities should continue to raise awareness among students and researchers on the advantages of collaborating with enterprises, such as providing impactful solutions for society and valorising public research results and technologies, both for the institution but also for the individual, for whom such engagement can prove positive for their career development.

Universities should also maintain their efforts in developing tools to map research units' resources and technologies and thus have more impact when reaching out to enterprises and when seeking to find new possibilities of collaborations.

Thus, with the help of this report, the Alliance's partners can situate themselves in the advancement and appropriateness of their strategies and measures put in place to foster collaborations with enterprises and societal stakeholders. Universities can see the areas where they perform best and identify where future work still needs to be undertaken or developed to better support those collaborations. They can find inspiration in practices and initiatives implemented in other countries and universities that could be valuable to replicate in their own institution.

DEFINITIONS

Co-creation: A concept encompassing many different channels of interaction between science, industry and society, including collaborative research, research contracts, licensing, joint patenting and academic spin-off creation¹.

Collaborative Research: Research lead by at least two or more public or private actors. This report refers to research lead by academics and businesses.

Intersectoral Mobility: Mobility between the academic and private, governmental and non-governmental sectors.

Knowledge Transfer: A concept encompassing many different channels of interaction between science and industry, including research contracts, joint patenting, and academic spin-offs.

Spin-in: Start-up, that begins with the Intellectual Property of a company's employees or affiliates. The start-up that results from this Intellectual Property belongs to the employee or affiliate, but not to the company. In this report, they refer to start-ups created by companies' employees, hosted on the universities' campuses.

Spin-off: In this report, the term "spin-off" refers to an academic spin-off, that is to say, start-ups created by researchers. Smilor et al. (1990) talk about "Research-Based spin-offs" (RBSO), which correspond to start-up creation by a staff member of the university and/or base on a technology developed inside the university².

Technology Transfer or Transfer of Technology: Technology transfer is the movement of data, designs, inventions, materials, software, technical knowledge, or trade secrets from one organization to another or from one purpose to another. The policies, procedures, and values of each organization guide technology transfer. Technology transfer can take place between universities, businesses, and governments, either formally or informally, to share skills, knowledge, technologies, manufacturing methods, and more. This form of knowledge transfer helps ensure that scientific and technological developments are available to a wider range of users who can then help develop or exploit it³.

¹ A. Campbell, C. Cavallade, C. Haunold, P. Karanikic, and A. Piccaluga (2020). Knowledge Transfer Metrics - Towards a European-wide set of harmonised indicators, Publications Office of the European Union, <<https://publications.jrc.ec.europa.eu/repository/handle/JRC120716>> [Accessed 26 Nov 2021]

² V. Francois (2015). « Les dynamiques entrepreneuriales d'une spin-off universitaire en phase d'émergence et lauréate du concours BPI », *Revue de l'Entrepreneuriat*, vol. 14, no. 1, pp. 41-72.

³ TWI, *What is technology transfer? (Definitions and examples)* <<https://www.twi-global.com/technical-knowledge/faqs/what-is-technology-transfer>> [Accessed 26 Nov 2021]

ABSTRACT

Work Package number 5 “Strengthening cooperation between universities and enterprises” aims at identifying and analysing strategies and practices implemented within the Alliance’s Members to improve the cooperation with the private sector and key societal stakeholders in the full spectrum of their activities: training, entrepreneurship, collaborative research, economic valorisation. Cooperation between universities, enterprises and societal actors allows enhancing innovations and creativity by boosting the exchange of skills and ideas, creating long-term partnerships, and promoting entrepreneurial culture alongside students and researchers.

The five CHARM’s s alliance-universities, Eötvös Loránd, Barcelona, Montpellier, Utrecht, and Trinity College of Dublin, have all developed strong ties with the business world and societal stakeholders of the national and local innovation ecosystems, from education to research and valorisation. This first report of WP5 aims at introducing and analysing these strategies by putting them into context, underlining the best practices, and formulate recommendations to overcome identified barriers.

INTRODUCTION

Objectives of Work Package 5 Task 1

The overall objective of Work Package 5 “*Strengthening cooperation between universities and enterprises*” is to understand and analyse how innovation can be boosted and have a greater sustainable economic and societal impact through collaborative research between universities and enterprises, in cooperation with societal stakeholders, plus by encouraging and developing entrepreneurship inside universities⁴. As innovation is not linear and research not always translated into innovation, the aim is to understand and analyse how to initiate and support the transmission from research to innovation.

Work Package 5 is one of the four transformational modules of TORCH’ project, considering cooperation with non-academic actors, with a focus on partnerships with enterprises as mentioned in the title of WP5 “*Strengthening cooperation between universities and enterprises*”. It participates to TORCH’ specific objectives to reinforce the central role of universities in the creation and generation of knowledge and to make science more responsive to society’s needs and demands, by including cooperation with societal stakeholders of innovation ecosystem involved in co-creation of knowledge (a “nothing about us without us” approach).

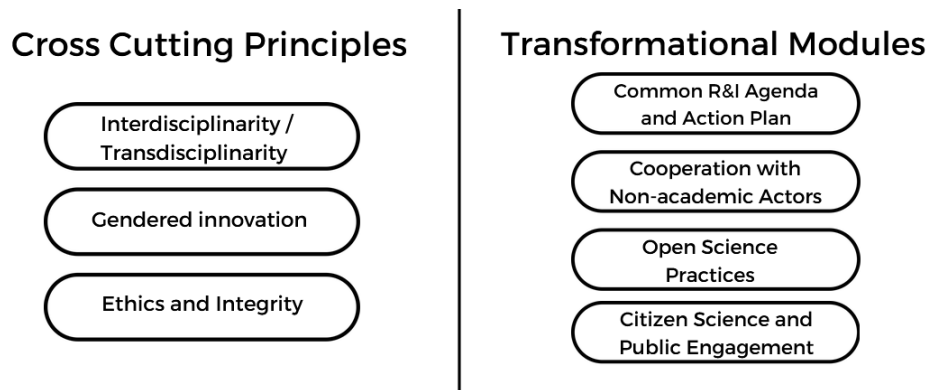


Figure 1. CHARM-EU R&I Dimensions Model⁵

The overall objective of Task 1, “*Context and strategies analysis on how alliance’s partners associate with non-academic actors*” is to foster collaboration between universities, enterprises and societal stakeholders in the whole spectrum of their activities: training, response to calls for projects, collaborative research, technology transfer, and economic valorisation of public research. Partnerships between universities and enterprises should be developed and conducted in close collaboration with societal stakeholders such as national and local organisms, agencies, authorities,

⁴ European Commission, Research Executive Agency, Grant Agreement Number 101017229 - TORCH

⁵ What We Do (TORCH/CHARM-EU website) <<https://www.charm-eu.eu/torch/what-we-do>> [Accessed 26 Oct 2021]

incubators, foundations, citizens associations, to take into account the real and concrete needs of end-users when conducting research and developing technologies with enterprises.

Data collected and analysed for this report will be valuable inputs for WP8 “Common Policies and Strategies” and WP9 “Actions plans and pilots” to develop a common roadmap for increasing the support and develop collaborations with societal stakeholders and enterprises to boost Research and Innovation, and applied science with concrete societal impact within the Alliance.

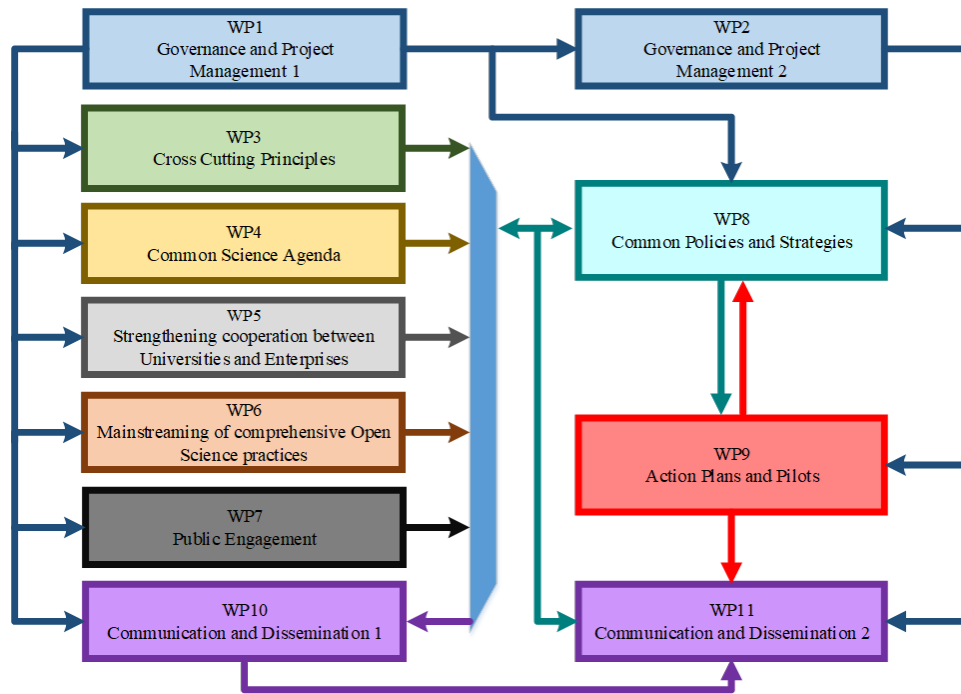


Figure 2. TORCH Work Packages

Why strengthening ties between universities, industry and societal stakeholders?

Partnerships between university, industry and societal stakeholders can participate in strengthening links between research and society. Indeed, societal stakeholders can help researchers and enterprises in better understanding end-users needs and fore grounding their expectations and experiences as a starting point for research/ industry collaborations. Then, public scientific research can provide excellent innovation solutions to end-users needs, that business can help valorise and commercialise. Universities’ strategies are in line with the quadruple innovation helix framework that recognizes four major actors in the innovation ecosystem: science, policy, industry and society.

Those four actors play a key role in shaping an open innovation ecosystem that is user-driven⁶. In an Open Innovation Ecosystem, actors share ideas and knowledge in a co-creation of science and research process. Open Innovation Ecosystem helps reducing time-to-market of advanced products

⁶ L. Gonzalo, R. Martínez (2016). Q&A, How Can a University Drive an Open Innovation Ecosystem? Technology Innovation Management Review, <<https://timreview.ca/article/1004>> [Accessed 26 Nov 2021]

and services (Von Hippel, 2005)⁷. End-users play a prominent role as users' community (Gassmann, 2010)⁸; they have become the new protagonist to be addressed. Their needs and expectations must be taken into account in academia-industry partnerships. Thus, Open Innovation, term introduced in 2003 by Henri Chesbrough, allows broader outcomes that would not be possible under traditional models of university-industry interactions.

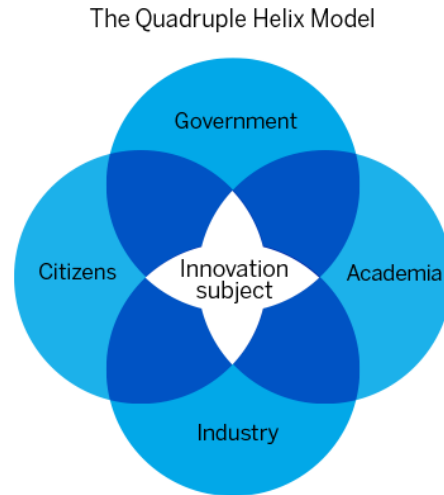


Figure 3. The Quadruple Innovation Helix Model

In addition, as happens in knowledge innovation communities, it is necessary to incorporate other actors that support the funding of promising research results to convert them into commercial products or services⁹.

For researchers, partnerships with enterprises and societal stakeholders are opportunities to understand end-users needs and markets, to raise funds, to valorise public research, transfer scientific knowledge and technologies to have a concrete impact. For businesses, collaborating with public researchers is an opportunity to have access to excellent scientific knowledge and skills to unlatch technical or scientific locks. Collaborations between universities and enterprises with the intermediary of societal actors enable researches applied to concrete needs, to address pressing challenges such as climate change, health, disabilities, food, or inclusion, and develop concrete societal solutions and applications. It is indeed essential for universities to engage with key stakeholders from the innovation community and with end-users to collect their needs and expectations. Those solicitations from the society will help researchers and enterprises to conduct applied research that is useful for society.

⁷ E. Von Hippel (2005). *Democratizing Innovation*. Cambridge, MA: MIT Press.

⁸ O. Gassmann, E. Enkel, and H. Chesbrough (2010). The Future of Open Innovation. *R&D Management*, 40(3): 213–221, <<https://onlinelibrary.wiley.com/doi/10.1111/j.1467-9310.2010.00605.x>> [Accessed 26 Nov 2021]

⁹ L. Gonzalo, R. Martínez (2016). Q&A, How Can a University Drive an Open Innovation Ecosystem? *Technology Innovation Management Review*, <<https://timreview.ca/article/1004>> [Accessed 26 Nov 2021]

University-enterprise collaborations and universities-societal stakeholders are at the heart of European Universities' strategies¹⁰, whose vision is to develop further those partnerships. In this perspective, the TORCH project aims at connecting universities to innovation ecosystems to create an innovation community, giving university-enterprise partnerships and transferrable activities a new dynamic by scaling them up at European level¹¹.

An ecosystem of Research and Innovation encompasses a dynamic set of related actors, activities, facilities, and rules that collaborate for the creation of benefits, in particular of added value. Scholars use the term “innovation ecosystem” to refer to a network of relationships through which information and talent flow through systems of sustained value co-creation (Russell, 2011). University-enterprise collaborations facilitate the translation of Research outcomes into Innovation that shows impact and most frequently economic value. A Research and Innovation ecosystem creates new knowledge, skills, and capacity to design and implement innovations, including social innovation to address societal challenges such as climate change and inclusion. The value involved lies both in the creation of benefits and in the ecosystem’s contribution to welfare and well-being in the broad sense (Dialogic, 2020)¹². Increasingly, universities are seeking ways to play a more proactive role in innovation, including transfer of knowledge from academia to industry (and vice versa) and to create opportunities for direct collaboration in innovation activities with diverse stakeholders¹³.

TORCH’s objective is to create a shared Research Agenda to facilitate public-private cooperation and strengthen the existing ecosystems of innovations by better connecting universities to them.

Report’s plan

Deliverable 5.1 introduces the national Research and Innovation policies, regulations, and strategies of each university part of the CHARM’EU alliance and the regional and/or local innovation ecosystem in which they are implemented. D5.1 acts as a landscape report for WP5. From this start, D5.1 conducts a comparative analysis of the strategies and common and best practices implemented within the universities to conduct and formalize partnerships with enterprises with the intermediary of key societal stakeholders, but also of the real and perceived barriers at different scales: individual, institutional and systemic. From this presentation of the strategies and practices of the five universities and their partners, emerge a gap analysis and potential recommendations to commonly improve and stimulate collaborations with enterprises and, in the future, create a common roadmap for work required.

¹⁰ European University Association, <<https://eua.eu/>> [Accessed 26 Nov 2021]

¹¹ European Commission, Research Executive Agency, Grant Agreement Number 101017229 - TORCH

¹² Government of the Netherlands, Dutch Strategy to Strengthen Research and Innovation Ecosystems, <<https://www.government.nl/documents/reports/2021/03/12/dutch-strategy-to-strengthen-research-and-ecosystems>> [Accessed 26 Nov 2021]

¹³ L. Gonzalo, R. Martínez (2016). Q&A, How Can a University Drive an Open Innovation Ecosystem ? Technology Innovation Management Review, <<https://timreview.ca/article/1004>> [Accessed 26 Nov 2021]

METHODS

To collect appropriate data to depict the national contexts and develop a comparative analysis of universities' strategies, best practices, and challenges, the following methodology was implemented:

Literature review and documents analysis

The identification of national regulations, policies and strategies and of universities' practices and activities partly emerges from a literature review, websites, including websites of the European Commission, national Ministries, regional agencies, research institutes and centres, national regulation, university policy/vision documents, documents supporting different projects, etc.

Common survey

A qualitative survey with closed and open questions was developed by the WP5 leading team (UM) and filled by representatives of each partner university. Our intention was to follow similar lines of questioning for each university while still allowing space for the individual characteristics. This data collection method has allowed the collection of key data (national/regional/local regulations, universities' practices) and facilitates a comparative analysis between the CHARM' alliance's members. It has also allowed to detect best practices and initiatives implemented inside universities to collaborate with enterprises and societal stakeholders.

Case studies through interviews

Semi-directed interviews, following interview matrixes developed by the WP5 leading team, were conducted by four of the five universities with appropriate administrative agents, business developers, researchers, industrial Ph.D. students, and enterprises, as well as discussions with appropriate professors and project initiators. These interviews and discussions allow to understand each actor's perspective on the subject and to detect incentives, disincentives and best practices based on personal everyday-life experience of people experimenting those partnerships.

ELTE

Researchers

ELTE Researchers	7
Researchers who have created a spin-off	2

Enterprises

Enterprises	4
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Industrial PhD students

Industrial PhD student	4
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Trinity College of Dublin

No interviews could have been conducted in TCD for this task.

University of Barcelona

Method: Semi-directive interviews, by Zoom

Administrative agents

Fundació Bosch i Gimpera	
Investigación colaborativa	1
Detección de la innovación	1
Comercialización de la investigación-	2
Creación de spin-off	1
StartUB!	
Innovation Manager	1
Business developer	1

Researchers

UB researchers	2
Researchers who have created a spin-off	1

Enterprises

Enterprises	1
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PhD

Industrial doctorates	1
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University of Montpellier

Method: Semi-directive interviews, by Zoom

Administrative agents from the Innovation and Partnerships Directorate

Contracts and Valorization Office	
Contracts managers	5
Valorisation officers	3
Business Developers	2
Office manager	1
Project engineering and support Office	
Research projects officers/managers	4
Office manager	1

Researchers

UM researchers	7
Researchers who have created a spin-off	4

Enterprises

Enterprises	4
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Other discussions

Method: Open discussion by Zoom

Initiatives supporting partnerships between universities and enterprises	2
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Utrecht University

Method: Semi-directive interviews

Administrative agents

Research Support Office	
RSO Officer	1
Strategic research theme Life Sciences Team of UU and Research office of UMC Utrecht	
EU Liaison Officer	1
Independent Unit (TT)	
Director	1

Business Developers

Business Developers (from different faculties, Utrecht Holdings, USP)	5
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Researchers

UU Researchers	3
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Industrial PhD Students

Industrial PhD Students	4
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Bilateral discussion

Bilateral discussions between WP5 leading university and the alliance's universities to better understand each context, strategy, and internal organization for research, development, and innovation were organised.

WP5 Meetings

WP5 leaders organised three meetings to discuss progress on methodology and data collection with WP5 representatives.

Levels of analysis

Incentives and incentives are identified and categorised in four levels:

Table 6. Levels of analysis for incentives and disincentives

Levels	Definition
Systemic Level	Global, EU and national level
Enterprise Level	Enterprises involved in collaboration with universities/research units
University	This level relates to different levels of the university (research teams, departments, faculties and universities)
Individual	Individual (dis)incentives relate to personal and professional aspects. For example, researchers, PhD students.

1. AN ALLIANCE IMPLEMENTED IN A DYNAMIC EUROPEAN CONTEXT FOR RESEARCH AND INNOVATION AND UNIVERSITIES-ENTERPRISES COLLABORATIONS.

Programme Horizon 2020¹⁴ (H2020) has represented a significant step by reinforcing ties between Research and Innovation in Europe from 2014 to 2020. The funding program for Research and Innovation in Europe focused on excellent science, industrial leadership, and societal challenges. In 2021, the new programme Horizon Europe¹⁵ superseded H2020 with an increased budget of 95.5 billion euros compared to 64.6 billion euros of H2020. Horizon Europe is the European Union's key funding programme for Research and Innovation over the 2021-2027 period. It focuses on climate change, UN's Sustainable Development Goals, and boosting the EU's competitiveness and growth.

The Research and Innovation policy is driving the European Union's green and digital transitions¹⁶. The R&I policy contributes significantly to achieving each of the European Commission's six headlines priorities for 2019-2024¹⁷ : a European Green Deal, a Europe fit for the digital age, an economy that works with people, a stronger Europe in the world, promoting the European way of life and a new push for the European democracy. European Research and Innovation is also at the forefront of the EU's response to health, social and economic challenges caused by the global COVID-19 pandemic.

About two-thirds of Europe's economic growth over the last few decades has been driven by innovation¹⁸. The "Innovation principle"¹⁹ has been implemented by the European Union to help achieve policy objectives by ensuring that all new policies or regulations support innovation. The European Innovation Council (EIC)²⁰ has been created to identify, develop and support new technologies and game-changing innovations by supporting SMEs and start-ups with a high innovative and commercial potential. Horizon Europe aims at developing a European Ecosystem of Innovation to support the establishment of new connexions between regional and national actors of innovation inside the EU. The Horizon Europe strategic plan for 2021-2024 thus focuses on "cooperation between universities, scientific communities, and industry, including small and medium

¹⁴ European Commission, *Horizon 2020*, <https://ec.europa.eu/programmes/horizon2020/> [Accessed 26 Nov 2021]

¹⁵ European Commission, *Horizon Europe*, <https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en> [Accessed 26 Nov 2021]

¹⁶ European Commission, *Research and Innovation Strategy 2020-2024*, <https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024_en> [Accessed 26 Nov 2021]

¹⁷ European Commission (2020), *Strategic Plan 2020-2020*

¹⁸ Euronews, *Innovation : Europe's road to growth*, <<https://www.euronews.com/next/2019/04/03/innovation-europe-s-road-to-growth>> [Accessed 26 Nov 2021]

¹⁹ European Commission, *Innovation Principle makes EU laws smarter and future-oriented, experts say*, <https://ec.europa.eu/info/news/innovation-principle-makes-eu-laws-smarter-and-future-oriented-experts-say-2019-nov-25_en> [Accessed 26 Nov 2021]

²⁰ European Innovation Council, <https://eic.ec.europa.eu/index_en> [Accessed 26 Nov 2021]

enterprises”²¹. Indeed, there is a need to find ways to translate research performance answering societal challenges and end-users needs to innovation and more funding sources to fund the commercialization of the idea from the research unit to the enterprise. In addition, developing partnerships with enterprises include associating with key societal stakeholders of innovation ecosystems at all levels - European, national, regional and local. Indeed, public research and technological innovation intended to be commercialized should answer real and concrete users and social needs and tackle societal and global challenges. Thus, citizens and societal stakeholders should express their needs, expectations and experience, and this should be the starting point for public research and industry collaborations. Thus, the European Commission judges essential to reinforce interactions in the ecosystems of innovation. EC aims at broadening interactions between diverse stakeholders of ecosystems of innovation to create a European Innovative Ecosystem plus expand the market of innovations. In this view, the European Institute of Innovation and Technology (EIT)²² aims at gathering key actors of innovation (research organisms, education, and enterprises) around the common objective to boost innovation and tighten the ties of a community of innovation working on global issues such as health, climate changes or urban mobility.

Furthermore, the “Marie Skłodowska-Curie” actions²³ seek to provide access to new knowledge and skills for research thanks to the mobility and training of researchers. Notably, «Research *Networks: support for Innovative Training Networks*” (ITN)²⁴ supports joint research training and/or doctoral programmes, implemented by European partnerships of universities, research institutions, and non-academic organizations. In industrial doctorates, non-academic organizations have an equal role to universities in respect of the researcher's time and supervision. Furthermore, one of the missions of the “*International and inter-sectoral cooperation through the Research and Innovation Staff Exchanges*” (RISE)²⁵ is to support partnerships of universities with non-academic organizations.

The CHARM alliance universities are well integrated into European ecosystems of Innovation. Some of them are members of the International Higher Education association and networks. TCD, UB, and UU are members of the LERU²⁶ Initiative, a network of twenty-three leading research universities that are located in twelve European countries. Additionally, all five universities are members of the Coimbra Group²⁷, an association of European multidisciplinary universities of a high standard. One of the Coimbra Group’s missions is to create opportunities to create academic collaboration and service to society and its purpose is to capitalize on best practices through the exchange of

²¹ European Commission, *Horizon Europe Strategic Plan 2021-2024*, < <https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/3c6ffd74-8ac3-11eb-b85c-01aa75ed71a1> > [Accessed 26 Nov 2021]

²² European Institute of Innovation and Technology, *Making Innovation Happen*, <<https://eit.europa.eu/>> [Accessed 26 Nov 2021]

²³ European Commission, *Marie-Sklodowska-Curie actions*, <<https://ec.europa.eu/programmes/horizon2020/en/h2020-section/marie-sklodowska-curie-actions>> [Accessed 26 Nov 2021]

²⁴ Idem

²⁵ Idem

²⁶ League of European Research Universities, <<https://www.leru.org/>> [Accessed 26 Nov 2021]

²⁷ Coimbra Group, *A tradition of Innovation*, <<https://www.coimbra-group.eu/>> [Accessed 26 Nov 2021]

experience. Furthermore, most of the Alliance' universities have engaged in the HRS4R accreditation²⁸ of the European Commission, a quality seal that recognizes efforts to foster equal opportunities and the capacity to attract talent. TCD has not yet completed the HRS4R process, but are at the beginning point of engaging in the process.

Since the late 1970s, many countries have changed their legislation and created support mechanisms to encourage interactions between universities and firms, including through knowledge transfer (Van Looy et al. 2011)²⁹. All of the Alliances Members have implemented specific elements of the European strategies on innovations mentioned above. The CHARM alliance countries have renewed their regulations and national strategies that aim to boost partnerships between universities and the private sector to fit with European objectives. In the next chapter, we present an overview of these national policies and strategies in order to understand how universities have developed their universities-enterprises partnerships' strategies.

²⁸ European Commission, *EURAXESS*, <<https://euraxess.ec.europa.eu/jobs/hrs4r>> [Accessed 26 Nov 2021]

²⁹ A. Arundel, S. Athreye, and S. Wunsch-Vincent (2021). *Harnessing Public Research for Innovation in the 21st Century: An International Assessment of Knowledge Transfer Policies (Intellectual Property, Innovation and Economic Development)*. Cambridge: Cambridge University Press.

2. NATIONAL CONTEXTS FOR RESEARCH AND INNOVATION AND UNIVERSITIES-ENTERPRISES COLLABORATIONS IN THE CHARM 'ALLIANCE COUNTRIES.

In this section, national contexts on Research and Innovation, that is to say, national strategies, policies, regulations, and funding opportunities are introduced with a focus on enterprise-university partnership strategies, regulations, intermediaries, and mechanisms. Indeed, public support is essential due to the not-for-profit entities (universities) playing a driving role in the open innovation ecosystem.

2.1 Hungary (ELTE)

The European Innovation Scoreboard³⁰ considers Hungary as a “moderate innovator”, with a performance between 50% and 95% of the EU average. We have seen a performance increased of 7.6%-points, with annual performance increases since 2013.

2.1.1 National strategies, policies and regulations on Research and Innovation in Hungary

In Hungary, the 2014 Act on “Scientific Research, Development and Innovation” (Act2014/LXXVI)³¹ establishes the “specific statutory and financial preconditions for the autonomy of scientific research enshrined in the Fundamental Law of Hungary, the knowledge-based society required for ensuring the competitiveness and income-generating capacity of the Hungarian economy, as well as development- and innovation-based growth, promoting sustainable social and economic development and job creation”, in the view of supporting “applied research and experimental development based on fundamental research”, promoting “the sustainable development of the Hungarian economy by supporting the creation and exploitation of research, development and innovation results”, contributing to “increase the competitiveness of enterprises based on research, development, and innovation”. The Act is following the basic principles laid down in the Europe 2020 Strategy ‘Innovation Union’ document.

Completing this national regulation, several RDI strategies have been implemented at the national level in Hungary:

(1) The “Investment in the Future, National Research and Development and Innovation Strategy”³², covering the 2013-2020 period was approved by the Hungarian Government in 2013. This national RDI Strategy aimed at promoting world-class research groups, integrating R&D centres and global large companies into the national innovation ecosystem, and fostering R&D-intensive Hungarian medium-sized enterprises expanding in international markets, together with small enterprises

³⁰ European Commission, *European Innovation Scoreboard 2020*, <https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_1150> [Accessed 26 Nov 2021]

³¹ Act LXXVI of 2014 on “*Scientific Research, Development and Innovation*”, published on 05 December 2014

³² Nemzetgazdasági Minisztérium, “*Befektetés a jövőbe Nemzeti Kutatás-fejlesztési és Innovációs Stratégia*” (2013-2020)

building on RDI and capable of fast growth. The strategy states that compliance with global societal challenges is a horizontal priority throughout the elaboration of RDI policy instruments.

(2) The National RDI strategy has been renewed by the National Research, Development and Innovation Office (NRDIO)³³ in compliance with the provisions of the relevant Government Decision to take into account the domestic and international trends that have emerged since 2013³⁴. The New National Research, Development, and Innovation strategy 2021-2030³⁵ intends to give policy responses to the challenges of the international environment, including changing trends such as digitalization, industry 4.0., open access, new innovation models, and transition of the labour market. Specific objectives have been developed related to knowledge production, cooperation, and knowledge flow and knowledge use, and corporate innovation³⁶, among which:

- Introduction of doctoral programs in line with real needs, the introduction of industrial PhD
- Knowledge-creating collaborations in higher education and research institutes with external actors
- Encourage active knowledge and technology transfer between actors in the innovation ecosystem
- Creating a research career that allows interoperability between academia and business
- Encourage start-up ecosystem development and the creation of spin-offs
- Encouraging business innovation

(3) The “Economic Development and Innovation Operational program”³⁷ from 2014-2020 aimed at promoting public-private collaboration and knowledge circulation through many calls for projects, co-funding for incubators, accelerators, and start-up companies, funding for academic-private consortia, etc.

³³ National Research, Development and Innovation Office, *Main focus areas of the office*, <<https://nkfi.gov.hu/about-the-office>> [Accessed 26 Nov 2021]

³⁴ STIP COMPASS, *Hungary*, <<https://stip.oecd.org/stip/countries/Hungary>> [Accessed 26 Nov 2021]

³⁵ National Research, Development and Innovation Office, <<https://nkfi.gov.hu/english/research-development-innovation-strategy/proposal-of-the-rdi-strategy-of-hungary>> [Accessed 30 Nov 2021]

³⁶ National Research, Development and Innovation Office, *Utilisation of the knowledge and capacity of Hungarian higher education institutions is key to the sustainable development of the innovation ecosystem*, <<https://nkfi.gov.hu/about-the-office/utilisation-of-the>> [Accessed 26 Nov 2021]

³⁷ STIP COMPASS, *Economic Development and Innovation Operational Programme*, <<https://stip.oecd.org/stip/policy-initiatives/2019%2Fdata%2FpolicyInitiatives%2F5556>> [Accessed 26 Nov 2021]

(4) The “National Smart Specialisation Strategy” (S3) running from 2021 to 2027³⁸, helps RDI policy to support RDI processes and compliance with the territoriality principle more effectively: it highlights strengths and areas for improvement for RDI stakeholders. In the 2021-2027 planning process, the scope of the S3 will expand beyond research and innovation: it will define new priorities addressing cross-sectoral challenges, such as globalization, climate change, or the emergence of new technologies. S3 priorities are developed using the Entrepreneurial Discovery Process method. This bottom-up process enables a wide range of stakeholders from the business sector, academia, research institutes, and social actors to contribute to the planning process.

2.1.2 Research and Innovation Policy steering and implementation

In Hungary, the Ministry for Innovation and Technology is the supervising authority for RDI regulation and policies.

The National Research, Development, and Innovation Office (NRDI) is the agency responsible for the national RDI strategy. It works in collaboration with competent ministries and stakeholders of the RDI system and supports the scientific and innovation ecosystem. The NRDI Office emphasizes properly strengthening the university RDI ecosystem, as universities are “*at the centre of RDI cooperation*”³⁹ to meet industrial needs and enable businesses to improve their efficiency in research and innovation. It facilitates relationships building and networking⁴⁰. Moreover, the Customer Service⁴¹ of the NRDI Office provides general information on RDI funding and support to applicants.

The “National Research Infrastructure Committee” (NKIB) was established in 2014 to support the creation of a national roadmap of research infrastructures⁴². The National Research Infrastructure Roadmap aims at:

- Identifying the major research infrastructures (RIs) in Hungary and providing an insight into their operations
- Presenting the nature and diversity of domestic capacities

³⁸ National Research, Development and Innovation Office, *National Smart Specialisation Strategy (S3) – 2021-2027*, <<https://nkfih.gov.hu/english/national-smart-specialisation-strategy/s3-2021-2027>> [Accessed 26 Nov 2021]

³⁹ National Research, Development and Innovation Office, *Providing university innovation services*, <<https://nkfih.gov.hu/about-the-office/university-innovation>> [Accessed 26 Nov 2021]

⁴⁰ National Research, Development and Innovation Office, *Building national and international relations, networking, finding consortium partners*, <<https://nkfih.gov.hu/about-the-office/building-relations>> [Accessed 26 Nov 2021]

⁴¹ National Research, Development and Innovation Office, *Information supply and technical support related to funding schemes*, <<https://nkfih.gov.hu/about-the-office/support-related-to>> [Accessed 26 Nov 2021]

⁴² National Research, Development and Innovation Office, *National Research Infrastructure Roadmap*, <<https://nkfih.gov.hu/english-2017/strategy-making-by-the/hungarian-research>> [Accessed 26 Nov 2021]

- Drawing the attention of the national and international research community to Hungarian research capacities and opportunities
- Providing background information for setting further development directions and outlining connection points to European infrastructures and cooperation relationships.

2.1.3 Public Research Funding

The National Research, Development, and Innovation Office is the government agency that promotes a coordinated, predictable and sustainable system for research funding through supporting excellent scientific research and promoting innovation⁴³.

The RDI law created a unified National Research, Development and Innovation Fund (NRDI Fund) *“to provide state support for research, development, and innovation and can be used solely for this purpose”*⁴⁴. Therefore, the NRDI Office of Hungary is the national strategic and funding agency for scientific research, development, and innovation, the primary source of advice on RDI policy for the Hungarian Government, and the primary RDI funding agency. Creation of the NRDI Office and use of the resources of the NRDI Fund serve the scientific and economic competitiveness of Hungary, the effective involvement of Hungary in the forefront European Research Area and initiate economic growth.

Furthermore, The Eötvös Loránd Research Network⁴⁵ (ELKH) Secretariat is an independent public budgetary institution, created in 2019. The Network manages and operates the publicly funded independent research network in Hungary, which constitutes a central pillar of the country's scientific domain.

2.1.4 Universities-Enterprises Gateways in Hungary

a) Researchers' sectorial mobility regulation

In Hungary, at national level, the entry of researchers into the private sector is regulated by Act XXXIII of 1992 on the Legal Status of Public Servants (*Kjt.*)⁴⁶. On this basis, during the existence of a public servant's legal relationship, a public servant may not establish an additional employment relationship if it is incompatible with his or her position. The public servant is obliged to get authorization from or notify the employer before establishing a further legal relationship, which has the influence on establishing a further legal relationship. If the further legal relationship concerns specific activities (education, research, proofreading, voluntary work... etc.) and does not fall into the public servant's same working time schedule as the one at the university, it would not be

⁴³ STIP COMPASS, Hungary, <<https://stip.oecd.org/stip/countries/Hungary>> [Accessed 26 Nov 2021]

⁴⁴ Fund it, *National Research, Development and Innovation Office*, <<https://fundit.fr/en/institutions/national-research-development-and-innovation-office-hungary-nkfi>> [Accessed 26 Nov 2021]

⁴⁵ Eötvös Loránd Research Network, <<https://elkh.org/en/>> [Accessed 26 Nov 2021]

⁴⁶ Hungary, *Act XXIII of 1992 on the Legal Status of Public Officials*, <<http://www.ilo.org/dyn/natlex/docs/ELECTRONIC/31681/63267/F-1347962864/HUN31681%20Eng.pdf>> [Accessed 26 Nov 2021]

necessary to be reported. However, according to the University's Employment Requirements and Rules of Procedure, such a case cannot occur, since the working hour schedule of the instructors/researchers is unrestricted. Thus, the concept of non-identical working time in whole or in part cannot be interpreted, since the period of regular work is not restricted in their case, so the period outside it cannot be determined either.

Kjt. § 41 (1) A public servant shall not establish a further employment relationship if it is incompatible with his or her job as a public servant.

Kjt. § 43 (1) If the working time of a public servant falls within the same period of time in the public servant's legal relationship and in the further legal relationship for the purpose of work, in whole or in part, the additional legal relationship for the work may be established only with the prior written consent of the employer.

If there is no conflict of interest, a further legal relationship may be established if the public servant complies with the rules relating to the establishment of the further legal relationship described above. Furthermore, the Hungarian legislation also provides for employment other than that is set in the appointment, which may apply to the place of work. Nevertheless, cases of "diversion" are possible only in other entities in public administration, not in the corporate sector.

Kjt. § 44/A (1) With regard to the legal relationship of public servants, § 57 of the Labour Code provisions on the completion of employment contract (Chapter VIII) shall not apply.

(2) Based on the § 53 of the Labour Code⁴⁷ work may be carried out with another employer if, on this basis, the public servant works for an employer covered by this act or the Civil Service Officers Act No. CXCIX of 2011⁴⁸ or the Act on the Status of Military Personnel.

Nevertheless, the efforts have started, and the introduction of a scientific career model is discussed in the Research, Development and Innovation Strategy of Hungary 2021-2030 published by the Ministry for Information and Technology.

b) Universities-enterprises' collaborations' intermediaries

The Hungarian Government has established the Science, Innovation, Technology and Industrial Park Network⁴⁹, which aims at achieving fully integrated cooperation between industry, researchers, and academia. Future Science Parks will include incubators, accelerators, venture capital funds, and business angels. Based on the most recent policy debate on the move to a third-generation university mode, as seen above, universities' role in knowledge transfer is important. This means the most relevant instrument in knowledge transfer and sharing is the programme that aims to strengthen the innovation ecosystem at universities.

⁴⁷ Hungarian Labor Code, <<https://njt.hu/jogszabaly/2012-1-00-00>> [Accessed 26 Nov 2021]

⁴⁸ Act No. CXCIX of 2011, <<https://njt.hu/jogszabaly/2011-199-00-00>> [Accessed 26 Nov 2021]

⁴⁹ STIP COMPASS, Hungary, <<https://stip.oecd.org/stip/countries/Hungary>> [Accessed 26 Nov 2021]

In addition, the government is promoting market-oriented knowledge transfer projects with new calls for proposals for open innovation (focusing on vertical innovation capacity building), university ecosystem building (focusing on horizontal innovation capacity building), and the Competence Centres – Research Infrastructures development programme.

Also, Bay Zoltán Non-profit Ltd. for Applied Research⁵⁰ acts as an innovation intermediary through applied R&D and technology transfer activities. The organisation cooperates with the Hungarian Academy of Sciences and universities and their research institutes. It aims to contribute to the competitiveness and efficiency of Hungarian companies by providing services in innovation and technology transfer in cooperation with Hungarian and foreign partner institutions.

The Hungarian Innovation Association⁵¹ is the main organization in Hungary ensuring the representation and enforcement of the interests of the innovation sphere, the aim of which is to promote the growth of the Hungarian economy by the effective integration of the Hungarian innovation results. Its members include representatives of academia: higher education institutions and research institutes, as well as market players: development companies, innovative companies and enterprises, consulting, marketing and other innovation service companies, self-employed people, venture capitalists, etc. Among these actors, the Association operates an information system, helps their networking and the establishment of intersectoral collaborations, as well as the mutual knowledge and matching of the interests and needs of the individual actors. Representing its members, it maintains formal contacts with public bodies, chambers, other interest groups, legislators and law enforcers, as well as innovation organizations, and actively participates in the development of domestic R&D and innovation policy (for example, it participated in the “National Smart Specialization Strategy” (S3)). The Higher Education Department of the Hungarian Innovation Association purposefully provides a favourable professional background for the innovation activities of higher education institutions.

c) Implemented mechanisms to support universities-enterprises collaborations in Hungary ⁵²

Government policy supports the use of soft instruments to promote knowledge transfer, such as participation in different mobility programmes, for instance, the Fulbright programme⁵³. The dissemination is encouraged by networking programmes organized by the National Research, Development, and Innovation Office, such as the “Territorial Innovation Platform” (TIP)⁵⁴ programme. TIP's objective is to facilitate territorial partnerships within the country based on university knowledge centres to ensure direct access to information about innovation policy

⁵⁰ Bay Zoltán Nonprofit Ltd. for Applied Research, *Welcome*, <<http://www.bayzoltan.hu/en/welcome/>> [Accessed 26 Nov 2021]

⁵¹ Hungarian Association for Innovation, *Mission*, <https://www.innovacio.hu/en_1a.htm> [Accessed 26 Nov 2021]

⁵² STIP COMPASS, *Hungary*, <<https://stip.oecd.org/stip/countries/Hungary>> [Accessed 26 Nov 2021]

⁵³ Fulbright Hungary, *Fulbright in Hungary*, <[Fulbright Hungary » Fulbright in Hungary](#)> [Accessed 26 Nov 2021]

⁵⁴ National Research, Development and Innovation Office, *Territorial Innovation Platforms*, <<https://nkfih.gov.hu/english-2017/events-of-the-office/territorial-innovation>> [Accessed 26 Nov 2021]

directions, enable and strengthen cooperation between local innovators, and create new professional foundations.

The 2019 program “*Establishment of centres of competence*”⁵⁵ implemented by the NRDI has provided market-oriented and competitive funding sources to higher education institutions and enables active and continuous cooperation with the business partners, thus ensuring a sustainable economic model even after a project has been finalized. This program aimed to create market demand based RDI hubs in higher education institutions that provide a modern research background to their business partners for a successful implementation of innovations and development objectives⁵⁶.

The “*Economic Development and Innovation Operational program*”⁵⁷ from 2014-2020 implemented mechanisms encouraging public-private collaborations, such as the “*Innovation Vouchers*” (funding of buying innovation services by the SMEs from third parties), co-funding for incubators, accelerators, and start-up companies. The state shares the risks associated with investing in innovation-based start-ups, with the owners of incubators specializing in the business development of start-ups. Many calls were also launched, for instance:

- R&D competitiveness and excellence co-operations – The programme focuses on providing funding to established consortia that are built on stable industrial-academic partnerships and the leader of a consortium must be a medium-size or large company.
- Prototype, product, and technology and service development: The call focuses on two development phases that are difficult to be financed from the market, specifically in-house prototype development by SMEs and the commercialization of the resulting innovative products, services and processes.

To add, the NRDI Office has launched the “*University Innovation Ecosystem*” programme⁵⁸, in line with the aforementioned objective to encourage active knowledge and technology transfer between the actors of the innovation ecosystem, including in particular making greater use of the knowledge dissemination function of higher education institutions. The programme aims at:

- Encouraging universities to facilitate the commercialization of scientific results;

⁵⁵ National Research, Development and Innovation Office, *Establishment of centres of competence – development of research infrastructures*, <<https://nkfi.gov.hu/english/nrdi-fund/establishment-of-centres-of-competence-2019-131-kk/call-for-project-proposals-2019-131-kk>> [Accessed 26 Nov 2021]

⁵⁶ STIP COMPASS, *Establishment of centres of Competence*, <<https://stip.oecd.org/stip/policy-initiatives/2019%2Fdata%2FpolicyInitiatives%2F25969>> [Accessed 26 Nov 2021]

⁵⁷ STIP COMPASS, *Economic Development and Innovation Operational Programme*, <<https://stip.oecd.org/stip/policy-initiatives/2019%2Fdata%2FpolicyInitiatives%2F5556>> [Accessed 26 Nov 2021]

⁵⁸ National Research, Development and Innovation Office, *Utilisation of the knowledge and capacity of Hungarian higher education institutions is key to the sustainable development of the innovation ecosystem*, <<https://nkfi.gov.hu/about-the-office/utilisation-of-the>> [Accessed 26 Nov 2021]

- Fosters cooperation between academia and the business sector in research, development, technology, and innovation;
- Increasing the active participation of universities in the R&I framework programmes of the European Union.

Programme objectives include the creation of an online platform that helps to align the portfolio of RDI services of universities with the specific demand of the business sector. The matchmaking function of the platform makes it easier for businesses to contact and partner with universities.

2.2 Ireland (TCD)

Ireland is classed as a 'strong innovator' Member State and was placed ninth in the European Innovation Scoreboard⁵⁹ for 2020 with a performance between 95% and 125% of the EU average. Performance increased strongly in 2016, leading to an overall performance increase compared to 2012 of 9.8%-points.

2.2.1 National strategies, policies and regulations on Research and Innovation in Ireland

Ireland has transformed itself over the past forty years into one of Europe's top innovation nations. Irish Science, Technology & Innovation policy has evolved over recent years with an increased focus on accelerating the economic and societal impact of public investment in research and increasing industry/academic collaborations plus the commercialisation of research.

The national IP Protocol 2016⁶⁰ is a revision of the first national IP Protocol issued in 2012. It provides a framework for the way in which companies and research-performing organisations can work together and how companies can benefit from access to new ideas, technology and inventions/IP.

"Innovation 2020"⁶¹, Ireland's current strategy for Research and Development, Science and Technology was launched in 2015. Innovation 2020 has enabled Ireland to build on the significant successes delivered by the Government's science strategy over the past decade, which has seen Ireland dramatically improve its performance globally in this area. The next phase of the strategy aims at building on existing infrastructures and achieving ambitious private-public collaborations.

The "Innovation 2020" key objectives are the following:

- Excellent research must be performed in strategic areas with relevance and impact on the economy and society.

⁵⁹ European Commission, *European Innovation Scoreboard 2020*, <https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_1150> [Accessed 26 Nov 2021]

⁶⁰ National IP Protocol, <<http://www.knowledgetransferireland.com/ManagingIP/KTI-Protocol-2016.pdf>> [Accessed 26 Nov 2021]

⁶¹ Gov.ie, *Innovation 2020*, <<https://www.gov.ie/en/publication/7287b-innovation-2020/>> [Accessed 26 Nov 2021]

- Ireland must develop a strong, innovative, and internationally competitive enterprise base, growing employment, sales, and exports.
- The development of a renowned pool of talent in Ireland's public research system and in industry, which maximizes the exchange of talent and knowledge between the two.
- A coherent, joined-up innovation ecosystem, responsive to emerging opportunities, delivering enhanced impact through the creation and application of knowledge.
- An internationally competitive research system that acts as a magnet and catalyst for talent and industry.

In Ireland, there has been broad consistency in what has been regarded as the core activities or elements of the National Innovation System and in what linkages between them are required to support knowledge creation, knowledge diffusion, and innovation that result in economic and societal impact⁶². The interrelated elements that have shaped public investment in R&D since 2000 are:

1. Knowledge Exchange System: strengthen the system of knowledge exchange through three main channels: formal collaborations, human capital mobility, and knowledge transfer infrastructure.
2. Publicly performed research and human capital: develop the capacity and capability of publicly performed research and build an excellent research system within Higher Education Institutes (HEIs), based on research excellence through investments in human capital, infrastructure, and underpinning sciences and technologies.
3. Enterprise R&D Base: broaden and deepen the enterprise R&D base, its absorptive capacity, and its ability to develop and commercialize intellectual property.
4. Public sector research: invest in Government research organizations and funding programmes to underpin public policy.

The National Innovation System has developed to date through sustained investment across these main pillars⁶³.

The core priorities for the Department of Business, Enterprise and Innovation (DBEI) for innovation have held broadly similar over time in terms of:

- Building capacity and capability in the form of broadening and deepening RDI activity in the enterprise base

⁶² Data collected from the survey filled by TCD

⁶³ Department of Jobs, Enterprise and Innovation, *Review of Capital Expenditure on Research, Development and Innovation (2000-2016)*, <<https://enterprise.gov.ie/en/Publications/Publication-files/Review-Capital-Expenditure-Research-Development-and-Innovation-2000-2016.pdf>> [Accessed 26 Nov 2021]

- The need to invest in human capital and infrastructure to strengthen the base
- Strengthening collaboration between the public research system and enterprise through supports for collaboration and commercialization,
- Focus on recognized excellence and engagement internationally.

These objectives and associated investment and supports are seen as complementary and necessary to support in parallel to develop the system as a whole. This aligns with the portfolio approach to innovation, which is recommended internationally.

Ireland aims to provide an exemplary innovation ecosystem that creates economic and societal benefits, especially the creation of sustainable jobs. An essential condition for this is a system that enables industry and the public research sector to work well together, and which encourages the commercialization of all forms of intellectual property arising from research in the public sector⁶⁴. The national policy set out here aims to ensure that all enterprises, from start-ups and small and medium enterprises (SMEs') to multi-national corporations, can easily access this IP. Enterprises should be able to negotiate access arrangements quickly, on terms that provide fair value to all parties, and in ways that are predictable and consistent from one negotiation to the next.

2.2.2 Research and Innovation Policy steering and implementation in Ireland

The Higher Education Authority (HEA)⁶⁵ leads the strategic development of the Irish higher education and research system, intending to create a coherent system of diverse institutions with distinct missions. The HEA's strategic objectives link with the implementation of Ireland's national strategy for research and innovation - "Innovation 2020" presented above⁶⁶.

The Innovation 2020 Implementation Group is driving the implementation of the Strategy at an overall level. This group has a whole-of-Government approach, includes representatives of the main public research funders as core members, and is chaired by the Department of Business, Enterprise, and Innovation.

2.2.3 Public Research Funding

The Irish government identified about thirty public sources of funding for research and development. The Department of Business, Enterprise, and Innovation manages more than half of these, spending through agencies and the Higher Education Authority's programme for research in third-level institutions. Each agency oversees a specific field or domain. The ministries assign objectives and missions to the agencies, but each of them intervenes for specific tasks and with respect to their own interests.

⁶⁴ Data collected from the survey filled by TCD

⁶⁵ Higher Education Authority, <<https://hea.ie/>> [Accessed 26 Nov 2021]

⁶⁶ Higher Education Authority, *Principles of Good Practices in Research in Irish, HEIs, 2020*

The Irish Research Council⁶⁷ funds research in all disciplines, mainly through PhD and post-PhD scholarships. The council also manages:

- Partnerships with enterprises' scheme
- Programmes co-funded by Marie Curie scholarship
- A programme which objective is to associate a researcher, a firm, and a university to allow a post-graduate student to acquire an experience in industrial research.

Science Foundation Ireland⁶⁸ (SFI) is the national foundation for investment in research in the areas of science, technology, engineering, and mathematics to assist the development and competitiveness of industry, enterprise and employment in Ireland.

The Health Research Board (HRB)⁶⁹ is a State Agency that operates under the auspices of the Department of Health. The HRB funds health and social care related research and leverages this to inform policy and practice.

2.2.4 Universities-Enterprises Gateways in Ireland

a) Researchers' sectorial mobility regulation

EURAXESS⁷⁰ Ireland is the national researcher mobility office providing practical advice and assistance for all research-active organisations across research agencies, academic, private and public sector. Promoting the mobility of researchers is a key element of Ireland's science/technology policy and the Irish Universities Association (IUA) and the Department of Further and Higher Education, Research, Innovation and Science jointly fund this service. The office is linked to a network of over 580 EURAXESS mobility centres in 41-member states for incoming and out-coming R&D personnel. The IUA provides a number of services under the EURAXESS umbrella:

- Provision of information, advice and guidance through the EURAXESS Ireland portal and help desk
- Fast Track Work Permit (Hosting Agreements) for R&D personnel
- Career development
- Other services

Enterprise Ireland provides the *Innovation Partnership Programme*, which encourages Irish-based companies to work with Irish research institutes resulting in mutually beneficial co-operation and

⁶⁷ Irish Research Council, <<https://research.ie/>> [Accessed 26 Nov 2021]

⁶⁸ Science Foundation Ireland, <<https://www.sfi.ie/>> [Accessed 26 Nov 2021]

⁶⁹ Health Research Board, <<https://www.hrb.ie>> [Accessed 26 Nov 2021]

⁷⁰ EURAXESS, <www.euraxess.ie> [Accessed 26 Nov 2021]

interaction. Companies can access expertise and resources to undertake research towards the development of new and improved products, processes, services, and generate new knowledge and expertise. The participating company benefits in terms of growth, the evolution of its strategic research and development and the creation of new knowledge that it can use to generate commercial advantage. The research institute benefits in terms of developing skill sets, intellectual property and publications.

b) Universities-enterprises' collaborations' intermediaries in Ireland

Many organisms in Ireland aim at supporting and creating collaborations between the academic and business worlds in Research and Innovation. Here is a quick and non-exhaustive overview of these organisms acting at the national level:

- The Industrial Development Authority (IDA)⁷¹ created numerous technology parks in the 2000s, linked with a university campus, enterprises and public authorities. These activity areas attract technological firms with high growth potential.
- Science Foundation Ireland (SFI) invests in academic researchers and research teams who are most likely to generate new knowledge, leading-edge technologies and competitive enterprises. SFI programmes form a key element of the drive to boost Ireland's international competitiveness and attract foreign direct investment.
- Enterprise Ireland⁷² (EI) is the government organization responsible for the development and growth of Irish enterprises in world markets. Enterprise Ireland's RDI competencies are broad, with supports for both companies and researchers in Higher Education Institutes to develop new technologies and processes that will lead to job creation and increased exports. Broadly, supports include direct funding to firms (Irish and foreign owned) and funding for commercialization and collaboration between enterprises and the research system.
- Knowledge Transfer Ireland⁷³ (KTI) is the public agency that oversees the Knowledge Transfer system in Ireland. KTIs objective is to make it simpler for industry and entrepreneurs to access the expertise, resources, technology and Intellectual Property in the State-funded research base. KTI engages with business, investors and technology transfer offices to shape practice.
- The Technology Transfer Offices (TTOs) and industrial liaison offices in Ireland's HEIs and research organizations help companies and investors to:

⁷¹ IDA Ireland, <<https://www.idaireland.com/>> [Accessed 26 Nov 2021]

⁷² Enterprise Ireland, <<https://www.enterprise-ireland.com/en/>> [Accessed 26 Nov 2021]

⁷³ Knowledge Transfer Ireland, <<https://www.knowledgetransferireland.com/>> [Accessed 26 Nov 2021]

- Access new knowledge and expertise to drive innovation through research collaboration, contracted services and consultancy.
- Identify and license new technologies and intellectual property relevant to their business.

c) Implemented mechanisms to support universities-enterprises collaborations in Ireland ⁷⁴

Diverse institutions and organisms in Ireland have implemented several mechanisms to encourage the development of partnerships between universities and enterprises, for example:

- The Disruptive Technologies Innovation Fund (DTIF)⁷⁵ is a €500 million fund established under the National Development Plan 2018-2027 (NDP)⁷⁶ in 2018. The Department of Enterprise, Trade and Employment manages the DTIF with administrative support from Enterprise Ireland. The purpose of the Fund is to drive collaboration between Ireland's excellent research base and industry as well as facilitating enterprises to compete directly for funding in support of the development and adoption of these technologies. The aim is to support investment in the development and deployment of disruptive technologies and applications on a commercial basis. The third call of the DTIF covers the 2020-2021 period.
- Knowledge Transfer Ireland⁷⁷ (KTI) manages the Technology Transfer Strengthening Initiative (TTSI) programme on behalf of Enterprise Ireland. This funding programme, established in 2007, has been instrumental in driving the development of a professional Technology Transfer system at Ireland's public research institutions. The "TTSI-3 Strategy" is currently operationalised and running from 2017 to 2021. It is a €34.5 million programme, supporting the continued development of Technology Transfer Office within Ireland's research performing organisations (RPOs), by offsetting the costs of staffing and operations. The objective of the programme is to sustain and develop appropriate skills within the TTOs, for the management and commercialisation of Intellectual Property, and to facilitate meaningful knowledge transfer interactions between Irish RPOs and Irish industry. New Ventures and technology transfer strategy is currently being re-developed in anticipation of the new national funding program TTSI-4 set to 2023. The objectives of TTSI3 include the development of a fast, flexible response to industry's requests for access to intellectual property and research expertise.

⁷⁴ STIP COMPASS, *Ireland*, <<https://stip.oecd.org/stip/countries/Ireland>> [Accessed 26 Nov 2021]

⁷⁵ Department of Enterprise, Trade and Employment, *Disruptive Technologies Innovation Fund*, <<https://enterprise.gov.ie/en/What-We-Do/Innovation-Research-Development/Disruptive-Technologies-Innovation-Fund/>> [Accessed 26 Nov 2021]

⁷⁶ Gov.ie, *National Development Plan 2018-2027*, <https://www.gov.ie/en/policy-information/07e507-national-development-plan-2018-2027/> [Accessed 26 Nov 2021]

⁷⁷ Knowledge Transfer Ireland, <<https://www.knowledgetransferireland.com/>> [Accessed 26 Nov 2021]

- The “Industrial Academic Expansion Grant”, running since 2019, is a fund administered by Enterprise Ireland through the Technology Gateway Network. The fund aims to help increase the levels of interaction between institutes of technology and industry in Ireland.
- “The Innovation Partnership program” steered by Enterprise Ireland and IDA Ireland assists enterprises in accessing the latest skills and expertise from research institutes throughout Ireland, contributing to the cost of research work to develop new and improved products, processes and services, or to generate new knowledge or know-how.
- Since 2007, Innovation Vouchers build links between Ireland’s public knowledge providers (Higher Education Institutions, Public Research Bodies) and small businesses; vouchers worth €5,000 are available to assist a company or companies to explore a business opportunity or problem with a registered knowledge provider.

2.3 Spain (UB)

Spain is the fourth beneficiary of H2020 program and ranked 14th on the European Innovation Scoreboard 2020, thus considered as a “Moderate Innovator” with a performance between 50% and 95% of the EU average. Performance increased by 14.6%-points, with strong increases in 2016, 2018 and 2019.

2.3.1 National strategies, policies and regulations on Research and Innovation in Spain

The Law 14/2011 on Science, Technology and Innovation⁷⁸ provides the adoption of a Spanish Strategy for Science, Technology and Innovation. The current strategy “*Estrategia Española, Tecnología e Innovación 2021-2027*”⁷⁹ describes the Spanish Global Policy on RDI. A long and extensive consultancy process (lasting for a year or more) was developed before the approval of the current Spanish R&D and Innovation Strategic Plan. Many organizations (trade unions, business organizations, scientific societies, as well outstanding researchers and businesspersons) have taken part on it.

The Spanish Strategy for Science, Technology and Innovation is divided in two phases:

- The 2021-2023 period aims to guarantee a strong basis for research in Spain, strengthening research infrastructures and defining a research’s career. This first phase will support Research, Development and Innovation on the following subjects: health, ecological transition, and digitalization. The aim is to face global social, economic, industrial and environmental challenges to reach a sustainable societal well-being.

⁷⁸ Law 14/2011, of June 1st on “*Science, Technology and Innovation*”. (*Ley de la Ciencia, la Tecnología y la Innovación*, BOE 131 of June 2nd, 2011), <<https://www.boe.es/buscar/doc.php?id=BOE-A-2011-9617&lang=en>> [Accessed 26 Nov 2021]

⁷⁹ Gobierno de España, Ministerio de ciencia e innovacion, « *Spanish Science, Technology and Innovation Strategy (ECTI)* »

- The second period, from 2023 and beyond, aims at consolidating this system, encouraging, and supporting Research, Innovation and Technology Transfer. The objective is to facilitate the transition between research and economy through innovation.

The Spanish strategy underlines the scientific and technologic opportunity that represents public-private partnerships and therefore partnerships between universities and enterprises. The plan aims reinforcing the detection of disruptive technologies and encouraging innovative investments. The objective is also to develop and support existing research infrastructures such as living labs or digital innovations hubs.

2.3.2 Research and Innovation Policy steering and implementation⁸⁰

The Act 14/2011 on Science, Technology and Innovation defines the Spanish Science, Technology and Innovation System as a "system of systems" that integrates and coordinates general State policies with those of the Autonomous Regions and articulates the actions in the public and private spheres via the Science, Technology and Innovation Policy Council.

In Spain, the Ministry for Science and Innovation supervises Research and Innovation policy since January 2020. The Scientific and Technology Policy and Innovation Council coordinates the Research, thus acts in the strategy's definition, monitoring of state plans, promotion of joint actions between the central administrations and the autonomous communities. The scientific and socio-economic worlds formulate recommendations through the Consultative Council for Science, Technology and Innovation.

The National Agency for Quality Evaluation and Accreditation (ANECA)⁸¹, related to the Ministry of Universities, measures the university system's efficiency, foster competition and increase research quality and universities management. Inside the National Agency, the National Commission for Research Activity Evaluation yearly evaluates research activities of universities' researchers and professor-researchers.

Several organisms related to the Ministry of Science and Innovation participate in the implementation of public research. The High Council for Scientific Research (Consejo Superior de Investigaciones Científicas - CSIC)⁸² is the biggest public institution dedicated to research in Spain. Its objective is to coordinate, promote and develop research. Singular Scientific and technological infrastructures aim to develop forefront and excellent research and support exchanges, transmission, technological transfer and innovation.

⁸⁰ Gouvernement Curie Xplore, *Espagne*, <<https://curiexplore.enseignementsup-recherche.gouv.fr/fiche/ESP>> [Accessed 26 Nov 2021]

⁸¹ Agencia Nacional de Evaluacion de la calidad y acreditacion, ANECA, <<http://www.aneca.es/eng/ANECA#:~:text=ANECA%20is%20the%20leading%20Spanish%20quality%20assessment%20body,adaptation%20to%20the%20European%20Higher%20Education%20Area%20%28EHEA%29>> [Accessed 26 Nov 2021]

⁸² The Spanish National Research Council, <<https://www.csic.es/en>> [Accessed 26 Nov 2021]

Alongside these national institutions, public research is conducted more and more by universities and centres related to autonomous communities. Regional agencies play an important role in terms of Innovation and for the competitiveness of businesses. It works through two key elements: innovation and internationalisation, as well as through crosscutting programmes to support all phases and areas which help to grow and guarantee companies' competitiveness.

2.3.3 Public Research Funding

At the national level, the State Research Agency (AEI) (part of the Spanish Science and Innovation Ministry structure) is a Spanish agency responsible for the promotion of scientific and technical research in all areas of knowledge through the competitive and efficient allocation of public resources. It also oversees the monitoring of actions financed and their impact, and advice on action planning or initiatives through which the R&D policies of the General State Administration are implemented.

Firms also participate in research funding at the national level. Many enterprises' foundations support research and development projects⁸³.

2.3.4 Universities-Enterprises Gateways in Spain

a) Researchers' sectorial mobility regulation

The Ley Orgánica 4/2007 de Universidades (LOMLOU 4/2007)⁸⁴ gives some details on the possibilities for the mobility of researchers towards enterprises:

The article 41.2-g indicates that creating links between university research and the productive system enable to articulate the transfer of the knowledge generated and the presence of the university in the process of innovation of the companies. It adds, *"This link may, where appropriate, be carried out through the creation of technology-based companies based on university activity, in whose activities the teaching and research staff of the universities may participate in accordance with the regime provided for in Article 83"*. To this end, universities promote the mobility of teaching and research staff, as well as the joint development of research and technological development programmes and projects, the creation of mixed centres or structures and membership and active participation in knowledge networks and technological platforms.

Article 83, *"Collaboration with other entities or natural persons"*, indicates *"The research groups recognized by the University, the Departments and the University Research Institutes, and their teaching staff through the same or the bodies, centres, foundations or similar organizational structures of the University dedicated to the channelling of the research initiatives and to the transfer*

⁸³ Law 14/2011, of June 1, on Science, Technology and Innovation, <BOE.es - [BOE-A-2011-9617 Ley 14/2011, de 1 de junio, de la Ciencia, la Tecnología y la Innovación.](http://BOE.es)> [Accessed 26 Nov 2021]

⁸⁴ BOE, Ley Orgánica 6/2001, de 21 de diciembre, de Universidades, Jefatura del Estado « BOE » núm. 307, de 24 de diciembre de 2001, Referencia: BOE-A-2001-24515, <<https://www.boe.es/buscar/pdf/2001/BOE-A-2001-24515-consolidado.pdf>> [Accessed 26 Nov 2021]

of the results of the investigation , may conclude contracts with persons, Universities or public and private entities for the realization of scientific, technical or artistic works, as well as for the development of specialization teachings or specific training activities”.

Furthermore, the tenth additional provision on *“The temporary mobility of the personnel of the Universities”* declares that the public authorities will promote mobility mechanisms between universities and other research centres, with their corresponding funding programmes. Likewise, they will promote measures of promotion and collaboration between the universities, centres of non-university education, Public Administrations, companies and other entities.

Teaching staff of public universities must exercise their functions preferably on a full-time basis, or part-time. The dedication shall in any case be compatible with the performance of the scientific, technical or artistic work referred to in Article 83.

Research staff can:

- Have more than 10% of participation in an enterprise
- Takes part of the executive bodies of an enterprise

b) Universities-Enterprises' collaborations intermediaries in Spain

There are many organisms providing gateways between public and private research in Spain:

- The Technology Transfer Offices, hosted by the universities, public research centres and Support centres for Technological Innovation facilitate cooperation between researchers and enterprises. Indeed, the 2001 organic law, which has been modified in 2007, has transformed the Spanish academic system⁸⁵. This law broadens the arm's length principle of Spanish universities asserted by the 1978 Spanish constitution. The 2007 modification increases the universities autonomy by allowing them to create structure to valorise their research. In Spain, the reinforcement of the universities research activities is being confirmed: 60% of public research efforts comes from universities' labs or from mixt unities. Transfer activities are being developed through these Technology Transfer Offices.
- The Universities-Enterprises' Foundations are dedicated to knowledge and technology transfer between universities and enterprises.
- Technological Platforms are public-private structures working on scientific and technologic advancements of a specific research field in order to increase enterprises' growth and competitiveness.

⁸⁵ Gobierno de España, Ministerio de la presidencia, relaciones con las cortes y memoria democratica, *Ley Orgánica 4/2007, de 12 de abril, por la que se modifica la Ley Orgánica 6/2001, de 21 de diciembre, de Universidades*, <<https://www.boe.es/eli/es/lo/2007/04/12/4>> [Accessed 26 Nov 2021]

- Spanish universities take part of the implementation policy for the Scientific and Technologic Parks. The mission of these parks is to encourage high tech enterprises' industrial development, to host academic spin-off, or enterprises that aim at benefiting from universities' skills. See, for example the Parc Científic de Barcelona⁸⁶ which is one of Europe's model ecosystems in research, technology transfer and innovation, covering a built-up surface area of more than 100,000 m² with some 3,000 professionals working mainly in the health sector: pharmacology, biotechnology, medical technologies, food and cosmetics.

c) Implemented mechanisms to support universities-enterprises collaborations in Spain ⁸⁷

Several mechanisms to encourage the development of partnerships between universities and enterprises have been implemented by diverse institutions and organisms in Spain, such as:

- The distinctions « Excellence centre Severo Ochoa » and « Excellence Unit Maria de Maeztu » accredit and finance centres and unities with an international leadership and collaborating with the socio-economic environment.
- The "Strategic Business Research Consortium Program (CIEN), running since 2014, is an R&D business program that foster large projects of consortia of three to eight companies with the participation of at least one SME, the leadership of a large or medium enterprise and the participation under contract of a significant number of research centres. The objectives are to develop effective collaborations by business associations that are focused on the planned research in strategic future areas and to boost public-private cooperation in R&D⁸⁸.
- The "Collaborative Social Challenges Projects" steered by the Spanish Research Agency brings support to projects of cooperation between companies and research organizations, in order to promote the development of new technologies, the business application of new ideas and techniques, and contribute to the creation of new products and services. The objectives of this program are to encourage public-private collaborations, promote creation of innovative companies and address today society's challenges⁸⁹.
- The Spanish Strategy for Research, Development and Innovation 2013-2020 has introduced several mechanisms, grants and programs to foster collaborations between universities and enterprises, that are steered by the Spanish Research Agency:
- Since 2013, the "Grants for Contracts Torres Quevedo" pursue the objectives of favouring the professional career of researchers, stimulating the demand in the private sector for

⁸⁶ Parc Científic de Barcelona, <<https://www.pcb.upb.edu/en/>> [Accessed 26 Nov 2021]

⁸⁷ STIP COMPASS, Spain, <<https://stip.oecd.org/stip/countries/Spain>> [Accessed 26 Nov 2021]

⁸⁸ Ibid

⁸⁹ Ibid

qualified personnel to undertake R&D plans and projects, helping the consolidation of newly created technology companies and thus promoting mobility among the public and private sectors. This program proposes grants for the employment of PhD graduates in companies, to develop industrial research projects, experimental development or previous feasibility studies.

- Since 2013, “Contracts for technical support personnel” encourages the hiring of technical support staff in organizations and research centres in order to increase and improve the performance and performance of scientific-technological infrastructures.
- Since 2014, EMPLEA encourages the development of R&D and innovation activities in small and medium-sized companies and fosters the creation of quality employment for University Graduates and Graduates in Vocational Training. The program proposes grants aimed at the hiring of university graduates and non-university graduates in higher or equivalent professional training for the execution and development of R&D activities in companies. The grant is used to finance part of the contracting costs.
- Industrial doctorates allow PhD to be trained in companies by co-financing the employment contracts of research personnel who participate in an industrial research or experimental development project that is developed in the company, in which their doctoral thesis will be framed, in order to favour the labour insertion of researchers in companies since the beginning of their professional careers. The pursued objectives of Industrial Doctorates are to promote the incorporation of talent in firms to increase their competitiveness and to favour the labour market entry of researchers in companies from the beginning of their professional careers⁹⁰.
- The “Enterprise doctorates in Health Sciences and Technology” steered by Carlos III Health Institute⁹¹ is an incentive for firms to hire doctorates. This is a grant aimed at public- private collaboration through the development of training programs in business workplaces as well as accredited ISS.

2.4 France (UM)

France has shown a strong progression since 2015 and position itself as the third beneficiary country of H2020 program.

France is considered as a strong innovator on the European Innovation Scoreboard 2019 with a performance between 95% and 125% of the EU average. Performance compared to 2012 increased by 6.2%-points, but in the two most recent year’s performance has seen moderate declines.

⁹⁰ Ibid

⁹¹ Instituto de Salud Carlos III, <<https://www.isciii.es/Paginas/Inicio.aspx>> [Accessed 26 Nov 2021]

2.4.1 National strategies, policies and regulations on Research and Innovation in France

The 2013 law for Higher Education and Research⁹² has set the objective to reinforce the ambition and coherence of Research in France and to strengthen its international influence. The National Strategy for Research is included in this law. This strategy aims at maintaining France in the research's global leaders, and at enabling French research to focus on the scientific, technologic, environmental and societal challenges of the XXI century.

Concerning Innovation, The Ministry for Higher Education, Research and Innovation has implemented a National Plan for Innovation in 2013⁹³ to develop entrepreneurship, intensify the interactions between public research and enterprises and valorise research.

The National Research Strategy "France Europe 2020"⁹⁴ is the Strategy Agenda for Research, Transfer and Innovation that have been published in 2014 by the Ministry of Higher Education and Research. This agenda defines national priorities and specific measures that must be implemented to foster research, transfer and innovation and to secure the position of France in the European Research Area. The challenge was to better prepare the French research to answer global challenges in coherence with the European dynamic propelled by H2020 and now amplified by Horizon Europe. "France Europe 2020" aims at mobilizing numerous actors on societal challenges such as climate change, clean energy, health and well-being, food security, sustainable urban systems and mobility The strategy intends to reform the coordination and orientation of the research facility and to promote technological research.

The current plan for Research and Innovation, "The programming law for Research 2021-2030"⁹⁵, aims at more dissemination of research into society and economy. Densifying links with enterprises is part of this strategy with the following mechanisms implemented:

⁹² LOI n° 2013-660 du 22 juillet 2013 relative à l'enseignement supérieur et à la recherche : <https://www.legifrance.gouv.fr/loda/id/JORFTEXT000027735009/> [Accessed 26 Nov 2021]

⁹³ Legifrance, *Loi n° 2013-660 du 22 juillet 2013 relative à l'enseignement supérieur et à la recherche (1)*, <[https://www.enseignementsup-recherche.gouv.fr/pid30736/www.enseignementsup-recherche.gouv.fr/pid30736/plan-national-pour-l-innovation.html](https://www.enseignementsup-recherche.gouv.fr/pid30736/www.enseignementsup-recherche.gouv.fr/pid30736/www.enseignementsup-recherche.gouv.fr/pid30736/plan-national-pour-l-innovation.html)> [Accessed 26 Nov 2021]

⁹⁴ Ministère de l'enseignement supérieur, de la recherche et de l'innovation, *France Europe 2020*, <[https://www.enseignementsup-recherche.gouv.fr/pid29645/www.enseignementsup-recherche.gouv.fr/pid29645/france-europe-2020.html](https://www.enseignementsup-recherche.gouv.fr/pid29645/www.enseignementsup-recherche.gouv.fr/pid29645/www.enseignementsup-recherche.gouv.fr/pid29645/france-europe-2020.html)> [Accessed 26 Nov 2021]

⁹⁵ Ministère de l'enseignement supérieur, de la recherche et de l'innovation, *Loi de programmation de la recherche 2021-2030 (Loi n° 2020-1674 du 24 décembre 2020 de programmation de la recherche)* : <[https://www.enseignementsup-recherche.gouv.fr/pid39124/www.enseignementsup-recherche.gouv.fr/pid39124/loi-de-programmation-de-la-recherche-2021-2030.html#:~:text=Loi%20n%C2%B0%202020-1674%20du%2024%20d%C3%A9cembre%202020%20de,%28%20Articles%2016%20%C3%A0%2022%29%20Plus%20d%27articles...%20](https://www.enseignementsup-recherche.gouv.fr/pid39124/www.enseignementsup-recherche.gouv.fr/pid39124/www.enseignementsup-recherche.gouv.fr/pid39124/loi-de-programmation-de-la-recherche-2021-2030.html#:~:text=Loi%20n%C2%B0%202020-1674%20du%2024%20d%C3%A9cembre%202020%20de,%28%20Articles%2016%20%C3%A0%2022%29%20Plus%20d%27articles...%20)> [Accessed 26 Nov 2021]

- Researchers or staff working part time for their attachment institution can carry another function for a public or private employer if these functions enter in the framework of their missions.
- Part time functions are considered for the researchers' pensions calculation.
- Public and private institutions can provide additional remuneration to researchers.
- Public researchers can create or participate as associates or directors to enterprises commercializing public research and teaching results even if this work has not been realized in performing their functions.

The French Stimulus Package⁹⁶ and the Investments for the Future Plan (PIA)⁹⁷ reinforce "The programming law for Research 2021-2030".

2.4.2 Research and Innovation Policy steering and implementation

The French Research policy is conducted by the Ministry of Higher Education, Research and Innovation⁹⁸. The Ministry of Higher Education, Research and Innovation and the Strategic Council for Research⁹⁹ define the strategic agenda for research, the general objectives and the global budget for the public research policy.

The funding agencies, such as the National Research Agency, research organisms and alliances formulate sectorial thematic priorities and decide of the allocation of resources. The High Council for the Evaluation of Higher Education and Research conducts the evaluation.

2.4.3 Public Research Funding

The public research laboratories are partly funded by the budgetary funds of the universities, public research organisms and agencies, the most important one being the National Research Agency¹⁰⁰. Public Research laboratories benefit from allocations from regions, industries and the European Union.

⁹⁶ Ministère de l'économie, des finances et de la relance, *Plan de Relance* : <<https://www.economie.gouv.fr/plan-de-relance>> [Accessed 26 Nov 2021]

⁹⁷ Gouvernement, *Secrétariat général pour l'investissement, Le Programme d'Investissements d'Avenir* : <<https://www.gouvernement.fr/le-programme-d-investissements-d-avenir>> [Accessed 26 Nov 2021]

⁹⁸ Gouvernement, Le ministère de l'enseignement supérieur, de la Recherche et de l'Innovation, <<https://www.gouvernement.fr/le-ministere-de-l-enseignement-superieur-de-la-recherche-et-de-l-innovation>>

⁹⁹ Ministère de l'enseignement supérieur, de la recherche et de l'innovation, *Stratégie Recherche, Conseil Stratégique de la Recherche*, <<https://www.enseignementsup-recherche.gouv.fr/cid75958/www.enseignementsup-recherche.gouv.fr/cid75958/www.enseignementsup-recherche.gouv.fr/cid75958/conseil-strategique-de-la-recherche.html>> [Accessed 26 Nov 2021]

¹⁰⁰ Agence nationale de la recherche, *Missions*, <<https://anr.fr/en/anrs-role-in-research/missions/>> [Accessed 26 Nov 2021]

The National Research Agency is a public administrative institution under the authority of the French Ministry of Higher Education, Research and Innovation. The agency funds project-based research carried out by public operators cooperating with each other or with private companies. Since 2010, the Agency has also been the national operator managing the Investments for the Future Programmes¹⁰¹ (PIA 1, 2 and 3) in the field of higher education and research. This role involves managing the calls for proposals, organising the selection, negotiating agreements, providing funding, monitoring and reviewing the impact of the projects and the activities of the programme that fall under this heading.

2.4.4 Universities-Enterprises Gateways

a) Researchers' sectorial mobility regulation

In France, since 1980's broad legislation changes have allowed, gradually, to foster, encourage and facilitate researchers' mobility towards the private sector.

In 1983, law 83-634 « Le Pors »¹⁰² had introduced the public officer' status, depicting his or her rights and obligations, from which two fundamental principles must be retained:

- Professional exclusivity: the officer must be committed to his public position.
- Disinterest: lucrative activities are prohibited.

The 1983 law prevented researchers from, among others:

- Creating or taking over an existing firm if he had a full-time public position;
- Taking part to the executive bodies of a firm or lucrative association;
- Taking part or detaining interests that can jeopardize his or her independence in an enterprise submitted to his or her administration's control;
- Cumulate a full-time job with another full-time job.

To overcome these restrictions, French regulation has evolved over the past three decades to enhance researchers' mobility and foster partnerships with enterprises.

¹⁰¹ Agence nationale de la recherche, *Investments for the Future*, <<https://anr.fr/en/investments-for-the-future/investments-for-the-future/>> [Accessed 26 Nov 2021]

¹⁰² Legifrance, *Loi n° 83-634 du 13 juillet 1983 portant droits et obligations des fonctionnaires. Loi Dite Loi Le Pors*, <<https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000504704>> [Accessed 26 Nov 2021]

In 1999, Law Allègre on Research and Innovation¹⁰³ initiated a legal framework to support participation or creation of enterprise for researchers. Allègre Law introduced three mechanisms for public researchers to be part of enterprises, which have been translated in Code of Research¹⁰⁴:

- **Article 25.1** of the Law on Research and Innovation, corresponding to Articles L.531-1 and following of the Code of Research: public researchers can create or participate as directors, associates or associate-directors to new or existing enterprises commercializing public research results. They can take stakes in the enterprise 'capital without limitations.
- **Article 25.2** of the Law on Research and Innovation, corresponding to Articles L. 531-8 and following of the Code of Research: public researchers can provide scientific support to a new or existing enterprise commercializing public research results up to 50% of their working time.
- **Article 25.3** of the Law on Research and Innovation, corresponding to Articles L.531-12 and following of the Code of Research: public researchers can participate in new or existing commercial companies' executive bodies. They can participate in the firm' social capital up to 32%. Researchers remain working full-time for the university. The maximum time for a period is three years, renewable within a limit of ten years.

The objective of Allègre law has been to support researchers' mobility by giving them opportunities to develop activities in the private sector and therefore develop partnerships between universities and enterprises. However, some limits and barriers were still preventing a deeper and long-term relationship with enterprises. For instance, Law Allègre formulated the prohibition for researchers to maintain a link with public research service in case of enterprise's creation, plus the prohibition for researchers to maintain any link with the enterprise after the outcome of scientific consultancy (even if they had taken part in the creation of the enterprise). In addition, the law prohibited researchers from retaining capital after the end of their mission in the enterprise.

To overcome these limits, recent laws have been implemented in France to soften the conditions for researchers to be part of an enterprise: The Programming Law for Research in 2006¹⁰⁵, Law PACTE in 2019 (Law for the Enterprises' Growth and Transformation)¹⁰⁶ and the programming Law for Research 2021-2030.

Public-private gateways have been simplified, notably with the following mechanisms:

¹⁰³ Legifrance, *Loi n° 99-587 du 12 juillet 1999 sur l'innovation et la recherche*, <<https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000759583/>> [Accessed 26 Nov 2021]

¹⁰⁴ Legifrance, *Code de la Recherche*, <https://www.legifrance.gouv.fr/codes/texte_lc/LEGITEXT000006071190/> [Accessed 26 Nov 2021]

¹⁰⁵ Legifrance, *Loi de programme n° 2006-450 du 18 avril 2006 pour la recherche (1)*, <<https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000000426953/>> [Accessed 26 Nov 2021]

¹⁰⁶ Legifrance, *Loi n° 2019-486 du 22 mai 2019 relative à la croissance et la transformation des entreprises*, <<https://www.legifrance.gouv.fr/dossierlegislatif/JORFDOLE000037080861/>> [Accessed 26 Nov 2021]

- Simplification of approval procedures: the seisin of the Ethics commission is no longer compulsory.
- No penalty for researchers in their careers: during scientific consultancy, researchers can devote 50% of their time to the enterprise simultaneously of working for their research unit and simultaneously of their teaching duties. If the 50% are taken on their teaching duties, the company must refund this quote part.
- Possibility for researchers to preserve their social shares in an enterprise even after the end of their scientific consultancy, in the limit of 49%. The employer must be informed.

Also, Article 25.1 bis (implemented by The Programming Law for Research 2021-2030), corresponding to article L531-6 focuses on participation of research staff as partners or managers in an existing company.

Moreover, a Consultative Commission for research Ethics can now be implemented by universities for a more effective accompaniment to technology transfer (this is not compulsory; it is up to each university). It is no longer required to hand a request to the national commission if a researcher want to benefit from the articles 531-1 and following.

The ten-year objective presented in the Programming Law for Research is to reach 500 start-ups of high technology created each year in France, compared to 170 currently.

With this new open regulation; France is willing to address challenges of reinforcing French enterprises innovation capacities and competitiveness by increasing interactions with public research and to enhance transfer, collaborative research, researchers' mobility and academic start-up creation.

In addition to these regulations favouring public researchers' mobility toward enterprises, three statutory positions are available for researchers to take sabbaticals or a part-time position in order to work for enterprises or create an enterprise:

- The Detachment or Secondment position ("Détachement"): with this statutory position, researchers and professors-researchers can be full-time detached in enterprises or private organisms to exercise functions of training, research, research valorisation, scientific and technical dissemination for a five-year period that can be renewed within a limit of ten years. Researchers are disposed out of their original body (the university) but continue to benefit from their rights to advancement and pension entitlements. No agreement needs to be implemented in this case. The enterprise or private organism in which they are detached must pay researchers' salaries. When the detachment or secondment period is finished, researchers and professors' researchers reintegrate by right their original body and in the same establishment.

- The Provision (for researchers) or Delegation (for professors-researchers) positions. These two positions enable researchers and professors-researchers to work out of their original administration part-time or full-time while keeping their remuneration and keeping benefiting from their rights attached to their original activity. They can work for an establishment or office within the scope of the Ministry of Higher Education, Research and Innovation to perform management functions. They can undertake these positions for a period of five years, renewable within a ten-year limit. For any provision or delegation request, a convention must be signed between the original administration and the host institution. The original establishment maintains the remuneration but there must be a repayment of the salary claim.
- Availability positions. There are two possibilities of availability:
 - A two-years availability to create or take over a business
 - A five-years availability for personal convenience

Researchers and professors-researchers can choose one of these positions or be placed under one of these statuses to work for an enterprise or create a business.

b) Universities-enterprises 'collaborations' intermediaries in France

Collaborative research and innovation are facilitated at national level by a broad set of mechanisms, actors and status available aforementioned.

- The Technologic Research Institutes (TRI): Eight Technologic Research Institutes have been certified by the State in the framework of the Investments for Future Plan. TRI are based on long-term partnerships between Higher Education establishments and enterprises. Their ambition is the intensify the dynamic Industry-Research-Training and to develop collaboration between public research and enterprises around common research challenges, shared tools and means and to stimulate knowledge transfer thanks to upstream partnerships. Each of them is built on an interdisciplinary theme combining the R&D skills of industry and public research. TRI aim at boosting the competitiveness of strategic technological sectors and promoting local economic growth around the best performing industrial clusters.
- The SATT: “Société d’Accélération du Transfert de Technologies” (Technology Transfer Accelerators)¹⁰⁷: The first SATT were created in 2012 by the State to create gateways between technologies coming from public research and the socio-economic world by helping researchers valorise their results. The thirteen SATT implemented in France have missions to fund and accompany the technical and economic development of innovations and commercialize them to answer the needs of industry and entrepreneurs. Moreover,

¹⁰⁷ Réseau SATT, <<https://www.satt.fr/>> [Accessed 26 Nov 2021]

these accelerators accompany and support entrepreneurs to create their start-ups. SATT work in close collaboration with universities' TTOs.

- **Competitiveness Clusters:** They gather enterprises of all dimensions, training establishments and research units on a territory and of a specific technological field. Their objective is to create a favourable environment for the emergence of innovative products, proceeding and services. Competition clusters aim at facilitating links between their adherents to elaborate collaborative research projects. They accompany SMB from Research and Development to commercialization and facilitate capital investment, international growth and access to skills. Competition clusters also push the integration of their adherents to innovation ecosystems to boost their bounds with Technology Research Institutes, Technology resources centres (French quality label for organisms providing technological support to enterprises), boost technology transfer, so they can benefit from public research's developments, and negotiate new partnerships.
- **Technology Transfer and Dissemination Structures** help companies to define their needs, participate in the development of their activities through innovation and technology. National certifications are given since 2007. There are three labels for three types of structures:

1- **Technology Dissemination Cell:** for light structures in charge of prospecting SME to raise awareness on innovation, support them to formalize their technological issues and put them through skills centres.

2- **Technological Resources Centres:** technologic advices missions to answer SME's needs.

3- **Technological Platform:** technological platforms located in technology and professional higher education establishments. SME can have access to their skills and equipment.

- **Business incubators for Public Research** were created as part of the call for projects provided for by the law on Research and Innovation (loi Allègre) of July 1999. They have been set up at the regional level, on the initiative of Higher Education Institutions or research organizations to promote the transfer of technologies developed in public research laboratories to the socio-economic world through the creation of innovative companies.

c) Implemented mechanisms to support universities-enterprises collaborations in France

Several mechanisms support collaboration between universities and business in France:

- **The Investments for the Future Programme (PIA)** aims to encourage public-private research partnerships by enabling the development of synergies between the higher education, research and business sectors.

- The National Research Agency has launched a “LabCom” 2021 call¹⁰⁸ to foster academic enterprises collaboration through the creation of joint laboratories between a research unit and an enterprise. Joint Laboratories are co-constructed structured partnerships between an SME or an intermediate-sized company and a research laboratory. They are governed by a contract signed between the two parties that define common governance, a research and innovation roadmap, resources to operate the roadmap and a strategy to ensure the value creation from the research activities. The programme was launched in 2013 for an initial period of three years, for which the laboratories received a grant of 300,000 euros. The project has been very successful with the creation of 160 joint structures funded. Since 2019, the funding has been modified with a six-month project set-up phase for a maximum grant of 50,000 euros, and a forty-eight-months operational phase starting from the validation of the LabCom contract, with a maximum grant of 300,000 euros. The industrial partner is required to make an equivalent contribution to the joint laboratory. The programme is multidisciplinary and funds research projects at high levels of technological maturity (TRL 6-7+)¹⁰⁹.
- “Dispositif Carnot” valorises research structures engaged in collaborative research and sustains enterprises’ endeavour in Research and Innovation. The “Carnot Label”¹¹⁰, an excellence label discerned by the Ministry of Higher Education, Research and Innovation, was created in 2006 to certify these research structures. The “Dispositif Carnot” has proven its efficiency and was completed in 2006 by the facility “Tremplin Carnot” dedicated to research structures willing to reinforce their skills in building contractual relations with enterprises. The “Dispositif Carnot” therefore supports collaborative research to accelerate the transition between research to innovation and increase technology transfer. Accredited structured, called “Carnot Institute” can receive special funding. These funding are calculated on the volume of income generated by research contracts in collaboration with enterprises. Collaborations between Carnot Institutes and enterprises can take several forms: direct research, collaborative research, tests on technological platforms, advices and expertise, creation of common research units. There are currently twenty-nine Carnot Institutes and nine Tremplin Carnot in France.
- The Research Tax Credit (Crédit Impôt Recherche) is a public financial help that allow sustaining enterprises’ endeavour in Research and Development (fundamental research, applied research, experimental development) and in Innovation (prototype or pilots for new products).

¹⁰⁸ Agence Nationale de la Recherche, *Laboratoires communs organismes de recherche publics – TPE :PME, ETI (LabCom) appel à propositions Edition 2021*, <<https://anr.fr/fr/detail/call/laboratoires-communs-organismes-de-recherche-publics-tpepme-eti-labcom-appel-a-propositions-ed-1/>> [Accessed 26 Nov 2021]

¹⁰⁹ STIP COMPASS, *France*, <<https://stip.oecd.org/stip/countries/France>> [Accessed 26 Nov 2021]

¹¹⁰ Le réseau des carnots, *Le Label Carnot*, <<https://www.instituts-carnot.eu/fr/le-label-carnot>> [Accessed 26 Nov 2021]

- Thèse CIFRE (Industrial Research PhD)¹¹¹ : through this mechanism, enterprises can benefit from financial help to employ one PhD whose research project will conduct to thesis defence. The CIFRE convention associates three partners: one enterprise, one PhD student and one research laboratory. An enterprise employs on PhD student under a three years' contract, with a minimum annual gross salary of 23 484 euros. The enterprise receives an annual 14 000 euros' subvention for the three years from the National Association for Research and Technology. Spending are eligible to the Research Tax Credit from which the obtained subvention is deducted. Moreover, if the enterprise employs the doctor after the end of the CIFRE collaboration, it can benefit from the status of "Young Doctor" in the Research Tax Credit calculation.
- National status have been created for new enterprises in order to support their research and innovation initiatives:
 - "Young Innovative Firms" is a state facility for new SME (of less than eight years of existence) that invest in R&D. The status enables the young enterprises to benefit from social and fiscal exemptions.
 - "Young Academic Firms" is a special category of Young Innovative Enterprises that must belong to at least 10% to students or to researchers-professors. The young university enterprise must conduct research valorisation as their main activity. The executives or associates must have participated in the research being valorised.

2.5 The Netherlands (UU)

The Netherlands belongs in the top-five Innovation Leaders in Europe, ranking fourth in the 2020 European Innovation Scoreboard of the EU Commission. Relatively strong annual increases are observed for 2018 and 2019 for the Netherlands leading to an overall increase of 10.5%-points.

The Netherland is the seventh beneficiary of the H2020 program.

2.5.1 National strategies, policies and regulations on Research and Innovation in the Netherlands

The Netherlands is one of the leading destinations for Research and Development activities and enjoys a considerable reputation worldwide, due to its renowned research institutes and universities, strong digital infrastructures, test facilities and highly educated talent. Moreover, Dutch researchers and universities are internationally oriented and well represented in the European Horizon Framework Program.

¹¹¹ Ministère de l'enseignement supérieur, de la recherche et de l'innovation, *Conventions industrielles de Formation par la Recherche (CIFRE)*, <<https://www.enseignementsup-recherche.gouv.fr/cid22130/les-cifre.html>> [Accessed 26 Nov 2021]

The Netherlands wishes to maintain and strengthen this leading position. In the “2025 Vision for Science choices for the future”¹¹², the Dutch government formulated three ambitions for the future:

1. Dutch science is of worldwide significance.
2. Dutch science has even closer ties with society and the private sector.
3. Dutch science continues to be a breeding ground for top talent.

The new mission-driven innovation strategy¹¹³ of the Netherlands is similar to that of the European Union. An important part of European research only receives funding to contribute to societal transformations. Horizon Europe, for example, includes a special section for societal missions. While the Netherlands is deploying twenty-four missions within four social themes, the European Union is deploying six clusters. The European clusters and the Dutch themes overlap. One of the European clusters, for example, is 'soil, health and food'. This can be compared to the Dutch theme 'agriculture, water and food'¹¹⁴. From 2020 onwards, the strategy consists of three parts: attract companies, stimulate cooperation and accelerate transitions.

Moreover, the Dutch Research Council¹¹⁵ (NWO) also introduced a national strategy for linking science and society. The strategic plan “Connecting Science and Society”¹¹⁶, describes the course for the period 2019 to 2022. In this plan, NWO emphasises its connecting role: making connections within science and between science and society together with its knowledge partners. For the period 2019-2022, the council has formulated five ambitions along which its mission will be shaped:

- Connecting agendas, science and society
- Perspective for researchers
- Collaboration for excellence and innovation
- Accessible and sustainable scientific infrastructure
- Effective use of knowledge through co-design and co-creation

Collaboration with societal stakeholders, including companies, is vital in this regard. Where the research intends to contribute to societal challenges from the global perspective, collaboration with scientists and societal actors across national boundaries is necessary.

¹¹² Government.nl, 2025- Vision for Science choices for the future, <<https://www.government.nl/documents/reports/2014/12/08/2025-vision-for-science-choices-for-the-future>> [Accessed 26 Nov]

¹¹³ Rathenau Instituut, “Mission-driven innovation policy: what, how, why?” (June 2020)

¹¹⁴ Rathenau Instituut, <<https://www.rathenau.nl/en>> [Accessed 26 Nov 2021]

¹¹⁵ Dutch Research Council, <<https://www.nwo.nl/en>> [Accessed 26 Nov 2021]

¹¹⁶ Dutch Research Council, Strategy NOW 2019-2022, <<https://www.nwo.nl/en/strategy-nwo-2019-2022>> [Accessed 26 Nov 2021]

The Dutch Research Council also implements the Dutch Research Agenda¹¹⁷ (NWA) that was realized through an innovative process with the input of citizens and scientists. The Dutch knowledge community, united in the Knowledge Coalition, grouped almost 12,000 questions from citizens in cluster questions: urgent issues for research and innovation. Twenty-five routes were established based on these issues. These self-organising networks investigate important scientific, societal and economic issues and put them on the agenda. The Dutch Research Agenda provides opportunities for a broad knowledge chain approach in which fundamental, strategic, practice-oriented and applied research will relate to each other, where relevant. Non-scientific parties will also have the opportunity to be involved in realising research in these programmes. The realisation of the Dutch National Research Agenda in 2015 was the answer to a need for greater connection and coherency within the Dutch system of Research and Innovation.

Dutch research is organized through innovative top sectors. The topsector approach is a national policy strategy that differs in many ways from its predecessors. Instead of a policy mix based merely on financial instruments, such as subsidies from FES (Economic Structure Enhancing) funds, the approach adheres to the principles of 'modern industrial policy'. A characteristic element is the scope created within the golden triangle of companies, research institutes and governments to develop a shared vision on which direction they want to take and what is required. Better alignment between companies' needs and institutional expertise is achieving that joint direction, for example through Topconsortia for Knowledge and Innovation (TKIs) and related allowances for public private partnerships (PPP). The policy approach also provides customised solutions for bottlenecks that stand in the way of achieving collective innovation plans. Thus, this approach is a way of giving players in the field more responsibility to develop the innovation systems they are part of¹¹⁸.

The top sectors are the following ones:

- Horticulture and propagation materials
- Agri-food
- Water
- Life sciences and health
- Chemicals
- High tech
- Energy

¹¹⁷ Dutch Research Council, *Dutch Research Agenda (NWA)*, <<https://www.nwo.nl/en/researchprogrammes/dutch-research-agenda-nwa>> [Accessed 26 Nov 2021]

¹¹⁸ Management summary, <https://www.dialogic.nl/wp-content/uploads/2017/08/Evaluation-Topsector-Approach-Management-Summary.pdf> [Accessed 26 Nov 2021]

- Logistics
- Creative industries

The Knowledge and Innovation Agendas of the top sectors focus more than the Dutch National Research Agenda on economic valorisation in collaboration with companies. Here, the joint articulation of knowledge questions plays a pivotal role, and the use and development of key technologies is vital. The Knowledge and Innovation Agendas of the top sectors therefore complement the Dutch National Research Agenda.

2.5.2 Research and Innovation Policy steering and implementation

In the Netherlands, the parliament and the government define the scientific and innovation policy framework. The steering is centralized but the government allows a high autonomy to research actors as far as excellence is reached.

Public research is primary supervised by two ministries:

- The ministry of Education, Culture and Science (*Onderwijs, Cultuur en Wetenschappen*)¹¹⁹, is responsible for the coordination of the scientific policy in science and grants.
- The Ministry of Economic Affairs and Climate Policy¹²⁰ plays an essential role in research policy. This ministry is leading the overall orientations thanks to the Netherland Enterprise Agency (*Rijksdienst voor Ondernemend- RVO*)¹²¹, which objective is to inform, implement laws and regulations, relay calls and finance projects.

Several bodies oversee the definition the national strategy for research:

- The Consultative Council for Scientific and Technologic Policy (*Adviesraad voor het Wetenshaps- en Technologiebeleid - AWTI*)¹²² advises the government and the parliament on the scientific and technologic policy.

¹¹⁹ Government of the Netherlands, *Ministry of Education, Culture and Science*, <<https://www.government.nl/ministries/ministry-of-education-culture-and-science>> [Accessed 26 Nov 2021]

¹²⁰ Government of the Netherlands, *Ministry of Economic Affairs and Climate Policy*, <<https://www.government.nl/ministries/ministry-of-economic-affairs-and-climate-policy>>

¹²¹ Netherlands Enterprise Agency, <<https://english.rvo.nl/>> [Accessed 26 Nov 2021]

¹²² Advisory Council for science, technology and Innovation, <<https://english.awti.nl/>> [Accessed 26 Nov 2021]

- The Royal Netherlands Academy of Arts and Sciences (*Koninklijke Nederlandse Akademie van Wetenschappen* - KNAW)¹²³ plays an advisory role and coordinates a number of well-known research Academy institutes¹²⁴.
- Rathenau Institute¹²⁵ produces numerous studies on Research and Innovation in the Netherlands.
- The Scientific Council for Governmental Policy (WRR)¹²⁶, the social and economic council and the planning agencies can advise the ministry on subjects related to economy and knowledge.

The Dutch Research Council advances excellent scientific research with impact. NWO plays a connecting role in Dutch science because on the one hand, it carries out research in its institutes and on the other hand, it enables other research organisations to do research through the funding of projects and programmes by the NWO domains.

The Netherlands Organisation for Applied Scientific Research (TNO)¹²⁷ is an independent research organisation connecting people and knowledge to create innovations that boost the competitive strength of industry and the well-being of society in a sustainable way. TNO was founded by law in 1932 to enable business and government to apply knowledge. As an organisation regulated by public law, they are independent: not part of any government, university or company.

The Knowledge Coalition is a partnership of parties in the Dutch research and innovation field and consists of the universities (VSNU), universities of applied sciences (VH), University Medical Centres (NFU), KNAW, NWO, VNO NCW (Confederation of Netherlands Industry and Employers)¹²⁸, MKB-Nederland (Royal Association SME)¹²⁹ and the institutes for applied research (TO2 federation). The Knowledge Coalition strives jointly to optimal conditions for research and innovation to flourish in the Netherlands and as an interlocutor for the government. In 2014, the Knowledge Coalition was commissioned by the Ministry of Education, Culture and Science (OCW) to coordinate the establishment of the National Science Agenda.

Every four years it defines a strategic plan in line with the ambitions and challenges of the Top Sector Policy and social themes in the Netherlands and Europe.

¹²³ Koninklijke Nederlandse Akademie Van Wetenschappen, <<https://www.know.nl/en/about-us>> [Accessed 26 Nov 2021]

¹²⁴ Akademie Van Wetenschappen, *Academy Institutes*, <https://www.know.nl/en/topnavigatie/contact/know-instituten?set_language=en> [Accessed 26 Nov 2021]

¹²⁵ Rathenau Instituut, <<https://www.rathenau.nl/en>> [Accessed 26 Nov 2021]

¹²⁶ The Netherlands Scientific Council for Government Policy, <<https://english.wrr.nl/>> [Accessed 26 Nov 2021]

¹²⁷ TNO, <<https://www.tno.nl/en/>> [Accessed 26 Nov 2021]

¹²⁸ VNONCW, *VNO-NCW in brief*, <<https://www.vno-ncw.nl/over-vno-ncw/english>> [Accessed 26 Nov 2021]

¹²⁹ MKB, *Nederland, Combined strenght for entrepreneurs*, <<https://www.mkb.nl/over-mkb-nederland/english>> [Accessed 26 Nov 2021]

2.5.3 Public Research Funding

Concerning research funding, there is a complementary in the various forms of funding public research. Dutch universities partly receive direct funding from the government. In addition, indirect government funding is allocated to research projects in competition based on international assessments. Consequently, it serves to support excellence and innovation across the full range of Dutch research. It is partly thanks to this competition and international assessments that Dutch science belongs to the world top. Research funding from third parties to universities and research institutes includes funds from the European Union, private organisations, government bodies, non-governmental organisations and charities. Dutch enterprises highly contribute to the funding of public scientific applied research, particularly via subsidy schemes of the Dutch Topsector.

The Dutch Research Council (NWO) is one of the most important science funding bodies in the Netherlands and realises quality and innovation in science. Each year, NWO invests almost 1 billion euros in curiosity-driven research, research related to societal challenges and research infrastructure. NWO's core task is performed in the NWO domains, research institutes and regional bodies: encouraging quality and innovation in the sciences.

In addition, the “National Growth Fund”¹³⁰ is funding innovative projects through grants. The fund, a long-term investment schedule in the Netherlands, focuses on research and developments projects that develop skills and expertise, infrastructure and innovation.

2.5.4 Universities-Enterprises Gateways in the Netherlands

a) Researchers’ sectorial mobility regulation

How the university and its employees are expected to deal with companies are partly laid down in the Collective Labor Agreement for Dutch Universities, which also has an appendix 'Sectorial regulations for ancillary activities'¹³¹. In the Netherlands, there are no obstacles to having another position in addition to a scientific position at a university, provided that the following rules and codes are properly observed:

- The Netherlands Code of Conduct for Research Integrity¹³².

¹³⁰ Dutch News, Dutch launch 20bn euros investment fund to boost prosperity and growth (September 2020), <<https://www.dutchnews.nl/news/2020/09/dutch-launch-e20bn-investment-fund-to-boost-prosperity-and-growth/>> [Accessed 26 Nov 2021]

¹³¹ Sectorial scheme covering ancillary activities (July 2017), <www.vsnul.nl/files/documenten/CAO/Sector_regeling_nevenwerkzaamheden_2017-ENG.pdf> [Accessed 26 Nov 2021]

¹³² The Netherlands Code of Conduct for Research Integrity, <https://www.uu.nl/sites/default/files/netherlands_code_of_conduct_for_research_integrity_2018_uk.pdf> [Accessed 26 Nov 2021]

- The Code of Conduct of Utrecht University¹³³. In the words of UU Code of Conduct, members of staff who carry out ancillary activities in addition to their university positions must ensure that the activities do not conflict with and are not detrimental to their main task. They must keep their business and personal interests clearly separate and refrain from activities that may harm the interests or reputation of the University. Members of staff shall be transparent about their ancillary functions.
- The Ancillary Activities Regulations¹³⁴. Employees are obliged to request permission in writing from the mandatory to carry out ancillary activities, as well as to inform the mandatory of any changes in the nature and/or scope of existing ancillary activities. Staff must then seek permission from executive board.

The same generally applies when a university employee is fully seconded to a company, and therefore does not perform any work for UU during that period. Additional agreements will then undoubtedly be made regarding confidentiality and non-competition clauses. Currently, there are no (national) regulation or funding scheme that encourages the secondment of academics to companies.

However, more and more is being invested in training employees of companies in special arrangements. Within the UU, the so-called 'AI labs'¹³⁵ are a good example of this. In this way, employees of external, public or private parties can work on an academic dissertation in addition to their regular job. Moreover, the four technical universities in the Netherlands have a comparable range for professional doctorates¹³⁶.

b) Universities-enterprises' collaborations' intermediaries in the Netherlands

The Netherlands applies the "Triple Helix" principle that postulates that interactions between the government, the enterprises and the universities are necessary to create an innovative system. Therefore, links between public research and enterprises are very dense in the Netherlands and is a high governmental priority. Numerous initiatives and structures have been implemented to encourage interactions between public research and enterprises:

- Universities' knowledge transfer offices, and infrastructures such Innovation Lab and research support centres, handle research contracts with enterprises and promote technological transfers and the generation of spin-off companies.

¹³³The Code of Conduct of Utrecht University, <https://www.uu.nl/sites/default/files/en_code_of_conduct_uu.pdf> [Accessed 26 Nov 2021]

¹³⁴The Ancillary Activities Regulations, <https://www.uu.nl/sites/default/files/ubd_en_regelingnevenwerkzaamheden.pdf> [Accessed 26 Nov 2021]

¹³⁵ AI Labs, <<https://www.uu.nl/en/research/ai-labs/our-labs>> [Accessed 26 Nov 2021]

¹³⁶ <https://www.utwente.nl/en/education/tgs/prospective-candidates/pdeng/> [Accessed 26 Nov 2021]

- Business incubators, working in close ties with universities, encourage a synergy between business and academic worlds.
- Scientific parks stimulate cooperation between researchers in high-tech and social sciences and humanities (SSH)¹³⁷.
- Innovation centres provide advice to SMB. In this context, the regional development agencies (ROMs)¹³⁸ are playing an increasingly important role.
- NWO-I (Netherlands Foundation of Scientific Research Institutes)¹³⁹, is an independent foundation that falls under the Dutch Research Council (NWO). NWO-I manages nine national research institutes: AMOLF, ARCNL, ASTRON, CWI, DIFFER, Nikhef, NIOZ, NSCR and SRON. NWO-I institutes collaborate with research groups from universities and other knowledge institutions. They provide a breeding ground for talent and different institutes function as portal with respect to large research infrastructure, either because they accommodate, develop and exploit it, or because they act as the access point to international facilities. The institutes are one of the most direct resources with which NWO can implement research policy.
- The association of universities in the Netherlands¹⁴⁰ has published “Principles for Public-Private Partnerships”¹⁴¹, a short document introducing principles for academic industry collaboration:

1. Freedom to publish own results
2. Freedom to do follow up research
3. Freedom to do follow up research with third parties
4. Freedom to use foreground for educational purposes
5. Ownership of foreground follows inventorship/creatorship
6. No obligatory assignment of foreground
7. Market conditions for access to foreground for commercial use

¹³⁷ Nationaal Campussen Overleg, *Het manifest toplocaties*, <<https://topcampussen.nl/het-manifest/>> [Accessed 26 Nov]

¹³⁸ Regionale Ontwikkelings Maatschappijen, <<https://www.rom-nederland.nl/en/>> [Accessed 26 Nov]

¹³⁹ Dutch Research Council, NOW-I, *Institutes Organisation of NOW*, <<https://www.nwo.nl/en/nwoi>> [Accessed 26 Nov]

¹⁴⁰ VSNU, <https://www.vsnu.nl/en_GB/about-vsnu.html> [26 Nov 2021]

¹⁴¹ VSNU, *Public-private cooperation*, <https://www.vsnu.nl/en_GB/Public-private-cooperation.html> [Accessed 26 Nov 2021]

8. Access conditions include an anti-shelving clause
9. No obligation to grant access to background for use outside the project
10. No automatic access to future results/IP rights (which are not foreground)

c) Implemented mechanisms to support universities-enterprises collaborations in the Netherlands

Public private partnerships are regarded as an essential element of the Dutch Top Sector policy. The capacity to realise multidisciplinary and interdisciplinary collaboration between researchers, disciplines and institutions is already a major strength of the Netherlands. To stimulate specific public private partnerships, the Dutch government put in place the TKI Supplement, a governmental funding scheme for these partnerships. The TKI Supplement is awarded to public private partnerships. The Supplement consists of a top up of 25% on private cash/in kind investments in public research organisations. For each euro, the government adds a quarter. To encourage SME participation, cash but also in-kind investments up to € 20.000 are rewarded with a higher top up of 40%. As of February 2nd, 2017, a public private partnership of more than € 2 mln with at least 30% private funding, can apply directly for the TKI Supplement at the Netherlands Enterprise Agency.

Valorisation has been a subject of special interest in the Netherlands for years. In particular, the finding that excellent research infrastructure is not accompanied by excellent innovative performance has traditionally been a reason to devote a great deal of attention to valorisation in terms of policy. The Ministries of Economic Affairs and Climate and Education, Science and Culture are working in various ways to make more intensive use of available knowledge. One of the recent initiatives was the Valorisation Program, running from 2010-2018. Through this program, twelve regional consortia give shape to, among other things, entrepreneurship education and knowledge transfer.

Most recently, the VSNU has launched the Faculty of Impact: the world's first faculty devoted to boosting the impact of scientific research. The mission of the Faculty of Impact is to give young talented researchers greater opportunities to combine entrepreneurship and science. The faculty of Impact offers the first ever post-doc programme focusing on entrepreneurship and valorisation. For two years, this programme will give talented young scientists the freedom and opportunity to develop further their creative and ground-breaking ideas.

3. REGIONAL AND LOCAL ECOSYSTEMS FOR RESEARCH AND INNOVATION AND UNIVERSITIES-ENTERPRISES COLLABORATIONS

This section introduces the alliance' members regional and/or local and universities ecosystems for Research and Innovation and universities-enterprises collaborations.

3.1 Eötvös Loránd University (ELTE) regional and local ecosystem for Research and Innovation and universities-enterprises collaborations

3.1.1 Central Hungary's ecosystem for Research and Innovation and universities-enterprises collaborations

The Central Hungary Research and Innovation Strategy for Smart Specialisation (RIS3 Strategy of Central Hungary)¹⁴² adopted in 2013 for the period 2014-2020, includes several objectives such as the enhancement of business innovation, and particularly SMEs' innovation activity, improvement of universities' R&D infrastructure, creation and development of knowledge clusters and improvement of human resources.

The RIS3 Strategy has been driven by the vision that CH becomes an outstanding region by 2020 from the perspective of innovation. The RIS3 Strategy aims to contribute to the region's and nation's inclusive and intelligent growth by fully exploiting the economic and societal excellence of Budapest and Pest County and by actively involving the local and international innovation stakeholders.

The sectors and technologies identified as drivers of regional innovation-driven growth include ICT, creative industries, health industry, biotechnology and environmental technologies. Policy measures addressed these strategic objectives through promotion of SMEs' investment in technology upgrading, support to basic research and innovation excellence in universities, and to enterprises' applied research. Innovation collaboration was promoted through support provision to enterprises' cluster-based joint innovation undertakings, to industry-university collaboration and indirectly, through the funding of universities' investment in research infrastructure. Some policy measures targeted innovation intermediaries: incubators, technology parks and innovation clusters, supporting the improvement of services and to the development of these organisations' infrastructure.

The RDI policy set the goal for Hungary, being one of the emerging innovators in the EU, to catch up with Europe's important innovators by the end of the decade through the value-creating capacity of the RDI ecosystem, the intensive increase of the innovation performance of the corporate sector

¹⁴² European Commission, *Regional Innovation Plus Monitor, RIS3 Strategy of Central Hungary*, <<https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/policy-document/ris3-strategy-central-hungary>> [Accessed 26 Nov 2021]

and the consistent implementation of smart specialization. To achieve this goal, the Government undertook in the RDI strategy¹⁴³ to increase R&D expenditure as a proportion of GDP to 3% by 2030.

Based on the above mentioned, the target system of the RDI strategy for 2021-2030 is based on three main pillars:

- Strengthening knowledge creation by expanding and modernizing the capacities of the RDI institutional system and ensuring the supply of researchers.
- Enhancing the flow of knowledge by encouraging more efficient cooperation between RDI ecosystem actors, increasing interoperability between sectors, and expanding knowledge transfer opportunities.
- Making the use of knowledge more effective by enhancing corporate innovation.

3.1.2 Budapest's ecosystem for Research and Innovation and universities-enterprises collaborations.

Budapest is the economic, commercial, financial, administrative and cultural centre of Hungary. Its economic, social, institutional, educational and R&D related performance indicators are far above the national average¹⁴⁴. With a high concentration of research capacities in the capital, Budapest's innovation performance is outstanding among all Hungarian regions. The Budapest region concentrates well-equipped science and competence centres, accredited innovation clusters and concentration of innovation-intensive activities.

Similar to its economic performance, Hungary's innovation performance is also concentrated in Budapest. Budapest hosts the Hungarian Academy of Sciences¹⁴⁵ and the majority of its affiliated research institutes. Being the centre of higher education, there is also a high concentration of university-based research. The headquarters of the European Institute of Innovation and Technology¹⁴⁶ is also located in Budapest. R&D-intensive multinational enterprises (MNEs) are mostly located in Budapest, or in some cases have research centres in Budapest and production facilities in convergence regions¹⁴⁷. Budapest hosts several accredited innovation clusters in the field of ICT, health industry and medical instruments, creative industries and sustainable construction. Cooperation between the science and business communities is much more intensive than in other Hungarian regions. Universities in Budapest have developed knowledge clusters, and due partly to

¹⁴³ National Research, Development and Innovation Office, *Proposal on the Research, Development and Innovation Strategy of Hungary (2021-2030)* : <[National Research, Development and Innovation Office | Proposal on the Research, Development and Innovation Strategy of Hungary \(2021-2030\) \(gov.hu\)](https://www.gov.hu/nrdi/propozicio)> [Accessed 26 Nov 2021]

¹⁴⁴ European Commission, *Regional Innovation Monitor Plus, Budapest*, <<https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/budapest>> [Accessed 26 Nov 2021]

¹⁴⁵ Hungarian Academy of Science, <<https://mta.hu/english/>> [Accessed 26 Nov]

¹⁴⁶ European Institute of Innovation and Technology, <<https://eit.europa.eu/>> [Accessed 26 Nov 2021]

¹⁴⁷ European Commission, *Regional Innovation Monitor Plus, Budapest*, <<https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/budapest>> [Accessed 26 Nov 2021]

huge EU co-financed investments in the upgrading of their research infrastructure, they provide contract research services to business enterprises.

The Regional Innovation Scoreboard 2019 classifies the region as a “Moderate + Innovator”. As compared to other Hungarian regions, Budapest can be considered the most innovative region in Hungary. It had the highest RII score among all, followed by Pest County.

3.1.3 ELTE’s ecosystem for Research and Innovation and enterprises-universities collaborations

Eötvös Loránd University¹⁴⁸ is the oldest continuously operating, largest and top-ranked research university in Hungary. It is a prestigious institution of public higher education. It holds bilateral agreements for cooperation and exchange with top-ranked higher education institutions worldwide and is an active member of prestigious international university networks. ELTE is an institution where excellent research is undertaken. Research at ELTE comprises international collaborations, interdisciplinary approaches, modern laboratory infrastructure, and innovation. ELTE researchers run cutting-edge projects funded by the European Union and national institutions. Along with international partners, research groups also establish strong connections with the industry¹⁴⁹.

Innovation, third mission and knowledge transfer are among the top priorities at ELTE as stated in the Institutional Development Plan for 2021-2024. The recently established University Strategic Office, in support of the Vice-rector for General Affairs, is responsible for the preparation of institutional level innovation, third mission and development strategies and the strategic coordination of related development projects. The University Innovation Board is responsible for making industrial property decisions and for the supervision of the implementation of IP regulation.

The ELTE Centre for Innovation¹⁵⁰ is a dynamically developing organizational unit of the university established to perform its tasks related to innovation, corporate cooperation and technology transfer. Its aim is to form a bridge between the University and industry, thus promoting the industrial utilization of the research results generated at the University. Its other main task is to improve the innovation potential of the university. To this end, the Center examines the economic exploitation possibilities of research results (whether being an output of scientific, IT or humanities) generated at the University, and assists researchers in their utilization and seeks an industrial partner. It also assists and encourages the establishment of spin-off companies and knowledge transfer companies, operates a central secretariat for intellectual property rights (Secretariat of the Invention Board), and liaises with domestic and international innovation offices and organizations. The Center for Innovation has six dedicated agents to manage the university’s tasks for organization of research.

¹⁴⁸ Eötvös Loránd University, <<https://www.elte.hu/>> [Accessed 26 Nov 2021]

¹⁴⁹ Eötvös Loránd University, *Research facts and subjects*, <<https://www.elte.hu/en/facts>> [Accessed 26 Nov 2021]

¹⁵⁰ ELTE Innovation Center, <[Innovációs Központ \(elte.hu\)](https://www.elte.hu/innovacios-kozpont)> [Accessed 26 Nov 2021]

The “Development of the ELTE’s Innovation Ecosystem in line with industry expectations” project¹⁵¹ is going to end this year (2021). The aim of this project was to establish and operate technology transfer and support cooperation between the University and the business world in research, development, technology and innovation plus the active participation of the University in EU research and innovation framework programs. Through this project, ELTE aimed at achieving several objectives:

- Establishing an active, business-friendly relationship between the ELTE and the business community based on mutual benefits.
- Displaying the university's intellectual and infrastructural competences as a transparent service.
- Establishing a one-stop shop for businesses at ELTE that collaborates with similar departments in other universities.
- Operating the University's technology transfer and innovation management activities on a results-oriented basis.
- Increase the University's external revenues through business utilization of RDI results and expand corporation in close partnerships.
- Developing and strengthening entrepreneurial mindsets and knowledge among academics, researchers and students.

To achieve these objectives, ELTE has aimed to:

- Develop and strengthen the culture and processes of interdisciplinary cooperative work in accordance with multidisciplinary needs.
- Mapping the university’s RDI capacities and services, linking corporate needs and university potential
- Strengthen the business attitude, corporate culture within the institution.
- Expanding the University's partners and network and raising its profile.
- Broad communication of the University's RDI and business results both at home and abroad.

¹⁵¹ Eötvös Loránd University, *Development of the ELTE’s innovation ecosystem in line with industry expectations*, <<https://www.elte.hu/en/content/development-of-the-elte-s-innovation-ecosystem-in-line-with-industry-expectations.t.1239>> [Accessed 26 Nov 2021]

3.2 Trinity College of Dublin (TCD) ecosystem for Research and Innovation and universities-enterprises collaborations

3.2.1 Dublin's ecosystem for Research and Innovation and universities-enterprises collaborations

Dublin's Research, Development and Innovation sector is a very dynamic one, driven by an exceptional level of collaboration between industry, academia, state agencies and regulatory authorities.

It provides companies with an excellent commercial, political and social environment in which to carry out RDI activities¹⁵².

3.2.2 Trinity College of Dublin's ecosystem for Research and Innovation and universities-enterprises collaborations.

Trinity College Dublin¹⁵³ promotes a diverse, interdisciplinary, inclusive environment, which nurtures groundbreaking research, innovation, and creativity through engaging with issues of global significance. Trinity is Ireland's highest ranked university and have a campus culture of scholarship, innovation, creativity, entrepreneurship and dedication to societal reform. TCD has a proud tradition of performing excellent research and translating this research excellence into solutions with global economic and social impact. TCD is further committed to fostering a culture of innovation and entrepreneurship across all disciplines for all staff and students within the higher education ecosystem. Translation of research through collaboration and commercialisation is an essential activity for TCD to continue realising impact from research¹⁵⁴. Trinity already has a strong and long history of research collaborations within and across disciplines in the university and is well known for interdisciplinary research¹⁵⁵.

The current TCD strategy for the 2020-2025¹⁵⁶ period states that over the next first years, research will focus on challenges that our planet faces through engineering, environment, emerging technologies in order to find balance solutions to a better world. Trinity places research at the heart of its vision and promote intersection of disciplines and sectors to tackle challenges. TCD wants to invest in staffing and infrastructures in order to remain pioneer in education, research and innovation with a planned increase of academic staff by approximately 200 to enhance research excellence across the university.

The concept of « One Trinity Community » has been developed: a university connected to national and international partnerships and promoting societal responsibility in research to create a global

¹⁵² Dublin.ie, *Business Ecosystem*, <<https://dublin.ie/invest/why-invest-in-dublin/business-ecosystem/>> [Accessed 26 Nov 2021]

¹⁵³ Trinity College of Dublin, <<https://www.tcd.ie/>> [Accessed 26 Nov 2021]

¹⁵⁴ Trinity College of Dublin, *"Policy, Practice and Regulations on Intellectual Property"* (2018)

¹⁵⁵ Trinity College of Dublin, *"A living Research Excellence Strategy"*

¹⁵⁶ Trinity College of Dublin, *Strategy 2020-2025*, <<https://www.tcd.ie/strategy/>> [Accessed 26 Nov 2021]

connected community of learning and research¹⁵⁷. Trinity research centres, of which there are more than fifty, are the smallest formal scale at which collaborations occur. Nineteen themes bring researchers together at a larger scale. The five Trinity Research Institutes (CRANN, TBSI, TCIN, TLRH and TTMI) are formal structures focusing on areas of great strength in the university. Trinity also currently hosts three SFI Research Centres in Trinity (AMBER, ADAPT, and CONNECT), and is a participant in many others.

- AMBER¹⁵⁸ (Advanced Materials and BioEngineering Research) is a Science Foundation Ireland funded centre that provides a partnership between leading researchers in materials science and industry.
- ADAPT¹⁵⁹ center combines the know-how of industry partners with the expertise of researchers from different universities (including TCD) in the field of Digital Content Technology.
- CONNECT¹⁶⁰ is the world leading Science Foundation Ireland Research Centre for Future Networks and Communications.

There are also other collaborative initiatives beyond these groupings.

In the 2020-2025 strategy, TCD indicates the objective to put in place an Industry Advisory Board by 2021, and to consolidate the position of the Trinity Research Institutes.

Thus, TCD is well connected to an innovative ecosystem facilitating collaboration with enterprises and aims at deepening its internationalisation in business partnerships. TCD pursues the objective to intensify its engagement within LERU and Coimbra groups that play a key role in transforming Dublin into the top 20 of innovation cities by 2030. TCD's objective is to develop at least on new industry collaboration from a new country per year. Furthermore, TCD strategy aims at further developing and supporting academic consultancy across the disciplines via CONSULT Trinity¹⁶¹, which offers a service to support consultancy activities by researchers, to share their knowledge with businesses and/or charities, state bodies and the public sector. CONSULT provides a legal framework and support to protect academics from potential risks.

Besides its 2020-2025 strategy, TCD has also developed a Research Charter¹⁶² in 2018, listing the key principles of TCD's approach to research. The Charter was the result of a consultative process that engaged people from different disciplines and divisions across Trinity. Based on this Charter,

¹⁵⁷ Trinity College of Dublin, "2020-2025 Strategic Plan"

¹⁵⁸ AMBER, <<http://ambercentre.ie/>> [Accessed 26 Nov 2021]

¹⁵⁹ ADAPT, <<https://www.adaptcentre.ie/>> [Accessed 26 Nov 2021]

¹⁶⁰ CONNECT, <<https://connectcentre.ie/>> [Accessed 26 Nov 2021]

¹⁶¹ Trinity College of Dublin, *Trinity Research & Innovation*, <<https://www.tcd.ie/innovation/consult/>> [Accessed 26 Nov 2021]

¹⁶² Trinity College of Dublin, *Research Charter*, <file:///C:/Users/P02CD9~1/AppData/Local/Temp/Research%20Charter%20Final_English.pdf> [Accessed 26 Nov 2021]

TCD has built a “Living Research Excellence Strategy”¹⁶³, which first objective is to stimulate and build strategic research collaborations, engaging in a better use of the research expertise and research support and looking outwards at more external opportunities and understanding societal needs. To pursue this objective, TCD has identified four key actions:

- 1- Systematically develop, advance and refresh collaborative research initiatives at University, for instance by also keeping in touch with an enterprise after the end of a collaboration.
- 2- Bring the identified initiatives to fruition in an open and collaborative way.
- 3- Build wider collaborative networks and mapping current networks, identifying gaps, plus make more strategic use of the networks already built, for instance the EIT Knowledge and Innovation Community (KIC) network which facilitate collaborations.
- 4- Recruit to match TCD’s ambitions. In this Excellence Strategy, TCD plans to create The Grand Canal Innovation District”¹⁶⁴ and to see emerge new campus on the Trinity Technology and Enterprise Centre College (TTEC)¹⁶⁵ site for a mixed development focused on academic and industry initiatives. It will be a mixed development focused on academic and industry endeavours. It will be constructed to encourage and facilitate widespread collaboration between academia, industry, start-ups, and the community.

Several offices are committed to support and develop research and collaboration with enterprises inside TCD:

- The Office of the Dean of Research works in support of the Dean of Research, Associate Deans of Research and Trinity’s Research Committee. The Office is responsible for implementing Trinity’s Living Research Excellence Strategy and driving institutional research strategy and policy development. The Office conducts strategic research analytics, works on institutional strategic research initiatives, informs external policy development, coordinates institutional responses to external stakeholders, and promotes good research practice across the University. The Office is home to several strategic research communications projects and the Research Impact Unit.

Trinity Research and Innovation combines three offices:

- The Office of corporate partnership and knowledge exchange supports both industry engagement and the commercialisation of Trinity research. The office reaches out to industry and the business community to develop partnerships that enable industry to benefit from the world leading teaching, research and infrastructure within Trinity. The

¹⁶³ Trinity College of Dublin, “A living Research Excellence Strategy”

¹⁶⁴ Trinity College of Dublin, *Grand Canal Innovation District*, <<https://www.tcd.ie/innovation-district/>> [Accessed 26 Nov 2021]

¹⁶⁵ Trinity College of Dublin, *College Maps*, <<https://www.tcd.ie/Maps/map.php?b=219>> [Accessed 26 Nov 2021]

Technology transfer Team are responsible for capturing, protecting and managing the intellectual property generated from academic research at Trinity. It manages the patent portfolio for the university and for licensing the output of the excellent research to industry partners. Other outputs that are facilitated by the team are consultancy contracts and campus spin out companies.

- The Research Development Office seeks maximising the amount of Research Funding into the College in a balanced and sustainable way, and to aid in the strategic development and implementation of research, research policy and research systems.
- The Contracts Office has responsibility for reviewing and executing all funded research contracts entered by Trinity.

The University Fund

TCD is a founding member of the University Bridges fund I with the University College of Dublin and II¹⁶⁶ with the University College Dublin and University College Cork. Supported by the European Investment Fund, Enterprise Ireland, Allied Irish Bank, Bank of Ireland (Fund I only) and managed by Atlantic Bridge these funds invest in spinout companies built from world class Irish University research and innovation. The aim is to accelerate the commercialisation of excellent science and to globally scale the companies formed and thus maximise the benefit from research that takes place in the higher education sector. The combined funds will invest €140M in spinout companies from Irish Universities. This will leverage further investment funding for example, university spinouts in Fund 1, have already raised €120M in equity and non-equity funding since 2016.

3.3 University of Barcelona (UB) ecosystem for Research and Innovation and universities-enterprises collaborations

3.3.1 The Catalonia Generalitat's ecosystem for Research and Innovation and universities-enterprises collaborations

In Spain, the autonomous communities participate in the public funding of research. The Catalan Government, Generalitat, developed the first plan for Research in 1993 for the 1993-1996 period. This plan established the basis of the scientific policy. In 2005, the first plan for Research and Innovation was conducted. From there, several plans, agreements and strategies were developed and conducted, such as the last plans in date: The Catalan Agreement for Research and Innovation

¹⁶⁶ Trinity College of Dublin, *Trinity Research and Innovation*, <<https://www.tcd.ie/innovation/news-items/Venture%20Capital%20Fund%2011%20launch.php>> [Accessed 26 Nov 2021]

2008-2020¹⁶⁷ and The Research and Innovation Strategy for Smart Specialization in Catalonia (RIS3CAT Strategy)¹⁶⁸, which ended in 2020.

The National Agreement for Research and Innovation for the 2008-2020 period aimed at guarantying a commitment to ensure security and stability of research and innovation policies, independently of the composition of governments and management of the involved institutions, and to enable action by all stakeholders towards a common vision. The agreement introduced nine challenges: talent, cutting-edge research, systemic innovation, internationalisation of Research, Development and Innovation, and RDI in society. It also defined three driving challenges: focalisation and prioritisation of RDI, better governance, and increasing RDI investment¹⁶⁹.

The Research and Innovation Strategy for Smart Specialization in Catalonia has developed four objectives:

- Modernisation of the business fabric by improving the efficiency of production processes.
- Internationalisation and the reorientation of consolidated sectors towards activities with greater benefit.
- Promotion of new emerging activities through research and innovation.
- Consolidation of Catalonia as a European knowledge hub, improvement of the Catalan innovation system to increase to companies' competitiveness and steering public policies towards the promotion of innovation, internationalisation and entrepreneurship.

Four pillars action have been developed: leading sectors, emerging activities, crosscutting enabling technologies and innovation environment.

Catalonia has adopted Europe 2020 priorities through the Catalonia 2020 Strategy (ECAT 2020)¹⁷⁰, which is the roadmap of the Government of Catalonia for relaunching the economy and reorienting the production sector towards a smarter, more sustainable and more inclusive economic model. The ECAT 2020 could support the achievement of RIS3CAT objectives since it focuses particularly on

¹⁶⁷ European Commission, *Catalan Agreement for Research and Innovation 2008-2020*, <<https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/policy-document/catalan-agreement-research-and-innovation-2008-2020-pnri>> [Accessed 26 Nov 2021]

¹⁶⁸ European Commission, *Research and Innovation Strategy for Smart Specialization of Catalonia (RIS3CAT)*, [https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/policy-document/research-and-innovation-strategy-smart-specialisation-catalonia-ris3cat#:~:text=Research%20and%20Innovation%20Strategy%20for%20the%20Smart%20Specialisation%20of%20Catalonia%20\(RIS3CAT\),-Region&text=To%20improve%20the%20overall%20Catalan,of%20innovation%2C%20internationalisation%20and%20entrepreneurship.](https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/policy-document/research-and-innovation-strategy-smart-specialisation-catalonia-ris3cat#:~:text=Research%20and%20Innovation%20Strategy%20for%20the%20Smart%20Specialisation%20of%20Catalonia%20(RIS3CAT),-Region&text=To%20improve%20the%20overall%20Catalan,of%20innovation%2C%20internationalisation%20and%20entrepreneurship.) [Accessed 26 Nov 2021]

¹⁶⁹ European Commission, <<https://ec.europa.eu/>> [Accessed 26 Nov 2021]

¹⁷⁰ European Commission, *Catalonia 2020 Strategy (ECAT 2020)*, <<https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/policy-document/catalonia-2020-strategy-ecat-2020>> [Accessed 26 Nov 2021]

measures that have a direct and quantifiable impact on priority areas: employment and training, social cohesion, innovation and knowledge, entrepreneurship, internationalisation and the green economy. Innovation policy is also a key pillar of the National Agreement on Industry¹⁷¹, which has been approved in 2017. It is the roadmap for the industrial transformation of Catalonia and it has been agreed between the Government, trade unions, employer's association, universities, professional official associations, technology centres, political parties and local entities associations. It encompasses the following pillars: competitiveness and industrial work, business dimension and funding, industry 4.0 and digitalization, training, infrastructure and energy, sustainability and circular economy.

Innovation governance in Catalonia is supported by the Industrial and Research Directorates, and is implemented by the Agency for Business Competitiveness of Industrial Innovation of Catalonia (ACCIÓ)¹⁷². ACCIÓ aims to promote the competitiveness and growth of the Catalan business fabric by promoting innovation, internationalization and by attracting investment. The agency intends to facilitate the competitive differentiation of companies placing them in a position of advantage. It collaborates with business entities to add synergies and to ensure that the companies have a broader range of instruments to grow in competitiveness.

The Agency for Management of University and Research Grants (AGAUR)¹⁷³, depending on the Secretariat of Universities and Research, Ministry of Enterprise and Knowledge of the Government of Catalonia supports the Catalan university and scientific policy, which is based on competitiveness in R&D with excellence at the core, by giving financial support to students and researchers. AGAUR's mission is to improve the quality and competitiveness of the Catalan system by providing grants and loans for the promotion of university education, scientific and technical research and technological innovation in Catalonia.

3.3.2 The city of Barcelona's ecosystem for Research and Innovation and universities-enterprises collaborations

The metropolitan area of Barcelona has a dense and innovative industrial community of small and medium-sized companies and an active presence of large multinationals, particularly in the biomedical, agro-food, automobile and telecommunication sectors. In addition, Catalonia has a long tradition of scientific research. It currently stands out in the bioscience field, although all fields of research are represented in Catalonia to some degree, both in the generation of knowledge and in its application¹⁷⁴. In Catalonia, the private sector leads the investment in technological innovation.

¹⁷¹ Biblioteca de Catalunya, *Pacte nacional per la indústria*, <http://empresa.gencat.cat/web/.content/actualitat/documents/arxius/Pacte_Nacional_Industria.pdf> [Accessed 26 Nov 2021]

¹⁷² Agència de Gestió d'Ajuts Universitaris i de Recerca, <<https://agaur.gencat.cat/ca/inici>> [Accessed 26 Nov 2021]

¹⁷³ Agència de Gestió d'Ajuts Universitaris i de Recerca, <<https://agaur.gencat.cat/ca/inici>> [Accessed 26 Nov 2021]

¹⁷⁴ European Commission, *Regional Innovation Monitor Plus, Catalonia*, <<https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/catalonia>> [Accessed 26 Nov 2021]

That is the key to explain the top position of the region at national level. Barcelona is one scientific excellence capital city, attracting more and more researchers.

3.3.3 The University of Barcelona's ecosystem for Research and Innovation and universities-enterprises collaborations

The University of Barcelona¹⁷⁵ is the principal centre of university research in Spain and has become a European benchmark for research activity, both in terms of the number of research programmes it conducts and the excellence these have achieved. The University of Barcelona is ranked first Innovative University in Spain¹⁷⁶.

The objective of the RDI strategy of the University of Barcelona is to promote research, complementing external sources of funding, offering a strategic vision of its structure, coordinating with the rest of the universities and other agents of the R&D and innovation ecosystem, and guaranteeing efficient and permanent support to teaching and research staff. It also wants to place innovation as a priority, putting the transfer of results at the centre and promoting an entrepreneurial attitude among all groups¹⁷⁷.

UB is engaged in a dynamic and ambitious strategy for Research and Innovation with a Vice-Rector dedicated to Research and a Vice-Rector for Entrepreneurship, Innovation and Technological Transfer. Several offices are dedicated to Research, Innovation and partnerships management inside the University of Barcelona:

The General Affairs Office designs and manages the research information system, produces and publishes information about research and grants call, manages UB and external research calls.

- The “Foundation Bosch i Gimpera (FBG)”¹⁷⁸, composed of forty-four agents, is dedicated to connect the university and business and to transfer innovation. The foundation covers several missions: research services for companies, contractualisation of research collaboration, business creation, technology transfer and commercialization. The FBG coordinates two networks of the call for grants for RDI networks to carry out valorisation and transference programmes of research results, partially cofunded by the European Regional Development Fund (ERDF).
- The International Research Projects Office is responsible for the management of research projects funded by the European Commission under the H2020 and now Horizon Europe programs. Through this unit, the FBG Foundation provides support to researchers throughout the process.

¹⁷⁵ Universitat de Barcelona, <<https://www.ub.edu/web/portal/en/>> [Accessed 26 Nov 2021]

¹⁷⁶ Reuters TOP 100

¹⁷⁷ Data collected through the survey completed by UB

¹⁷⁸ Bosch i Gimpera, <<http://www.fbg.ub.edu/en/>> [Accessed 26 Nov 2021]

- Scientific and Technological Centres of the UB (CCiTUB)¹⁷⁹ are research infrastructures facilities with the main goal to support research and innovation in the areas of chemistry, materials sciences and biosciences.

In 2020, the collaboration between the UB and the different socio-economic agents has allowed the development of 623 projects, and resulted in € 41.93 million in revenue, 24 technology licences, and the creation of 4 spin-off¹⁸⁰.

The University of Barcelona is involved in various national or European initiatives encouraging collaboration between universities and enterprises but also several other actors, all together creating an innovative community. Therefore, the University is well connected to innovation and challenge-based ecosystems.

- The University of Barcelona is a partner of the EIT Health community¹⁸¹, established in 2015 as a 'Knowledge and Innovation Community' (KIC) of the European Institute of Innovation and Technology (EIT). The UB was involved in its creation and is part of the Spanish Board. This EIT Health network is composed of approximately 150 partners' organisations from the worlds of business, research, education and healthcare delivery, collaborating to conduct research addressing health challenges. One of the missions of EIT Health is to match innovators with experts to develop commercially viable products and services with the greatest potential for societal and economic impact in Europe.
- UB is also integrated in EIT digital¹⁸², the Europe's largest digital innovation community involving numerous stakeholders inside an open and innovative ecosystem such as corporations, SMEs, start-ups, universities and research institutes.
- UB is part of « Red Transfer »¹⁸³, an association gathering transfer, innovation and research management professionals both in public and private organisms. This association notably organises and promotes learning activities and professional developments events, networking, develops knowledge transfer, innovation and research management projects.

¹⁷⁹ Scientific and Technological Centers, <<http://www.ccitub.edu/EN/home.html>> [Accessed 26 Nov 2021]

¹⁸⁰ Bosch i Gimpera, *We contribute to economic and social progress through technological innovation*, <<http://www.fbg.ub.edu/en/what-we-do/the-fbg-in-figures/>> [Accessed 26 Nov 2021]

¹⁸¹ Eit Health, <<https://eithealth.eu/>> [Accessed 26 Nov 2021]

¹⁸² Eit Digital, <<https://www.eitdigital.eu/>> [Accessed 26 Nov 2021]

¹⁸³ Redtransfer, <<https://redtransfer.org/>> [Accessed 26 Nov 2021]

3.4 University of Montpellier's ecosystem for Research and Innovation and universities-enterprises collaborations

3.4.1 Occitanie Region's ecosystem for Research and Innovation and universities-enterprises collaborations

The University of Montpellier is anchored in Occitanie territory in the area of Montpellier. Occitanie is the first French region for endeavour in public and private Research and Development with 3.5% of PIB dedicated¹⁸⁴. There are about 300.000 researchers in the Region (third French region in number of researchers), representing 11.5% of French researchers' headcount. It is also the third region in number of PhD students. Occitanie Region has a strong political will to encourage local enterprises' growth and to foster innovation. This willingness is reflected in the « Regional plan for Higher Education, Research and Innovation »¹⁸⁵ voted for five years in 2017 and implemented by the Research, Technology Transfer and Higher Education Department. The Occitanie Region, mobilizing 70 billion euros' budgets, among which 30 billion euros are UE funds, has created sixteen new mechanisms. Science is seen as a lever for social and economic change and dynamism on the territory.

The regional plan introduces four main strategies, among which the third one addresses the challenge of innovation expansion and economic performance on Occitanie territory. This strategic orientation is itself divided in four priorities: fostering research resourcing, reinforcing research transfer, supporting innovation and commercialization patterns and sharing of knowledge. Nine mechanisms have been implemented to reach Occitanie's objectives : PhD allowances, Research and Society calls, Regional Platforms for Research and Innovation, support to proximate technology transfer, reinforcement of collaborative research European projects involving enterprises, PILE-CIFRE mechanisms, PRIME mechanism : Premium for innovative researches led by enterprises, support to pre-maturation and maturation, GRAINE mechanism : Groups for innovative applied research with enterprises.

In the framework of the « Regional plan for Higher Education, Research and Innovation » Occitanie Region aims at reinforcing the partnerships dynamism between the different local innovation's actors and encourage skills synergy to arise innovation and employment. In this perspective, the Region has launch the Readynov call for projects¹⁸⁶ for the 2019-2021 period. The objectives are to boost collaboration between research organisms and enterprises, to reinforce local SMB and ETI's research and development skills to create qualified jobs, to contribute to the patterning of local

¹⁸⁴ Institut National de la Statistique et des Etudes Economiques, *R&D : l'Occitanie, au premier rang des régions françaises et bien placée au niveau européen*, Le Lan Romuald, Insee Analyses, Occitanie, n°104 (Février 2021) <<https://www.insee.fr/fr/statistiques/5209675>> [Accessed 26 Nov 2021]

¹⁸⁵ La Région Occitanie, *Schéma Régional de l'Enseignement Supérieur de la Recherche et de l'Innovation (SRESRI)*, <<https://www.laregion.fr/SRESRI>> [Accessed 26 Nov 2021]

¹⁸⁶ La Région Occitanie, *Appel à projets READYNOV – 2019-2021*, <<https://www.laregion.fr/READYNOV-2019-2021>> [Accessed 26 Nov 2021]

sectors and to the emergence of innovation on the territory, and to impel enterprises to engage in a first innovative approach or action.

Region Occitanie funds public and private research through calls presented above. It focuses on projects with high maturity level to allow technology development, thus participates in the continuity between fundamental and industrial research. The Region supports initiatives gathering research units and enterprises in emerging sectors, regional platforms for research and innovation, amenities to reinforce the regional innovation ecosystem.

Occitanie Region aims at reinforcing:

- Technology Transfer by developing platforms open to enterprises and accompanying technology support structures.
- Support to innovation and research commercialization by supporting structures involved from pre-maturation to incubation of research projects (incubators, development societies ...) and by stimulating collaborative research through mechanisms mentioned earlier (PRIME, GRAINE etc.).

The “Regional Strategy for Innovation in Occitanie for 2021-2027”¹⁸⁷ was adopted in April 2021. The Strategy aims at accompanying and supporting enterprises of the Occitanie Region in their innovation, by implementing human, financial and technical helps. Four challenges have been identified:

- 1- Boost innovation by linking together the actors constituting the regional innovation ecosystem.
- 2- Increase regional dynamism and disseminate more widely innovations inside the regional economic network.
- 3- Respond to societal challenges through innovation, notably by developing news schemes oriented towards the “Green New Deal”.
- 4- Ensure territorial balance and land-use planning through innovation.

The Regional Innovation strategies led by the Occitanie Region are supported by the Regional Agency for the Economic Development “AD’OCC”¹⁸⁸. This agency is federating Research and Innovation’s public actors inside the « Réso Occitanie » network, gathering 320 actors and 145 regional organisms (technology centres, competitiveness centres, TT accelerators, Carnot institutes for instance, and other organisms).

¹⁸⁷ La Région Occitanie, *2021-2027 Stratégie Régionale de l’Innovation Occitanie*, <<https://www.agence-adocc.com/wp-content/uploads/2019/03/SRI-2021-2027.pdf>> [Accessed 26 Nov 2021]

¹⁸⁸ AD’OCC, <<https://www.agence-adocc.com/>> [Accessed 26 Nov 2021]

Since the 25th of August 2021, the University of Montpellier has integrated the network RésO IP+¹⁸⁹ (Incubators and Nurseries Network), in the “integration” course for one year. This network federates structures supporting and hosting high-potential business creators. The RésO IP+ is mobilised throughout the Occitanie Region to support the emergence of innovative projects. The network has consolidated a charter, a business reference system, a common operational functioning and adapted tools.

3.4.2 Montpellier Méditerranée Metropolis and the city of Montpellier’s ecosystem for Research and Innovation and universities-enterprises collaborations

Montpellier is one of the two metropolitan university pole and equilibrium university city (“ville universitaire d’équilibre”). Montpellier is located in a large business area with many economic opportunities (the largest area after Paris), that attracts many researchers and experts. There is a dense network of actors working on technology transfer, collaborative research and research commercialization in the Occitanie Region: eighteen organisms for technology dissemination, three incubators, on average ten clusters, fourteen competitiveness centres, two development societies, one institute for technological research and two Carnot institutes. Therefore, the University of Montpellier is implemented in a high research potential territory.

Montpellier Méditerranée Metropole is developing the project “MedVallée”¹⁹⁰. The ambition of this project is to federate the stakeholders belonging to the different ecosystems of research, higher education and companies to create an innovative, collective and shared dynamism. The purpose is to make the metropolitan territory a European class centre in the field of health, environment, food and well-being. This cluster will be geographically located in the north of the Montpellier metropolitan area, will benefit from academic establishments, research and healthcare establishments, and will help to rebalance business locations in the metropolitan area.

3.4.3 The University of Montpellier’s ecosystem for Research and Innovation and universities-enterprises collaborations

The University of Montpellier¹⁹¹ is anchored in a dynamic innovative territory, and situates itself as a university open to the world and engaged in developing innovating partnerships. The University is ranked first university in innovation in France in 2019¹⁹² thanks to its capacity to transform research results and to support start-up creations. The Intellectual Property Protection Policy of the University of Montpellier is one of the best at the national and European level¹⁹³. This policy confers

¹⁸⁹ Agence AD’OCC, IP+, <<https://www.agence-adocc.com/reso-ip-adocc/>> [Accessed 26 Nov 2021]

¹⁹⁰ Entreprendre à Montpellier, MedVallée, <<https://www.entreprendre-montpellier.com/fr/med-vallee>> [Accessed 26 Nov 2021]

¹⁹¹ Université de Montpellier, <<https://www.umontpellier.fr/>> [Accessed 26 Nov 2021]

¹⁹² REUTERS, *The World’s Most Innovative Universities in 2019*, <<https://www.reuters.com/innovative-universities-2019>> [Accessed 26 Nov 2021]

¹⁹³ Haut Conseil de l’Evaluation de la Recherche et de l’Enseignement Supérieur, *Rapport d’évaluation de l’Université de Montpellier*, Campagne d’évaluation 2019-2020 Vague A (2021)

credibility to the University towards the industrial partners, which are aware of the importance of a strong territorial university to boost innovation and to provide high quality and valuable research.

The University of Montpellier oversees collaborative contracts' management. The University performs trusteeship on research laboratories that do not have the moral personality and therefore must refer to research organisms' tutors to perform legal acts. There are seventy-two research laboratories at the University of Montpellier and sixteen technological platforms, structured in nine departments. These structures host 1560 permanent researchers. Some research laboratories can be mixed units of research with two or more trusteeships, which can be research centres.

Each year, the University of Montpellier has an average of 200 new business partners, and since it is difficult to communicate regularly with all of them, the team selects the most important partners based on the following priorities: i) company is a university spinoff, ii) company is based on university campus, iii) company has lots of researchers employed, etc. The University President sends letters to these companies each year. In five years, the number of enterprises present on the campus had doubled¹⁹⁴, reaching sixty-two nowadays.

The University of Montpellier has developed a strong partnerships dynamism, with a Vice-Chair dedicated to value and industrial partnerships and a department of an average of twenty-eight agents dedicated to collaborative projects accompaniment: The Innovation and Partnerships Department. This Department has a secretariat with three permanent agents and is divided in two offices:

- An office dedicated to projects' accompaniment and engineering (composed of seven to eight agents), supporting researchers in proposal submissions for regional, national, European and international calls-for-projects. The work between the agents is split by calls: some agents for regional and national calls, some agents for European and international calls, with one agent being focus on ERC calls.
- An office for contracts and research valorisation support (an average three agents for research valorisation plus on assistant, five full-time agents, two part-time agents and one 20%-time agent for contracts' negotiation and management). The contracts are split between the agents per research unit (big or small) and per thematic.

The department creates an annual average of 600 contracts between the University and private entities¹⁹⁵. Part of contracting work entails patent filling and licensing. They have 600 patent families, eighty software programs and twenty trademarks at the name of the University. The

¹⁹⁴ Muse, "Nous allons vers cette évaluation de manière sereine", https://www.umontpellier.fr/articles/muse-nous-allons-vers-cette-evaluation-de-maniere-sereine?utm_medium=mail&utm_source=newsletter&utm_campaign=15 [Accessed 26 Nov 2021]

¹⁹⁵ Figures from an interview of the Director of the Innovation and Partnerships Department for the Unite4Horizon Project.

Innovation and Partnerships Department is working collaboratively with the Research Department and with the SATT AxLR. They support each other rather than compete against.

As a consequence of law PACTE in 2019, the University of Montpellier has set up a Consultative Commission for Research Ethics since the 9th of March 2020. The setup of this commission is not compulsory for French universities, it was a choice of UM. This commission is in charge of formulating preparatory recommendations regarding authorisations for researchers' mobility between public research units and the private sector. The president of the University of Montpellier can take note of the recommendations of the Commission but is the one to give the final agreeing for a project. The Consultative Commission for ethics meets every month or every two months, according to the number of files to be processed. The Human Resources Department and the Innovation and Partnerships Department participate in the Research Ethics Consultative Commission, composed by the Ethics referent, The Delegated Vice-Rector to Valorisation and Industrial Partnerships, and the Vice-Rector for Research. The manager of the contracts and valorisation office also attend the meeting with the three valorisation' officers and provide their expertise on the applications.

MONTPELLIER UNIVERSITY OF EXCELLENCE (MUSE)

Therefore, the University of Montpellier already has a strong innovative collaborative partnerships dynamism and the initiative MUSE (Montpellier University of Excellence)¹⁹⁶ acts as an accelerator of these links. MUSE is an 'I SITE", gathering nine research centres, three health organisms and one international organisation.

The national mechanism IDEX¹⁹⁷/ISITE¹⁹⁸ was imagined in France¹⁹⁹ in 2010 in the framework of Investments for Future Program (PIA), under the aegis of the General Secretariat for Investment. The objective of such mechanism was to support the emergence of a limited number of Research Universities in areas with high scientific potential, and to create a synergy between universities, Higher Education Schools, Research Centres and, when applicable, health organisms and enterprises. In Montpellier, fifteen establishments, led by the University of Montpellier, have defined a common project that gather all type of institutions (Research Centres, Higher Education Schools, health organisms, International Organisation) and that involve scientific communities around three global challenges of sustainable development: food security, environmental protection and human health. This common project "Montpellier University of Excellence" (MUSE) was labelled "I-SITE" in Spring 2017, and have led to the development of intensive activities in all fields of academic life: research, innovation, education, research transfer and valorisation. MUSE has given the University of Montpellier and its partners the means to set up a structuring system to

¹⁹⁶ Montpellier Université d'Excellence, <<https://muse.edu.umontpellier.fr/en/muse-i-site/>> [Accessed 26 Nov 2021]

¹⁹⁷ IDEX : Initiatives of Excellence.

¹⁹⁸ I-SITE : Initiatives Science / Innovation / Territoires / Economy

¹⁹⁹ Gouvernement, Secrétariat Général pour l'investissement, IDEX/ISITE, <<https://www.gouvernement.fr/idex-isite>> [Accessed 26 Nov 2021]

transform education, research and innovation and create more links and synergies with the economic world, mainly enterprises²⁰⁰.

The MUSE initiative is a central lever in the speeding of developing partnerships with the economic world. Its objective is to create a thematic university of intensive research by supporting economic development through structured partnerships based on a strategy of enterprises' integration on university sites.

One of the MUSE objectives is to foster partnerships between public research structures and enterprises, mainly through the following initiatives:

- **PRIME@MUSE:** Premium for Innovation research led in partnership with enterprises. In 2018, Occitanie Region had launch « Prime call » aiming to develop partnerships with local enterprises.
- **Calls « Companies on Campus »:** development of new partnerships between research units and enterprises by hosting enterprises' staff in research units for a six-month minimum.
- **Booster Innovation Montpellier (BIM):** BIM is an event for innovative projects owners (PhD Students, researchers, teachers, students ...) at an upstream maturation stage. The objective of these two-day sessions is to help them shape their project, learn how to pitch it, discover funding possibilities and benefit from an appropriate accompaniment.

Through PRIME, Occitanie Region has also started to finance business 'developer's positions inside research centres and Montpellier University in 2017. The role of business developer is to map the available research laboratories resources inside MUSE and to meet and reach enterprises that could be interested in establishing a partnership with a research unit.

SATT AxLR

In France, the SATTs (Acceleration Societies for Technology Transfer) have been created in the framework of the Investments for Future Program (PIA). The SATTs finance the technological development of innovation derived from public research thanks to an exclusive investment fund of 856M€. SATTs are not intended to own the IP generated during innovative projects' maturations. There is a return of the IP to the maturation institutions in exchange of an exclusive license on the results granted to the SATTs. SATTs then sub-license to enterprises.

The SATT AxLR, implemented in the former Languedoc-Roussillon Region (nowadays part of the "Occitanie Region" since the merged of French regions in 2016), was created in 2012, with important support from the State and the Region. The creation of AxLR follows the Prime Minister's decision of 19 January 2012, taken at the end of the call for SATT projects led by the National Research

²⁰⁰ Montpellier Université d'Excellence, *Rapport d'activité 2017-2019*, <<http://muse-num.fr/>> [Accessed 26 Nov 2021]

Agency. The five universities in the region (UM1, UM2, UM3), Perpignan (UPVD) and Nîmes (Unîmes), two Grandes Ecoles (Montpellier SupAgro and the Ecole Nationale Supérieure de Chimie de Montpellier) and four research organisations (CNRS, INSERM, IRD and IRSTEA), have seized the opportunity to put an end to the fragmentation of the valorisation structures. Their objective is the improvement of the efficiency of the transfer of technology and the economic value created. The University of Montpellier is one of the shareholders of the SATT AxLR. 2013 was the year of the operational implementation of the SATT AxLR, with the signature of framework agreements with the SATT AxLR's shareholders. In September 2013, SATT AxLR and UM signed a framework agreement.

There is a large patents portfolio available at the University of Montpellier. The technology transfer policy is supported by performing actors, notably by the SATT AxLR²⁰¹ that acts as the TTO of UM. The accelerator AxLR is specialized in academic-industrial relationships. SATT AxLR hires people with previous experience in the private sector, to have high-skills and experimented managers leading the projects. This society is financing pre-maturation and maturation agreements, fostering technology transfers, managing patents applications and supporting academic spin-off creation. In the initial beneficiary contract between the SATT AxLR and UM, it is agreed that the University of Montpellier must transfer all its innovations to the SATT AxLR for examination.

Firstly, the Partnerships and Innovation Department supports researchers on upstream Intellectual Property and in filling in Invention Disclosure Forms. The IDF are transferred to the SATT AxLR for examination.

The SATT AxLR has implemented several procedures to support technology valorisation and transfer towards industrial partners:

- Every month, an “Intellectual Property Committee” is organized between the SATT AxLR and its shareholders to introduce IDF and SDF and intention sheets to decide if the SATT AxLR is willing to invest on these projects. Researchers can benefit from pre-maturation or maturation investments to level up the Technology Readiness Level (TRL) of their projects and de-risking innovation. Each year, the SATT AxLR receives on average 100 to 110 invention or software disclosure forms and select 50% of the forms for fundings and valorisation²⁰². The criterias to select a project are, among other: no divulgation must have been done on the results, because that means no Intellectual Property Protection is feasible, the research must be applied research with a response to societal needs and a possible market application. Pre-maturation and maturation programs can last up to twenty-four months.
- Launch and coordinate calls for projects: the projects can be funded from SATT AxLR funds or other entities' funds, such as Occitanie Region. Researchers' laboratories or

²⁰¹ SATT AxLR, <<https://axlr.com/>> [Accessed 26 Nov 2021]

²⁰² Data collected during the interview of the SATT AxLR's legal director by UM's representatives

independent researchers can apply and present projects with low Technology Readiness Level (TRL) to obtain a pre-maturation or maturation fundings. There are also special calls for projects for PhD students.

- Informative sessions for researchers on Intellectual Property.
- Creation of a start-up incubator with a full aids-package, currently under development.

3.5 Utrecht University's (UU) ecosystems for Research and Innovation and universities-enterprises collaborations

3.5.1 Utrecht Region's ecosystem for Research and Innovation and universities-enterprises collaborations

Utrecht Region²⁰³ is the second most competitive Region in Europe since 2010 according to the European Innovation Scoreboard and considered an innovative leader. Utrecht has been able to maintain a steady score throughout the years and can be considered one of the more academic or research-oriented regions of the Netherlands. It outperforms the national average as well as the EU average on almost all innovation indicators.

The Region is a national hub for business and Utrecht city is the core economic engine, responsible for two third of the regional GDP in 2018 (CBS, 2020).

The region offers a supportive, collaborative environment and a competitive, innovative and stable business climate with excellent academic and research infrastructure. A rare mix of accessible scale and global capacity, of history and innovation, defines Utrecht region. The province is home to organically grown knowledge intensive ecosystems around health, climate change and smart services.

The Regional Economic Agenda, "Regionale Economische Agenda"²⁰⁴, was published in November 2019 by the Province of Utrecht and lower regional governments. The agenda aims to develop broad economic prosperity by specifically focusing on the creation and support of initiatives that generate societal benefit on a long-term basis. The agenda is a strategic vision for economic growth, business development, network formation and internationalisation.

Several funds were available for stimulating knowledge and innovation. Examples are the Regional Energy Fund with a total of €21m available for energy projects; the MIT-R&D Cooperation Projects; the Green, Healthy, Smart Fund and others such as the Utrecht Health Seed Fund managed by Utrecht Holdings BV.

²⁰³ Utrecht Region, <<https://www.utrechtregion.com/>> [Accessed 26 Nov 2021]

²⁰⁴ Utrecht Region, *Regionale Economische Agenda*, <<https://www.regiogv.nl/wp-content/uploads/2019/11/6b-Regionale-Economische-Agenda-Regio-Utrecht-CONCEPT-november-2019.pdf>> [Accessed 26 Nov 2021]

Utrecht region hosts Utrecht Science Park²⁰⁵, gathering competence from business, industry and academia together in order to design and create healthier, safer and more sustainable cities for today and for subsequent generations. Utrecht Science Park is the beating heart of Utrecht's knowledge-based economy and provides a vibrant, dynamic and inspirational environment. It is the home to over sixty research and development companies.

3.5.2 Utrecht University's ecosystem for Research and Innovation and universities-enterprises collaborations

Utrecht University²⁰⁶ is the biggest university of the Netherlands and was ranked 50th in the Shanghai Ranking 2021²⁰⁷, 120th in the QS World University Rankings 2020²⁰⁸, and 75th in the Times Higher Education World University Rankings 2020²⁰⁹.

Utrecht University is a wide-range, international research university of high standing. It is the largest and most prestigious research university in the country with a deep and historical connection to the city of Utrecht. UU interdisciplinary research targets four themes: Life Sciences, Pathways to Sustainability, Dynamics of Youth and Institutions for Open Societies. These themes focus on large societal challenges. Eleven focus areas are testing grounds in which fundamental research is connected to societal tasks and there are twenty hubs to tackle key societal challenges²¹⁰.

Research conducted at the faculties of Utrecht University is carried out within the research institutes. A Director of Research, who is responsible for the level of the research and the academic orientation of the institute, leads each research institute. Every faculty has a Research Support Office (RSO). In these offices, researchers receive support in:

- Project and grant applications: Support in preparing competitive grant applications, feedback on draft proposals and tips & tricks for increasing chances of success
- Legal support, Contract negotiations
- Legal and financial affairs
- Project management
- Formation of consortiums

²⁰⁵ Utrecht Science Park, <<http://www.utrechtsciencepark.nl/nl>> [Accessed 26 Nov 2021]

²⁰⁶ Utrecht University, <<https://www.uu.nl/en>> [Accessed 26 Nov 2021]

²⁰⁷ Shanghai Ranking, 2021 Academic Ranking of World Universities, <<https://www.shanghairanking.com/rankings/arwu/2021>> [Accessed 26 Nov 2021]

²⁰⁸ QS TopUniversities, QS World University Rankings, <<https://www.topuniversities.com/university-rankings/world-university-rankings/2020>> [Accessed 26 Nov 2021]

²⁰⁹ THE World University Ranking, <[https://www.timeshighereducation.com/world-university-rankings/2020/world-ranking#!/page/0/length/25/sort by/rank/sort order/asc/cols/stats](https://www.timeshighereducation.com/world-university-rankings/2020/world-ranking#!/page/0/length/25/sort%20by/rank/sort%20order/asc/cols/stats)> [Accessed 26 Nov 2021]

²¹⁰ Utrecht University, *Research*, <<https://www.uu.nl/en/research>> [Accessed 26 Nov 2021]

- Valorisation of research

RSO supports researchers in finding external funding for their research. The RSO has extensive experience with the different funding schemes and can offer specialized support for researchers to maximize their chances of success.

To give entrepreneurship, public-private collaboration and regional partnerships an extra boost, the UU has appointed a corporate director for Entrepreneurship and Regional Partnerships in 2021. In addition, the Executive Board has set up a separate fund to finance supra-faculty entrepreneurship projects.

The Knowledge Transfer Office (KTO), part of Utrecht Holdings, offers knowledge transfer support²¹¹. The KTO offers support in writing knowledge utilisation paragraphs, advice on cooperation with third parties, intellectual property and can support licensing, patenting and entrepreneurship.

Utrecht Holdings is the joint Knowledge Transfer Office of Utrecht University and University Medical Centre Utrecht (UMC Utrecht)²¹². Thirteen administrative agents work for its success. Its missions are to facilitate and enable economic and societal impact by science-based innovation, knowledge transfer and outstanding partnerships. Utrecht Holdings helps academics translate knowledge into economic value. It has several active licensing opportunities available for collaborating. Utrecht Holdings activities include:

- Screening and scouting of promising research
- Advising on knowledge utilization, grants and consortium building
- Early-stage market, business and legal advice
- Intellectual property protection and licensing
- Controlling patent applications and patents
- Leading the formation of new companies, including legal and financial structuring
- Providing investment capability
- Life science incubator and housing facilities

In 2020, Utrecht Holdings was the home of sixty-five new ideas and inventions, twenty-five new projects started, sixteen patent filled, nine new families granted, fourteen new contracts for commercialization²¹³.

²¹¹ Utrecht Holdings, <<https://utrechtholdings.nl/>> [Accessed 26 Nov 2021]

²¹² UMC Utrecht, *Research*, <<https://www.umcutrecht.nl/en/research>> [Accessed 26 Nov 2021]

²¹³ Utrecht Holdings, *About*, <<https://utrechtholdings.nl/about/>> [Accessed 26 Nov 2021]

In addition, Utrecht University participates in many inter-university research schools in which research institutes from different universities collaborate. It is the coordinating university for ten of these research schools.

Utrecht University researchers collaborate intensively with organisations and institutes in matters relating to teaching and research, in the Netherlands and elsewhere. These collaborations result in innovation and economic development and help to solve societal issues.

Utrecht University is a participant on the Economic Board Utrecht (EBU)²¹⁴. The EBU stimulates innovation and collaboration between businesses, knowledge institutions, and public sector bodies with the aim of creating a green, healthy, and smart region.

Utrecht University is a shareholder of the regional development agency (ROM Utrecht Region).

Utrecht University is partner in the Eindhoven-Wageningen-Utrecht Alliance (EWUU Alliance)²¹⁵: Eindhoven University of Technology (TU/e)²¹⁶, Wageningen University & Research (WUR)²¹⁷. Utrecht University and University Medical Center Utrecht (UMC Utrecht)²¹⁸ are intensifying cooperation and forming a new knowledge alliance. They are complementary in knowledge, talent, and work together to contribute to societal transitions. The institutions are combining their complementary expertise for the sake of finding solutions to issues involving health, food, energy and sustainability.

²¹⁴ Economic Board Utrecht Region, <<https://www.economicboardutrecht.nl/>> [Accessed 26 Nov 2021]

²¹⁵ Utrecht University, *Collaborate*, <https://www.uu.nl/en/collaborate/utrecht-eindhoven-wageningen-alliance> [Accessed 26 Nov 2021]

²¹⁶ TU/e Eindhoven University of Technology, <<https://www.tue.nl/en/>> [Accessed 26 Nov 2021]

²¹⁷ Wagening University & Research, <<https://www.wur.nl/fr.htm>> [Accessed 26 Nov 2021]

²¹⁸ UMC Utrecht, <<https://www.umcutrecht.nl/n/>> [Accessed 26 Nov 2021]

4. COMMON STRATEGIES AND PRACTICES IMPLEMENTED BY THE CHARM' ALLIANCE 'UNIVERSITIES TO PARTNER WITH ENTERPRISES WITHIN INNOVATION ECOSYSTEMS

In all five universities of the CHARM 'Alliance, the development of partnerships with enterprises can be considered as full-spectrum. Each university has implemented a strategy and has developed practices to cooperate with the private sector in a wide branch of its activities, notably education, training, answer collaborative calls for projects, research collaboration, knowledge and technology transfer. Those strategies are developed in collaboration with societal stakeholders of the innovation ecosystems at national and local levels. Partnerships are formalized through a contract, commonly used as the legal tool to frame universities-enterprises collaborations. The agreements can be short-term or long-term, each university preferably aims at developing long-term partnerships with the private sector, as the University of Montpellier explains: *“Although projects are different, same issues arise as challenges: negotiating power/decision-making, money and property rights. Therefore, establishing your own stance on these aspects and considering stakes you give to others in partnerships is important. For example, for UM, as a university, it is not of highest importance to have large funding on the contract, but it is more for them that companies take PhD students for training. UM is always working for a long-term goal. Quick wins are not in the focus.”*

In addition, partnerships with enterprises can take the form of offering the housing of enterprises' staff in research laboratories' physical premises. This partnership takes the form of a housing agreement.

In this chapter, seven areas of collaboration between public researchers and enterprises are introduced:

- Education and training
- Collaborative calls-for-proposal
- Collaborative research
- Technology Transfer
- Business Development
- Sectoral mobility
- Industrial PhD

The strategies, procedures and practices implemented in each of those areas are presented and analysed. In addition, during interviews, interviewees have been asked to identify best practices and barriers in collaboration between universities and enterprises, based on their personal past and current experiences. Thus, best practices are not quantified with precise indicators, but have emerged from diverse actors' feedback. Barriers, expressed as “disincentives” have been identified at different levels and categorised in four level: systemic, enterprise, university and individual

(researchers). Moreover, researchers have shared preliminary recommendations at different levels (systemic and university notably), to improve collaboration between universities, enterprises and societal stakeholders, also based on their personal experiences and perspectives.

Main highlights of this chapter:

Best practices at university level to collaborate with enterprises

Education and Training	Integration of collaboration with the private sector in courses/training from bachelor
Collaborative calls-for-proposal	Collaboration with an enterprise is a criteria to submit a project University support researchers for writing proposals and managing administrative and financial project set-up Tools to keep researchers updated on current calls-for-proposal
Collaborative research	Intellectual Property Rights Policy Model contract Electronic signature Good negotiation skills Being flexible and communicate clearly with the enterprise Joint laboratories
Technology Transfer	Idem Good knowledge of the local/regional economic ecosystem Mapping the resources available in each research laboratory Maintaining close relation with partner enterprise
Sectoral mobility of researchers	Providing possibilities and incentives for researchers to work for enterprises
Industrial PhD	Linking students for research units and enterprises to work on a common project Communication on industrial PhD
Business developers	Working in close relations with other departments and offices of the university Mapping resources of the research units Customer Relationship management Matchmaking events

Incentives and disincentives

Collaborative calls for proposal

	Incentives	Disincentives
Systemic level	Collaboration with enterprises can be a criteria in some calls-for-proposal	Rules of funders are demanding Administrative burden
Enterprises' level	Access to funding Access to scientific knowledge Share the workload Penetrate networks	Lack time, resources and experience Administrative work is too consequent and slow
Universities' level	Access to fundings	Employee's workload

	Reputation and ranking	More and more is being ask to RSO
Individual level	Access to fundings Applied research with concrete applications Activities diversification Develop new skills	Lack time and resources to write an impacting and comprehensive research proposal

Collaborative research

	Incentives	Disincentives
Systemic level	National and local RDI strategies and policies	Salaries are not enough valorised for public officers
Enterprises' level	Access to scientific knowledge, excellence and top-expert Unlock technological and scientific locks Speeds up innovation Being at the cutting-edge of the technology Research outputs: publications, patents for instance	Slowness of the administration is not compatible with enterprises' timeline Question of fundings. For instance, financial rules of universities can disable small or medium enterprises Lack of risk sharing with universities IPR
Universities' level	Universities' strategies and policies IPR Policy Administrative and legal support Expertise, negotiation	Lack of indicators to follow-up on research contracts Lack of human resources to negotiate contract with enterprises Administrative burden and slowness Diverging views and goals from enterprises
Individual level	Applied science with concrete application Financial resources Access to business skills Research outputs: publications, patents for instance	Lack of understanding from enterprises of the research's temporality and procedures IPR negotiation Dialogue with enterprises can be difficult

Technology Transfer

	Incentives	Disincentives
Systemic level	The European Commission has encouraged the creation of TTOs in countries members of the EU since the early 2000's.	National IP policies + prices (selective rules + pricey) Research assessment criterias
Enterprises' level	Access to cutting-edge technology	Contracts negotiation is too slow Subjected to market tendency and competitiveness

Universities' level	<p>KT and TT more and more integrated to universities' agenda</p> <p>3rd mission of the universities</p> <p>Administrative and legal support</p> <p>Expertise</p> <p>IPR Policy</p>	<p>Lack of human resources</p> <p>Contracts take a lot of time to negotiate with a risk of losing the contract</p> <p>Point of intent for Social and Human Sciences: immaterial knowledge. complex contractualisation methods are unsuitable to collaborative Human and Social Science researches.</p>
Individual level	<p>See the concrete application of their research</p> <p>Financial retribution</p>	<p>KT and TT takes time and energy (more than publication)</p> <p>Lack competencies in evaluating the value of their technology and in negotiating with enterprises during first approach and talk</p>

Business development

	Incentives	Disincentives
Systemic level	Incentives to develop and fund business developers positions inside universities	Not all national or local instructions from the CHARM 'Alliance countries have implemented strategies or mechanisms to support business development positions inside universities.
Enterprises' level	Business developers are an entrance door to research laboratories Facilitation of dialogue	Not very aware of these positions yet
Universities' level	Integrate those positions in RSO, TSO, faculties and research units: transversal	Not enough working tools and training for business developers Research units can be reluctant to work with business developers These new positions still need to be apprehended inside universities
Individual level	Challenging and stimulating positions	These positions sometimes remain unclear Need to build up a new methodology, procedures and tools

Sectoral mobility

	Incentives	Disincentives
Systemic level	National regulations providing incentives for researchers' mobility to enterprises	Not enough mechanisms and flexibility implemented in national strategies and policies

Enterprises' level	Access to scientific knowledge and skills Scientific support and consultancy	The regulations on duration of researchers' mobility activities can be considered being too short.
Universities' level	Legal and administrative support Researchers' mobility Policy, for instance Scientific Consultancy Policy Financial returns	Not enough communication on the possibilities of mobility to enterprises for researchers
Individual level	Discover the business world Open new career opportunities Participate to start-up creation without leaving the university Stimulating and gratifying	Possible loss of institutional position, of acquired benefit, of courses Difference of culture between academy and industry can be intimidating

Industrial PhD

	Incentives	Disincentives
Systemic level	Initiatives at European and national levels to develop industrial PhD	National rules to validate a PhD may not be adequate with industrial PhD because lay be too demanding
Enterprises' level	Financially interesting: enterprises can receive fundings to help them hire industrial PhD students Extra human resources Access to scientific knowledge and skills Possible research outputs such as publications or patents. Training period for a potential future employee Create bridges with public research units	The uncertainty on the results of the collaboration can be dissuasive May not have enough time to dedicate to the doctorate Firms do not respond well to the bureaucratic load, response lead times are usually very long and part of the companies have to be reminded several times before they provide certain documents, statements etc. necessary for certain administrative reasons.
Universities' level	Allows the research unit to have extra-staff remunerated by an enterprise available to work on a strategic research project with economic valorisation's potential Possible research outputs such as publications or patents	No intensive communication on industrial PhD
Individual level	Stimulating research leading to thesis defense and to a new diploma Excellent professional experience Open new career opportunities	Salaries not high enough for such positions Must deal with different expectations from the research unit and the enterprise

	Learn scientific research and business skills	Industrial doctorates demand high investment and flexibility Important workload Risk that the enterprise loses interest in the project during the duration of the industrial doctorate
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4.1 Developing partnerships with enterprises in education and training

Interacting and collaborating with enterprises start from education and training. Long-term commitments to ensure innovation activities merge with educational support (i.e., Master and PhD theses) aligned to industrial interests²¹⁹. In addition, it supports the professional integration of students.

The European Commission encourages the development of several mechanisms to help reinforce partnerships between universities and enterprises for students' internships and to ensure professional insertion of students through the programme Erasmus +²²⁰.

At the university level, partnerships with enterprises for education and training can take several forms:

- Speakers from the business world can intervene in classes to provide students with applied business cases or talk about their experience.
- In bachelor or master programs, students can intern in enterprises, from several weeks to several months to gain professional experience. Internships can be optional or compulsory to graduate. In addition, students can take a gap year to intern in enterprises between two years of study and remain attached to their parent university during this sabbatical.
- Work-linked programs allow students to share their time between the university and an enterprise (for instance, two days at the university to study and follow a training and three days per week at the enterprise to work). It allows students to validate a diploma while gaining professional experience at the same time.
- Bachelor or master programs can also propose to students to follow academic projects in partnership with enterprises. For instance, an enterprise presents a specific need or

²¹⁹ Technology Innovation Management Review, Q&A, *How Can a University Drive an Open Innovation Ecosystem ?*, Gonzalo León, Roberto Martínez (July 2016), <<https://timreview.ca/article/1004>> [Accessed 26 Nov 2021]

²²⁰ European Commission, Erasmus +, <https://ec.europa.eu/programmes/erasmus-plus/node_en> [Accessed 26 Nov 2021]

demand to students. Then, students have several weeks or months to work on the projects with a follow-up of the enterprise.

- Youth-enterprises are students' associations with economic vocation in which students conduct consulting activities for enterprises and can be remunerated for their services. These youth enterprises allow students to better apprehend the economic world and market needs and to start building a network in the labour market.
- In all five universities, entrepreneurship courses and diplomas are available for students interested in start-up creation. These trainings participate in creating strong links with the business sector and in raising awareness among students from an early stage of their studies.

At the University of Montpellier, the Spatial Academic Centre²²¹ has developed a collaboration with enterprises for students' training. Partner companies fund the Spatial Academic Centre in exchange of students' training on very specific needs, for them to develop advanced skills. This initiative allows training students with very high qualifications who, once graduated, are ready to be hired by the enterprises. At the same time, it allows the Spatial Academic Centre to develop its activities and research by having access to standing and steady funding. Furthermore, the University of Montpellier and some companies have created the Van Allen Foundation²²² and a "partners club". These foundation and club allow, among other missions, to fund students' internships.

In each university, there is an office dedicated to students' internships and professional integration that has a database of enterprises available to hire students and often follow-up on those partnerships. Universities can organize meeting events between students and enterprises to give future graduate advices for their professional insertion. For instance, the University of Montpellier organizes the "Enterprises-University Forum"²²³ each year. This forum is dedicated to students from the last year of bachelor to the doctorate. Multiple activities are available during four days: job dating with enterprises, round-table discussions, and webinars moderated by recruitment professionals.

In ELTE, the ELTE Career Centre²²³ operates a central system, including a business partner's database, and organizes job markets and training courses for students to support finding a job and employment.

Eventually, developing partnerships with enterprises for training and internships is also essential for universities and professors-researchers because it can lead to further cooperation with the university in the future, not only for training but also for collaborative calls for projects, collaborative research or technology transfer.

²²¹ Centre Spatial Universitaire de Montpellier, <<https://csum.umontpellier.fr/>> [Accessed 26 Nov 2021]

²²² Fondation Van Allen, <<https://fondationvanallen.edu.umontpellier.fr/>> [Accessed 26 Nov 2021]

²²³ The ELTE Career Center, <<https://www.elte.hu/content/karrierkozpont.t.10960>> [Accessed 26 Nov 2021]

4.2 Association of researchers with enterprises to answer collaborative calls for projects

To have access to funding to pursue their research and conduct a project, researchers usually answer to “calls for projects” launched at the international, European, national or local levels by funding institutions, agencies or enterprises. In some calls, one of the eligibility conditions is to be associated with one or several enterprises to conduct the research together and thus have economic and social impact.

4.2.1 Presentation of collaborative calls for projects support inside the universities

In each university, a research support office accompanies researchers to build up their project proposal to answer calls, which can be cooperative calls. A broad support is available for researchers:

- Calls for projects follow-up and information on calls.
- Administrative and financial support: set-up and final check.
- Support and advice in writing the proposal.
- Organization of informative session of specific calls for proposal and training sessions.

At ELTE, there is not explicitly one such supporting office. For the preparation and management of proposals/projects, the University Grant Centre and the faculty grant offices provide assistance. In addition to that, in the framework of the University Innovation Ecosystem (EIÖ) project, in the case of specifically large-scale proposals focusing on the university as a whole, following the decision of the university leadership, it was (is) possible to require help for the preparation of the proposal from external consulting firms via the University Centre for Innovation. Regardless of the EIÖ, the university wishes to maintain this possibility in the future, provided that financial resources are available.

Most of the time, researchers and enterprises answering together to a call for project had met before and even had worked together before. Researchers and enterprises usually meet thanks to their personal network, during events, meetings, colloquies, through common colleagues, through students, PhDs. They can also meet by conducting active search and watch on scientific and technological advancements and doing their own prospect to find a partner that will fit their needs. For instance, researchers can investigate in the local economic ecosystem to look for an enterprise working on a subject related to their interests. Enterprises can be pro-active in RD: for example, read scientific reviews to find a publication related to its work/products/services, stay updated on scientific news, and meet research laboratories’ directors. Business developers can also match researchers and enterprises, but their role is still new and under development, as we will discuss later on in this report.

The benefits of collaborative calls lie in developing a service or product with a high technological and scientific level answering societal needs and challenge.

4.2.2 Incentives implemented at different levels to support association between researchers and enterprises to answer collaborative calls for projects

a) Systemic incentives

From a systemic perspective, partnerships between researchers and enterprises to answer calls-for-projects are encouraged through the composition itself of those calls that imply the participation of HEI and enterprises for the project to be eligible.

For instance, in its strategy “Innovation 2020”, Ireland stated in the point 2.12 to aim at increasing collaboration between firms and the public research system by “*expanding the SFI Strategic Partnership and SFI Centres Spokes programme for adding new industrial and academic partners to the SFI Research Centres*” and “*increasing the use of the EI Innovation Partnership scheme to drive market-led collaboration between firms and the public research system*”.

b) Enterprise's 'incentives

From the enterprises' perspective, being involved with HEI to respond to calls for proposals is a way to have access to funding to develop a product. More than that, it allows them to have access to scientific excellence and skills that are essential to develop excellent, innovative and at the cutting edge of the technology products. It allows sharing the workload and penetrating the networks of public research.

c) University incentives

From the University perspective, having researchers that answer to collaborative calls-for-projects in partnerships with enterprises is a way to meet new partners and develop new partnerships.

It is also important for universities' reputation and ranking in national, European and international rankings to have researchers that win calls-for-proposal and develop collaborative research, in order to demonstrate the scientific excellence lead inside the university.

Each university has developed tools to keep the researchers updated on ongoing calls for proposals: newsletter, gates, intranet, Grants Information Day (ELTE) etc.

Researchers and enterprises usually appreciate the work conducted by the administrative office of the universities to support them in answering collaborative calls²²⁴. They appreciate the dedication, reactivity and skills of the qualified administrative agents, plus the “*clarity on rules and regulations*” given and the “*support in communication with external partners*”²²⁵.

d) Individual incentives

²²⁴ According to the interviews conducted in the framework of WP5 research inside all five universities of the CHARM' alliance.

²²⁵ From interviews of researchers part of the consortium

From the researchers' perspective, answering to collaborative calls-for-projects in partnership with enterprises is an opportunity to have access to funding to lead research that will have a social impact: *"The aim is to have an impact in the Region"*²²⁶. It is also a great opportunity to gain peer recognition and important for career advancements and activities diversification. In addition, it is an opportunity to share the workload and utilize the network and the skills of the private partner.

4.2.3 Disincentives hampering association between researchers and enterprises to answer collaborative calls-for-projects detected at different levels

a) Systemic disincentives

From a systemic perspective, rules of funders of collaborative calls-for-proposals are demanding, especially for enterprises that are not used to tie administrative procedures and bureaucracy. These rules are considered as an *"administrative burden"*²²⁷ by the enterprises, that do not understand why they must provide so many documents, even ones considered as being confidential (for instance pay slips). These funders' practices are seen as intrusive and can be prohibiting for enterprises to participate in collaborative calls with researchers.

b) Enterprise's disincentives

Linked with the systemic disincentive, enterprises are reluctant to gather all necessary documents for a call proposal. They also lack time, experience and resources in submitting research call proposals.

c) University disincentives

From a university perspective, it happens that researchers contact the administrative agents of the RSO one-day prior the deadline. This situation generates an important workload for the employees. In addition, there is an uncertainty in this case if the proposal can be handed on time to the funder. Universities and researchers, because of researchers' lack of anticipation, miss some opportunities.

One of the challenges also underlined during interviews is that more and more is being asked to RSOs (for instance Open Access, knowledge utilization, ethical aspects, Research Data Management, ...), but there are no extra staff positions, that lead to an increased workload and less time spend on the quality of the research proposals.

d) Individual disincentives

Some researchers are reluctant to work with enterprises and rather apply to non-collaborative calls to conduct fundamental research. They can also lack time and resources to write an impacting and comprehensive research proposal.

²²⁶ From the interview of a researcher part of the consortium

²²⁷ From the interview of a partner enterprise

4.2.4 Best practices inside the universities to foster and support partnerships between universities and enterprises to answer collaborative calls-for-projects.

Each university of the alliance has developed tools to keep researchers updated on the current calls going on at different levels and to communicate easily with them. Following are some examples of this best practice from some universities of the consortium.

- At ELTE, the University Grant Centre's new service for researchers is designing visual elements for Horizon Europe proposals²²⁸. (E.g., geographical location of project collaborates, hierarchy of WPs, summary, etc.). In September 2021, the University Grant Centre started a series of "Grants Information Day" for the faculties on a monthly basis where they inform lecturers and researchers on international/European project funding opportunities.
- At the University of Barcelona, the Foundation Bosch i Gimpera provides up-to-date information about the different calls at different levels²²⁹.
- At the University of Montpellier, researchers can use the online service "Open 4 Research"²³⁰, a platform gathering all ongoing calls for proposal. This tool allows researchers to find new sources of funding for research, training and valorisation. This platform allows a quick and easy access to information, with the possibilities for research to create warnings for future calls they are or could be interested in. Researchers can personalise their researches to find funding that are the most adapted to their projects. More than 7000 funding are listed in this platform. Furthermore, the University of Montpellier send a monthly newsletter summarising the most important ongoing calls for an easy access to information for researchers.
- At Utrecht University, Research Support Offices use "Research Connect"²³¹, an online service that comprises thousands of research funding opportunities, which can be searched in various ways, and provides extensive support to its researchers via the Research Funding Academy. This Academy provides several activities and tools very useful for researchers, such as:
 - Research Funding Days, an annual event with information sessions, workshops and panel discussions to help researchers with applications for research funding.
 - Writing courses, providing researchers with support in writing a successful research application.

²²⁸ ELTE, <[Ismerje meg a PÁK új szolgáltatását! \(elte.hu\)](https://www.elte.hu)> [Accessed 26 Nov 2021]

²²⁹ Fundació Bosch i Gimpera, *Grants and Fundings*, <<http://www.fbg.ub.edu/en/what-we-do/grants-and-funding/>> [Accessed 26 Nov 2021]

²³⁰ Université de Montpellier, *Open 4 Research*, <<https://www.open4research.eu/montpellier/>> [Accessed 26 Nov 2021]

²³¹ Idox, *Research Connect*, <<https://www.myresearchconnect.com/>> [Accessed 26 Nov 2021]

- Research Funding Toolkit, providing all kinds of useful online information on acquiring research funding.
- Impacter, an online tool to help researchers improving the impact paragraph in their research proposals.

4.2.5 Recommendations to improve universities strategies and practices to better support partnerships between universities and enterprises to answer collaborative calls for projects

From the interviews lead with administrative agents of RSOs, researchers and enterprises taking part to collaborative calls for projects emerge some recommendations for the systemic level (calls funders) and universities:

- Calls funders should reduce bureaucracy (especially around the approval of proposals and agreements) to lower the “entrance cost” for enterprises to take part of collaborative calls for projects.
- Universities should be more proactive in approaching private actors and, if not already done, must set up a network/archive of private actors that were collaborators before, being proactive in setting up this network. For interviewees in some universities, it could be useful to implement a procedure for multi-faculty proposals, including legal agreement templates for submandates between the deans.
- Finally, universities must operationalise post-grants support.

4.3 Collaborative research, the main way for researchers to collaborate with enterprises

4.3.1 Presentation of collaborative research between universities and enterprises

Collaborative research is research conducted by two or several stakeholders. In the framework of this report focusing on academy-industry, we approach collaborative research as a collaboration between one or more researchers and one or more enterprises to lead research. Collaborative research is defined in time and must be of mutual interest for both the researcher and the enterprise. Negotiation must be transparent and equitable. Collaborative research can result in co-authored publications, patents or models application. Research results must be protected by the IP.

Each university has an office dedicated to collaborative research support: at ELTE, the Centre of Innovation, in TCD, Trinity Research and Innovation, in UB, the Foundation Bosch i Gimpera, in UM, Partnerships and Innovation Department, in UU, Utrecht Holdings and the RSOs of each faculty.

Collaborative research is of mutual benefits: it allows enterprises to have access to excellent scientific knowledge and develop new cutting-edge products to be more competitive, and it can be fundamental in researchers' careers to develop new applied knowledge.

4.3.2 Collaborative research as legal relationships framed by a contract

To ensure the terms and conditions of the collaboration between a university and an enterprise, partnerships are conceived as legal relationships fixed by agreements over fixed-term period, linking public and private actors such as universities, public research/technology institutions with enterprises. Both sides interact in the decision-making process, and co-invest scarce resources such as money, personnel, facility, knowledge and information in order to achieve specific common objectives in Research and Innovation. The partners share risks, rewards, and responsibility for shared investments²³². Collaborative research can take many diverse forms –described hereunder-, each of them framed by a contract: consortium agreement, research collaboration agreement, confidentiality agreement, maturation agreement, service delivery etc. Contractual relationships are often a challenge for industry and academics undertaking collaborative research projects as it takes time to negotiate and both sides can have different interests to assert.

The contract is the legal tool broadly used by all the alliance's universities. It frames the universities-enterprises' partnerships, but it is not a finality. Each contract is unique and negotiated with the mediation of administrative agents inside the university: research support officers, contracts managers, valorisation officers, jurists, legal experts.

Even though each contract is unique, common rules and minimum definitions are commonly negotiated in all research contract. For instance, defining the partnership's objectives and its duration, defining the obligation (obligation of means or of performance?), describing the scientific project and planning, the necessary resources involved in the project (human material, financial), the financial impact, the Intellectual Property Rights and the rules for results exploitation and dissemination. In France, the partners fund collaboration research at marginal cost and service delivery is funded on a full cost basis.

Each university has developed or is developing model contracts or is working with model contract developed by an associate partner (for instance in TCD, Trinity Research and Innovation TR&I has adopted the KTI model agreements) or checklist to facilitate officers' work and communication with researchers and enterprises.

a) Collaborative' research contracts

Collaborative research between researchers and enterprises can take diverse forms, each relationship being framed by a specific contract:

- The consortium agreement is an agreement between numerous stakeholders to define a collaboration between the beneficiaries and to set their rights and obligations. Most of the

²³² OECDiLibrary, *OECD Science, Technology and Innovation Outlook 2016*, <https://www.oecd-ilibrary.org/docserver/sti_in_outlook-2016-10-en.pdf?expires=1623679080&id=id&accname=guest&checksum=9AAE81E2FAC8B82B3D324D46B9E5904D> [Accessed 26 Nov 2021]

time, consortium agreement takes longer time to negotiate because of the number of stakeholders involved.

- The research collaboration agreement is an agreement between two or more parties that want to collaborate on a specific research project defined over time. The stakeholders can be public or private. For instance, the agreement set out the rights and obligations of each party, defines the funding, the intellectual properties and dissemination rights, divides the benefits, and more.
- The research collaboration agreement for an industrial PhD is an agreement between a PhD student, a research laboratory and an enterprise to lead a common research project on several years.
- The confidentiality agreement is a legal contract between at least two parties that outlines confidential materials or knowledge the parties wish to share with one another purposes but wish to restrict from generalized use. The confidentiality obligation can be mutual or not. The disclosing party remains the owner of the information disclosed.
- The maturation agreement is framing a “maturation phase”. The maturation phase is a crucial step to make a scientific result more reliable. This phase can be realized in partnership with one or several economic actors to guaranty key areas of application and secure the transfer. In France, maturation agreements are specific to SATT.

b) Service delivery contracts

The service delivery agreement is an agreement between the university and an enterprise for the university to deliver services to the enterprise. There is a performance obligation. The partner financing the service delivery is the unique owner of the results. Normally, there is no inventive activity in service delivery contracts, so there must be no Intellectual Property Rights negotiation. If there is one inventive activity, the stakeholders must negotiate together to define IPR.

4.3.3 Incentives implemented at different levels to support collaborative research between universities and enterprises

a) Systemic incentives

From a systemic perspective, we have previously seen that all national RI strategies include developing, promoting and granting funds for collaborative research between universities and enterprises.

Competitions can also be organised at the national level to foster universities-enterprises collaborations.

b) Enterprise's incentives

From the enterprise's perspective, collaborating with researchers is highly interesting to find the knowledge and expertise needed to unlock technological locks and develop new products: *“we wanted to gain knowledge”*²³³. It allows them to have access to top experts and scientists, and to be pioneers in the market with news and innovative products, at the cutting-edge of the technology: *“the most cutting-edge in our niche market”*; thus, to give advantage on other competitors *“we deciding to create our own asset”, “an exclusive knowledge”, “give us the competitive advantage”*. It speeds up innovation and gives new ideas and applications possibilities. Enterprises staff appreciate working with researchers because *“Academic freedom gives a bit more playground than corporates directions”, “researchers who are passionate by their work are often the bests”*²³⁴.

The research output is also very interesting for enterprises: reports, publications, conferences, which can make their enterprise and products known and recognised with the credibility of scientists. It also allows educating business employees to public research and scientific field. They like to *“explore the scientific background of the technologies [they] use, adopt or considering adopting”*²³⁵.

c) University incentives

Developing, promoting and supporting partnerships between researchers and enterprises is at the heart of the Alliance's strategies as seen in the first section of the report. Universities provide legal and administrative support to researchers through their RSO or contract and valorisation office to accompany them in contracts negotiation. These offices act as an interface between the researchers and the enterprises. Administrative agents from these offices can be proactive and organise meetings with research laboratories to introduce and explain their missions and how they can support researchers in collaborating with enterprises by negotiating good contracts conditions (financial, IP protection ...). Administrative agents have the expertise to negotiate contracts on behalf of university, identify risks and advice the authorized persons on signing of contracts, identify opportunities for creating impact. They are flexible in setting these tasks and take time to understand the needs of both stakeholders to negotiation conditions that satisfy both parties.

d) Individual incentives

Researchers underline several incentives to associate with enterprises and societal stakeholders to conduct collaborative research:

- It is a way to conduct applied science with a pragmatic approach and tangible results, to gain an insight in the economic world and have a societal impact by understanding and taking into account end-users needs. The research carried out can have a concrete application and economic results. It allows finding fields of application for their

²³³ Data collected during enterprises' interviews

²³⁴ Data collected during interviews with enterprises

²³⁵ Data collected during interviews with enterprises

researchers and ideas. It allows them to translate science into products and technology and better understand market needs and business functioning.

- It is a way to have access to financial resources that help maintaining a research group and buy new equipment.
- Collaborative research allows sharing the workload and having access to business and economic skills.
- It is a way to access the network of private companies, a network that can for instance be useful for students to find internships or for their professional insertion, or for researchers to find new partners and to carry out future projects.
- It is a different way to do research that can be exciting and challenging.
- If the research is successful and drives to publications or patents, it can be a booster for researchers' peer recognition and career advancement. In addition, concluding partnerships with big and recognized companies create a sense of pride. This pride can reinforce links between participants and generates long-term partnerships.

4.3.4 Disincentives hampering collaborative research between universities and enterprises detected at different levels

Some administrative or financial rules, an institution's organisation, specific approaches, methodologies, way of working ... can hinder cooperation between universities and enterprises to conduct collaborative researchers, or brake researchers and enterprises to consider partnerships.

a) Systemic disincentives

From a systemic perspective, the sometimes-low salaries and precarious working contracts of the administrative agents may lead to an important turnover. This turnover is disabling for a quality partnerships and projects follow-up. At the end, researchers do not know who their contact person inside the office are as it can quickly change. There is a loss of time and information by re-explaining the project to a new administrative agent.

If the contract is managed by an external associate actor, management costs and stake held, induced by the economic model of this external actor enforced at the national level, can be considered too high by researchers and enterprises. It can be a huge disincentive and a no-go for both parties.

b) Enterprise's disincentives

From the enterprise's perspective, the administrative procedures make the contract negotiation slow, which is not compatible with enterprises' timelines. Indeed, enterprises are subject and sensitive to market tendency and competitiveness. For instance, high-tech enterprises must stay at the forefront of cutting-edge technology and thus be able to negotiate quickly research contracts to

start collaborative research. Most of the time, it takes too much time for enterprises to negotiate, settle and sign a contract. Enterprises underline a lack of flexibility inside the universities administration that hamper collaborative research.

In addition, if the project is strongly linked to a specific person inside the enterprise and this person leave his or her position inside the business; this situation can lead to a lack of continuity in the project. The new person can have less interest in the project that will be slowed down by a lack of investment from the enterprise.

In spite of the pandemia leading to extensive use of online tools in general, some universities have experienced that many entrepreneurs have not shifted to electronic signature causing slight disruption in the process, but the tendency is improving.

Furthermore, the question of funding is an important challenge for enterprises, unless they have a basic research budget. Otherwise, finding sufficient financial resources to fund research is not an easy task. Companies consider that it is not easy to obtain financing for collaborative projects between companies and universities. In some cases, companies do not have the economic capacity to assume the cost of the project on their own. This, together with the long resolution periods, increases the uncertainty associated with the risk of not obtaining funds. In addition, enterprises note that there are often delays in grant payment from funders, which backlog projects.

In addition, financial rules of universities can disable small or medium enterprises. For instance, there might be rules stating that if the length of the contract is inferior or equal to one year, only one bill can be issued. This rule can be problematic for small and new enterprises that do not have necessary funds to pay the whole amount in one time.

Moreover, the lack of risk sharing with the university is seen as a disincentive for enterprises. Thus, when enterprises assume all the risk, they expect exclusivity of the results resulting from the collaboration.

In addition, the formulation of a university-company cooperation agreement may run into obstacles and thus be seriously delayed, especially because of the universities and the companies' contradicting principles on Intellectual Property Rights.

c) University disincentives

From universities' perspective, several disincentives have been detected:

- **Internal organisation and procedures**
 - In some universities of the Alliance, it has been underlined that there is a lack of indicators and follow-up of research contracts that conduct to a lack of efficiency of the management of collaborative research contracts.

- Administrative agents must learn what is the university's policy and global procedures for contracts negotiation. However, the information is not always easily accessible; there is a poor data storage system in some of the Alliance 'universities. In addition, it is sometimes difficult to identify the relevant interlocutors inside the Universities on precise matters.
 - The academic administration lacks efficiency. Administrative bureaucracy, complexity and slowness imply that it takes a lot of time to negotiate, settle and sign a contract.
 - There is a lack of precise and common methodology to all administrative agents for contract negotiation inside RSO and/or contracts and valorisation offices.
 - Financial monitoring of research contracts with enterprises is not always efficient, as tools are not performing enough.
- **Researchers' skills on contract negotiation**
 - It happens that researchers negotiate upstream with the enterprise, without first involving the office dedicated to contract management. However, there is a misknowledge of juridical rules by researchers that may negotiate out-of-the-box conditions. This can lead to difficult and longer negotiations for the jurists and contracts managers that must re-negotiate new conditions with the enterprise.
 - Insisting on certain terms of a contract implies the risk of losing the partnership.
 - The University has not trained researchers enough regarding contract negotiation and communication with businesses. The lack of common ground partly explains poor negotiation skills of researchers.
- **Economic evaluation of an intellectual asset**
 - Some researchers perceive that universities are not able to evaluate properly the value of an asset. This incapacity can have real negative impact on the outcome of the collaborative research in terms of IP and publications.
- **Diverging views and goals from enterprises**
 - Universities have a publication goal, while the enterprises' goal is more about the project goal and generating economic value. As the priorities differs, common goal needs to be found.
- **Training**
 - Some universities can note a low participation rate to training sessions that conflict with researchers' demand. If there are not enough participants, these sessions may not be maintained in the long-term.

d) Individual disincentives

As mentioned above on the calls for projects section, some researchers are reluctant to work with private partners as they have an ideal of the public research that must remain disinterested from generating economic value.

For researchers willing to associate with enterprises to lead collaborative research, they perceive a lack of understanding from enterprises of the research's temporality and procedures. It is a challenge for them to better understand business language and make their language understood.

Furthermore, negotiation of Intellectual Property (IP) Rights can be a sensitive point for researchers. If the share of the IP is not equitable, it can be a huge disincentive and a no-go for researchers.

4.3.5 Best practices on collaborative research support detected inside the universities

Administrative agents of RSO, researchers and enterprises taking part to collaborative research have detected some best practices from the universities on managing and supporting collaborative research between universities and enterprises:

- Continuity of the activity
 - For researchers and enterprises, it is essential to have a support office that is independent and has a continuous activity regardless of the fluctuations of the university (political, economic or social fluctuations). The Foundation Bosch i Gimpera is a model of independent office with a continuous activity.
- Administrative offices' good practices
 - In the five universities, there is a high expertise and dedication of administrative agents to support collaborative research. The communication is transparent and administrative agents put many efforts in the understanding of the research's project to negotiate the best conditions for the scientific project with the enterprises.
 - The universities work with contract models that make the negotiation simpler for administrative agents: they know which terms are sensitive and must be negotiated and have a roadmap to follow. Model contracts allow accelerating the transaction process. Nevertheless, change to achieve swift and easy contracting cannot be at the expense of contractual clarity.
 - Administrative agents communicate a lot and share experience, difficulties and successes to improve their practices.
 - Each university tries to ensure good and long-term relations with enterprises to provide researchers with more collaborative research possibilities. Universities build up close relationships with private partners.

- A good practice unfolded by universities is the sharing of good practices, of models' contracts, of invention disclosure forms and other item with public partners for mutual experience capitalisation and improvement of procedures.
- Electronic signature
 - The implementation of the electronic signature, speed-up by the Covid-19 pandemic and working from home, has allowed to considerably speed-up the contract signature process and thus to gain valuable time. For instance, the University of Montpellier is using the platform "Yosign". This tool is one answer to the disincentive above-mentioned of administrative slowness.
- Intellectual Property Policy
 - The Alliance' universities have developed an "Intellectual Property Policy" to make sure that research staff's work, intellectual and scientific contribution is recognized. Principles unsure that there is a fair return and benefits for the universities, in recognition for state-funded research. The IP Policy can regulate ownership, protection and management of IP-related matters and provides specific direction to staff, students and partners, publication, commercialisation of Intellectual Property, conflicts of interest, Data Protection, dispute resolution. At the UM the general principle for the share of intellectual property is that the share must be up to each stakeholder's inputs in the project.
- Single representative
 - In France, some research units are "Joint Research Units" (Unités Mixtes de Recherche – UMR). Joint Research Units have several supervisors/tutors, among whom the University of Montpellier. Other supervisors can for instance be Research Centres, such at the National Centre for Scientific Research. Those supervisors must be engaged in the contracts. This could constitute an obstacle if all the public establishments that are supervisors of a research unit negotiate with an enterprise to conclude a contract. Thus, framework agreements are negotiated between public partners that are supervisors of research units, for an entity to receive a mandate in the framework of a well-defined negotiation perimeter. The representative entity thus negotiates in the name of and on behalf of all the joint research unit's supervisors. Thus, the enterprise as only one single representative with whom to negotiate, which make negotiation simpler and easier.
- Informative and training sessions for researchers
 - Informative and training sessions on the support available inside the universities and on the basic rules of contracts' negotiation with enterprises are available for researchers in all Universities.
- Matchmaking events

- Events gathering researchers, administrative agents and businesses are very useful to meet new partners and engage in first discussions, for instance the “Science and Partners” event in Spain.

4.3.6 Joint laboratories: one of the best ways to do collaborative research identified by researchers and enterprises

A joint laboratory is a partnership between a research laboratory and an enterprise or another stakeholder to create together a research laboratory where staff from each stakeholder can be hosted and work on a common scientific and technical project. A joint laboratory is formalized by a contract and defined in time. The contract can define a common governance (co-direction) between an academic and a private director, a research and innovation roadmap, common work means and a strategy for the enterprise to valorise research results. Joint laboratories allow financing both fundamental and applied research and direct knowledge and technology transfer to the enterprise. The partnership is inscribed in a longer temporality than usual research contracts. For instance, at the University of Montpellier, the joint laboratory (“LabCom”) “InToSea”²³⁶ (“INnovative TOols under the SEA”) is a project financed by the National Research Agency Labcom Program 2. This LabCom is a cooperation between the enterprise Andromède Océanologie²³⁷ and the research lab MARBEC²³⁸. The aim of this collaborative project is to develop innovative tools that can help in decision-making by improving the monitoring and *in situ* diagnosis of the coastal seabed, in a context of changing national and European regulations.

Another type of cooperation can be found at ELTE with for instance the Biotechnology Higher Education and Industrial Cooperation Centre (*FIEK*)²³⁹. This is a science research centre in which the staff of ELTE and the Hungarian Academy of Sciences work together to contribute to the support of private academy research. The goal of the FIEK is to utilize effectively and successfully the high-standard intellectual potential and instrument suite, offered by the research teams of the Faculty of Science of ELTE and the Research Centre for Natural Sciences of the Hungarian Academy of Sciences (RCNS HAS), in line with the needs of the biotechnology and pharmaceutical biotechnology sectors and the national healthcare system.

According to researchers that have been interviewed, the creation of a common laboratory is “*One of the most exciting way to conduct research*” and that “*Everybody involved in the project benefit from this experience*”. The lab setup is considered being “*great*” by enterprises because it is a long terms relationship that provide stability. It allows researchers to see the finality and usefulness of their research and to develop their capacity to project their scientific and technological ideas to a

²³⁶ University of Montpellier, *In To Sea*, <<https://labcomintosea.edu.umontpellier.fr/>> [Accessed 26 Nov 2021]

²³⁷ Andromède Océanologie, <<https://www.andromede-ocean.com/>> [Accessed 26 Nov 2021]

²³⁸ MARBEC, <<https://umr-marbec.fr/>> [Accessed 26 Nov 2021]

²³⁹ ELTE, *Biotechnology Higher Education and Industrial Cooperation Center*, <<https://fiek.elte.hu/en/content/the-mission-of-elte-biotechnology-fiek.t.3699?m=17497>> [Accessed 26 Nov 2021]

product that can be commercialized. Both the enterprise and researchers can imagine technologies for the future and are enriched by their mutual presence and talks.

At the national level, research institutions support the creation of joint laboratories by providing funding. For instance, in France, the National Research Agency has launched the calls for projects “LabCom”²⁴⁰ as introduced in the first section of this report. In addition, Hungary has launched recently the National Laboratories Programme²⁴¹. Funded by the National RDI Office, the establishment of seventeen laboratories in the R&D focus areas began in 2020. The national laboratories are thematic knowledge centres created together by higher education institutions, research institutes and non-academic organisations, and can become scientific hubs in areas with high potential for the national economy, capable of acting internationally, as well. The year 2020 marked the beginning of the establishment of seventeen laboratories in the R&D focus areas “Industry and Digitalization”, “Culture and Family”, “Health” and “Secure Society and Environment”.

4.3.7 Recommendations to improve universities strategies and practices to better support partnerships with enterprises for collaborative research

From the interviews lead with administrative agents of RSO, researchers and enterprises taking part to collaborative research emerge some recommendations for the universities to better support partnerships with enterprises to conduct research:

a) Recommendations from administrative agents

Administrative agents from RSO have made suggestions on several matters:

- Human resources
 - Universities must try to prevent staff turnover by making the position more attractive by negotiating better salaries and working contracts.
 - Administrative agents underline the need to promote administrative assistance for research teams. It is essential to reduce the administrative complexity for researchers so that they can focus on the development of their core activities.
- Procedures to negotiate and sign a contract

RSO’s advice universities to simplify the procedures to negotiate and sign a contract. They wish that more models contracts and general guidelines on negotiation would be implemented for a quicker negotiation. All administrative agents must negotiate terms and conditions based on the same

²⁴⁰ Agence Nationale de la Recherche, *Laboratoires Communs*, <https://anr.fr/fr/detail/call/laboratoires-communs-organismes-de-recherche-publics-tpepme-eti-labcom-appel-a-propositions-ed/> [Accessed 26 Nov 2021]

²⁴¹ National Laboratories Programme, *National Research, Development and Innovation Office, Hungary* <https://nkfi.gov.hu/for-the-applicants/innovation-ecosystem/national-laboratories-programme/nlp> [Accessed 26 Nov 2021]

universities policies and rules. Universities' policies on IP, contract negotiation information and key contact persons must be easily accessible to administrative agents for more efficiency. They also advice to generalize the use of the electronic signature to faster the signature process.

- Working tools

An efficient storage system must be implemented to properly monitor collaborative research contracts.

- Universities' reputation

Administrative agents' advice universities to better manage their image and reputation of towards business partners, notably on the flexibility of the administration.

b) Recommendations from researchers

Researchers have made suggestions on several matters:

- Human resources and workload

Researchers' advice universities to hire skilled people on the legal side, but also on the business side for a better understanding of the business culture and better communication and negotiation with enterprises. Another solution would be to ensure business practice for administrative agents. Researchers also ask not to overtask administrative agents for the negotiations carried on being qualitative and faster.

- Procedures to negotiate and sign a contract

Researchers' advice universities to simplify the procedures to negotiate, settle and sign a contract and to have less bureaucracy. They would also appreciate to have a "how-to" guide implemented for them to better understand and learn how to interact with industrial partners and how to initiate first approach and talk with an enterprise. On the Intellectual Property side, researchers' advice universities to develop an "auto-evaluation guide" that could use researchers and administrative agents to properly evaluate the value of an intellectual asset.

- Training

Researchers do believe that learning to collaborate and negotiate with enterprises must be integrated in university education. Business and entrepreneurial trainings must be unsure for students, for them to acquire an understanding of business' language, timeline, practices, objectives and challenges and have an overall vision of the economic world and business sector. This could allow young researchers to better consider and negotiate collaborations with enterprises to create greater value with high economic and societal impact and prevent potential bottleneck in negotiating and implemented those partnerships. Furthermore, research trainings and education

must be done in English as collaborative research can quickly take an international twist with foreign partners.

- Form of collaborative research

Researchers that have created joint laboratories advice universities to support and develop these initiatives as joint laboratories are one of the best ways to carry collaborative research between universities and enterprises.

In addition, it is agreed that the introduction of co-creation spaces in university campuses appears as a useful element to bring together students, scientists, entrepreneurs, and other industry partners that inspire each other with different perspectives on the same subject (Huhtelin & Nenonen, 2015)²⁴². These supportive spaces with relevant services are needed to support open innovation with other stakeholders²⁴³. This is integrated in the context of development of university-driven open innovation ecosystems, the approach in which university; industry, public administration, and user community collaborate in a shared (virtual or physical) space to addressing common interests.

c) Recommendations by enterprises

Enterprises have also made recommendations on several matters:

- Procedures

Enterprise's advice universities to make the contract negotiation and signature less complex and faster to align with enterprises and market timeline.

- Negotiation and IP

Enterprise's advice universities to make the interaction with enterprise an actual priority. They wish the IP and publication strategies were discussed sooner. They also advice universities to focus less on wanting to own all, or an important part, of the IP.

²⁴² M. Huhtelin, and S. Nenonen (2015). A Co-Creation Centre for University–Industry Collaboration – A Framework for Concept Development. *Procedia Economics and Finance*, 21: 137–145., [http://dx.doi.org/10.1016/S2212-5671\(15\)00160-4](http://dx.doi.org/10.1016/S2212-5671(15)00160-4) [Accessed 26 Nov 2021]

²⁴³ Technology Innovation Management Review, Q&A, *How Can a University Drive an Open Innovation Ecosystem ?*, Gonzalo León, Roberto Martínez (July 2016), <<https://timreview.ca/article/1004>>

4.4 Valorising public research result through Knowledge and Technology Transfer to enterprises

4.4.1 Presentation of public research's economic' valorisation through Knowledge and Technology Transfer to enterprises

In public research, economic valorisation can be operationalized through the transfer to the economic world of research results, products or technologies developed by researchers, mainly to enterprises that have the potential to commercialize these assets. Technology Transfer includes a wide range of activities that are strongly linked with Intellectual Property and is one of the official missions of the universities. These activities aim at promoting innovation and the dissemination of technology through different forms. Researchers must declare their inventions and take contact with their universities' Technology Transfer Offices to see which kind of valorisation of their work can be done and how IP can be protected. IP protection can take several forms: Copyrights, Patents, Trademarks and Trade Secrets. Once protected, IP can be transferred under several conditions to enterprises. Knowledge Transfer can be translated into scientific consultancy, Technology Transfer can be translated into material transfer or disposal, licensing, co-ownership, deed of assignment etc. Also, some enterprises can be interested by a technology that is not yet fully developed because more research needs to be carried on. TTO can detect the potential of this technology being developed. In this case, researchers can benefit from pre-maturation and maturation funding, from TTO, enterprises, investors, to increase the TRL²⁴⁴ of their technology.

Valorising public research's results and technologies is beneficial for all stakeholders:

- For researchers, valorising allows them to see the outcome of their research, to have a real and concrete impact on society. Valorisation proves the usefulness of excellent scientific research when applied to economical and societal needs. It also drives peer and external recognition and researchers' career development. Valorisation can also lead to financial retributions for the research laboratories and researchers.
- For universities, their reputation and scientific excellence's recognition is being reinforced. Indeed, research valorisation's capacity of a university is paramount for future negotiations with enterprises, research organisms, other research laboratories and to receive funding for the research units.
- For enterprises, it allows them to commercialize new innovative products, to be leader on the market, remain competitive and at the cutting edge of technology. It also allows them to lift scientific and technical locks.
- For the public scientific research field, an innovation leads to another innovation; the field of scientific knowledge is reinforced and broadening.

²⁴⁴ Technology Readiness Level

- Thanks to technology transfer, users and the civil society in general can have access to innovative products or technologies responding to their needs and expectations.

Each university of the CHARM' Alliance has developed a Knowledge and Technology Transfer strategy and has an internal or external TTO to support these matters.

TTOs' missions are to protect Intellectual Property assets, support pre-maturation and maturation, support industry partnerships to transfer the technology and give advice for spin-off creation. Research's valorisation and technology transfer officers keep a watch on the IP portfolio of their universities (for instance to know which patents have been accepted and published), valorise IP through contracts with enterprises, support researchers in building a case if they want to provide scientific consultancy to enterprises, watch for every stakeholder to receive their royalties (for instance profit-sharing, patent bonus), initiate the signature process etc.

Access to research valorisation via technology transfer can emerge from both economic and academic sectors:

- Companies can look for technological solutions coming from research laboratories. Therefore, each TTO have a list of available technologies for licensing accessible to enterprises.
- Researchers can look for companies that have the capacity and market access to commercialize their technologies. Indeed, researchers have a good knowledge of their thematic environment and competitiveness. Researchers promote their works through publications, scientific colloquies for instance.

4.4.2 Knowledge and Technology Transfer as legal relationships between universities and enterprises, framed by a contract

Just as collaborative research between a researcher and an enterprise, KT and TT is considered as a legal relationship framed by a contract, the juridical tool used to formalize the partnerships.

Universities determine the means and instruments to transfer their technology from research laboratories to enterprises. Different types of agreements exist to formalize and frame Technology Transfer from universities to enterprises, mainly the following ones:

- A material Transfer Agreement is a contract that frames the transfer of materials for use in research between universities and enterprises. This agreement addresses issues such as ownership of the transferred material, limitation of the use and of further dissemination of the material. As all contract, it also mentions publication rights, confidentiality and rights to invention and research results.
- A licensing agreement is a partnership between an IPR owner (licensor) and another who is authorized to use such rights (licensee) in exchange for an agreed payment (fee or royalty) for a limited period.

- A disposal agreement is a contract framing the disposal of universities equipment to enterprises, for the assignment or outright sale or disposition of IP rights, in whole or part.
- A co-ownership agreement set the rights of each owner of the IP (universities and enterprises), and addresses matters such as dealing with the patent protecting the IP, licensing, right to commercialize and more.
- Scientific consultancy agreement/convention is a relationship between the university, the researcher and the enterprise for the researcher to be able to spend a certain % of his or her working time to provide scientific consultancy for an enterprise.
- A deed of assignment is transferring the IP from universities to enterprises.

4.4.3 Incentives implemented at different levels to support Knowledge and Technology Transfer from universities to enterprises

a) Systemic incentives

The European Commission has encouraged the creation of TTOs in countries members of the EU since the early 2000's. Technology Transfer is supported as a mean to facilitate the transfer of knowledge to enhance innovation and the competitiveness of the EU economy. This support has taken several forms. Firstly, the European Commission has convened several groups of experts and issued several policy statements drawing attention to the importance of improving linkages between public researchers and industry and regulations and guidelines facilitating knowledge and technology transfer. Secondly, the Commission has funded several projects to improve the capacity of public research organisations and higher education institutes performing research to engage in more Technology Transfer. Finally, the Commission has, through its funding programme Horizon 2020 and its rules for participation, created instruments to fund and finance technology transfer and facilitated the claiming of patent costs as eligible costs in its framework research programmes²⁴⁵. The European Commission adopted on the 21st of March 2014 new competition rules for the assessment of Technology Transfer agreements (TTBER and Guidelines)²⁴⁶, through which a licensor permits a licensee to exploit patents, know-how or software to produce goods and services.

In France, the French government has created the SATT, Society for Technology Transfer Acceleration to better support TT. SATT have developed high expertise in Technology Transfer and work in close collaboration with universities' TTOs, as presented in the first section of this report.

²⁴⁵ P. McCutcheon (2018), *Capacity Building in Technology Transfer, The European Experience, Chapter "European Commission Initiatives Supporting Technology Transfer"*. pp.9-28

²⁴⁶ European Commission, *Licensing agreements for the transfer of technology*, <<https://ec.europa.eu/competition/antitrust/legislation/transfer.html>> [Accessed 26 Nov 2021]

In addition, in France, profit-sharing bonus and patent bonus constitute financial incentives for technology valorisation. The bonuses have been implemented in 2005 by decree²⁴⁷. The amount of the patent bonus has been set to 3,000 euros.

b) Enterprises' incentives

For enterprises, collaborating with universities to have access to scientific knowledge and technology through IP transfer is an opportunity for them to have legally access to cutting-edge technology. Concluding a KT or TT contract with universities is a way for enterprises to prevent the risk of being sued for the use of IP or patent.

c) University incentives

The universities tend to develop and encourage KT and TT. This desire is reflected in the CHARM 'Alliance's universities strategies as TT is more and more integrated to their agenda. Each of them has a TTO dedicated to support TT from researchers to enterprises on the administrative and legal side. They try to provide new and better tools to monitor contracts and to facilitate invention and software declaration for researchers. For instance, the University of Montpellier is currently working on an online platform, PLUM, to facilitate software declarations and knowledge of the university of its research units' resources in terms of software.

Universities can also propose training sessions to their researchers to teach them how to negotiate, present and pitch their project to enterprises to better sell their technologies.

For universities, KT and TT is a way to make their researchers' scientific knowledge and technology known and recognized, thus, to gain recognition and credit. It is also a way to obtain financial retributions.

d) Individual incentives

For researchers, KT and TT is a way to see the concrete application of their research and to help enterprises develop and improve their products and technologies. It is also an opportunity to obtain financial retribution for their work.

²⁴⁷ Décret n°2005-1217 du 26 septembre 2005 relatif à la prime d'intéressement et à la prime au brevet d'invention attribuées à certains fonctionnaires et agents de l'Etat et des établissements publics auteurs d'une invention et modifiant le code de la propriété intellectuelle, <https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000263489/> [Accessed 26 Nov 2021]

4.4.4 Disincentives hampering Knowledge and Technology Transfer from universities to enterprises detected at different levels

a) Systemic disincentives

Applying for IP protection through patents involves high costs in time and money. In Hungary, patent application can cost between 2 200 to 3 000 euros depending on whether it is a domestic or a European patent application²⁴⁸. In Ireland, cost for initial application is about 5 000 euros²⁴⁹. In Spain, it is more affordable: about 100 euros²⁵⁰. In France, patent application costs between 3000 to 5000 euros for French or European patent application²⁵¹. In the Netherlands, a first patent application is about 8 000 to 10 000 euros to which must be added accumulated cost until entry to national/regional phase of about 20 000 to 25 000 euros²⁵².

Moreover, during their studies and career, researchers learn that publication is very important for peer recognition and for promoting their work and is a main criteria in research assessment. However, to apply for a patent, no publication must have been done before and must not be done for several months after the patent application. These rules are not intuitive for researchers, for whom publication is a faster way to have their research known and recognized among the scientific community.

The economic model of external technology transfer partners may imply that they take a high percentage on the benefits generated by Technology Transfer. This is a disincentive for researchers and companies to use external technology transfer partners as intermediaries. When they can, they would rather avoid going through such external partners to transfer their technology and valorise their research²⁵³.

b) Enterprise's disincentives

From enterprises' perspective, Technology Transfer (TT) agreements take too much time to negotiate, there are often numerous discussions and back and forth to adapt the contract. However, enterprises need to have an easy and quick access to the technology as they are subject and sensitive to market tendency. A technology can quickly become outdated, as there is a lot of competitiveness.

c) University disincentives

From the universities perspective, software declarations systems are not efficient enough. Researchers develop many software, but most of them are not declared because researchers do not

²⁴⁸ Figures from the survey filled by ELTE

²⁴⁹ Figures from the survey filled by TCD

²⁵⁰ Ministerio de Industria, Comercio y Turismo, *Patentes y modelos de utilidad*.

²⁵¹ Ministère de l'économie, des finances et de la reliaance, *Déposer un brevet: mode d'emploi*.

²⁵² Figures from the survey filled by Utrecht University

²⁵³ From interviews of researchers

think about declaring them. Therefore, the software remains in research units and there is a loss of opportunities for Technology Transfer.

In addition, if TT contracts take a long time to negotiate, there is a risk of losing the contract with the enterprise.

Moreover, some universities can note a low participation rate to trainings sessions for negotiating KT and TT that conflict with researchers' demand. If there are not enough participants, these sessions may not be maintained in the long-term.

Regarding Knowledge Transfer, a point of intent should be made for Human and Social Sciences. Human and Social Sciences' results are tangible and are usually immaterial knowledge. Therefore, it has been noted that the complex contractualisation methods are unsuitable to collaborative Human and Social Science researches. For researchers, it can be difficult to find concrete applications and to promote their research's results. On the enterprises' perspective, they know too little about Human and Social Sciences Research. The evaluation of potential inputs of Human and Social Sciences is complex from both side (academic and business sides). In addition, there is a partitioning of knowledge in the field of Human and Social sciences and when research's results are valorised, a lack of exchanges slows down the sharing of good practices. Finally, the lack of engaging relationships between enterprises and researchers in the field of Human and Social Sciences can partly be explained by a lack of understanding of expectations from both sides in the formulation of the collaboration.

d) Individual disincentives

For researchers, TT takes much more time and energy than publication. If they make the mistake to disseminate their innovation (even by even talking about it), they cannot apply for a patent anymore to valorise their work or can be lined by competitors.

When valorisation is feasible, researchers may lack competencies in evaluating the value of their technology and in negotiating with enterprises during first approach and talk.

4.4.5 Best practices on Knowledge and Technology Transfer to enterprises detected inside the universities

Each university from the Alliance has implemented an internal or independent TTO to manage Knowledge and Technology Transfer's activities, support researchers into valorising their technologies and make the link with the economic world.

Close monitoring of partnerships with enterprises and recontacting former partners is a good practice to build long-lasting relationship with businesses. In addition, mapping the resources available in each laboratory and having a catalogue of technologies available inside the university to inform the enterprises allows boosting technology transfer, reinforcing trust of enterprises and giving a good image of universities' efficiency.

According to administrative agents from the Alliance' universities who have been interviewed, one best practice is to take up the level of TT to promotion, negotiation and management, hence be proactive in these activities.

4.4.6 Recommendations to improve universities strategies and practices on Knowledge and Technology Transfer to enterprises

TTOs administrative agents, researchers and enterprises have formulated recommendations for universities to better support KT and TT to enterprises:

For researchers and administrative agents, it is important to have less formalism and more agility in the relation with enterprises. It is essential to update the procedures and to raise awareness among researchers on the challenges of a valorisation procedure.

For enterprises, universities must speed up their negotiation and signature process for them to have more rapidly access to a technology.

Regarding the valorisation of the research's results in Human and Social Sciences, an adjustment and simplification of models of contracts must be implemented, especially on contract's finalisation and future exploitation of the research's results. Collaborative research in Human and Social Sciences should be encouraged and supported as it creates a double-value: social and economic. A real integration of Human and Social Science's skills must be done in enterprises, as access to this knowledge and skills are acclaimed.

4.5 Creating business developer's positions to develop partnerships between universities and enterprises

4.5.1 Presentation of business development in TCD, UB, UM and UU

Universities need the support of business development professionals to identify opportunities of research collaboration or Knowledge and Technology Transfer. Bringing in commercial agents able to connect universities and businesses allows researchers to be given more time to conduct scientific research without spending too much of their working time on seeking industrial partners. Some universities (TCD, UB, UM, UU) have recently opened business development's positions to facilitate and increase the development of partnerships between universities and enterprises. These positions are not standard yet, there are still under implementation.

- At Trinity College of Dublin, Business Development activities are managed internally in Trinity in conjunction with SFI Research Centre Business Development Teams. The Business Development Teams consists of four full time professional staff within the Office of Corporate Partnership and Knowledge Exchange. While attending International Conferences and Trade Events, the business development team will put researchers at the centre of the value proposition. As part of the KTI function, the business development team matches core competencies and expertise with industry needs. The team also work

in conjunction with National Science Research Centres such as SFI Research Centres such as AMBER, ADAPT and CONNECT, presented in the first section of this report.

- At the University of Barcelona, the Foundation Bosch i Gimpera departments involved in KT and TT operates coordinated to perform similar task of business developers' roles. Furthermore, StartUB! is implementing the official position to strengthening relations with the entrepreneurial ecosystem and managing fund raising.
- At the University of Montpellier, Occitanie Region funding has allowed to open business developers' position inside MUSE (Montpellier University of Excellence) in 2018. There is one full-time business developer and one part-time business developer integrated to the Contract and Valorisation Office of the Partnerships and Innovation Department. Other business developers' positions are integrated to different MUSE partners (CNRS, INRAE, CARNOT CHIMIE BALARD). All business developers are attached at operational level to MUSE. Each business developer is responsible for a thematic (for instance environment, mathematics, chemistry). Some of them can have a part-time position that is completed by a mission of contract management. For instance, one employee can be 50% business developers and 50% contracts manager, managing research laboratories' contracts of the agent' employers (for instance, the University of Montpellier).
- At Utrecht University, there are official business developers' positions but also other administrative agents that do not have the title "Business Developers" but perform similar tasks. At Utrecht, research is divided in four strategic themes and each theme has business developer(s) to broker partnerships. Furthermore, some business developers are attached to faculties or departments, to Utrecht Holdings or to the Foundation Utrecht Science Park. Business Developers can also be integrated in RSO.

Business developers work in collaboration with all actors involved into the national and local ecosystem of innovation: public authorities, institutions, agencies, public funding bodies ...

In all four universities, business developers pursue the following common objectives and missions:

- Establishing and maintaining relationships with external parties involved in the local and national ecosystems of innovation, such as public authorities, institutions, agencies, public funding bodies ...
- Mapping the research laboratories resources that could be exploited by enterprises.
- Raising awareness among researchers about the potential and the possibilities of collaborating with enterprises to conduct research or valorise their knowledge and technologies.
- Scouting and screening for new opportunities: Business Developers meet enterprises to discuss about collaborations' possibilities with the universities. They attend events to seek

for new partners. Business developers do a lot of networking and must maintain constant and good relations with enterprises. They act as an intermediary, facilitator and translator between public researchers and enterprises.

- Helping researchers to make use of the new partners found.
- Matching enterprises with research projects.

Business developers' practices are not standard practices yet, there are being constructed step by step and still under implementation, monitoring and adjustments. Building partnerships take time and need facilitation/effort/expertise to set up. A fruitful collaboration between university and private sector is in constant need of (re-)evaluation and requires a permanent effort to align the objectives of the partners involved²⁵⁴.

At Utrecht University, business developers can also be entitled with other missions, for instance acquiring funding through consultancy, licensing agreements or Education for Professionals, supporting the impact/business-oriented elements in grant proposals, development of postgraduate education programmes.

Through data collection, we can notice that business developers must not follow specific working methodology. The position is more about human relationships, networking and negotiation. Each business developers are building their own methodology. Here is an example of a guideline set up by one interviewed business developer: identify market/medical need > identify core competencies/technologies that can address need > building value chains > perform gap analysis > develop or collaborate for completeness > develop proposal to fulfil need > identify strategic partners/clients > build alliance team > attract funding & identify matching > build execution plan > execute & monitor progress.

Some of them also claim that there is no working methodology but more of a "working ideology" as each project and contact require a tailored approach²⁵⁵.

Business developers are also developing some mapping and monitoring tools to manage their activity.

Business developers must acquire some skills and qualities. They must be open to new ideas, curious, outgoing, talkative and convincing, share a positive and dynamic energy to interact with research units, enterprises and meet new partners. In addition, business developers must be very flexible and multi-skilled as their activities are very diverse and require expertise, knowledge and more practical skills such as invoicing.

²⁵⁴ From the interviews of business developers

²⁵⁵ From the interviews of business developers

4.5.2 Incentives implemented at different levels to support business development positions inside universities

Business developers' positions inside universities are more and more being supported at all levels through various incentives.

a) Systemic incentives

At the national or local levels, initiatives can be implemented to support the development of business development positions inside universities or another research organism. For instance, in France, Regions can distribute subventions to fund business developers' positions.

b) Enterprises' incentives

From enterprises' perspective, business developers can be an entrance door to have a better knowledge of the research and technology resources of the universities. Business developers can act as efficient intermediaries and facilitators as they understand both the academic and business cultures. They are flexible, adapt to enterprises' needs and are familiar with business' language and timeline.

c) University incentives

Universities develop and invest in these new positions that still need to be acknowledged and accepted inside the research laboratories. They organise workshops and seminars/meetings for researchers and external stakeholders (including the private sector) to better apprehend public-private collaborations.

d) Individual incentives

Business developers are very proactive. It is challenging and stimulating for them to connect the languages of research and non-university practice and create matchings. Succeeding in involving a new partner and establishing a new partnership is rewarding. The job position and missions are enriching and variate.

4.5.3 Disincentives hampering business developers positions inside the universities detected at different levels

Nevertheless, some disincentives and challenges are still existing at all levels regarding the implementation of business developers inside universities. Those challenges would need to be overcome.

a) Systemic disincentives

Not all national or local instructions from the CHARM 'Alliance countries have implemented strategies or mechanisms to support business development positions inside universities.

b) Enterprise's disincentives

For now, enterprises are not really aware of business development positions inside universities. They do not think directly of contacting business developers when they think about collaborating with researchers. They still need to better know and apprehend the role of business developers inside universities.

c) University disincentives

Not enough working tools and trainings have been implemented for business developers at the university level. A better integration and acknowledgment of these new positions inside universities must be considered.

d) Individual disincentives

Positions and missions of business developers are sometimes unclear; they must build their own working methodology and tools from the beginning, as there are new positions. In addition, research laboratories can be reluctant to work with business developers and do not understand why these positions have been implemented in universities. There is a need to build a trustful relation between research units and business developers.

4.5.4 Best practices detected inside the universities to support business development positions

Business developers have underlined those best practices concerning their everyday missions, organization and tools. As enterprises and researchers are not yet aware of these positions or have not work with a business developer to find a partner, we could not collect any best practices from their perspective.

- Organization of regular meetings between business developers to share experiences allow to be inspired by peers' practices, to exchange ideas and efficient working tools to improve business developers' daily work.
- Creation of a "Business Development impact network" in which news and developments can be shared.
- Working in close relations with other departments and offices of the university, notably controllers and financial administration, research support offices, Technology Transfer Office to coordinate actions.
- Mapping the research laboratories resources to get a general overview of the type of expertise universities have to offer and the current projects that are ongoing. For instance,

Utrecht Science Park has created a booklet, *“Accelerating innovation in Life, Science & Health. Research Facilities and Services”*²⁵⁶ that introduces the hubs present at the USP.

- Some universities have implemented a Customer Relationship Management, an efficient tool to follow up on universities private partners.
- Matchmaking events such as the Innovation Days at the University of Barcelona are good practices to achieve fluidity with the companies.
- Monitoring contracts with companies and recontacting enterprises whose contracts are ending to discuss what is next.

4.5.5 Recommendations to improve universities strategies and practices to better support business development positions

According to business developers, improvement should start within the universities²⁵⁷:

- **Human resources**
 - Universities must employ specialists in the field of impact/business development.
- **Tools**
 - Implement an efficient Customer Relationship Management.
 - Invest in setting up a user-friendly system in which university employees find an overview of existing partners, database listing available knowledge and technology and add records of their own experiences.
 - Invest in internal knowledge transfer and in the development of stakeholders' engagement strategies, thereby further equipping the business developers (and Research Support Offices) with tools to support this process. This could possibly include offering training modules tailored to business development for both support staff and researchers. For the latter group, these modules could serve to further stress the significance and promise of including business development in the everyday research practice.
 - Map national, regional and local actors involved in the development of universities-enterprises partnerships.

²⁵⁶ Utrecht Science Park, *Accelerating innovations in life science and health. Research facilities and services*, <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewjyZq2-vHyAhVOSEEAHtIBBg4QFnoECAMQAQ&url=https%3A%2F%2Fwww.utrechtsciencepark.nl%2Fuploads%2Fmedia%2F5f9829eec5fd6%2Fusp-boosterboek-2020-vdef-web.pdf&usg=AOvVaw1x4BEYhyFCQbS3_5Cjml_V> [Accessed 26 Nov 2021]

²⁵⁷ From interviews of business developers

- Good positioning of the different initiatives through an innovative officer.
- **Internal communication**
 - Create an internal atmosphere at universities where collaboration with external partners is encouraged and recognised.
 - Organize more interactions between management layers, scientific officers and business development department.
 - Implement an efficient and formal communication and coordination with contracts management officers.
 - Researchers must be more involved in business development matters for better success. Indeed, we cannot do collaboration without them. Universities must not disengage research and business development too much. The needs of researchers for collaboration must be defined (benefit, proposition), and they must be aware of and understand the benefits of creating more partnerships with enterprises.
- **External communication**
 - Universities should organize more frequent interactions with the private sector and enable the exchange of views, of ideas and information.
 - Universities should develop a better business intelligence.
 - Universities should invest in facilitating initial contacts, generating leads, and in maintaining existing contacts with enterprises.
 - Strengthen relationships with the ecosystem through events that bring enterprises closer to the university.
- **Trainings**
 - Trainings to acquire certain commercial acquisition competences should be organized for young scientists.
- **Housing**
 - It could be a booster to have a common place for scientists, companies and business developers to connect on a regular base, for instance a co-working/learning space where researchers, students, professionals can work together on new applications.
 - Universities should invite enterprises to be present permanently on the campus.
- **Interdisciplinary research**

- Focusing on an interdisciplinary/multidisciplinary research approach can be very useful: the private sector can often benefit from the knowledge in interwoven disciplines.

4.6 Facilitating researchers' mobility to foster universities-enterprises collaboration

Another way to reinforce collaboration between universities and enterprises is to develop and support mobility of public researchers to enterprises.

4.6.1 Why reinforcing researchers' mobility towards enterprises?

Reinforcing the possibilities of intersectoral mobility to enterprises for researchers is an efficient strategy to facilitate universities-enterprises collaboration as it creates a stable opportunity for researchers to expand and connect with enterprises. It supports universities in advancing practical contribution to knowledge, and to apply academic and scientific expertise in society. Intersectoral mobility provides researchers with the opportunity to gain experiences in a commercial research environment while also providing industry with access to highly specialised trained researchers from the academic institutions.

Intersectoral mobility can take several forms, for instance scientific consultancy for external bodies such as enterprises (which is the most known and used activity by researchers), taking part of the executive bodies of an enterprise, taking shares in enterprises, or creating a spin-off. Developing consultancy by academic staff is one of the simplest ways for academia to interact with industry and exchange research expertise.

The strategies to develop intersectoral mobility for researchers are also diverse, for instance via staff exchanges, part time positions, sabbaticals, honorary positions, or multiple jobholding. Universities can also provide financial or statutory incentives for both early stages and established researchers to encourage them into pursuing these activities. For instance, in France three statutory positions²⁵⁸ with several advantages are available for researchers to support their mobility to enterprises.

4.6.2 Incentives implemented at different levels to support researchers' intersectoral mobility to enterprises

At all levels, incentives are implemented to develop and support the mobility of public researchers to enterprises.

a) Systemic incentives

For systemic incentives, we can refer to national regulations on public researchers' mobility introduced in the first section of this report. National regulations tend to soften the conditions of researchers' mobility to encourage these practices.

²⁵⁸ These positions have been introduced in the first section of this report

b) Enterprise's incentives

Researchers' mobility towards enterprises is very beneficial for enterprises as it allows them to have access to high scientific skills and advice on the long term. Researchers can also be a support to create a new company.

c) Universities incentives

Intersectoral mobility is being encouraged by universities with legal and administrative support to help researchers build their case to obtain authorization to conduct external activities for enterprises and to relieve administrative burden associated with consultancy project. Support to academics can also include assistance with costing and pricing guidance, negotiation of terms and conditions, arrangement for licencing universities' IP, invoices and payment collection for instance.

Universities can implement Researchers' mobility Policy and policies on more precise matters such as the "Scientific Consultancy"²⁵⁹ developed by CONSULT Trinity²⁶⁰ to have a general guideline for researchers willing to conduct activities for enterprises and secures their activities.

Consultancies activities allow financial returns to universities. Also, it is an incentive to attract and retain talented people.

d) Individual incentives

For researchers, being able to work for or participate in the executive bodies or social capital of an enterprise is a real opportunity to open to new dimensions and discovering the business world by supporting enterprises in developing technology. This can be very stimulating and gratifying for researchers. It can also lead to career advancement or twist by creating new career opportunities.

Furthermore, it is also a way to participate to a start-up creation without leaving the university. These matters will be developed in WP5 second report on spin-off creation support inside the Alliance's universities.

4.6.3 Disincentives hampering researchers' intersectoral mobility to enterprises detected at different levels

However, some disincentives still exist at all levels, preventing researchers from taking advantage of their mobility possibilities to private sector.

a) Systemic disincentives

Some national regulations of the CHARM 'Alliance countries have not implemented enough flexibility and mechanisms to support researchers' mobility toward the business sector. In countries where such policies are implemented, some systemic barriers can still lower the impact of

²⁵⁹ Trinity College Dublin, the University of Dublin, *Consultancy & Outside Earnings Policy*, 2019

²⁶⁰ CONSULT Trinity is the consultancy office in TR&i

researchers' intersectoral mobility: it can be matter of duration of the mobility, remuneration, retain shares in an enterprise, loss of acquires benefits and symbolic position of the researchers inside the university for instance.

b) Enterprise's disincentives

From enterprise's perspective, the regulations on duration of researchers' mobility activities can be considered being too short.

c) Universities disincentives

Not enough business trainings for researchers are being developed by universities. In addition, not enough awareness is being raised among researchers by universities to inform them about the possibilities and their rights to intersectoral mobility.

d) Individual disincentives

By taking sabbaticals to conduct activities for enterprises, researchers can loss their acquired benefits, which is a huge disincentive for researchers for whom career advancement is important. When researchers come back from sabbaticals, they have lost their former institutional and symbolic position inside the universities. They can reintegrate their functions but be sent to another campus, which might be further away from their homes. Thus, personal disincentives can prevent collaborations with enterprises through intersectoral mobility if no compensative measures are taken by universities.

In addition, by taking part-time position, researchers may not have enough time dedicated to the position in the enterprise. Furthermore, the difference of culture between the academic and business worlds can intimidate researchers and prevent them from working for or collaborating with enterprises.

4.6.4 Best practices on researchers intersectoral mobility

Concerning scientific consultancy, Trinity College of Dublin via Consult Trinity has developed a "Consultancy section" (section 8) in the "Policy, Practice and Regulations on Intellectual Property-2018"²⁶¹ on which there are general guidelines on consultancy and IP:

- Staff may engage in Consultancy for third parties, either in their private capacity or in their academic capacity. Staff may engage in Consultancy work for third parties.
- Academic Consultancy. Staff may engage in Consultancy through the Consultancy Office of TR&I where TCD will contract with a client on behalf of staff. The Consultancy Office provides a support service to Staff including contract and fee negotiations, arrangements

²⁶¹ Trinity College of Dublin, The University of Dublin, *Policy, Practice and Regulations on Intellectual Property – 2018*.

for use of TCD IP and facilities as appropriate, invoicing, income receivables and distribution of income directly to the relevant School of the Staff carrying out the Consultancy.

- Private Consultancy. Where Staff wish to engage in Consultancy in their private capacity, the Staff will contract directly with the client and must seek their own legal advice. The consultant manages invoicing, payment collection and all tax liabilities. Staff may also undertake private Consultancy on an unpaid or pro bono basis. + some restrictions

Furthermore, Consult Trinity has developed a “Consultancy Policy” in 2019²⁶², introducing four principal goals:

- 1- Encourage and develop links with society by working with a broad range of actors
- 2- Provide all stakeholders with clear consultancy operational framework
- 3- Ensure appropriate economic return to Trinity for the use of resources and intellectual contribution
- 4- Provide incentives for academic staff to undertake consultancy work

This policy document defines classification rules of the service to decide if contract research or consultancy must be carried on, but also rules on hierarchical authorization, time spend on the project, use of resources, competition, financial procedures and distribution of income etc.

Consultancy policies can be considered as good practice as they allow the implementation of general rules and regulations at the university level to protect university and researchers' value and prevent conflicts of interest.

4.6.5 Recommendations to improve universities strategies and practices to better support researchers' intersectoral mobility to enterprises

Some recommendations have emerged from researchers' interviews for universities to develop and improve their support to researchers' intersectoral mobility to enterprises:

- If not already done, implement statutory or financial incentives for researchers to be able to work for enterprises.
- Expand existing schemes to facilitate mobility and knowledge transfer in order to increase the number of researchers from public research programmes being placed in industry²⁶³.

²⁶² Trinity College of Dublin, The University of Dublin, *Consultancy & Outside Earnings Policy 2019*, <<https://www.tcd.ie/innovation/consult/>> [Accessed 26 Nov 2021]

²⁶³ Research Gate, Emmanuel Boudard, *Mobility of Researchers between Academia and Industry: 12 Practical Recommendations*, (January 2006), <https://www.researchgate.net/publication/317722409_Mobility_of_Researchers_between_Academia_and_Industry_12_Practical_Recommendations> [Accessed 26 Nov 2021]

- Allow researchers to keep their acquire benefits and career advancement even though they take sabbaticals.

4.7 Industrial doctorates

4.7.1 Presentation of industrial doctorates

Industrial doctorates are collaborations between a PhD student, a research laboratory and an enterprise, working on a common research subject. They may be considered as young researchers' intersectoral mobility's opportunities. The collaboration can start in several ways:

- Between the researcher and the enterprise with the definition of a common research subject they're both interested in and want to explore. They can decide to hire a PhD student to work on this subject.
- Between an enterprise and a person/student willing to do an industrial doctorate. They can define a research subject and contact research laboratories to see if there is an academic interested by pursuing this research.
- A person/student has developed a research project and looks for an enterprise and a research unit that could be interested to be involved in the project.

Subventions and grants can be granted to students or enterprises engaged in industrial PhD, according to each country' regulation. In France for instance, enterprises can receive financial help in the form of subventions to hire the PhD student for a period of several year. (It is usually three to four years, according to the countries' regulations). In Ireland, students can be granted scholarship. A research collaboration agreement is established with the university to which the research unit and the PhD student are attached. The enterprise remunerates the industrial PhD student who share his or her time between the enterprise and the research. The thesis is co-directed by the academic and the industrial.

4.7.2 Incentives implemented at different levels to support industrial doctorates

a) Systemic incentives

Incentives to develop and support industrial doctorates have been implemented both at European and national levels.

At the European level, the "Marie Skłodowska-Curie" actions²⁶⁴ seek at providing access to new knowledge and skills for research thanks to mobility and training of researchers. Notably, "Research Networks: support for Innovative Training Networks" (ITN)²⁶⁵ supports joint research training

²⁶⁴ European Commission, *Marie Skłodowska-Curie actions*, <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/marie-sklodowska-curie-actions>

[Accessed 26 Nov 2021]

²⁶⁵ Idem

and/or doctoral programmes, implemented by European partnerships of universities, research institutions, and non-academic organisations. In industrial doctorates, non-academic organisations have an equal role to universities in respect of the researcher's time and supervision.

In Hungary, The National Research, Development, and Innovation strategy 2021-2030 has the objective to introduce industrial doctorates. The Cooperative Doctoral Programme (KDP), announced for the first time in the 2020/21 academic year, in view of its extraordinary popularity among doctoral students, was re-announced in the 2021/22 academic year. The aim of the Cooperative Doctoral Programme is to further expand the number of employees in the field of RDI who wish to increase their professional knowledge with the latest scientific research results and are committed to the social and economic exploitation of their knowledge. In order to achieve this stated goal, doctoral students participating in the Cooperative Doctoral Programme will process their topic in corporate cooperation within the institutional framework of doctoral schools in higher education. Within the framework of the competition, the cooperative scholarship student receives a support of net 400,000 HUF per month. The supervisor and expert assisting the scholarship holder and assisting in the implementation of the application will also be awarded. This is gross 240,000 HUF per month. The doctoral school receiving the scholarship student will also receive a grant of 1,300,000 HUF per semester. The latter can be used primarily for research, development and innovation activities or related infrastructure development, international relations, knowledge transfer and related services. During the period of the Cooperative Doctoral Programme's scholarship relationship, students must have labour relations or other employment relationship with the partner organization of their choice, for which they are entitled to remuneration. The professional manager of the proposal is the Ministry of Innovation and Technology, and its operational management body is the National Office for Research, Development and Innovation. The National Research, Development and Innovation Fund funds the announced scholarship.

The industrial collaboration within KDP has several 'layers':

- Beside studying at the University, the PhD candidate has a work contract at the firm;
- Beside the regular PhD supervisor, the PhD candidate has an industrial supervisor working also at the affiliated firm;
- A cooperation agreement is necessary between ELTE and the firm taking part in KDP, stating that the institution and firm collaborate in order to support the PhD students' work and research.

In Ireland, the Research Council coordinates a program which objective is to associate a researcher, a firm and a university to allow a post-graduate student to acquire an experience in industrial research: the « Employment-based program » for postgraduates²⁶⁶. The applicant, in collaboration

²⁶⁶ Irish Research Council, *Employment-based programme (postgraduate)*, <https://research.ie/assets/uploads/2021/06/Employment_Based_Programme_2021_Terms_Conditions_June-2021.pdf> [Accessed 26 Nov 2021]

with an Employment Partner and host HEI, develops the application for a scholarship. Awardees have, for the term of the award, dual status as employee of the employment partner and postgraduate student of the host HEI. Application for a scholarship can be made in respect of both a master's degree by research or a PhD. The aim of the scholarship for industrial PhD is to embed the scholar in a professional research and innovation environment for training and development whilst simultaneously providing postgraduate education leading to a master's by Research or PhD. The programme facilitates research collaboration, knowledge transfer and networking between scholars and their host HEIs and Irish-based employers. The programme will be of interest to eligible Employment Partners with one or more of the following interests or priorities:

- To pursue a research project linked with its mission through the employment of a dedicated researcher, collaborating with a HEI.
- To further develop the research capacity/output of the organisation • to enhance links with research leaders in HEIs
- To support the training, development and throughput of early-stage researchers in areas linked to the organisational mission
- To target future research talent for permanent roles in the organisation.

In Spain, the program “Ayudas para contratos para la formación de investigadores en empresas (Doctorados Industriales)”²⁶⁷ was launched in 2014 by the Spanish Research Agency and the Ministry of Science and Innovation. These grants are part of the general objectives of the Spanish Strategy for Research, Development and Innovation 2013-2020, which are articulated through the instruments and calls for programs detailed in the National Plan for Scientific, Technical and Innovation Research. Through this program, Industrial doctorates allow PhD to be trained in companies by co-financing the employment contracts of research personnel who participate in an industrial research or experimental development project that is developed in the company. The doctoral thesis will be framed in the company, in order to favour the labour insertion of researchers in companies since the beginning of their professional careers. The pursued objectives of Industrial Doctorates are to promote the incorporation of talent in firms to increase their competitiveness and to favour the labour market entry of researchers in companies from the beginning of their professional careers.

In France, since 1981, the Ministry in charge for Research finances the “Industrial Conventions for Training through Research” mechanism, called “CIFRE” (Conventions Industrielles de Formation par

²⁶⁷ Gobierno de España, *Ministerio de ciencia e innovacion, Ayudas para contratos para la formacion de investigadores en empresas (Doctorales Industriales) 2018*, <<http://www.aei.gob.es/portal/site/MICINN/menuitem.dbc68b34d11ccbd5d52ffeb801432ea0/?vgnnextoid=2e6be8ade1e01610VgnVCM1000001d04140aRCRD&vgnnextchannel=115222e988f75610VgnVCM1000001d04140aRCRD>> [Accessed 26 Nov 2021]

la Recherche)²⁶⁸, to foster collaboration between universities and enterprises. Enterprises can benefit from financial help to employ one PhD whose research project will conduct to thesis defence. With the new Programming Law for Research, the mechanism is expanding to reach 2 150 industrial doctorates per year in 2027, versus 1 500 in 2020.

The industrial doctorate's convention associates the three partners (one enterprise, one PhD student and one research unit). The research unit frames the PhD, while the enterprise employs the PhD student under a fixed-term or permanent contract for a three-year duration. The minimum annual gross salary for the PhD is 23 484 euros, that is to say 1 957 euros per month. The enterprise receives an annual subvention of 14 000 euros from the National Association for Research and Technology that manages CIFRE conventions for the Higher Education, Research and Innovation Ministry. The PhD student is enrolled in the doctoral school of his or her hosting research unit. The PhD student is supervised by his or her PhD director and by his or her scientific leader inside the enterprise. The enterprise must sign a cooperation contract with the research unit. The contract specifies conditions for research and ownerships clauses for obtained results. Spending involved by the CIFRE are eligible to Research Tax Credit²⁶⁹ (From which the 14 000 annual subvention is deducted). If the enterprise employs the doctor in permanent contract after the end of the thesis, the enterprise can benefit from the status of "Young Doctor in Enterprise" in the calculation of the Research Tax Credit. Research-work constitutes the main mission of the PhD-employee inside the enterprise.

In the Netherlands, the Industrial Doctorates are rather a new phenomenon. The Industrial Doctorates pilot program²⁷⁰ was launched in 2017 by the NWO²⁷¹. The programme is part of the Startimpulse that was issued for the Dutch National Research Agenda. The aim of the pilot project Industrial Doctorates is to make intensive collaboration possible in PhD projects within both a knowledge institution and a company in every scientific area. NWO makes funding available from the budget of the Ministry of Education, Culture and Science. Participating companies contribute materially and financially to research projects. Applicants must submit a research proposal to one of the programmes of the NWO to apply for funding. If the scientific research project is awarded, applicants are granted a grant.

b) Enterprises' incentives

For enterprises, it is financially interesting to employ an Industrial PhD employee as they can receive funding for it. Moreover, there can be extra-money incentives such as in France with the Research

²⁶⁸ Ministère de l'Enseignement Supérieur, de la Recherche et de l'Innovation, *Conventions Industrielles de Formation par la Recherche (CIFRE)*, <<https://www.enseignementsup-recherche.gouv.fr/cid22130/les-cifre.html>> [Accessed 26 Nov 2021]

²⁶⁹ République Française, Service-public, *Crédit d'Impôt Recherche (CIR)*, <<https://www.service-public.fr/professionnels-entreprises/vosdroits/F23533>> [Accessed 26 Nov 2021]

²⁷⁰ NWO, *Industrial Doctorates*, <<https://www.nwo.nl/en/researchprogrammes/industrial-doctorates>>

²⁷¹ STIP COMPASS, *Industrial Doctorates Programme*, <<https://stip.oecd.org/stip/policy-initiatives/2019%2Fdata%2FpolicyInitiatives%2F15783>> [Accessed 26 Nov 2021]

Tax Credit and the Young Doctor in Enterprise mechanism. Industrial doctorates allow enterprise to have access to extra human resources, qualified in leading research on the long term, and to create ties with a research unit. The presence of an PhD inside the enterprise can also raise awareness of the colleague on the importance of research and innovation inside a company. Finally, it can be a training period for a future potential employee, the PhD student being able to join the enterprise at the end of its industrial doctorate.

c) Universities incentives

For the universities, it is interesting to have students and research laboratories participating in industrial PhD conventions with enterprises, as it allows the research unit to have extra-staff remunerated by an enterprise available to work on a strategic research project with economic valorisation's potential. It allows raising awareness among the university and the research laboratories on applied research and partnerships with the industry. The universities administration can support the industrial doctorate through legal and administrative support to unload the research unit and the doctorate for them to focus on their research project. Industrial doctorates have good reputation inside universities. Outcome of collaborations are often successful: co-authored publications, patents filled, manuscripts published, strengthened collaboration between the university and the enterprise.

At ELTE, Cooperative industrial educational programmes, including industry-sponsored fellowship programmes as well as cooperative doctoral training have been part of the university's educational practice for several years, although typically mainly present at the STEM Faculties (Faculty of Sciences, Faculty of Informatics). For example, the György Hevesy Doctoral School of Chemistry offers, on its own, scholarships supported by pharmaceutical companies. These distinguished scholarships help to retain and recruit MSc students interested in research directly related to the need of the well-developed pharmaceutical companies of Hungary. The Faculty of Informatics mobilizes its existing business partnerships eg. in the framework of the EIT Digital training programme. In addition to the abovementioned practices, in 2020 ELTE joined the government-sponsored Cooperative Doctoral Programme (KDP). ELTE considers the KDP to be a very important instrument in strengthening university-industry cooperation and ensuring the labour market relevance of PhD studies. Students significantly benefit from this kind of fusional training as harmonising their doctoral studies and researches and integrating their practice-oriented experiences into their studies and researches may represent a competitive advantage even in short term, especially if they intend to carry on rather applied than basic research.

d) Individual's incentives

At an individual scale, Industrial doctorates allow doctorates to pursue stimulating research leading to thesis defence and to a new diploma, to accumulate a depth knowledge on the research subject and to have access to the research unit and enterprises resources. It allows them to have a long-term employment contract, to gain valuable professional experience in both research laboratory and enterprise, to acquire new and highly qualified skills, to gain a business insight and thus a highly

wanted capacity to grasp businesses challenges and issues, capacity to work and dialogue with different entities/structures.

For researchers co-directing industrial doctorates, it is an efficient way to link fundamental and applied research, to explore new concepts and ideas and better understand how to translate scientific research into application. Industrial doctorates allow them to have access to funding to lead strategic research for the research unit they belong to. Researchers consider industrial doctorates as one of the best ways to conduct collaborative research, as it is a stable long-term collaboration and enable to have a depth insight inside the enterprise²⁷².

Furthermore, industrial doctorates are often successful and can lead to co-authored publications, patents applications or congress abstract for instance. This is rewarding for the researcher and the doctorate, as it participates in building their reputation in their scientific field, and to gain financial benefits.

4.7.3 Disincentives hampering the development and good implementation of industrial doctorates detected at different levels

a) Systemic disincentives

National rules to validate a thesis involve that PhD students must meet different obligations, such as a minimum number of publications or of attendance to scientific symposium. Meeting all these assignments can be challenging for industrial doctorates compared to normal PhD, as the industrial PhD students spend time in the enterprise.

In France, the National Association of Technologic Research (ANRT)²⁷³, the operator of industrial doctorate (thèses CIFRE) mentions that structures costs can be requested from the enterprise by public establishments. This may turn negotiation between the university and the enterprise complex, as the latter is not always aware of these costs at the time of the application.

b) Enterprise's disincentives

For enterprises, the uncertainty about the results of the collaboration can be dissuasive because it may not lead to anything concrete. In addition, enterprises may not have enough time to dedicate to the doctorate. Furthermore, publications or patents applications can be hold back from IP for a long time.

In addition, contracts take too much time to be implemented, that can lead to a delay in the doctorate employment, or force enterprise to employ the future doctorate firstly under fixed-term contract to then turn to the industrial doctorate contract.

²⁷² From interviews of researchers co-directing industrial PhD

²⁷³ Association Nationale de Recherche Technologique, <<https://www.anrt.asso.fr/fr>>

Communication and cooperation with industrial partners in the framework of industrial doctorates may only moderately hassle-free. For example, firms may not respond well to the bureaucratic load, response lead times are usually very long and part of the companies have to be reminded several times before they provide certain documents, statements etc. necessary for certain administrative reasons.

c) Universities disincentives

There is no intensive communication on industrial doctorate inside universities. Many students are not aware of these possibilities.

d) Individual's disincentives

From an individual scale, the salary may not be considered high enough for a doctorate in some countries. Industrial PhD students must deal with different expectations from the research unit and the enterprise that can be challenging. Industrial doctorates demand high investment and flexibility to satisfy both sides but also the doctorate him or herself. Furthermore, it happens that the PhD students must work on other projects for the research unit in addition to the thesis, that do not let enough time to dedicate to the initial project.

For researchers co-directing the industrial doctorate, disincentives can be if the project is too focused on the enterprise' needs and not enough on the research laboratory 'expectation. There is also a risk that the enterprise loses interest in the project during the duration of the industrial doctorate, which can disable or threaten the project's good execution.

4.7.4 Best practices detected inside the universities to support industrial doctorates

Best practices inside universities concern supporting industrial doctorates by ensuring an efficient legal and administrative support and being flexible regarding both sides' perspectives, try to understand each other's position in order to find common goals to collaborate.

4.7.5 Recommendations to improve universities strategies and practices to better support industrial doctorates

Industrial PhD students, hosting enterprises and co-directing researchers, have proposed recommendations for universities.

a) Recommendations by industrial PhD students

For industrial PhD students, it is essential to better communicate and negotiate with both the research unit and the enterprise to overcome the gap between research and the company interests and communicate in order to find common research topics/aims to further study. Furthermore, more communication must be done on industrial doctorates inside the universities and more collaborations opportunities for industrial PhD contracts must be developed. In addition, the timeframe for the approval of the results dissemination must be stricter.

b) Recommendations by enterprises

Enterprises advise universities to have contracts models implemented and to be quicker in settling the industrial doctorates contract to prevent any delay in the project. IP matters and dissemination must be well negotiated and included in the contract.

c) Recommendations by researchers

Universities must make active communication on industrial PhD towards students and research units and invest resource in negotiating and settling new partnerships with enterprises for industrial doctorates.

5. BEST INITIATIVES IMPLEMENTED INSIDE THE UNIVERSITIES TO DEVELOP AND SUPPORT COLLABORATIONS WITH ENTERPRISES

Each of the Alliance' universities have implemented several initiatives that helps better support collaborations with enterprises. Each university's representatives have selected the best initiatives that should be highlighted in this report and that could serve as an inspiration for other partners. This section introduces those best initiatives.

5.1 Best initiatives from ELTE

5.1.1 ELTE Innovation Day

The ELTE Innovation Centre organises a yearly event called "Innovation Day". The aim of this public event is to encourage the industrial and social utilisation of knowledge achieved at the university, to strengthen relations with the business sector, as well as to present funding opportunities and programmes for innovation. The actual student winners of the ELTE Innovative Research Award introduce themselves at this event, and the results of the Innovative Student Idea Competition are announced. A real success story is that one of ELTE's winners in social innovation category collaborated with the organizers of Sziget Festival in a project recycling waste tents to hammocks²⁷⁴.

5.1.2 ELTE Innovative Research Award

In 2009, ELTE established the ELTE Innovative Researcher Award in acknowledgement of outstanding research achievements. Each year, the award is given to the scientist who has made the greatest contribution to the knowledge generated for the benefit of the University in the previous year. In addition to professional recognition, this prize also entails a financial reward²⁷⁵.

5.1.3 ELTE Competences and Services Database

ELTE University has a Competence and Services Database²⁷⁶, which is suitable for various external companies to find the university and build partnerships with it.

5.1.4 ELTE UniCRM System²⁷⁷

Within the framework of the university innovation ecosystem, ELTE has set up a UniCRM System together with four other Hungarian universities, in which the partner network of the universities is

²⁷⁴ Winners of ELTE's Innovative Student Idea Competition, 2021 <<https://www.elte.hu/content/az-elte-innovativ-hallgatoi-2021-ben.t.23758>>

²⁷⁵ Az ELTE Innovativ Kutatoi, <<https://www.elte.hu/content/az-elte-innovativ-kutatoit.10711>>

²⁷⁶ Competence and Services Database, <<https://www.elte.hu/innovacio/szolgaltatasok>>

²⁷⁷ ELTE UniCRM System
<https://www.innoteka.hu/cikk/folyamatosan_epul_az_elte_innovacios_okoszisztemaja.2269.html>

available to each other and to external parties in order to build the widest possible network of contacts.

5.2 Best initiatives from TCD

5.2.1 Office of Corporate Partnership and Knowledge Exchange (OCPKE)

OCPKE is a professional support group, which support Trinity's academic and research community and enables research "from concept to impact." The office contains the TTO, Industry Engagement, Academic Consultancy and New Ventures teams in a vertically integrated unit.

5.2.2 The KTI Practical Guide

The KTI Practical Guides and accompanying Model Agreements are designed to be suitable for transactions between commercial companies and Irish research performing organisations. The Guides explain common terms in the Agreements and considerations that might apply. Each Guide contains annotated Model Agreements with commentaries on key drafting points to help in drafting and negotiation. The Model Agreements are offered as a starting point for drafting and discussion. The Model Agreements are also provided in a 'clean' form Word document, ready to download and use. These guides are very practices for administrative agents to conduct a contract negotiation.

5.2.3 Consult Trinity²⁷⁸

Consult Trinity offers an efficient service to support consultancy activities by Trinity academics. Consult Trinity enables Trinity academics to share their knowledge with businesses, charities, State bodies and the Public Sector. Consult Trinity has also developed a Consultancy policy.

5.3 Best initiatives from UB

5.3.1 "Open Innovation Forum"

The University of Barcelona takes part in the « Open Innovation Forum »²⁷⁹, a program developed to trigger public-private collaborations. Opened all year long, this forum allows companies to share innovative challenges to research groups in order to get proposals in the sectors of Health and Life Sciences, Food, Chemistry, Energy and Resources, Industrial Systems and Mobility. This program allows enterprises to have access to a scientific and technologic offer from Catalan universities and research centres, therefore densify links with public researchers, and generate collaborative networks and public-private partnerships. For researchers, this Forum is the perfect occasion to encounter new enterprises, promote their research and technologies, find partners to submit calls proposal and better understand economic needs and challenges. This program also organises

²⁷⁸ Trinity College of Dublin, *CONSULT TRINITY*, < <https://www.tcd.ie/innovation/consult/> > [Accessed 26 Nov 2021]

²⁷⁹ Open Innovation Forum, <<https://www.openinnovationforum.cat/>> [Accessed 26 Nov 2021]

matchmaking events between enterprises and researchers to explore collaboration possibilities and find partners of interest.

5.3.2 “Innovation Tickets”

The University of Barcelona has launched a program to promote Research, Development and Innovation project contracts: the UB Innovation Tickets²⁸⁰. The purpose of this program is to promote the creation of new collaborative projects between businesses and institutions and research groups with the SGR grant from the Catalan Government. This grant is dedicated to research groups’ development of a first analysis of the needs presented by the company or the institution. These analytical tasks are then funded by the Innovation Tickets up to a 75% of the budget (for a maximum amount of 1,500 euros). The company or the institution will pay for the rest of the budget.

The UB Innovation Tickets are a tool to promote the hiring of RDI projects through the partial funding of the first hours of the innovation activity carried out by the research groups. These help to innovate in products and processes and enable to establish a relationship between the company or institution and the research group to continue working together in the future.

5.4 Best initiatives from UM

5.4.1 “Companies on Campus”²⁸¹

“Companies on Campus” is a call-for-projects dedicated to developing new partnerships between companies and research laboratories involved with MUSE. The goal is to make it easier for company staff to set up directly in the research laboratories. Companies on Campus encompasses the arrival of new company employees and leaders of start-up projects benefiting from incubation services. Hosting companies in facilities close to researchers and students for a minimum period of six months is a way to overcome the logistical conditions that may often be a barrier for those types of projects. Being able to work closely with partners on topics of mutual interest is a factor that favours deeper and longer-term partnerships.

5.4.2 The “partners club” of the Academic Spatial Centre²⁸²

The Academic Spatial Centre of the University of Montpellier has created a “partner club” gathering researchers and enterprises working on the same subject (for instance on satellite). This club facilitates exchanges between academic and firms and allows fostering technology transfer.

²⁸⁰ Universitat de Barcelona, UB Innovation Tickets : new aids to promote R&D&I projects, <https://www.ub.edu/web/ub/en/menu_eines/noticies/2020/06/009.html> [Accessed 26 Nov 2021]

²⁸¹ Montpellier Université d’Excellence, *Companies on Campus*, <<https://muse.edu.umontpellier.fr/app/companies-on-campus-2/>> [Accessed 26 Nov 2021]

²⁸² Centre Spatial Universitaire de Montpellier, *Partenaires industriels*, <<https://csum.umontpellier.fr/partenaires-industriels/>> [Accessed 26 Nov 2021]

5.4.3 Success Story – The “Human aT Home” project (HUT)²⁸³

“Human aT Home” project is a scientific experiment started three years ago involving thirteen research laboratories, seven enterprises (Deliled, Enedis, Ikea, Nexity, Oceansoft, Sens Digital and Synox), institutional actors such as Montpellier Metropolis and citizens (students for now, latter will be open to other citizens), around the creation of a “connected apartment” where two students live. The project is a success, and is demonstrating how innovation can emerge through cooperation between academia, businesses, institutional and societal actors. The experiment will be extended to a whole student's residence building with 125 people living in connected studios. Involving citizens allows to understand end-users needs and expectations.

A consortium agreement is framing the project and the enterprises are part of the executive committee. Each stakeholder is sharing human, technical and financial resources. Bilateral conventions can also be implemented for a specific need, for instance an agreement was established with the firm “Orange” for a loan and use of a connected mirror.

This type of collaboration allows researchers to have access to funding and products. For enterprises, it is an opportunity to test the efficiency of their products. For citizens, it is the opportunity to participate to scientific research, and to reflect on their needs and expectations.

5.5 Best initiatives from UU

5.5.1 Utrecht University Strategic Themes

Utrecht University focuses its research on four strategic themes: Dynamics of Youth, Institutions for Open Societies, Life Sciences and Pathways to Sustainability. Utrecht strategy is focused on building excellent research communities beyond the traditional borders of academic research groups, connecting to external partners from across a regional and global network of research institutes, NGOs, patient organisations, government, and/or private companies. From each of the strategic themes thematic Hubs have been established. These hubs stimulate productive and long-lasting multidisciplinary collaborations with public and/or private stakeholders thereby creating shared value and, hence, societal and economic benefit²⁸⁴.

5.5.2 The Centre for Unusual Collaborations (CUCo)²⁸⁵

The centre for Unusual Collaborations (CUCo) stimulates and facilitates unusual collaborations between young academics. The centre stimulates out-of-the-box thinking and create opportunities for collaborations. This leads to unexpected connections across the boundaries of disciplines, driven by social challenges and the curiosity of researchers. Researchers focus on climate change and

²⁸³ Human at home project, *L'expérience HUT*, <<https://www.hut-occitanie.eu/>> [Accessed 26 Nov 2021]

²⁸⁴ Utrecht University, Research, <https://www.uu.nl/en/research/profile/strategic-themes> [Accessed 26 Nov 2021]

²⁸⁵ Utrecht University, *Utrecht Young Academy*, <<https://www.uu.nl/en/research/utrecht-young-academy/cuco>> [Accessed 26 Nov 2021]

pollution, inclusion and diversity, health, food and sustainability. They look for solutions that have a large and lasting impact on society.

To stimulate unusual collaborations, CUCo has set up two grants: The Spark Grant and Unusual Collaborations Grant. The grants are designed to enable long-lasting interdisciplinary science collaborations and scholarships that aim for societal impact.

The alliance also emphatically seeks to cooperate with external partners in the business community and in society.

5.5.3 “Selling your Science”²⁸⁶

In Utrecht University, the training “Selling your Science” is a two-day course for PhD-candidates, postdocs, (senior) researchers, aiming at providing them with the basics of a business perspective on research. During this course, they can learn about ideation, negotiation, presenting and pitching their project to external actors, but also about intellectual property and conflicts of interest.

²⁸⁶ Utrecht Holdings, *Training*, <<https://utrechtholdings.nl/academics/trainings/>> [Accessed 26 Nov 2021]

CONCLUSION

Deliverable 5.1 focuses on the first step of WP5 and will serve as a reference for the future WP5 reports (D5.2, D5.3 and D5.4), as it draws the landscape analysis of universities strategies and practices to partner with enterprises and to associate societal stakeholders in this process. In this task, the Alliance's institutions have shared their strategies, policies, practices and experiences on initiating and maintaining collaborations with enterprises and key societal stakeholders, notably in the framework of research projects and conducting innovation. All institutions have strong national RDI strategies and regulations with dedicated sections focusing on principles and rules for universities to collaborate with enterprises. We can notice important will of the national authorities to develop and support collaborations between HEI and companies with the implementation and promotion of several mechanisms, incentives and organisms aiming at supporting those partnerships. Indeed, public support is essential due to the not-for-profit entities (universities) playing a driving role in innovation ecosystem.

All five universities are evolving in a rich environment for RDI and public-private collaborations in research, notably with enterprises.

The strategies adopted by the universities to conclude partnerships with enterprises are in the full-spectrum of their activities, from education to research, underlying the importance of those strategies for the establishments as it brews all universities' components, departments and faculties. The strategies also include the association of societal stakeholders to better take into account end-users needs and sustainability concerns.

Conducting interviews with a broad sample of several actors involved in different aspects of the implementation of partnerships with enterprises and key societal stakeholders has allowed to gather various perspectives and enriching experience feedbacks on what is perceived as "incentive" or "disincentive" and "best practices" to conclude partnerships between universities and enterprises. In addition, it has allowed bringing to light preliminary recommendations dedicated to national policy makers and universities to increase the support brought to these collaborations. Indeed, by identifying the strengths and weakness of national, local and universities' support to partnerships with enterprises and key societal stakeholders, we can focus on the areas of development.

Collaborations between universities' researchers, enterprises and with societal stakeholders for research and technology transfer are always negotiated as legal relationships that are framed by a contract limited in time, agreed and signed by all parties. It is thus essential for universities to develop and apply a strong IP Policy to protect its researchers and knowledge. IP matters are often the longest to negotiate as researchers and enterprises' interests usually differ. Financing research projects can be a challenge for enterprises, especially when universities have tied financial rules.

Interviews have allowed underlining that Common Laboratories are positively perceived and experienced by both researchers and enterprises, as they allow implementing long-term

relationships between universities and enterprises. Alliance' universities thus should keep going or implement those kinds of relations with enterprises, and shared spaces between universities, industry, public institutions and users' community, that could be physical or virtual, to address common interest.

All countries and universities of the Alliance have introduced, more or less recently, Industrial Doctorates Programmes, which allow young researchers (PhDs) to work for an enterprise and a research laboratory that are collaborating on a common research project, with financial support from the State. These programs are positively experienced by research units, PhD and enterprises and thus should be encouraged by universities.

Some universities are still early at adopting business developers' positions to grow collaborations with enterprises while other have not build up such positions.

By reading this analysis, each university can notice its current strengths and weakness and see what's need to be worked on and improved in their establishment to foster academic-industry collaborations and involvement of societal stakeholders and end users' community. They can find inspirations in other partners' procedures, practices and initiatives.

ANNEX I: SURVEY ON CONTEXT

Context

Part 1: National strategy and policy analysis
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Introduction: Short history of national evolution of policy and regulations on RDI (please link the sources)

1. Please indicate whether a national policy/ development plan on RDI has been set at the national level

- Yes, implemented
- Yes, adopted
- Under Discussion
- No
- I don't know

1.1. Please indicate which of the following are included in the National Development Plan on RDI

- Partnerships between universities and enterprises
- Innovation's detection support
- Spin-off creation support
- Students' entrepreneurship
- None
- Other

1.2. If the policy exists, please indicate which of the following is implemented/established

- Implementation plan
- Budget
- Deadline for implementation
- Other

1.3. Please indicate is there was a participatory process involving various actors to develop the National Policy on RDI

- Yes, please give details on the process
- No

1.4. Please indicate if there is an advisory body for national RDI strategy and policy

- Yes, designated and in operation (please link the source)
- Yes, designated but not in operation
- Under discussion
- No
- I don't know

1.5. Please indicate if there is a supervisory body to supervise RDI policy implementation

- Yes, designated and in operation (please link the source)
- Yes, designated but not in operation
- Under discussion
- No
- I don't know

2. Is there any coordination between the National Policy on RDI and EU-level strategies and policies?

- Yes (please give details)
- In some aspects
- No
- I don't know

3. Has the Higher Education governing body developed any policy document/chart on RDI?

- Yes, implemented
- Yes, adopted
- Under Discussion
- No
- I don't know

3.1. Please indicate which of the following are included in the Higher Education governing body's policy document/chart on RDI

- Partnerships between universities and enterprises
- Innovation's detection support
- Spin-off creation support
- Students' entrepreneurship
- None
- Other

4. Is there a national structure financing research?

5. Indicate other public structures financing research

6. Indicate which following RDI actors exist in your country [Multiple answers]

Innovative enterprises' support

- Start-up Incubators
- Other (please indicate)

Technology Transfer

- Technology Transfer Companies
- Technology Diffusion Structures
- Other (please indicate)

Public-private partnerships

- Technology Research Institutes
- Innovation/Competitiveness centers/hubs
- Other (please indicate)

7. Indicate which status are available in your country to support RDI

- Young Innovative Enterprise's status
- Young University Enterprise's status
- Researcher-entrepreneur's status
- Student-entrepreneur's status
- Other (please indicate)
- None

Part 2: Regional* and/or local strategy and policy analysis (if applicable)

*Regional: EUROSTAT developed a "Nomenclature of territorial units for statistics" (NUTS). The NUTS classification is a hierarchical system for dividing up the economic territory of the EU for the purpose of the framing of EU regional policies, the collection, development and harmonisation of European regional statistics and socio-economic analyses of the regions. The NUTS regulation defines minimum and maximum population thresholds for the size of the NUTS regions: NUTS 1: 3 000 000 to 7 000 000 NUTS 2: 800 000 to 3 000 000 NUTS 3: 150 000 to 800 000 Choose the NUTS the most appropriate according to the most relevant level in terms of RDI policies for your country. [Source: Eurostat - <https://ec.europa.eu/eurostat/web/nuts/nuts-maps>]

Introduction: Short history of regional and/or local evolution of policy and regulations on RDI (if applicable) (please link the sources)

1. Please indicate whether a regional and/or local policy/ development plan on RDI has been set

- Yes, implemented
- Yes, adopted
- Under Discussion
- No
- I don't know

1.1. Please indicate which of the following are included in the regional and/or local Development Plan on RDI

- Partnerships between universities and enterprises
- Innovation's detection support
- Spin-off creation support
- Students' entrepreneurship
- None
- Other

1.2. Please indicate which of the following this policy includes/establishes

- Implementation plan
- Budget
- Deadline for implementation
- Other

1.3. Please indicate if there is a participatory process involving various actors to develop the regional and/or local Policy on RDI

- Yes, please give details on the process
- No

1.4. Please indicate if there is an advisory body for regional and/or local RDI strategy and policy

- Yes, designated and in operation (please link the source)
- Yes, designated but not in operation
- Under discussion
- No
- I don't know

1.5. Please indicate if there is a supervisory body to supervise RDI policy implementation at regional and/or local level

- Yes, designated and in operation (please link the source)
- Yes, designated but not in operation
- Under discussion
- No
- I don't know

2. Is there any coordination between the regional and/or local Policy on RDI and national and EU-level strategies and policies?

- Yes (please give details)
- In some aspects
- No
- I don't know

3. Indicate the main regional and/or local funders for research

Part 3: University's strategy and policy analysis

1. Indicate whether an RDI strategy has been set inside the University

- Yes, implemented
- Yes, adopted
- Under Discussion
- No
- I don't know

1.1. Please indicate whether these subjects are part of the University's work streams on RDI

- Partnerships between universities and enterprises
- Innovation's detection support
- Spin-off creation support
- Students' entrepreneurship
- None
- Other

2. Indicate the directorates and offices working on RDI and their main missions

2.1. Indicate the human resources available on each office

3. Please indicate which of the following structures exist inside the University

- Start-up incubators
- Students' start-up incubators
- Development structure
- Other (please specify)
- None

4. Is your university part of a broader initiative / of an ecosystem fostering research and innovation?

4.1. If yes, is there any program/support that has been system developed through this initiative/inside this ecosystem to foster RDI?

- Yes

On which thematic? [Multiple answer possible]

- Partnerships between universities and enterprises
- Innovation's detection support
- Spin-off creation support
- Students' entrepreneurship
- Other (please indicate)
- None
- No
- I don't know

ANNEX II: SURVEY ON UNIVERSITIES' STRATEGIES TO COLLABORATE WITH NON-ACADEMIC ACTORS

1. Do you have specific offices responsible for partnerships with enterprises?

- Yes
 - Contracts office
 - TTO
 - Projects' engineering office
 - Other (please indicate)
- No

2. Do you have partnership strategies in place with key player companies?

- Yes
 - Full-spectrum (initial and continuing training, internships, theses, recruitment assistance)
 - In some of these aspects (please specify)
 - Specific strategies, for example favorizing European funding
 - Other (please specify)
- No

3. How relationships with private partners involved in the financing or the realisation of research project are formalized?

- Response to a call for proposals/tenders
- Implementation of a market pull or technological push strategy
- Recruitment of business developers
- Making researchers the sale representatives of their research
- Other (please specify)

4. Type of agreement

- Punctual
- Short term
- Long term

4.1. Please indicate which of the following agreements and contracts can be negotiated inside the University and send us standard template for each contract if available

Collaborative Research

- Research Collaboration
- Research Collaboration for a PhD
- Service Delivery
- Confidentiality agreement
- Consortium agreement
- Maturation agreement
- Housing agreement
- Materiel Transfer Agreement
- Other (please indicate)

Technology Transfer

- Licensing agreement
- Disposal agreement
- Co-ownership agreement
- Scientific support agreement

- Deed of assignment
 - Other (please indicate)
5. Principles regularly applied in the partnerships [Multiple answer possible]
- Transparency
 - Fairness* (This means that all partners will be recognised and expected to contribute distinctive knowledge and expertise to the project, that no partner will be expected or entitled to bear the full weight of theorising or interpreting the work of the project, and that all partners will seek to build dialogue across different sets of knowledge and experience.)
 - Other (please specify)
- 5.1. How are these principles applied in the partnership?
- Included in the contract
 - Tacit agreement
 - Other (please specify)
6. Do researchers associated with enterprises to answer calls? [Multiple answers possible]
- Yes
 - For local and/or regional calls
 - For national calls
 - For European calls
 - For International calls
 - No
- 6.1. Do you have indicators to measure collaborative calls?
- Yes
- Please indicate the average number of calls answered per year by the researchers from the University for:*
- Local and/or regional calls
 - National calls
 - European calls
 - International calls
- Please indicate the average calls earned per year by the researchers from the University for:*
- Local and/or regional calls
 - National calls
 - European calls
 - International calls
 - Other indicators available
 - No
 - I don't know
7. Which of the following partnership strategies in Education and Training are implemented at the university?
- Guest speakers from the business world
 - Work-linked training (if yes, number of students following work-link training per year)
 - Entrepreneurship training (bachelor, master on entrepreneurship for instance)
 - Internship
 - Other (please specify)
 - None
8. Does a specific office dedicated to recruitment assistance exist?
- Yes (please indicate)
 - No

8.1. Strategies for recruitment assistance in collaboration with enterprises [Multiple answers possible]

- Fairs, meeting with enterprises
- Internships' research assistance
- Jobs interviews training with enterprises
- Other (please specify)
- None

ANNEX III: INTERVIEW MATRIX FOR RESEARCHERS COLLABORATING WITH ENTERPRISES

Introduction:

- Gender
 - Age
 - Nationality
 - Education
 - Seniority
 - Research unit
 - Research field
- 1) Do you have experience in research collaboration with enterprises?
 - 2) How did you encounter the enterprises you have collaborated with?
 - 3) What is the driving force to collaborate with an enterprise?
 - 4) What are your personal motivations to collaborate with an enterprise?
 - 5) What is the plus-value in collaborating with enterprises?
 - 6) Globally, are you satisfied with your collaborations with enterprises?
 - 7) What do you think of support offered by the University to formalize partnerships between enterprises and researchers?
 - 8) Which difficulties did you encounter during collaboration with enterprises?
 - 9) What are the best practices implemented by the University to support researchers in research collaboration with enterprises?
 - 10) Which recommendations would you give to the University to improve its services?
 - 11) In the future, will you partner again with an enterprise? Why?

ANNEX IV: INTERVIEW MATRIX FOR ENTERPRISE'S REPRESENTATIVE

Introduction:

- Name and position
- Date of creation of the enterprise
- Head
- Products/Services Sold

Collaborative research

1. Do you have experience in collaboration with researchers?
2. How did you encounter the researchers you have collaborated with?
3. What is the driving force to collaborate with a researcher?
4. What is the plus-value in collaborating with researchers?
5. Globally, are you satisfied with your collaborations with researchers?
6. What do you think of support offered by the University to formalize partnerships between enterprises and researchers?
7. What are the best practices implemented by the University to support research collaboration with enterprises?
8. Which recommendations would you give to the University to improve its services?
9. In the future, will you partner again with a researcher from the University? Why?

Industrial PhD

1. Do you have experience in hiring PhD students?
2. How do you encounter PhD students? (Job advertisement, informal meetings ...?)
3. Do you receive any grants or fundings for hiring a PhD student?
4. What is the driving force to collaborate?
5. What is the plus-value in hiring a PhD student?
6. Globally, are you satisfied with those collaborations?
7. What do you think of support offered by the University to formalize partnerships between enterprises and PhD students?
8. Which difficulties did you encounter during collaborations?
9. What are the best practices implemented by the University to support research collaboration between PhD students and enterprises?
10. Which recommendations would you give to the University to improve its services?
11. In the future, will you partner again with a PhD student from the University? Why?

ANNEX V: INTERVIEW MATRIX FOR INDUSTRIAL PHD STUDENTS

Introduction:

- Gender
 - Age
 - Nationality
 - Education
 - Research unit
 - Research field
 - Year of PhD
1. With which enterprise do you collaborate for this PhD? How did you encounter the enterprise?
 2. Did the enterprise receive any funding/grant to employ a PhD student?
 3. What is the subject of your thesis?
 4. How was your project matured?
 5. What were your personal motives to do a PhD in collaboration with an enterprise?
 6. Do you have a prior exposition to business before this collaboration? (For instance, roundtables, workshops, courses ...)
 7. Do you encounter any difficulties during your PhD?
 8. Are you globally satisfied with your PhD and your relation and integration in the enterprise?
 9. What are you plans after the PhD?
 10. For you, what are the best practices implemented inside the University to support collaborative PhD?
 11. Which recommendations would you give to the University to improve collaborative PhD and its support?
 12. According to you, which barriers are hampering collaborative PhD inside the University?

ANNEX VI: INTERVIEW MATRIX ADMINISTRATIVE AGENTS OF RESEARCH AND PARTNERSHIPS SUPPORT OFFICE

Introduction:

- Gender
 - Age
 - Nationality
 - Education
 - Department
 - Office
 - Position
 - Seniority at the University
 - Seniority at this position
 - Salary scale
 - Missions
1. What are the procedures to follow inside the Office and Department ?
 2. Do you have a specific working methodology?
 3. Which tools do you use in your daily work?
 4. Who can contact you to implemented a collaboration: the researcher, the enterprise?
 5. Do you canvass/approach enterprises on researchers' request?
 6. Do you canvass/approach researchers on enterprises' request?
 7. According to you, which barriers are hampering collaborative research inside the University? (For instance, regulatory, financial or political barriers)
 8. Which difficulties do you encounter in your daily work?
 9. According to you, what are the best practices implemented at the University to support collaborative research?
 10. Which recommendations would you give to the University to improve collaborative research's support?

ANNEX VII: INTERVIEW MATRIX FOR ADMINISTRATIVE AGENTS OF TTO

Introduction:

- Gender
 - Age
 - Nationality
 - Education
 - Department
 - Office
 - Position
 - Seniority at the University
 - Seniority at this position
 - Salary scale
 - Missions
1. What are the procedures to follow inside the Office and Department ?
 2. Do you have a specific working methodology?
 3. Which tools do you use in your daily work?
 4. Who can contact you to commercialize research: the researcher, an enterprise who is interested by a specific technology?
 5. Do you canvass/approach enterprises on researchers' request?
 6. Do you canvass/approach researchers on enterprises' request?
 7. According to you, which barriers are hampering research commercialization inside the University? (For instance, regulatory, financial or political barriers)
 8. Which difficulties do you encounter in your daily work?
 9. According to you, what are the best practices implemented at the University to support research commercialization?
 10. Which recommendations would you give to the University to improve research commercialization's support?

ANNEX VIII: INTERVIEW MATRIX FOR BUSINESS DEVELOPERS

- Gender
 - Age
 - Nationality
 - Education
 - Department
 - Office
 - Position
 - Seniority at the University
 - Seniority at this position
 - Salary scale
 - Missions
1. How do you meet and canvass new enterprises?
 2. Do you canvass enterprises on researchers' request?
 3. How do you put in contact a researcher and an enterprise?
 4. What are procedures implemented inside the Office and Directorate for business developers?
 5. Do you have a specific working methodology?
 6. Success story
 7. Do you encounter any difficulties in your work?
 8. According to you, what are the best practices implemented to develop relation and partnerships with enterprises at the University?
 9. Which barriers are hampering partnerships with enterprises at the University? (For instance, regulatory, financial, political barriers)
 10. Which recommendations would you give to the University to foster and support partnerships with enterprises?