SUCReD

Scaling up the commercialization of R&D

Pre-implementation analysis report

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1. RESEARCH AND DEVELOPMENT VALORISATION CHANNELS AND TOOLS

Despite substantial efforts at the EU, national and regional level, the European paradox continues to exist: the Union continues to be a global leader in terms of scientific output producing, for example, 22.7 % of all high-quality scientific publication, but still lags behind in translating this advantage into products, services, processes and solutions that meet the demand. Although many Member States have increased investments in their public research systems since 2000, leading to improvements in the quantity and quality of their scientific outputs, the achievements in terms of valorisation have not been commensurate. In a situation where too few researchers have a valorisation mind-set, many universities do too little to promote a valorisation culture that encourages to look beyond the academic environment and to actively engage in making research results available for broad societal use.

In the Council Conclusions on 'Accelerating knowledge circulation in the EU' (2018), the Council of the European Union called on the European Commission to develop a strategy to accelerate the potential uptake of research and innovation (R&I) results and data. This requires a new valorisation strategy, a multidimensional approach which goes beyond technological transfer and which recognises the essential contribution of all players involved, including citizens and public authorities. A review of the 2008 Commission Recommendation on the management of intellectual property in knowledge transfer activities will give the opportunity to extend the scope to the whole ecosystem, address new challenges and provide a broad set of valorisation guiding principles for all R&I actors.

This policy review aims to provide a toolbox for a valorisation strategy, identifying and analysing the main channels to promote the uptake of R&I results. They include:

- academia-industry joint research and mobility
- the creation of research-driven spin-offs and start-ups
- intermediaries and knowledge transfer professionals support
- the engagement of citizens and local communities
- intellectual property management and standardization
- knowledge dissemination and policy uptake

1.1 Academia - Industry relations

Although one third of global scientific publications are produced in the EU, the uptake of scientific results by industry, and their commercialization, remains below its fullest potential extent. There are indications that the EU is lagging behind in its ability to convert scientific results into products and services that stimulate sustainable growth. However, various knowledge valorization initiatives and numerous knowledge transfer channels are in place in the EU to support the use of scientific results in the economy and society.

1.1.1 Knowledge Transfer Channels for Research Results Uptake

Mobility Programmes

Mobility programmes provide opportunities to establish one-to-one contacts between academia and industry. In this regard, they are a key tool to facilitate academia-industry collaboration. These programmes may also enhance the quality of academic training and provide opportunities for the improvement of skills and expertise. However, mobility programmes do not appear to be flexible enough to provide opportunities for mixed working patterns for researchers - for example, splitting their working time between a university and a company.

Table 1: Examples of joint laboratories and mobility support schemes

Initiative	Implementing body	Description
CoLabs	Fundação para a Ciência e a Tecnologia, Portugal	Collaborative laboratories are built on the model of companies and research and development (R&D) units operating in association with a higher education institution (at least one company and unit per institution). The laboratories are established as non-profit private associations or as companies. Their main goal is to create skilled and scientific jobs, both directly and indirectly, by implementing R&I agendas for creating economic and social value.

Laboratories and JR Centres	Christian Doppler Research Association, Austria	These are specially established research units with fixed terms, undertaking application-orientated basic research. Under the direction of highly qualified scientists, research groups work in close contact with commercial partners on innovative responses to business-related research issues. In 2020, 91 laboratories and 17 Josef Ressel Centres contributed to science and innovation. The research budget of the research units was more than EUR 30 million.
InnoSart	Agency for Science, Innovation and Technology, Lithuania	This measure supports new and innovative SMEs to recruit researchers.
Industrial Fellowships	Luxembourg National Research Fund	The scheme awards PhD and postdoctoral grants to researchers who carry out their PhD or postdoctoral training in collaboration with a company in Luxembourg. The scheme is open to all scientific domains and to all researchers, regardless of their nationality. The collaborating companies must have a presence in Luxembourg.
CIFRE	Association Nationale de la Recherche et de la Technologie, France	The programme allows companies to recruit doctoral students whose research projects, conducted in collaboration with a public laboratory, will lead to the defense of their theses. The programme is funded by the Ministry of Higher Education, Research and Innovation.

Joint research and inter-sectoral mobility play a strategic role in the valorisation of R&I fostering a mutual exchange between industry and academia. On the one hand, they facilitate the flow of academic knowledge and results into industries. On the other hand, they offer researchers from academia the opportunity to enhance their skills and gain better knowledge of industrial needs.

Mobility programmes involving industry and academia are key for knowledge valorisation. Scattered evidence points to positive interactions between mobility policies and

grants for collaborative R&D projects between research centres and firms, because more joint projects result when combined with policies that promote exchange of postgraduate students in an industrial context.

Intellectual Property Management

Intellectual property management and standardisation is the second most applied activity, particularly in academia. The number of European patents granted in the 2010–2019 period increased, although at a slower pace than in other parts of the world. There are relatively few dedicated intellectual property support schemes, primarily because intellectual property management is often institutionalized within academia or provided through governmental bodies or intermediary organizations, rather than through specifically designed programs. Additionally, the EU IP Action Plan (EC COM (2020) 760) highlights particular challenges such as fragmented and complex intellectual property management systems and insufficiently developed tools.

Table 2: Examples of intellectual property management support

Initiative	Implementing body	Description
InnoWi	InnoWi GmbH, Germany	InnoWi GmbH was founded in 2001 by local universities and the state of Bremen to protect and market scientific results under protective law. For the 13 universities and research institutes in the Bremen region, InnoWi offers a complete service package ranging from patent protection to patent exploitation.
Innosuisse	Innosuisse, Switzerland	Innosuisse provides free of charge assisted patent searches and assisted patent landscape analyses to SMEs, start-ups, administrative bodies, non-profit organisations, and other private and public institutions and academic researchers, in collaboration with the Swiss Federal Institute of Intellectual Property.
InoPatent	Agency for Science, Innovation and Technology, Lithuania	The main objective of the InoPatent support scheme is to encourage legal entities to apply for international patents for inventions and to register designs, thereby strengthening the international protection of intellectual property rights, and to promote research, experimental development and innovation activities.

The valorisation of research results is facilitated by a fit-for-purpose intellectual property (IP) framework which assures the creators of research outputs a competitive advantage in the business. Standards also have a strong value for knowledge valorisation, facilitating the access of new products to the market.

The current landscape is moving away from the simple generation of IP and putting more emphasis on the use of intellectual assets. The EUIPO-EPO (2019) joint publication on 'High-growth firms and intellectual property rights' highlights that companies in IP-intensive sectors, including smaller ones, pay better wages and that small companies using IP grow faster and display better resilience to economic crisis.

Good-quality standards based on robust research results are an important way to valorise knowledge. Standards enhance the compatibility and interoperability of the outcome of projects and help to promote innovative products ensuring their quality, facilitating their access to the market and building trust among consumers. Standards are also instrumental for avoiding research duplication as they codify state of the art and promote the use of recognised methodologies, processes and terminology.

Research-driven Spin-off and Start-ups

Research-driven spin-off and start-ups are usually driven by academic research or joint academia-industry activities. Some of these initiatives are embedded in internal innovation and business development support structures within universities, while others are specifically designed support programmes at the national or regional level.

Table 3: Examples of support programmes for research-driven spin-off and start-ups

Initiative	Implementing body	Description
Industria del Coneixement	Government of Catalonia, Spain	The aim of the Knowledge Industry Programme is to foster the development of new science-based spin-off companies, derived from the research carried out at universities and research centres. This is part of the strategy to transfer the technology and knowledge generated in the academic and scientific spheres to the business sector.
Spin-Off Fellowships programme	Federal Ministry of Education, Science and Research,	The programme aims to increase the number of start- ups from universities and public research institutions, and to identify potential candidates willing to begin start-ups.

	Austria	
Jyväskylä University Startup Factory	Jyväskylä University, Finland	The Startup Factory is an incubator where the best initial-stage business ideas can grow into successful companies, in cooperation with educational institutes. Many companies have been established based on research results produced at the university and many of them have been founded by university students.

1.1.2 Support and tools for Academic researchers and Industry/SMEs collaboration and knowledge exchange

Academia-industry joint activities are generally encouraged through the following forms of support:

- Support schemes for companies to innovate
- Support to academia to commercialise research results
- Support to encourage academia-business collaboration
- Support to academia-business intermediary organisations

Support for innovation is provided predominantly at the national level and is part of governmental policy to stimulate research results uptake by the industry. The funding mostly comes from national budgets, EU programmes and own financing, including through the provision of services and commercial activities. EU support is mostly issued in the form of grants. Financial instruments are also provided, particularly to industry. The most important funding schemes are the Horizon 2020 programme, followed by the EU Structural and Investment Funds and other EU programmes such as L'instrument financier pour l'environnement (LIFE), Erasmus+, European Cooperation in Science and Technology COST Actions, European Research Council programmes and cross-border programmes. National and regional support includes grants and subsidies (budgetary support), tax incentives and financial instruments. Municipal support often includes access to R&I facilities, along with grants and tax incentives.

There is no significant difference in the funding sources for knowledge valorisation activities between the widening countries and the other countries. Widening countries more often receive support from other organisations such as the World Bank, the World Health Organization, the United States Agency for International Development, the Foreign,

Commonwealth & Development Office, the Japan International Cooperation Agency and Germany's Deutsche Gesellschaft für Internationale Zusammenarbeit. There are also bilateral research and industrial innovation programmes in some countries, such as Israel (with Singapore, South Korea and the United States) and Spain (with India).

The intensity of academia-industry collaboration depends on the research area/sector of the economy. Knowledge transfer in some sectors, such as social science and humanitarian science, is more challenging than in others.

Legislative and administrative incentives to foster innovation

A variety of mechanisms, institutions and initiatives support joint research, including structures that host academia-industry joint activities (joint laboratories, technology parks and co-working spaces), knowledge transfer through KTOs, clusters and networks, business advisory and business incubating services, entrepreneurial advice and training, innovation vouchers for companies to innovate or cooperate with academia and academia-industry mobility support schemes. Along with these, legislative and administrative provisions and incentives are in place to stimulate companies to invest in innovation.

Table 4: Examples of legislative and administrative incentives to foster innovation

Initiative	Country	Description
Crédit Impôt Recherche	France	The research tax credit is a generic measure to support the R&D activities of companies, without restriction by sector or size. Companies that incur expenses for fundamental research and experimental development can benefit from the research tax credit by deducting them from their tax, under certain conditions. The research tax credit rate varies according to the amount of investment.
Malta Enterprise - Interest Rate Subsidy	Malta	The Interest Rate Subsidy scheme supports qualifying businesses to subsidise the cost of debt finance of a loan. The support aims to facilitate investment in innovative businesses by enabling them to develop their operations and take products and services to the market.
SIFIDE – R&D tax credit programme	Portugal	SIFIDE is a tax incentive system for research and business development. It aims to increase the competitiveness of enterprises and support their R&D work by deducting the collection of the value added tax of the respective expenses.

Support schemes for companies to innovate

These schemes provide incentives for companies to collaborate with universities and research institutions. Most of these programmes are implemented by governmental agencies at the national level. The support is mainly in the form of grants, with varying levels of co-financing by the companies. Some of these programmes are financed through the EU Structural and Investment Funds and co-funded by the respective countries. Innovative start-up companies are also supported through grants, financial instruments (loans, equity) and advisory and capacity-building services through business incubation or business angel activities. These schemes are supported by governments, local authorities or by the private sector, or may be enabled through government/private collaboration.

Table 5: Examples of support schemes for companies to innovate

Initiative	Implementing body	Description
Innovation vouchers	Innovation Fund, Serbia	The aim of the Innovation Vouchers scheme is to provide financial incentives to SMEs to collaborate with R&D institutions, thereby engaging in innovation and making their products more competitive. Financial support is up to EUR 7.000 and covers up to 60 % of total service costs.
Smart&Start	Invitalia, Italy	Under the 'Smart & Start Italia' scheme, innovative start-ups can claim interest-free loans of up to 80 % of relevant costs for projects between EUR 100.000 and EUR 1.5 million. The money can be borrowed in instalments over 24 months and then paid back over a 10-year period.
OXO Labs acceleration programmes	OXO Labs, Hungary	OXO Labs offers start-up incubation and acceleration programmes to facilitate and mentor early-stage tech projects. It also supports and funds projects in order to boost growth and market entrance. Five projects and teams are selected each year. OXO Labs provides angel funding of up to EUR 200.000 per project, in the form of equity or convertible note financing.

Support to academia to commercialise research results

These support schemes aim to encourage universities and research institutions to cooperate with businesses. These initiatives include capacity-building and raising awareness for the possibilities to cooperate with the business, or support to commercialise research outputs and create spin-off or start-ups.

Table 6: Examples of support to academia to commercialise research results

Initiative	Implementing body	Description
SPINNO	Enterprise Estonia	Three universities are supported with EUR 2 million grants in total, in order to strengthen their knowledge transfer services, including intellectual property management.
FUSION Programme	Malta Council for Science and Technology	The programme provides support for researchers, in order to turn their innovative ideas into marketable products.
Jyväskylä University Unifund	Jyväskylä University, Finland	The University of Jyväskylä financing company (Unifund Jyväskylä Ltd.) supports research-based business start-ups. The operations of new businesses may be based on the exploitation of intellectual rights created at the university, or on services based on research results.
Higher Education Innovation Fund	Research England, United Kingdom	A GBP 230 million fund for knowledge exchange, in order to support and develop a broad range of knowledge-based interactions between higher education providers and the wider world (business, public and third-sector organisations community bodies and the wider public), which results in benefits to the economy and society.

Support to encourage academia-business collaboration

These schemes are mainly supported by national funding and implemented by governmental agencies. The support ranges from funding of joint research to experimental development and commercialisation.

Table 7: Examples of support schemes to encourage academia-business collaboration

Initiative	Implementing body	Description
Gama 2	Technology Agency of Czechia	Support is provided for the verification of results of applied research and experimental development, in terms of their practical application, and for preparing their subsequent commercial use or exploitation.
BRIDGE programme	Austrian Research Promotion Agency	Funding is available for basic research projects conducted by consortia of partners involved in scientific research and industrial commercialisation. Funding of up to 80 % is available if the project is carried out in cooperation with SMEs.
Co-innovation funding	Business Finland	Co-creation funding for preparing joint actions between companies and research organisations. Funding for the preparation of commercialisation of research-based ideas.
MAGNET	Israel Innovation Authority	Grants for R&D collaboration as part of a consortium (a group of industrial companies and research institutions developing technologies together).
ARN LabCom	Agence nationale de la recherche (ARN), France	The programme supports research actors to create new structured partnerships through the creation of 'joint laboratories' with SMEs. A joint laboratory is defined by the signing of a contract specifying its operational parameters, including common governance, a roadmap for R & I activities, resources to operate the roadmap and a strategy to ensure that research activities create value.

Support to academia-industry intermediaries

The support to academia-industry intermediaries (knowledge transfer or technology transfer offices, business parks, innovation agencies, etc.) is commonly set up at the national, regional or local level, or in some universities or research institutes. Support comes from various sources (governmental subsidies, industry, local or regional authorities, and/or project-based funding).

Table 8: Examples of support to academia-industry intermediaries

Intermediary organisation	Country / region	Description
Luxinnovation	Luxembourg	Luxinnovation is a national innovation agency established in 1984 in the form of a PPP between the Ministry of the Economy, higher education institutions, the Federation of Luxembourg Industry, the Chamber of Commerce and the Chamber of Crafts. The team has around 80 members. The funding comes predominantly from the government and has a 4-year horizon, while decision-making representation is split between the government and the private sector. Luxinnovation's activities are both top- down (implementation of governmental policy and strategic documents) and bottom-up, responding to the needs of the companies.
Audna TTO Iceland	Iceland	TTO Iceland is the national technology transfer office. It is a non-profit limited liability company and is owned by universities, the Federation of Industries in Iceland and research organisations. It was established in 2019 and is staffed by four experts but also has one contact person in each university and research organisation, as well as one contact person in the Federation of Industries. TTO Iceland receives annual funding in the form of a subsidy from the government and receives partial support from universities and research institutions. Companies pay for TTO services. The organisation provides intellectual property management, evaluations, R&D, licensing, SME analyses, market analyses, networking support (via contacts with a variety of institutions), provides insights to start-up companies, and organises masterclasses and training programmes for researchers, in order to increase their awareness of knowledge transfer and cooperation with industry.

Knowledge Transfer Ireland	Ireland	Knowledge Transfer Ireland is the country's central point of reference for industry-academia partnership and research commercialisation. It is a governmental structure advised by a group of commercially experienced people drawn from industry (SME and multi-national, Irish and overseas) and the investment community. Through a stakeholder forum, activities are coordinated with representatives of Irish higher educational institutions, TTOs, research funders and government agencies.
FEDIT	Spain	FEDIT is the Spanish Federation of Technological Centres. It was established in 1996 and works to promote innovation and technological development. The Federation consists of 35 technology centres distributed throughout Spain and staffed by about 5.400 people who provide services to 21.300 companies annually.
Lithuanian Innovation Centre	Lithuania	The Lithuanian Innovation Centre is a public non-profit organisation providing services to enterprises, research institutions, industry associations and business support organisations. The centre was established in 1996 as a non-profit organisation with the support of the United Nations development programme, and in 1997 was reorganised into a public body. Shareholders of the Centre are the Ministry of Economy and Innovation, the Ministry of Education, Science and Sports and the Lithuanian Confederation of Industrialists. The team consists of about 50 people. Each year, the centre on average provides 5.000 instances of services (consultation, training, research, technological missions) for more than 1.000 clients (business enterprises and research institutions).

1.2 Citizen and societal organisations engagement in knowledge valorisation

Societal actor engagement in knowledge valorisation means the involvement of societal representatives and citizens in the processes of planning, knowledge creation, implementation, evaluation and control of research and knowledge-generating initiatives at the European, national and regional levels.

Civic engagement in the R&D policy process largely determines the quality of the policies and, in particular, the social effects of their implementation. Societal engagement is an important dimension of innovation activities and practices, whose task is to make science, technology and innovation more open to stakeholders and society as a whole. Public engagement in R&D contributes to transparency and social sustainability. A continuous commitment to the involvement of societal actors in knowledge uptake is required, which in turn will materialise in the form of better results for the society.

The initiatives applied in the EU to engage societal actors in knowledge valorisation activities vary from more conservative approaches, such as involvement in research projects, to 'open science' types of action. Societal actors are usually involved in the following types of knowledge valorisation initiatives:

- joint research through research projects
- networking and participation in innovative actions
- innovation in cities
- co-creation spaces and living labs
- open science initiatives

1.3 Societal Actor Engagement

Governmental bodies and agencies usually provide administrative and financial support, identify and promote topics with high societal impact, develop guidelines, coordinate initiatives supporting R&I valorisation and facilitate the exchange of information. These authorities are also usually engaged in the monitoring and evaluation of knowledge valorisation activities, but are not likely to be engaged in the transfer and uptake of research results (apart from the use of results to inform decisions and policymaking). Innovative actions can include support for the uptake of innovative solutions and technologies by governmental bodies (policy innovation).

Local authorities, as compared to governmental bodies, are more often engaged in supporting and hosting knowledge valorisation initiatives and in disseminating scientific results to the general public, thus supporting the understanding and involvement of citizens. However, they are less involved in collaborative research than other societal actors such as hospitals, museums and civil-society organisations. Local authorities are usually involved in initiatives targeting municipal/local development and can encompass various topics such as sustainable development, transport, economic development, etc. The initiatives often involve actors such as academia, business, citizens or other societal organisations. Some of these initiatives are supported locally or regionally, while others can be supported through national level programmes.

Table 9: Examples of local authority involvement in the uptake of research results

Initiative	Local authority	Implementing body	Description
Berlin 21	Berlin, Germany	Berlin 21 association	Berlin 21 supports the participation of civil society in the development of a sustainable capital region. More than 30 institutional members and over 60 individual members work together for the further development and continuation of the goals set out in the Berlin Local Agenda 21.
SofiaLab	Sofia Municipality, Bulgaria	Sofia development association	SofiaLab was set up as an urban living lab – a smart city community infrastructure and ecosystem that promotes urban innovations and local development by bringing together the leading actors from public administration, academia, industry and social organisations.
PFR for Cities	Various Polish cities	Polish Development Fund	A programme addressed to city representatives and based on three pillars – education, consulting and financing. The aim of the activities carried out by the Polish Development Fund is to raise awareness about the development of smart cities, to increase the number of innovative solutions in Polish local government and to facilitate access to finance for this type of investment.

Smart Cities	Various Czech cities	Ministry for Regional Development of Czechia	Cooperation between universities and cities in the field of implementation of state-of-the-art digital systems, etc.
Urban mobility labs	Vienna, Graz, Linz/Steyr and Salzburg, Austria	Federal Ministry of Transport, Innovation and Technology, Austria	The Ministry uses urban mobility labs to support experimental environments in which research institutes, companies and citizens can jointly research and test new mobility solutions. Five urban mobility labs located in four urban areas address key issues of local and regional mobility futures. They will support the evolution of Austria's cities into hotspots for future mobility innovation by exploring, testing, implementing and scaling up new solutions.
Platform6	Tampere, Finland	Tampere Start- up Hub	Platform6 was set up by the city of Tampere. It is a co-working space, a home for more than 50 start-ups and a natural meeting place for the start-up community. It is operated by Tampere Start-up Hub, a non-profit organisation for serial entrepreneurs, start-ups and local community builders hosting the Tampere start-up ecosystem under one roof.

The societal actors that take part in collaborative research are hospitals, NGOs, museums and schools/other educational institutions. These organisations are usually actively involved in research activities and use research results, but (to varying degrees) may also be involved in the management of the initiatives.

Table 10: Examples of societal actor involvement in knowledge valorization activities

Initiative	Supporting body	Description
Sparkling Science	Federal Ministry of Transport, Innovation and Technology, Austria	This research programme actively involves schoolchildren in authentic research projects. The scientific institutions are supported to cooperate with educational institutions and, if possible, partners from business and society, to offer pupils an insight into the world of science.
E-learning platform for schools	Government of Flanders, Belgium	The i-Learn programme was launched in September 2019. In close cooperation with Flemish schools and teachers, an online portal was created through which software providers can make their digital applications for personalised learning widely available. Educational technology offers teachers the possibility to create a personalised learning path for each student. After a successful pilot in 12 Flemish schools in 2020–2021, the portal was officially launched on 1 September 2021.
Health Holland	Health Holland, Netherlands	The scheme offers citizen science for health and care. It supports R & I in the fields of health and care, based on the initiative of citizens who collaborate with researchers, healthcare professionals, entrepreneurs and, where relevant, the government. The aim of the programme is to produce creative, innovative and – above all – sustainable solutions based on citizen science. The initiative is jointly managed by representatives of industry, academia and government.
KEHO	Central Finland Health and Wellbeing Ecosystem (KEHO)	KEHO is a platform for cooperation, sharing information and strengthening the bond between operators. KEHO offers a social platform for promoting innovations, developing new ideas, coordinating cooperation and providing systematic information. The partners in the initiatives are research bodies in the area of health and sport, regional administration, the business services unit of the city of Jyväskylä, social welfare centres and the vocational colleague and business association.

Science Museum Group	Science Museum Group, United Kingdom	Science Museum Group is a group of five museums in the United Kingdom. Various initiatives such as the Science Museum Group Academy and research activities enable people to engage with and participate in science, technology, engineering and maths, and to contribute to science and innovation.

Citizen involvement can take the form of citizen science initiatives, in which citizens are involved in scientific work in collaboration with – or under the direction of – scientists and scientific institutions. Citizens are involved in initiatives such as co-creation spaces and living labs, or supporting innovative ideas through crowdfunding. The European Citizen Science Association promotes citizen science and hosts a platform for sharing citizen science projects, resources, tools and training.

Most existing living lab initiatives in EU are members of the European Network of Living Labs. The network promotes the living lab concept globally and enhances user-driven innovation ecosystems.

Citizens are rarely involved at the planning stage of R&I activities, although there are examples of activities that were created on the initiative of citizens or farmers (such as Lisboa Start-up and Innovative Farmers). Citizen involvement usually takes place at the implementation stage, often when they are consulted or take part in research activities. Citizen engagement in the early stages of planning for R&I initiatives is important to ensure that the resulting innovations are meaningful for society and deliver results for citizens.

Table 11: Examples of citizen involvement in knowledge valorisation activities

Initiative	Supporting body	Description
The Lorraine Fab Living Lab	Nancy Sud Lorraine Regional Development Agency	The Lorraine Fab Living Lab is a structure that has been supported since 2009 by the University of Lorraine and Grand Nancy, aiming to develop innovation through citizen collaboration. This makes it possible to pool know-how through collaboration between researchers, universities and citizens, students, researchers, entrepreneurs, designers, etc.
Centre for Citizen Science	Austrian agency for international mobility and cooperation in education,	An information and service centre for scientists, citizens and experts from a range of disciplines that allows interested parties to network with the national and international citizen science

	science and research	community.
Rzeszów Startup Accelerator	Collaborative initiative between the HugeTECH company and the city of Rzeszów, Poland	Supports people who have innovative ideas and are looking to implement them. Provides comprehensive support in the form of a series of training events for individuals preparing to enter the market. For the most promising projects, assistance is provided to obtain financing for further business development.
Innovative farmers	Innovative Farmers network, United Kingdom	Innovative Farmers is a non-profit network of farmers and growers who are running on-farm trials on their own terms. The network was created in 2012. Through the network, groups of farmers can work directly with a researcher to design 'field labs', i.e., on-farm trials that can be set up quickly and are highly practical. The group decides on the topic and the researcher helps design a trial. Field labs can be used for any issue that makes farm businesses more sustainable and resilient. There are over 40 field labs on topics including tomato sensors, potato pests and agroforestry on livestock farms.

Open science initiatives do not seem to be very popular across EU. These activities are usually initiated by academia or professional or sectoral organisations and are rarely supported by national or regional level support schemes.

Access to data is an important enabler of R&I. With this in mind, open science provides opportunities for easier access to data and thus supports knowledge valorisation. The EU open data directive (Directive (EU) 2019/1024) regulates data sharing generated with public funds, in an electronic format that can be easily accessed and used by stakeholders, including citizens. It provides possibilities for citizens and legal entities to use the data to create new, innovative products and services.

Table 12: Examples of open science initiatives

Initiative	Supporting body	Description
COSS	Centre of Open Systems and Solutions, Finland	The Finnish Centre for Open Systems and Solutions is a non-profit association that promotes open source, open data and open standards. Internationally, COSS is known as one of the oldest and most active centres for openness.
UKIM repository	St Cyril and Methodius University, North Macedonia	Open database of St Cyril and Methodius University, Skopje.
CeON Repository	Centre for Open Science, Poland	Repository of the Centre for Open Science, an open-access repository for research output of Polish scholars.

2. INTELLECTUAL PROPERTY IN THE EUROPEAN UNION

2.1 IPR Definitions, Regulations & Directives

Intellectual property includes all exclusive rights to intellectual creations. It encompasses two types of rights:

- **Industrial property**, which includes inventions (patents), trademarks, industrial designs and models and designations of origin, and
- **Copyright**, which includes artistic and literary property

Since the entry into force of the Treaty on the Functioning of the European Union (TFEU) in 2009, the EU has had explicit competence for intellectual property rights (Article 118).

Although governed by different international and national laws, intellectual property rights (IPR) are also subject to EU legislation. Article 118 TFEU provides that in the context of the establishment and functioning of the single market, Parliament and the Council, acting in accordance with the ordinary legislative procedure, establish measures for the creation of EU intellectual property law in order to provide uniform protection of IPR throughout the EU, and for the setting-up of centralised, EU-wide authorisation, coordination and supervision arrangements. The legislative activity of the EU consists chiefly of harmonising certain specific aspects of IPR through the creation of its own system, as is the case for the EU trademark and design, and as will be the case for patents. Many of the EU instruments reflect the Member States' international obligations under the Berne and Rome Conventions, as well as under the World Trade Organization Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and the 1996 World Intellectual Property Organization (WIPO) international Treaties.

While analysing the national regulations governing the intellectual property rights system, it is worth mentioning that in the European Union, there are areas of the IPR which are harmonised on the European level. Moreover, some of the IPR fields are unified across the member states. Such a situation is a consequence of the EU's shared competence (shared with member states) to pass laws concerning single market. Harmonization, or even further unification, of certain aspects of intellectual property protection, is crucial to enable proper functioning of the internal market.

Certain intellectual property rights, such as designs, patents and trademarks, exist on the national level, as well as on the European level in the form of a unitary right that covers the whole UE territory or, in the case of the unitary patent, the territory of the countries that are signatories of a Agreement on a Unified Patent Court.

Harmonization of the national laws is done via issuing directives that set goals for the Member States to be achieved. The legal instruments implemented by the countries to reach the set goals are left to the discretion of national legislators. As a consequence, certain aspects of IPR are aproximated across EU Member States, even though each of them implement the European standards autonomously.

The main acts harmonizing national laws that are important from the commercialization process perspective:

- Copyright:
  - *Directive 2001/29/EC* of the European Parliament and of the Council of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society;
  - *Directive 2009/24/EC* of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs;
  - *Directive 2006/116/EC* of the European Parliament and of the Council of 12 December 2006 on the term of protection of copyright and certain related rights;
  - *Directive 2006/115/EC* of the European Parliament and of the Council of 12 December 2006 on rental right and lending right and on certain rights related to copyright in the field of intellectual property;
  - *Directive (EU) 2019/790* of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC;
  - *Directive 2000/31/EC* of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market.
- Designs:
  - *Directive 98/71/EC* of the European Parliament and of the Council of 13 October 1998 on the legal protection of designs;
- Trademarks:
  - *Directive (EU) 2015/2436* of the European Parliament and of the Council of 16 December 2015 to approximate the laws of the Member States relating to trademarks;

- Databases:
  - *Directive 96/9/EC* of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases,
- Patents:
  - *Directive 98/44/EC* of the European Parliament and of the Council of 6 July 1998 on the legal protection of biotechnological inventions
- Plant varieties:
  - *Directive 2002/53/EC* of 13 June 2002 on the common catalogue of varieties of agricultural plant species;
  - *Directive 2002/54/EC* of 13 June 2002 on the marketing of beet seed;
  - *Directive 2002/55/EC* of 13 June 2002 on the marketing of vegetable seed;
  - *Directive 2002/56/EC* of 13 June 2002 on the marketing of seed potatoes;
  - *Directive 2002/57/EC* of 13 June 2002 on the marketing of seed of oil and fibre plants;
  - *Directive 66/401/EEC* of 14 June 1966 on the marketing of fodder plant seed;
  - *Directive 66/402/EEC* of 14 June 1966 on the marketing of cereal seed.
- IPR enforcement:
  - *Directive 2004/48/EC* of the European Parliament and of the Council of 29 April 2004 on the enforcement of intellectual property rights.

In the areas that require full unification, the EU adopts regulations. A regulation is a legislative act that is directly applicable in all Member States and binds in its entirety. Regulations apply automatically on the territory of the Member States, which do not have to take any further steps to ensure their entrance into force.

List of EU Regulations in the field of IPR:

- Trademarks:
  - Regulation (EU) 2017/1001 of 14 June 2017 on the European Union trade mark;
- Designs:

- Regulation (EC) No 6/2002 of 12 December 2001 on Community designs;

- Patents:
  - Regulation (EU) No 1257/2012 of 17 December 2012 implementing enhanced cooperation in the area of the creation of unitary patent protection;
  - Regulation (EC) No 469/2009 of 6 May 2009 concerning the supplementary protection certificate for medicinal products;
  - Regulation (EC) No 1610/96 of 23 July 1996 concerning the creation of a supplementary protection certificate for plant protection products;

- Plant variety:
  - Regulation (EU) No 1257/2012 of 17 December 2012 implementing enhanced cooperation in the area of the creation of unitary patent protection;
  - Regulation (EC) No 1610/96 of 23 July 1996 concerning the creation of a supplementary protection certificate for plant protection products
  - Regulation (EC) No 2100/94 of 27 July 1994 on Community plant variety rights;

- Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Speciality Guaranteed (TSG):
  - Regulation (EU) No 1151/2012 of 21 November 2012 on quality schemes for agricultural products and foodstuffs.

- IPR & competition:
  - Commission Regulation (EU) No 316/2014 of 21 March 2014 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of technology transfer agreements Text with EEA relevance.

2.2 EU framework for R&D&I results transfer

The European Union fosters R&D&I activities through the development of various recommendations and policies. In this report, it is important to highlight the following documents:

- Communications:

- Communication from the Commision Framework for State aid for research and development and innovation (2022/C 414/01);
- Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - A new ERA for Research and Innovation (COM(2020) 628);

➢ Recommendations:

- Commission Recommendation of 10 April 2008 on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organisations (notified under document number C(2008) 1329);

➢ Other relevant documents:

- Commission Recommendation (EU) 2023/499 of 1 March 2023 on a Code of Practice on the management of intellectual assets for knowledge valorisation in the European Research Area;
- European Research Area Policy Agenda – Overview of actions for the period 2022-2024;
- Strategic Plan 2020-2024 DG Research and Innovation.

2.3 Trademarks, designs and models

In the EU, the legal framework for trademarks is based on a four-tier system for trademark registration, which coexists with national trademark systems harmonised by means of the Trademark Directive (Directive (EU) 2015/2436 of 16 December 2015 to approximate the laws of the Member States relating to trademarks). In addition to the national route, possible routes to trademark protection in the EU are the Benelux route, the EU trademark, introduced in 1994, and the international route. Regulation (EU) 2017/1001 of 14 June 2017 on the European Union trademark (the EU Trademark Regulation) codifies and replaces all earlier EC regulations on the EU trademark. The codification was carried out in the interests of clarity, given that the EU trademark system had already been substantially amended several times. The EU trademark has a unitary character and equal effect throughout the EU. The European Union Intellectual Property Office (EUIPO) is responsible for managing the EU trademark and design. The EU Trademark Regulation also sets the fee amounts payable to EUIPO. They are fixed at a level which ensures that the revenue they

produce covers EUIPO's expenses and that they complement the existing national trademark systems.

Directive 98/71/EC of 13 October 1998 approximated national legislation on the legal protection of designs and models. A proposal for a recast directive was put to the vote in the European Parliament on 14 March 2024. It aims to ensure that the design protection system is adapted to the digital age (in particular to the advent of 3D printers) and becomes significantly more accessible and effective for independent designers, small and medium-sized enterprises and industries where designs play a major role, by lowering costs, simplifying procedures – making them faster and more predictable – and increasing legal certainty. Council Regulation (EC) No 6/2002 of 12 December 2001 (amended) instituted a Community system for the protection of designs and models. On 14 March 2024, the European Parliament adopted a legislative resolution on the proposal for a regulation amending Council Regulation (EC) No 6/2002 and repealing Commission Regulation (EC) No 2246/2002, for the same purpose of ensuring that the design protection system is adapted to the digital age and to improve the accessibility, effectiveness and affordability of the design protection systems, by simplifying procedures and optimising the level and structure of fees payable. Council Decision 2006/954/EC and Council Regulation (EC) No 1891/2006, both of 18 December 2006, linked the EU system for the registration of designs or models to the international registration system for industrial designs and models of WIPO.

2.4 Copyright and related rights

Copyright ensures that authors, composers, artists, filmmakers and others receive payment and protection for their work. Digital technologies have profoundly changed the way creative content is produced, distributed and accessed. EU copyright legislation consists of 13 directives and two regulations which harmonise the essential rights of authors, performers, producers and broadcasters. By setting some EU standards, national discrepancies are reduced, a level of protection required to foster creativity and investment in creativity is ensured, cultural diversity is promoted and access for consumers and businesses to digital content and services across the single market is facilitated.

a) Copyright

Directive 2001/29/EC of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society adapted legislation on copyright and related rights to technological developments, but is out of pace with the extraordinarily fast developments that have taken place in the digital world, such as the distribution of and access

to television and radio programmes, with 49% of internet users in the EU accessing music, audiovisual content and games online (Eurostat estimate). Harmonised copyright legislation across the EU for consumers, creators and companies is therefore necessary.

The EU Copyright Directive (Directive (EU) 2019/790) of 17 April 2019 provides for an ancillary copyright for press publishers and fair remuneration for copyrighted content. So far, online platforms have had no legal responsibility for using and uploading copyrighted content on their sites. The new requirements will not affect the non-commercial upload of copyrighted works to online encyclopedias such as Wikipedia. Directive (EU) 2019/789 (the CabSat Directive) was adopted on the same day and aims to increase the number of TV and radio programmes available online to EU consumers. Broadcasting organisations are increasingly offering online services in addition to their traditional broadcasts, as users expect to have access to television and radio content at anytime, anywhere. The directive introduces the country of origin principle to facilitate the licensing of rights for certain programmes that broadcasters offer on their online platforms (e.g. simulcasting and catch-up services). Broadcasters have to obtain copyright permissions in their EU country of establishment (i.e. country of origin) in order to make radio programmes, television news and current affairs programmes, and fully financed own productions available online in all EU countries. Member States had until 7 June 2021 to pass appropriate legislation to meet the directive's requirements.

Directive (EU) 2017/1564 of 13 September 2017 on certain permitted uses of certain works and other subject matter protected by copyright and related rights for the benefit of persons who are blind, visually impaired or otherwise print-disabled facilitates access to books and other print material in appropriate formats and their circulation in the single market.

Regulation (EU) 2017/1128 of 14 June 2017 on cross-border portability of online content services in the internal market aims to ensure that consumers who buy or subscribe to films, sports broadcasts, music, e-books and games can access them when they travel to other EU Member States.

b) Term of protection of copyright and related rights

These rights are protected for life and for 70 years after the death of the author/creator. Directive 2011/77/EU amending Directive 2006/116/EC on the term of protection of copyright and certain related rights extended the term of copyright protection for performers of sound recordings from 50 to 70 years after recording, and for authors of music, such as composers

and lyricists, to 70 years after the author's death. The term of 70 years has become an international standard for the protection of sound recordings. Currently 64 countries around the world protect sound recordings for 70 years or longer.

c) Computer programs and databases

Directive 91/250/EEC required Member States to protect computer programs, by copyright, as literary works under the Berne Convention for the Protection of Literary and Artistic Works. It was codified by Directive 2009/24/EC. Directive 96/9/EC (the Database Directive) provides for the legal protection of databases, defining a database as 'a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means'. The directive stipulates that databases are protected both by copyright, which covers intellectual creation, and by a sui generis right protecting investment (of money, human resources, effort and energy) in obtaining, verifying or presenting content. On 23 February 2022, the Commission presented a proposal for a new regulation on harmonised rules on fair access to and use of data (the data act) aimed at ensuring fairness in the allocation of value from data among actors in the data economy and at fostering access to and the use of data. After intensive legislative work supported by academic research, on 9 November 2023 Parliament's plenary adopted at first reading a position on this proposal. On 30 May 2022, Parliament and the Council adopted the Data Governance Act, which introduces mechanisms to facilitate the reuse of certain categories of protected public sector data, increase trust in data intermediation services and foster data altruism across the EU.

d) Collecting societies

A licence must be obtained from the different holders of copyright and related rights before content protected by such rights may be disseminated. Rights holders may entrust their rights to a collecting society, which manages those rights on their behalf. Unless a collective management organisation has justified reasons to refuse management, it is obliged to manage these rights. Directive 2014/26/EU on collective management of copyright and related rights and multi-territorial licensing of rights in musical works for online use in the internal market lays down requirements for collective management organisations, with a view to ensuring high standards of governance, financial management, transparency and reporting. It aims to ensure that rights holders have a say in the management of their rights and envisages a better functioning of collective management organisations by means of EU-wide standards. Member States must ensure that collective management organisations act in the best interests of the rights holders whose rights they represent.

2.5 Patents

A patent is a legal title that can be granted to any invention having a technical character, provided that it is new, involves an inventive step and could have an industrial application. A patent gives the owner the right to prevent others from making, using or selling an invention without permission. Patents encourage companies to make the necessary investment in innovation, and provide an incentive for individuals and companies to devote resources to research and development. In Europe, technical inventions can be protected either by national patents granted by the competent national authorities, or by European patents granted centrally by the European Patent Office. The latter is the executive branch of the European Patent Organisation, which now has 39 contracting states. The EU itself is not a member of this organisation.

After years of discussions among the Member States, Parliament and the Council approved the legal basis for a European patent with unitary effect (unitary patent) in 2012. An international agreement between the Member States thus set up a single and specialised patent jurisdiction.

The Court of Justice's (CJEU's) confirmation of the patent package in its judgment of 5 May 2015 in cases C-146/13 and C-147/13 cleared the way for a truly European patent. The previous regime coexists with the new system with transitory measures in place.

Since entering into force on 1 June 2023, the EU unitary patent, which is granted by the European Patent Office, has provided uniform protection with equal effect in all participating EU countries. Businesses will have the option of protecting their inventions in all EU Member States with a true EU patent. They will also be able to challenge and defend unitary patents in a single court action through the newly created Unified Patent Court (UPC). This will streamline the system and save on translation costs. The UPC Agreement (UPCA) provides that the primacy of EU law must be respected (Article 20 of the UPCA) and that the decisions of the CJEU are binding on the UPC. The UPC is a court that is currently common to 17 EU Member States. It is made up of a Court of First Instance, a Court of Appeal and a Registry. The Court of First Instance has a decentralised structure and comprises a central division in Paris with a section in Munich, as well as various regional and local divisions all over Europe. The Court of Appeal has its seat in Luxembourg and decides on appeals against decisions of the Court of First Instance and on requests for the rehearing of final decisions of the Court.

2.6 Trade secrets

The practice of keeping business information (know-how) confidential goes back centuries. Legal instruments to protect trade secrets, whether or not defined as part of IPR, exist in many countries. The level of protection afforded to confidential information cannot be compared to other areas of intellectual property law such as patents, copyrights and

trademarks, but can, in principle, apply indefinitely, rather than for a limited period only. The protection of trade secrets varies more from country to country than other areas of IPR law, and can be even more advantageous and cheaper than seeking formal patent protection. Since 2016, an EU legal framework has existed, namely Directive (EU) 2016/943 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure.

2.7 IPR for plant varieties

Plant variety protection, also called the 'plant breeder's right', is a form of IPR granted to the breeder of a new plant variety. The EU's system of protection for plant varieties, based on the principles of the 1991 Act of the International Convention for the Protection of New Varieties of Plants, contributes to the development of agriculture and horticulture. A system for the protection of plant variety rights was established by EU legislation. The system allows IPR to be granted for plant varieties. The Community Plant Variety Office implements and applies this scheme.

2.8 Geographical indications (GI)

Under the EU's agricultural IPR system, names of products registered as having a geographical indication are legally protected against imitation and misuse within the EU and in non-EU countries with which a specific protection agreement has been signed. Product names can be granted a geographical indication if they have a specific link to the place where the product is made. This recognition enables consumers to trust and distinguish quality products while also helping producers to market their products better. Recognised as intellectual property, geographical indications are playing an increasingly important role in trade negotiations between the EU and other countries. Regulation (EU) 2024/1143 of 11 April 2024 of the European Parliament and of the Council on geographical indications for wine, spirit drinks and agricultural products, as well as traditional specialities guaranteed and optional quality terms for agricultural products, identifies products that have qualities, characteristics or a reputation due to natural and human factors linked to their place of origin. Products that are under consideration or that have been granted GI recognition are listed in GI registers. On 12 September 2023, Parliament adopted its position on a similar regulation of the European Parliament and of the Council on geographical indication protection for craft and industrial products and amending Regulations (EU) 2017/1001 and (EU) 2019/1753. Regulation (EU) 2023/2411 of 18 October 2023 gives geographical indications for industrial products that can be associated with their geographical area of production (such as Albacete knives, Bohemian glass and Limoges porcelain) protection similar to that given to regionally produced food or beverages.

At international level, Council Decision (EU) 2019/1754 of 7 October 2019 on the accession of the European Union to the Geneva Act of the Lisbon Agreement on Appellations of Origin and Geographical Indications designates EUIPO as the competent authority in relation to geographical indications.

2.9 Combating counterfeiting

According to estimates, imports of counterfeit and pirated goods into the EU amount to approximately EUR 85 billion (up to 5% of total imports). Worldwide, trade in pirated goods accounts for as much as 2.5% of trade and is worth up to EUR 338 billion, which causes significant damage to rights holders, governments and economies.

As differences in national systems for penalising counterfeiting and piracy were making it difficult for Member States to combat those offences effectively, Parliament and the Council adopted Directive 2004/48/EC on the enforcement of intellectual property rights as a first step. It aims to step up the fight against piracy and counterfeiting by approximating national legislative systems to ensure a high, equivalent and homogeneous level of intellectual property protection in the single market and provides for measures, procedures and compensation under civil and administrative law. Regulation (EU) No 608/2013 concerning customs enforcement of intellectual property rights provides procedural rules for customs authorities to enforce IPR with regard to goods liable to customs supervision or customs checks.

3. THE INNOVATION ECOSYSTEM OF GREECE

3.1 Introduction

The Greek innovation ecosystem consists mainly of the core dimensions of Research & Technological Development and Innovation. The Research and Technological Development (R&TD) dimension is directly linked to the production of new knowledge through the use of scientific and technical methods, but also to the adaptation and application of new knowledge to the environment in which it is used. In addition to increasing the stock of scientific and technological knowledge, the aim of this activity is the economic and productive exploitation of research results (valorization of research) as well as addressing contemporary challenges (social, environmental, health, etc.) that may have a national, regional and/or global dimension.

As regards the Innovation dimension, it is carried out either through the exploitation of research results or ideas arising from professional and business practice and the very functioning and activity of the various enterprises (existing and emerging, large and small) and public and social sector organizations (public administration, local government, non-profit organizations, etc.). The development, diffusion and uptake of innovations is not limited to the high-tech sectors but also to the medium and low-tech sectors and to services.

3.2 Challenges to be addressed

The analysis of the Greek innovation ecosystem focuses on the two key dimensions mentioned, namely Research & Technological Development and Innovation, by presenting the challenges facing the country today as well as the strengths and progress made in recent years in each of these two dimensions. In more detail, the challenges facing the Greek innovation ecosystem are as follows:

- The persistence of the long-standing problem of low spending by the public sector and even more so by the business sector, despite the progress made in recent years.
- There is no stable, predictable and adequate flow of funding for basic research with specific strategic priorities and no systematic evaluation of the bodies conducting such research.
- There is a lack of coordination between the sources of research funding (several different Ministries, Hellenic Foundation for Research and Innovation (HFRI), National Strategic Reference Framework (NSRF), etc.) which leads to their fragmentation.

- There is a high degree of red tape in the various bodies involved in the funding of research activity (e.g. In the case of the Special Account for Research Funds), this concerns regulations, specific laws and provisions which impede the research project.
- Unrenewed and under-enriched human resources in the Greek research system, due to the significant lack of attraction of foreign researchers, the one-way 'brain drain' of Greek researchers abroad and the low level of mobilisation and exploitation of distinguished Greek scientists in the diaspora.
- Low utilization of the high-level equipment of many research institutes, both by the productive sector and by researchers from universities and other research institutions in Greece and abroad.
- Low cooperation between universities and research centres for research and training purposes (e.g. internships).
- Lack of strategic plans for the development of innovation by enterprises, leading to limited demand for innovative technological services by public research bodies.
- Despite the significant increase in R&D expenditure by enterprises in recent years in Greece, they remain very small or small in size with limited technological expertise, which greatly affects the level of innovation in the country.
- Greek enterprises use technology as a "ready-made commodity" and do not invest in the development and absorption of know-how through R&D activities, technological partnerships with academic and research institutions, which is also reflected in the low number of applications for patents and design patents.
- Significantly lagging behind enterprises in organisational innovation based on the use of information and communication technologies (ICT) and Industry 4.0 technologies.
- Many start-ups maintain their small business model with little interest in growth, so the resources invested in innovation are limited, fragmented and often insufficient to improve their competitive position.
- Difficulty in accessing finance and lack of a long-term strategy for firms to develop innovations resulting in fragmented investments.
- Low degree of adoption of functional specifications that allow needs to be met by developing alternative (and potentially innovative) solutions.
- Limited use of public procurement as a tool to stimulate demand for the development of innovative goods and services by the business sector.

- Lack of planning for the exploitation of the research results from the participation of operators in research projects.
- The apparent focus of excellence teams on European rather than national programmes, which limits cooperation with and the transfer of technology and know-how to domestic firms.
- Business accelerators coming from the private sector rather than organised technology transfer offices.
- Lack of funding for the creation of intermediate innovation support bodies to bridge the technology transfer gap and support the systematic flow of results and information from research actors to business.
- Low number of new PhD students in the STEM fields in Greece and insufficient internationalisation and extroversion of higher education.
- A high mismatch between the qualifications of the employed and labour market requirements, due to low job creation in knowledge-intensive sectors and the fact that the demand for specific qualifications from the labour market is not adequately met by the supply of skills and knowledge (e.g. soft skills) as defined through training programmes (especially at universities).
- Unsatisfactory investment by Greek enterprises in continuing vocational training and digital skills development programmes (21.7% of enterprises compared to the EU average of 72.6%).
- Low level of networking and cooperation between enterprises and universities/research bodies for knowledge exchange, exploration of new business opportunities and economic exploitation of research results, due to the long-standing lack of relevant mechanisms.
- Low levels of cooperation, such as networks of enterprises and clusters of enterprises, which are important tools for creating the right conditions for the development and innovation of SMEs in particular.
- Lack of a critical mass of innovation links of Greek enterprises to external knowledge sources from other innovation systems, with the participation of Greek enterprises in international value chains being a typical example which is marginal.
- Lack of a structured strategy to promote 'academic entrepreneurship' by most of the country's universities and lack of adequate mechanisms to exploit research results.

- The existence of significant factors that inhibit the entrepreneurial culture, such as: high bureaucracy and complexity of the legal framework, unstable tax framework, difficulty in finding bank financing, but also a controversial prevailing entrepreneurial culture that does not favour entrepreneurial risk-taking.

3.3 Strengths and points to be improved in recent years

However, despite the challenges facing the Greek innovation ecosystem, the strengths and improvements in the dimensions of Research & Technological Development and Innovation that have taken place in the country in recent years are significant. In more detail, the strengths and areas for improvement of the Greek ecosystem in Greece are summarised as follows:

- Significant increase in R&D appropriations (nearly double) in the state budget since 2017, resulting in the country being ranked 3rd among EU members in 2021 in terms of the share of government R&D appropriations in GDP. A significant role in this increase was played by the Public Investment Programme for specific research projects as well as the introduction of funding of public bodies mainly from the regular budget, which since 2014 has been steadily increasing.

- Enhancing the R&D investment expenditure of enterprises through the introduction of tax incentives by Law 4172 in 2013, reinforced in 2020 by Law 4712.

- Increase the rate of over-reimbursement of research expenditure from 30% to 100% and introduce a procedure for offsetting the automatic reimbursement of pharmaceutical expenditure with percentages of research and development expenditure and expenditure on investment plans for the development of products, services or production lines.

- Establishment of the Hellenic Foundation for Research and Innovation (HFRI) in 2016 and design of the National Recovery and Resilience Plan «Greece 2.0 ».

- A remarkable long-term active Greek presence of the national research system, mainly through the largest universities and research centers, in competitive European research programs (seven FP1-FP7 Framework Programmes and Horizon 2020 Programmes) during the last 38 years (1984-2022), as well as Greece's better performance than the EU average in terms of the success rate of proposals in most individual Horizon 2020 programs.

- Increasing the scientific output of Greek research groups, both in terms of the number of publications (from 15,356 in 2018 to 18,557 in 2020), and in terms of their international reach. In particular, Greece has significantly increased the share of

scientific publications, ranking them in the top 10% of publications with the most citations worldwide, while co-publications with researchers from foreign institutions have also increased significantly.

- Creation of 28 new research infrastructures of national scope with funding from the Operational Programme Competitiveness, Entrepreneurship and Innovation 2014-2020 (EPAnEK).
- Existence of high-level equipment in many research institutes and opportunity to maintain and upgrade them through funding from the NSRF 2021-2027 and funding from the Action «Creation - Expansion - Upgrading of the Infrastructures of the Research Centers supervised by the General Secretariat for Research and Innovation (GSRTD)» under the National Recovery and Resilience Plan «Greece 2.0 ».
- Significant increase in enterprises undertaking some form of innovation, coming from traditional industries and having accumulated a wealth of knowledge through business and professional practice.
- Establishment and financing of Technology Transfer Offices in Universities and Research Centres for the economic and social exploitation of their research results, as well as the creation of 11 Capacity Centres, aiming to bridge the gap between supply and demand of specialised innovation and technology transfer services in one or more of the thematic areas of the National Smart Specialization Strategy.
- Significant actions to support R&D and networking of enterprises and their other stakeholders in the Research, Technological Development and Innovation system through the «Research-Create-Innovate» action in the framework of the NSRF 2014-2020, whose evolution is the «Research-Innovate 2021-2027» action.
- Financing of actions such as Innovation Clusters to support emerging and/or existing collaborative formations of enterprises and bodies aimed at developing and exploiting innovative products and services of high added value.
- Increasing the number of SMEs working with other enterprises or organisations on innovation activities and increasing public/private partnerships.
- Strong and long-standing networking of many Greek universities and research centres with important European organisations, making them bridge-builders for the transfer of know-how to Greek enterprises and important hubs for the development of regional innovation systems.

- Significant increase in Foreign Direct Investment (FDI) inflows into the country, especially after 2014 (e.g. Tesla Greece, TeamViewer hub, Pfizer digital hub, etc.), which can enhance both the creation of a critical mass of networks and R&D.
- Creation of two «Innovation Districts» in the major Greek metropolitan areas. More specifically, the CHROPEI facilities in Piraeus and ThessIntec in Thessaloniki are expected to attract co-location and co-creation between public research laboratories, start-ups and corporate R&D departments as well as foreign direct investment and innovation-supporting financial institutions.
- Increasing the number of start-ups developing new innovative products and services, particularly since the outbreak of the Great Recession, and boosting the export of knowledge-intensive services, thus creating an ecosystem of new knowledge-intensive ventures characterised by an outward-looking attitude, growth prospects, business-to-business (B2B) services and the absorption of significant venture capital funding.
- Establishment of the «Elevate Greece» National Registry of Start-ups with the aim of fully capturing the start-up ecosystem in the country, providing them with specialised incentives and enhancing their extroversion.
- Simplification and clarification of the institutional framework for the establishment and operation of spin-offs through the implementation of the recent Law 4864 in 2021.
- Significant initiatives in the field of intellectual property such as the establishment of the newly established Hellenic Industrial Property Academy (HIPA) for the certification of specialized patent advisors.
- Improving the financing of innovative projects at all stages of business maturity, through grants and tax rebates (NSRF, Development Law), soft loans and guarantees, as well as through specialised mechanisms (venture capital, etc.) supported by European and national resources.

3.4 Intellectual Property at National Level

3.4.1 Copyright and Industrial Property Agreements

In Greece, the legal status of inventions and patents is governed mainly by Law 1733/1987 on the «transfer of technology, inventions and technological innovation», by the Ministerial Decision on the «Filing of applications for the grant of patents or utility model

certificates with the Hellenic Industrial Property Organisation (HIPO) O.B.I. and keeping of record books» (31/12/1987) and, finally, by Law 2121/1993 on «Copyright, Related Rights and Cultural Matters». The body on which the system of protection of inventions in Greece is based is the Hellenic Industrial Property Organisation (HIPO), which is a legal entity governed by public law under the supervision of the Ministry of Development.

A. Intellectual Property

According to Article 8 of Law No 2121/1993, in the case of works created by employees in the execution of an employment contract, initial holder of the economic and moral rights in the work shall be the author of the work. Unless provided otherwise by contract, only such economic rights as are necessary for the fulfilment of the purpose of the contract shall be transferred exclusively to the employer. The economic right on works created by employees under any work relation of the public sector or a legal entity of public law in execution of their duties is ipso jure transferred to the employer, unless provided otherwise by contract. Therefore, a project created by researchers in the context of their contractual relationship with the research organisation is therefore owned by the research organisation, which has all the property rights in the project, i.e. the exploitation rights. However, according to Article 4 of Law 2121/1993, the moral right, i.e. the recognition of the author, belongs to the researchers. This is because the moral rights shall be independent from the economic rights and shall remain with the author even after the transfer of the economic rights.

Work created outside the execution of an employment contract is primarily owned by the researcher. As regards intellectual property rights, there are three (3) ways of exploiting them as defined in Article 13 of the Intellectual Property Law 2121/1993:

(a) The researcher/inventor may transfer his property rights in the work to a third party, i.e. the spin-off.

(b) The researcher/inventor may draw up contracts by which he entrusts to the contractor (to the spin-off) and the latter undertakes to exercise the powers deriving from the proprietary right (exploitation contracts).

(c) The researcher/inventor of the work may allow someone else (the spin-off) to exercise powers deriving from his proprietary right (exploitation licences).

In any case, he shall retain the right to acknowledge authorship and to decide the time, place and manner in which the work is to be made available to the public (publication) and to prohibit any distortion, cutting or other modification of his work, as defined in Article 4 of Law 2121/1993. Where the project is owned by several researchers, they should all agree to exploit it.

B. Patent

Research can lead to invention. Article 6 of Law 1733/1987 on the transfer of technology, inventions and technological innovation defines the three (3) types of inventions:

a) **«Independent invention»:** An invention carried out by a private independent inventor, without the means of the employer, and wholly owned by him.

b) **«Service invention»:** is the outcome of a contractual relation between the employee and the employer for the development of inventive activity. In case that a service invention is accomplished, the employee shall have the right to request an additional reasonable recompense if the invention is particularly profitable to the employer. The rights to the invention belong entirely to the employer. In order for an invention to be classified as a service invention, it must be the result of a contract between an employer and an employee. It is irrelevant whether the contract is a contract for employment or an independent service contract.

c) **«Dependent invention»:** is the invention made by an employee with the use of materials, means or information of the enterprise in which he/she is employed. In this case, the invention is owned 40% by the employer and 60% by the inventor or group of inventors who made it. The inventor of the dependent invention shall without neglect notify in writing the employer on the accomplishment of the invention and shall give the necessary data for the filing of a joint patent application. If the employer does not answer in writing within four months form said notification to the employee that he is interested in jointly filing the patent application, the said application shall be filed by the employee only and in this case the invention belongs entirely to the employee.

3.4.2 Framework of Know-how Transfer Agreements

According to Article 23 of Law 2741/1999 (Government Gazette 199 A) the research results and knowledge produced in research centres, educational institutions, enterprises or other organisations in Greece and abroad can be put to economic use in various ways, in particular:

a) Direct commercial exploitation through the production and distribution of products or the provision of services by the same body as the one in which the knowledge is produced. Where the body is a higher education institution, the activities may be undertaken by its asset management companies.

b) Assignment of commercial exploitation with the provision by the knowledge production body of a license for commercial exploitation of the knowledge, against a

portion determined by an assignment agreement to another organization or business of any kind.

c) Establishment or participation in exploitation undertakings, either by the knowledge producer setting up a subsidiary undertaking of whatever form for the commercial exploitation of the same, or by the knowledge producer participating in a joint exploitation activity with other organisations or undertakings.

d) Technological undertakings of scientists, technologists and researchers by the creation of a business activity by natural persons who have produced commercially exploitable knowledge, in which the body in which the knowledge has been produced may participate in any way, as well as third natural or legal persons.

e) Coordination of two or more of the above or otherwise.

A presidential decree, drawn up on a proposal from the Ministers for Economic Affairs and Development, shall lay down the economic and financial incentives to be granted, the beneficiaries and the costs to be subsidised, the conditions and procedure for covering the costs of the beneficiaries financed, the control, suspension and reimbursement of payments, in accordance with the provisions of the Public Revenue Code, the manner in which knowledge and research exploitation undertakings are set up and the framework in which they operate, the ownership regime, the rules on ethics and competition, conflicts of interest and any other necessary details.

3.4.3 Framework of Spin-offs

The term spin-off refers to companies whose object is the commercial exploitation of intellectual property (rights or patent applications) or scientific knowledge, technology and research results of the academic and research staff of Research Organisations. It may take one of the following forms: Limited Liability Company (LLC), Public Limited Company (PLC) or Private Equity Company (PEC).

The exploitation of research results and know-how is aimed at transforming them into Technologically Innovative Products (goods and services) or Technologically Innovative Processes.

They are set up by members of the academic or research staff of Research Organisations, with or without the participation of third parties, and are spin-offs and are required by law to be set up with a licence granted by the Research Organisation itself. Research organisations are defined as public or private research centres and higher education institutions (HEIs).

These companies are called upon to fill the gap between the production of innovative knowledge by a research organisation and the promotion of the new knowledge in

production, while researchers are called upon to take on the entrepreneurial risk, in cooperation with the body within which the innovative knowledge was produced, by transforming it into a produced product or service and by carrying out the necessary commercial exploitation activities themselves.

The successful promotion of spin-offs is a combination of many factors, some of which relate to the amounts of funding available to the regions and regional institutions, business practices and legislation, as well as government cooperation programmes in the field of research and development. The spin-offs of research organisations appear innovative and dynamic, replicating their high technology and incorporating the features of the 'knowledge economy'. Today, spin-offs generate significant knowledge surplus value, so that they are inevitably conduits for technology transfer, financing and management of development and technology resources, eventually catching the attention of larger companies.

Establishment Process and Institutional Framework of a Spin-off

The establishment of a spin-off requires the submission by the researchers concerned of an application for establishment to the relevant Rector's Council of the HEI or the Board of the Research Centre or any other research organization, which shall approve, inter alia, the draft of the spin-off contract, i.e. the contract to be concluded between the research organization and the spin-off to regulate the relationship between them, as contained in the opinion of the respective Research Committee of the HEI or the Technology Transfer Office or of any corresponding competent Technical Service of the Research Centers and other organizations.

The decision to establish shall be adopted by the abovementioned decision-making body no later than four (4) months after the submission of the application, otherwise it shall be deemed to have been approved. Where applications for the registration of industrial property rights are pending for the exploitation of research results, the research organization shall, together with the co-researchers, submit the requisite applications for registration before the relevant decision on the establishment of the spin-off is taken. The founders/partners must set up the spin-off within six (6) months of the adoption of the approval decision, otherwise, in the event of an unsuccessful expiry of the deadline, a new application is required.

It also envisages the possibility of setting up a joint spin-off with the participation of more researchers from different research organizations. In this case, the request for establishment shall be submitted to the competent body of the organization to which the researcher belongs by drawing up a joint draft of a spin-off contract and shall specify the percentage of ownership of each research organization in the intellectual property rights assigned to the spin-off. This contract shall be concluded as a single contract between the spin-off or its founders/partners

on the one hand and the research organizations from which the researchers/partners come from on the other.

Spin-offs may have their registered office in Greece or in another State, provided that they establish in Greece a branch or office or other establishment recognized by the tax legislation in Greece as a permanent establishment. The head office may be transferred after the establishment to another State if a branch or office or other establishment recognized by the tax legislation in Greece is maintained in Greece.

Contract for a Spin-off

Within the six-month time limit for setting up the spin-off starting from the adoption of the approval decision, the research organization shall sign the spin-off contract with the founding partners, acting on behalf of the spin-off to be set up, on the basis of the approved draft establishment decision. The agreement is concluded with the purpose of establishing the spin-off and with the provision that the agreement will enter into force immediately after its establishment, in which case the spin-off becomes a party automatically. The term of the contract shall be fixed and, unless otherwise specified, shall be for a period of 10 years.

This contract lays down the conditions for the exploitation of the intellectual property rights of the research organization by the spin-off. In particular, it lays down, inter alia, the conditions for granting exclusive or non-licensed exploitation and/or transfer of intellectual property rights related to research results (or rights on applications for intellectual property rights in such research results), the remuneration paid by the spin-off to the research organization, as well as other duties of good faith and information, any additional licensing agreements, etc.

If the research results to be exploited are covered by intellectual property rights owned or co-owned by researchers, the contract of the spin-off shall also include the third-party contractors and the researchers entitled to those intellectual property rights in order to undertake the obligation to grant the aforementioned license on the intellectual property rights. If a researcher is both the holder of an intellectual property right and a co-founder, the researcher shall contribute in both capacities, with corresponding provisions in the contract.

Right to participate in Spin-offs

Interested researchers may join the spin-off as founding partners, enter as partners after its establishment, or become executive board members of the spin-off. It is also possible to conclude a project contract between the spin-off and any researcher of the research organization for the purpose of carrying out a research activity of the spin-off.

In a joint venture, both the research organization and third parties, natural or legal persons, may become partners, either at the time of its formation or subsequently by the transfer of shares by partners or by participating in an increase in the share capital. In the case of joint stock companies or other types of companies with a sole purpose of business participation, a shareholders' or partners' agreement must be concluded with the other partners of the spin-off, which must specify any restrictions on the transfer of company shares to third parties, the rights of information and dissent and the rights of the investor and the other partners in the event of a takeover or dissolution of the company.

The spin-off may issue for its financing corporate bonds or corporate bonds convertible into shares or shares under the legislation governing the corresponding type of company of the spin-off.

Relations between the Spin-off and the University

The spin-off has the following rights during the period of cooperation with a university:

- It may use the Institution's logo.
- It may use references to the institution when implementing promotional actions.

The spin-off, for the period of cooperation with a university, has the following obligations:

- Regularly inform the University of its activities.
- To inform immediately of any change in its statutes.
- To report immediately on the composition of its Board of Directors.
- To report on the agenda of the General Assemblies.
- To be informed of the minutes of the General Assemblies.
- Report on the annual accounts.

3.5 Searching for Good Practices at National Level

3.5.1 Support programs of the academic sector for the commercialization of research results

Some good examples of initiatives aimed at supporting academia in the commercialisation of research results are:

gnΩsi: Technology Transfer Network: The Greek gnΩsi network, coordinated by the Foundation for Research and Technology - Hellas (FORTH)/PRAXI Network, is a strong Network for the Promotion of Research Innovation in Insular Greece aiming at the 'translation' of research activity into knowledge-intensive products, services and innovative companies. More specifically, gnΩsi is the largest network of Technology Transfer Offices in

Greece for the exploitation of knowledge produced by 11 leading Universities and Research Institutes.

The aim of their partnership is to develop economies of scale and expand their networks of partners in order to reinforce and strengthen their internal technology transfer structures.

The gnΩsi network provides high-value-added technology transfer services for:

- Technological breakthrough
- Protection of intellectual property
- Commercial exploitation of technologies
- Promotion of commercially viable research results
- Interaction with the business community

The SCIENCE AGORA Technology Transfer Hub is a steady cooperation network for enhancing the technology transfer of the largest research and academic bodies based in Athens. It is a partnership of five top Institutions (NCSR Demokritos, ACEin - Athens University of Economics and Business Entrepreneurship Center, National Technical University of Athens, ATHENA Research Center and Research University Institute of Communication & Computer Systems) aiming to mutually strengthen the technology transfer activity and business acceleration produced within the respective entities.

The SCIENCE AGORA Technology Transfer Hub offers the following services:

- **Intellectual Property Management**: The Science Agora Technology Transfer Hub offers advisory services and support to researchers and young entrepreneurs on issues of protecting and managing intellectual property, with the aim of optimally developing the commercial and industrial exploitation prospects of their idea. Through its integrated team of executives that cover the entire spectrum of expertise required in the intellectual property management process (legal advisors, engineers, etc.) Science Agora offers step-by-step guidance and communicates good practices in this field. Intellectual property protection is a crucial step for further exploitation of research results and inventions. Often, researchers need guidance and access to information about the process of protecting and managing intellectual property.

- **Business Acceleration**: Services are provided to teams with innovative ideas and include the steps of checking the technological maturity of research results, support in determining business value and in defining a funding and management strategy. The provision of specialized advisory services (mentorship) on business matters and the possibility of networking with other teams, venture capitals and recognized businesses contribute to the transfer of business ideas from research to the real economy.

- **Education and Skills Development:** SCIENCE AGORA provides its beneficiaries with training (in the form of thematic seminars, workshops, bootcamps, etc.) on business acceleration, the management and protection of industrial and intellectual property (IP), the economic exploitation of research results with the aim of linking science and research with the labour market and entrepreneurship, and the development of entrepreneurial skills and mindset.

- **Networking and Financing**: The "Proof of Concept" program is one of the main actions of Science Agora and aims to support new entrepreneurial schemes and research teams in the form of granting financing (PoC Grants), providing consulting services and networking with the market. The program is implemented in cooperation with funding bodies and gives participating teams the opportunity to implement their business proposal in a real environment while the research teams can convert their research ideas into commercial products

3.5.2 Support programs to encourage academic-business collaboration

Some good examples of encouraging academic-business cooperation in Greece are the following:

The Center for Innovation and Entrepreneurship "Archimedes" is a National and Kapodistrian University of Athens (NKUA) unit that began its operation in the academic year 2019-20. Archimedes aspires to connect the research community with the industry. At the same time, it identifies the best business ideas within the university community, with the potential for start-up creation. Archimedes Centre is organized into two offices: The Technology Transfer Office and the Business Accelerator. The Technology Transfer Office connects researchers with the industry, with the linkage between the two evolving at the various stages of development and exploitation of the University's intellectual property. The Business Accelerator offers personalized consulting services, entrepreneurship training, collaborative workplaces, as well as mentoring and networking opportunities with other institutions in Greece and abroad, with the aim to accelerate the business process from the stage of the idea to the stage of market and create sustainable businesses.

The "Centres of Competence" initiative is co-financed by the European Regional Development Fund (ERDF) and by national resources allocated from the "Competitiveness, Entrepreneurship and Innovation" Operational Programme (EPAnEK) under the 2014-2020 NSRF. Centers of Competence are structured public-private sector collaborations aimed at bridging the gap between demand and supply of specialized innovation and technology transfer services in one or more chain values. The primary goal of the Action is to support comprehensive plans for the establishment and operation of Centers of Competence, which will be provided with the necessary infrastructure and know-how and will seek to support

innovation in sectors of the Greek economy through specialized/innovative services/products and technology transfer to enterprises, mainly SME.

Objectives of the Action include:

- Promoting innovation in domestic entrepreneurship; shared use of infrastructures and equipment; knowledge and know-how exchange; networking; information dissemination; and collaboration between enterprises and other organizations/bodies within the Competence Centre;
- Encouraging transfer of technological solutions and innovations to production processes including for the development/offer of products/services resulting from the development, uptake and diffusion of new technologies in enterprises, in order to improve their competitiveness;
- Steering enterprises towards high added-value products and services; exploiting competitive advantages; and promoting an outward-oriented entrepreneurship;
- Training enterprises in order to master new skills in the industry sector (with an emphasis on Industry 4.0), which are necessary to the implementation of new technologies, both online/in the classroom and in actual/pilot production conditions; contributing to the technological and digital transformation of enterprises.

The Action "Research-Innovate 2021-2027" in Greece is an Action of strategic importance under the new 2021-2027 NSRF "COMPETITIVENESS" Programme, designed to succeed the "Research-Create-Innovate" Action successfully implemented during the 2014-2020 programming period, building on the experience gained and the lessons learned from the latter. It falls under Strategic Priority Axis 1 "Promoting Research and Innovation", Specific Objective 1.1. "Developing and enhancing research and innovation capacities and the uptake of advanced technologies", and is co-financed by the European Union, specifically by the European Regional Development Plan (ERDF), and through national resources.

The main goal of Single Action "Research-Innovate 2021-2027" is to link research and innovation with entrepreneurship and improve competitiveness, productivity and outward orientation of Greek enterprises, with the purpose of achieving quality innovative entrepreneurship and increasing domestic added-value. It is addressed to enterprises, in particular small and medium enterprises (SMEs), and research organizations. Successful proposals will involve research and innovation projects.

The Action objectives are the following:

- To provide incentives for private investment in research, technological development and innovation, specifically for SMEs;

- Economic growth based on knowledge and sustainable specialization;
- To integrate new knowledge and innovation into existing and new products, services, production systems and value chains;
- To boost competitiveness of Greek enterprises and strengthen their export profile in a framework of international competition;
- To attract highly qualified and specialized scientific personnel (Brain Gain);
- To link academic research with the productive sector.

The Action aims primarily at satisfying the needs of enterprises and other stakeholders within the research and innovation ecosystem, in order to cover the largest possible number of potential recipients. Applications for funding under the Single Action may be submitted either by individual small and medium-sized enterprises (SMEs), or by groups of enterprises, or by partnerships between enterprises and research organizations.

The Single Action "Research-Innovate 2021-2027" will comprise four (4) interventions:

- **Research & Development conducted by enterprises**, which aims to create new employment for research and scientific/technical personnel by supporting research, promoting innovation and strengthening networking between enterprises.

- **Partnerships between enterprises and research organizations**, which aims to promote collaborations/partnerships between enterprises and research organizations.

- **Uptake of research outcomes**, which aims at promoting research to a next level of technology readiness, building on outcomes generated in previous research projects.

- **Seal of Excellence awarded to companies**, which aims at supporting research and innovation through financing of high-value proposals submitted under the EU Horizon Europe programme by Greek SMEs awarded with the Seal of Excellence label. The Seal of Excellence is a quality label awarded to projects that were submitted under the above programme and deemed worth funding but did not receive financing due to budgetary constraints.

Another initiative in Greece, is the **operation of business incubators within universities**, such as the Innovation and Entrepreneurship Unit at the National Technical University of Athens (NTUA), the EPI.noo incubator at the Institute of Communication and Computer Systems (ICCS)/NTUA, or the ACEin Unit at the Athens University of Economics and Business.

Another initiative is the **Industrial Doctoral Programmes** in Greece, such as the Industrial Fellowships programme of the National Centre for Scientific Research "DEMOKRITOS" in collaboration with the Stavros Niarchos Foundation and UPatras IQ of the University of Patras.

The second will support four-year industrial-oriented doctoral courses, funded by the university and a partner enterprise. The company will also be the final recipient of the applied scientific solution which will be the subject of the doctoral thesis in question (the copyright will remain with the doctoral candidate).

Finally, Thessaloniki Innovation & Technology Center (Thess INTEC) is a private sector initiative, that combines the involvement of the city's leading industries and institutions, with the Hellenic government's full support. It will be built on a superb waterfront plot of land with a total area of 760.807 sqm, next to Thessaloniki's International Airport, in the Municipality of Thermaikos. Thess INTEC will be one of Europe's largest Science and Technology Parks and it will attract approximately 500 Million Euros of foreign and domestic investments within the next five to ten years. It will gradually create more than 7.000 jobs. At present, more than 100 companies and research teams have expressed a written interest in collaborating and collocating their activities in Thess INTEC's premises. The interest in Thess INTEC's amenities and services is constantly growing. Several state-of-the-art research and business facilities will be constructed on this premium property, planned to host synergies (Mega Projects) that will lead to the development of new innovative products for the domestic and foreign markets.

4. THE INNOVATION ECOSYSTEM OF POLAND

4.1 Introduction

The National Document on Innovation in Poland was developed by the National Research Institute Information Processing Centre at the request of the Ministry of Education and Science in 2022. The report indicates that innovation in Poland still remains at an unsatisfactory level. According to the European Innovation Ranking 2022, Poland remains in the group of "emerging innovators", reaching 60.5% of the European Union average. In turn, in the last edition of the Global Innovation Index, Poland was ranked 38th among 132 economies in the world. While in recent years Poland has slowly moved up in these rankings, the pace of progress is not satisfactory. Intensive activities are necessary to create the development of innovation, because it is innovation in the long term that determines the level of socio-economic development of countries and societies.

Another innovation report, the European Innovation Scoreboard (EIS) 2024, ranks EU countries according to four levels of innovation maturity: innovation leaders, strong innovators, moderate innovators and emerging innovators. In 2022, the performance of the EIS improved compared to the previous year in 19 Member States, while it deteriorated in eight Member States. Poland continues to be among the emerging innovators, reaching 60.5% of the EU average, which is an increase of 4.3% compared to 2021 and an increase of 11.3% compared to 2015. The improvement of the EIS 2022 sub-indicators compared to last year occurred in areas such as business process innovation, employment in innovative enterprises and the presence of foreign doctoral students. On the other hand, deterioration of results was recorded in the area of environmental technologies, staff mobility in scientific and technological units and financial outlays on innovation per employee.

4.2 Challenges to be addressed

The authors of the National Document on Innovation have identified seven main barriers to the development of innovation in Poland:

1. Financial barriers consist in the lack of funds to cover cost-intensive innovative activities. These barriers are particularly felt by small and medium-sized enterprises.

2. Barriers related to excessive bureaucracy and inadequacy of legal solutions to the specifics of conducting innovative activities are, first of all, too long time to obtain support, administrative burdens in setting up and running one's own business, as well as complicated and lengthy procedures for services provided by public administration.

3. Barriers to cooperation between institutions, especially between companies and scientific institutions. These include ineffective information exchange due to differences in institutional structures and a lack of incentives for researchers to carry out implementation projects.

4. Insufficient availability of data and IT tools. Lack of IT tools to manage intellectual property, track the effects of project sustainability, costs of using IT tools, as well as the lack of tools for secure communication between business and science.

5. Dispersed knowledge and information on possible forms of support for innovative activities.

6. Lack of education focused on innovative attitudes.

7. Value systems and socio-cultural attitudes characterized by a lack of trust and risk aversion.

In addition to the conclusions resulting from the report, teams working in the area of university-business cooperation (including the authors of the study) made their own observations. The communities grouped in the Association of Academic Technology Transfer Centers of almost 100 Polish universities unanimously point out the main barriers to the commercialization of research results.

- Poor knowledge of commercialization and protection of intellectual property among the scientific staff of universities and research institutes.

- The evaluation system of universities, promoting scientific publications, causes little interest in the practical usefulness of the research conducted.

- Lack of commercialization mentors among experienced scientists who are willing and able to lead young research staff by their example.

- Underinvestment in applied research and development work at the national and university levels.

4.3 Strengths and points to be improved in recent years

The following measures have been proposed to strengthen the national innovation system in Poland. Some of them may be based on existing solutions supporting innovation (IT systems, data resources, policies, legal regulations).

1. Tools for managing innovative activities, tracking the continuity of activities and dependencies between projects, stakeholders and the effects of innovative activities. They are intended to provide legal and IT tools to support the management of intellectual property data, as well as the exchange of data between different systems for own and reporting purposes.

2. Tools presenting the research and development potential of entities of the higher education and science system, responding to barriers to cooperation between science and business. The tools are to be aimed at supporting enterprises in accessing information about the research and development activities of entities in the higher education and science system.

3. Tools for analyzing the potential of an invention, addressing the challenges associated with a long and expensive valuation of an invention for commercialization. These tools are aimed at supporting the creator in determining the readiness of a given solution for commercialization.

4. Tools presenting the ecosystem of institutions supporting innovation and supporting the building of partner relations, including the exchange of information between institutions and enterprises. They are intended to respond to the challenges of cooperation. The main objective will be to create a contact point for all entities of the innovation ecosystem, which will contribute to increasing awareness of the services provided by individual institutions and building better relations between entities of the National Innovation System.

5. Tools to support compliance that address the challenges of excessive bureaucracy and interpretation of legal provisions. The tools will be aimed at supporting enterprises in understanding and smoothly navigating complex legal regulations concerning innovation and conducting business activity.

6. Tools that collect data on the transfer of knowledge and technology and allow for its measurement. The preparation of such tools is related to the need for greater appreciation of entities from the science and higher education sector implementing the results of scientific research. This tool requires both legal changes in the parameterization of scientific units and adaptation of existing IT tools.

7. Tools supporting the development of pro-innovative attitudes at all stages of education, which are a response to barriers related to education in the field of innovation, including, above all, those related to the lack of qualified staff.

8. Tools enabling consulting and financing at every stage of the implementation of an innovative project, from basic research to implementation on the market, responding

to financial barriers, in particular obtaining funds for innovative activities in small and medium-sized enterprises. The main purpose of the tools will be to adjust the assistance and financing of the entrepreneur to the experience in innovative activities.

4.4 Intellectual Property at National Level

4.4.1 Copyright and Industrial Property Agreements

From the perspective of commercialization several Polish legal acts at a national level are of high importance. Firstly, the substantial law covering the protection given to intellectual creations shall determine the potential paths of commercialization. Those acts as well will lay down the principles of the ownership of the intellectual creations generated under a labour contract or in the framework of commission. Secondly, the acts governing the higher education system introduce specific rules that are inherent for the research results generated within the institutions that constitute a part of this system.

The national legal framework for IP protection includes the following acts:

- Copyright:
  - Act of February 4, 1994 on Copyright and Related Rights;
- Patents, utility models, designs, trademarks, geographical indications:
  - Act of June 30, 2000 on Industrial Property Law;
- Databases:
  - Act of July 27, 2001 on the Protection of Databases;
- Know-how, trade secrets:
  - Act of 16 April 1993 on combating unfair competition;
- Plant variety:
  - Act of 26 June 2003 on legal protection of plant varieties.

Legal Protection of Works:

Works that fulfill the statutory prerequisites are protected by copyright. The protection arises automatically and does not require any formal application, which is compliant with the relevant international agreements to which Poland is a signatory. Copyright protects solely

the form of expression, therefore ideas, concepts, and methods are outside the scope of copyright protection.

A work is subject to copyright if the following conditions are jointly met:

- The work is a manifestation of creative activity – copyright protects original creations, outcomes of human free and creative choices (the author's creative freedom cannot suffer too many constraints);
- The work has an individual character – the work reflects the author's personality;
- The work is fixed, which means that it is somehow externalized in a manner that enables perceiving the work by persons other than the author.

Copyright provides twofold protection by introducing proprietary and moral rights. Economic rights are transferable and are limited in time, whereas the duration of moral rights is unlimited and they cannot be transferred to another entity.

Moral rights are strongly linked to the author and protect the valuable bond between the author and their creation. The Copyright Act lists moral rights as follows:

- Right to the authorship of the work;
- Right to mark the work with a name or pseudonym, or make it available to the public anonymously;
- Right to the integrity of the content and form of the work and its fair use;
- Right to decide on the first public dissemination of the work;
- Right to supervision over the manner of using the work.

Economic rights provide the copyright owner a monopoly over the exploitation of the work and copyright disposal in the determined areas that are called "fields of exploitation." The fields of exploitation are listed in the Copyright Act in the form of an open catalog of separate fields of exploitation:

- Fixation and reproduction of the work - production of copies of the work using a particular technique, including printing, reprographic, magnetic recording, and digital techniques;
- Trading the original or copies on which the work has been fixed - introducing the original or copies on the market, lending, or renting the original or copies;

- Disseminating the work in a manner other than trading - public performance, exhibition, display, playback, as well as broadcasting and rebroadcasting, and also public making available of the work in such a way that anyone can access it at a place and time individually chosen by them.

Copyright on a particular field of exploitation may be licensed or transferred separately to different entities. The ownership of the copyright (proprietary rights) depends on the circumstances under which the work has been created by the author.

Type of work	The owner of the copyright
Independent work created by the author (a natural person)	The author
Work created under the employment contract	Employer, unless otherwise agreed in the employment agreement
Work created under a commission contract	Depends on the contractual arrangements – the author owns the copyright in the commissioned work unless otherwise agreed. It is necessary that the transfer agreement is made in writing.
Joint works	Joint ownership of the coauthors.
Collective works	Each author/owner has economic rights to separate works, however, if the arrangement of the separate works itself meets the copyright criteria, the author of such collective work is entitled to the copyright.
Derivative works	Separate copyright to the derivative work is vested in its author, however, the derivative work cannot be exploited or the copyright. to the derivative work cannot be disposed of unless the permission of the author of the original work is given.
Scientific works (a specific provision)	As an exception from the general rule governing the copyright ownership of the works created under employment contract, the author is the copyright owner, however, the research institution has priority to publish the scientific work.

The Polish Industrial Property Act regulates the principles of protection of inventions, utility models, designs, trademarks, and geographical indications. Protection of these intellectual results arises upon registration; therefore, it is necessary to file a formal application in order to benefit from the protection.

Polish industrial property law provides protection of technical solutions in two ways – under patent rights and protected utility models. The latter provides protection for technical creations which do not meet the rigorous conditions for patent protection; however, the term of protection for such results is much shorter.

Patents

Patents are granted for inventions that jointly meet the following conditions:

- They are new, which means that the invention does not form part of the state of the art;
- They involve an inventive step – it is not obvious to a person skilled in the art, having regard to the state of the art;
- They are capable of industrial application - based on the invention, a product may be obtained or a method used in a technical sense in any industrial activity, including agriculture.

The patent owner has an exclusive right to use the invention for profit or for professional purposes throughout the territory of Poland.

Utility Models

Protection of utility models is possible when the utility model meets the following conditions:

- It is new – it does not form part of the state of the art (novelty is understood in the same manner as in the case of patents);
- It is an industrially applicable solution of a technical nature;
- It concerns the shape or structure of an object of permanent form or an object consisting of functionally related parts of a permanent form.

The owner of the protected utility model obtains an exclusive right to use a utility model for profit or for professional purposes throughout the territory of Poland.

Industrial Designs

Industrial designs are protected in Poland via registration. The registration is possible for designs which:

- Are new, which means that no identical design has been made available to the public;
- Constitute an appearance of a product or part thereof. A product is defined as an industrial or artisan item, including in particular packaging, graphic symbols, and typographic typefaces;
- Have an individual character resulting from the features. An industrial design is considered to have individual character if the overall impression it produces on the informed user differs from the overall impression produced on such a user by any design that has been made available to the public.

A right-holder of the registered industrial design obtains the exclusive right to use the industrial design for profit or for professional purposes throughout the territory of Poland.

Common Rules on Ownership of the Right to an Invention, Utility Model, and Design Right

Type of invention project (invention/utility model/design)	The owner of the right
Independent invention project created by the inventor/the author (a natural person)	The author/the inventor
Created under the employment contract	Employer, unless otherwise agreed in the employment agreement
Created under a commission contract	Ordering party, unless otherwise agreed in the agreement
Joint invention projects	Joint ownership of the co-creators
An invention project developed by the creator with the assistance of an undertaking	The author/inventor, however, the undertaking may use the invention/utility model/design on its own account

Trademarks

Under Polish law, protection of a trademark may be granted if it is:

- A sign – in particular, a word, drawing, ornament, combination of colors, spatial forms, including the form of goods or of their packaging, and acoustic sounds;
- Capable of distinguishing the goods or services of one undertaking from those of another;
- Capable of being represented in the trademark register in a manner that allows for the precise and clear determination of the protected subject matter.

The owner of the protected trademark obtains the exclusive right to use the trademark for profit or for professional purposes throughout the territory of Poland.

Databases

EU member states are obliged to provide protection of databases in their national legal systems. A database means a collection of data or any other materials and elements arranged according to a specific system or method, individually accessible in any way, including by electronic means, requiring a substantial investment, whether in terms of quality or quantity, for the creation, verification, or presentation of its contents. Protection of databases arises automatically from the moment of its creation.

The exclusive right protecting a database covers extracting and reusing the data, in whole or in substantial part, in terms of quality or quantity. The right is vested in the producer of the database, who is an entity that bears the investment risk in creating the database.

Plant Variety

Another type of intellectual property right is an exclusive right for plant variety. The right is granted if the variety:

- Is distinct, which means it differs in at least one clearly distinguishable characteristic from any other variety that is commonly known;
- Is uniform - it is sufficiently uniform in its characteristics, taking into consideration the appropriate method of its propagation;
- Is stable - its distinctive characteristics do not change after it has been propagated;
- Is new – the definition of novelty is complex, but generally, a variety is considered new if, before the date of application, its breeder has not made the seed material or harvested material available for commercial use, nor has given written consent for such actions;

- Its name meets the particular requirements imposed by law.

The owner of the right for plant variety obtains the exclusive right to produce or reproduce, prepare for reproduction, offer for sale, sell or dispose of in other forms, export, import, and store the seed material of the protected variety.

Know-How

Know-how is commonly known as technical, business, or organizational information that possesses economic value, which is not generally known to the public or easily accessible and is kept confidential. However, it is worth noting that know-how, unlike other intellectual results listed above, is not protected by exclusive rights. Its market value derives solely from the fact that such information is not commonly known. Therefore, adopting internal measures aimed at maintaining confidentiality of know-how is crucial to enable its commercialization or keep the market advantage resulting from access to the know-how.

In Poland, legal protection of trade secrets is covered by the Act on Combating Unfair Competition. The act prohibits the disclosure, use, or acquisition of someone else's trade secret. A trade secret is understood as technical, technological, or organizational information of an enterprise or other information that has economic value, which as a whole or in a specific combination and set of its elements is not commonly known to persons usually dealing with this type of information or is not easily accessible to such persons, provided that the person authorized to use the information or dispose of it has taken, with due diligence, actions to keep it confidential.

4.4.2 Framework of Know-how Transfer Agreements

The principles of knowledge and technology transfer are contained in the Act of 20 July 2018, Law on Higher Education and Science. The Act lays down rules applicable to a variety of entities that compose the higher education and science system in Poland including higher education institutions (HEI). The Act states that one of the basic tasks of HEIs is to conduct scientific activities, participate in social development, and create an innovation-based economy by providing research services, and transferring knowledge and technology to the economy.

Transferring research results to the economy can be achieved through various pathways. This can include conducting research services commissioned by the business sector or through the commercialization of research results developed independently by the HEI. Another pathway is research collaboration between business entities and HEIs, which may lead to the joint development of results that are implemented by the business partner, in compliance with state aid rules.

The commercialization of HEI research results takes the form of direct and indirect commercialization.

Law on higher education and science provide special provisions governing the ownership of the research results developed in the framework of the epmployment agreement with the public HEI. Such results which constitute:

- invention, utility model, industrial design, or the topography of an integrated circuit, a bred or discovered and derived plant variety,
- development work,
- artistic creation,

fall under the abovementioned Law and a particular procedure applies to their management and commercialization. For the period during which the rights belong to the HEI, an employee of a public HEI is obliged to:

- maintain the confidentiality of the results and related know-how;
- provide the HEI with all the information, works along with the ownership of the media on which these works are recorded, and technical experiences needed for commercialization;
- refrain from undertaking any actions aimed at implementing the results;
- cooperate in the commercialization process, including proceedings aimed at obtaining exclusive rights.

Direct Commercialization

An employee is obliged to inform the public HEI about the results of their scientific activity and the know-how related to these results.

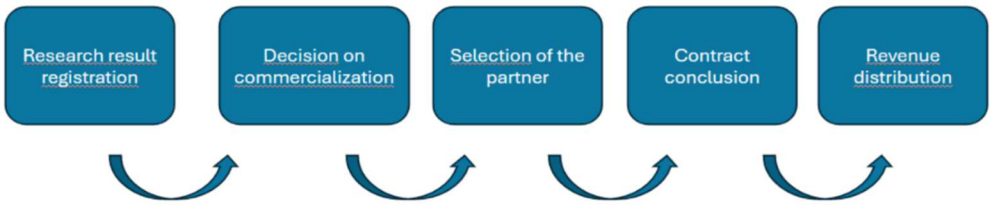
The public HEI then decides on the commercialization of these results. If the results are commercialized, the HEI is obligated to pay the respective share of the revenue to the employee, as described in the following section.

The employee may also be interested in pursuing the commercialization themselves. In such an event, the employee must inform the HEI of their intent within a period specified by law. If the public HEI decides not to commercialize the results, it must offer to conclude an IPR transfer agreement with the employee under the conditions laid down in the Law.

In the event of commercialization carried out by the employee, they are obligated to distribute a share of the revenue to the public HEI. The HEI is entitled to 25% of the value of

funds obtained by the employee from commercialization, reduced by no more than 25% of the costs directly related to this commercialization, incurred by the employee.

If the commercialization is conducted by the public HEI the institution is obliged to pay the employee the respective share of the revenue.



Technology Transfer Centres

HEIs may establish technology transfer centres (TTOs) for the purpose of conducting direct commercialization. In such an event, it is the TTO that coordinates all steps leading to the commercialization of the research results, such as:

- Identification of the intellectual property;
- Assessing the commercialization potential of the identified IP;
- Appropriate legal protection of the IP;
- Conducting market analysis;
- Active search for business partners that could be interested in the acquisition/licensing of the IPR to the research results;
- An objective valuation of the IPR according to the valuation method appropriate in the given case;
- Negotiation of the terms of the commercialization contract and its signature;
- Distribution of the remuneration received among creators and the HEI according to generally applicable law as well as internal regulations;
- Supervision of the execution of the agreement;
- Cooperation with the research teams on a daily basis.

The Technology Transfer Centre may be established in the form of a university-wide unit and operates on the basis of regulations approved by the HEI's senate.

Direct commercialization means the sale of research results or know-how related to these results, or the granting of the right to use these results or know-how, particularly based on a licensing agreement, lease, or rental.

In the event of the commercialization of the research results of HEI employees, the institution is obliged to distribute appropriate shares of the remuneration obtained among the authors of the commercialized results and HEI units. The Law on Higher Education and Science establishes a minimum share of 50% of the HEI's revenue (less a maximum of 25% of the commercialization direct costs) that is owed to the authors or inventors of the commercialized result. HEIs may adopt regulations providing higher shares for the creators.

Indirect Commercialization

Indirect commercialization is understood as acquiring or subscribing to shares or stock in companies, or obtaining subscription warrants entitling the holder to subscribe for or acquire shares in companies, for the purpose of implementing or preparing to implement the results of research activities or related know-how. Indirect commercialization is conducted via a special purpose vehicle.

The principles of indirect commercialization are set out in the Law on higher education and science.

For the purpose of indirect commercialization, a HEI may establish solely single-member companies, hereinafter referred to as "special purpose vehicles" (SPVs). To cover the share capital of a special purpose vehicle, an HEI may make an in kind contribution in whole or in part in the form of results of research activities and know-how related to these results. A special purpose vehicle is established by the HEI's rector with the consent of the university's senate.

An HEI may as well, by way of an agreement, entrust a SPV with the management of rights to results or to the university's know-how in the field of direct commercialization and the management of research infrastructure.

Several public HEIs or several private HEIs may establish one SPV, or a HEI may join an existing SPV established by another university, respectively public or private.

In the event of indirect commercialization, the author of the commercialized results is entitled to receive from the public university no less than 50% of the revenue obtained by the SPV as a result of indirect commercialization (reduced by no more than 25% of the costscommercialization direct costs, incurred by the university or the special purpose vehicle).

A HEI can transfer the IPR related to the research results to a SPV as an in-kind contribution. The SPV can then make a relevant in-kind contribution to the spin-off company,

which will then take the research results to the market. In this model, the revenue generated is distributed through dividend distributions between the spin-off and its shareholder, the SPV, and subsequently between the SPV and the university.

Academic Business Incubators

In order to foster the business activity of university employees, doctoral students, and students, HEIs may establish an academic business incubator. An academic business incubator may be established in the form of a university-wide unit or a capital company. The incubator in the form of a university-wide unit operates on the basis of regulations approved by the HEI senate.

4.4.3 Framework of Spin-offs

In Poland, the concepts of spin-off and spin-out are interpreted differently. Some interpretations align both concepts, while others differentiate between the types of spin-off companies based on whether the SPV holds shares (spin-off) or does not hold shares (spin-out). Generally, both concepts involve creating a new business to take advantage of research results that have been developed within an academic institution. This usually involves transferring technology to the new company, which can be done through direct or indirect commercialization. A spin-off/spin-out can be started by an employee of the academic institution, a student, a PhD student, or a graduate of the institution.

The establishment of spin-offs/spin outs can be fostered by SPVs or academic business incubators. Spin offs/spin outs often maintain a relationship with the HEI, which can be inter alia financial (through SPV shares in the spin-off), or legal (through technology license or assignment agreements). Two aspects of the relationship between a spin-off and its alma mater require special attention: managing conflicts of interest (when an HEI employee is a shareholder or performs a management role in the spin-off) and ensuring transparent access to the university's research infrastructure (to avoid any indirect state aid).

As mentioned above, a spin-off company constitutes an element of indirect commercialization, which is achieved through the in-kind contribution of intellectual property rights to the research results. The in-kind contribution is initially made by the university to the SPV, and then subsequently transferred from the SPV to the spin-off.

4.5 Searching for Good Practices at National Level

4.5.1 Support programs of the academic sector for the commercialization of research results

Incubator of Innovativeness

The most important national program that has boosted the development of commercialization, technology transfer, and intellectual property management at Polish universities and research units is the Incubator of Innovativeness. This program has been implemented in four consecutive editions from 2014 to 2023, operated by the Ministry of Science and Higher Education as part of the Intelligent Development Operational Program 2014-2020 EU.

The project had a significant impact on the development of the team and the commercialization process at the CUT. The projects funded 48 pre-implementation works, initiated cooperation between science and business, and improved the staff's competence in commercialization, technology transfer, and intellectual property management. As a result, we have developed a methodology that can be implemented in any scientific and research unit.

The following programs are currently available in Poland:

- **Erasmus+ InnHUB:** A cross-sectoral innovation centre that devotes its activities to European educational programmes and the popularisation of the Erasmus+ offer. One of the Centre's tasks is to support the development of vocational education and training programmes that offer a balanced set of vocational skills well adapted to economic cycles, constantly changing markets and working methods, key competences and work-based learning opportunities.

Operator: National Centre for Research and Development (NCBiR)

- **The LIDER program** to support innovation in R&D projects. LIDER is a programme addressed to young scientists. Its aim is to expand the competences of young scientists in independent planning of research work and management of their own research team, during the implementation of research projects, the results of which can be used in practice and have implementation potential.

Provider: European Funds Modern Economy (FENG) priority 2: Innovation-Friendly Environment

Operator: Ministry of Funds and Regional Policy

- **Science4Business**. Support for increasing the effectiveness of the activities of Technology Transfer Centers and Special Purpose Vehicles belonging to research organizations in the field of cooperation with business, including through commercialization of the results of R&D works. The scope of the project includes improving the qualifications of staff involved in the commercialization of R&D results and supporting activities undertaken by research organizations leading to the effective introduction of developed solutions into the economy. The program is a continuation of the Innovation Incubator program, which we mentioned at the beginning of the chapter.

Operator: Foundation for Polish Science (FNP)

- **FENG First Team programme** for young scientists. FIRST TEAM enables you to obtain funding for the establishment of a research team and conducting innovative research in Poland with application potential.

- **Proof-of-Concept (PoC) program**. This activity is addressed to scientists working in Polish research lem organizations who want to verify the implementation potential of their research results.

- **Team Net**. The programme offers research units funds to finance interdisciplinary scientific research carried out by a network of cooperating research teams led by outstanding scientists, completed with imp entation.

- **Team Tech**. Grants for research teams led by outstanding scientists implementing R+D projects related to the creation of a product or a production process (technological or manufacturing) of great importance for the economy.

- **Research Infrastructure of the Modern Economy**. Support for selected projects related to public research infrastructure, along with a mandatory component related to strengthening the competences of scientific and research staff in the area of infrastructure use, commercialization of R&D results, technology transfer and innovation management.

4.5.2 Support programs to encourage academic-business collaboration

Provider: European Funds Modern Economy (FENG) priority 2: An environment conducive to innovation

Operator: Ministry of Funds and Regional Policy

- **Prime.** Support for improving the business competences of research teams in research organizations interested in commercializing their scientific achievements and verifying their compliance with market needs. The aim of the project is the effective commercialization of the results of R&D works generated in selected projects conducted in research organizations. The project involves selecting the most advantageous path to commercialize the invention (e.g. establishing and developing a company, granting a license to use the invention, selling rights to the invention). Support is provided to teams intending to establish and develop companies and to newly established spin-offs.

- **InnoLab**. Support for the development of the national innovation ecosystem. The project develops new methods and tools to support the innovativeness of the Polish economy. The main target groups of the project are enterprises, business environment institutions supporting the development of economic innovation, scientific units and scientific-industrial consortia, and public administration.

- **Science4Business**. Support for increasing the effectiveness of the activities of Technology Transfer Centers and Special Purpose Vehicles belonging to research organizations in the field of cooperation with business, including through commercialization of the results of R&D works. The scope of the project includes improving the qualifications of staff involved in the commercialization of R&D results and supporting activities undertaken by research organizations leading to the effective introduction of developed solutions into the economy.

Operator: National Center for Research and Development

- **BRidge UP**. Support for R&D projects implemented by newly established technology companies: Start-ups, including: spin-offs originating from scientific units and those established by scientists who want to commercialize their inventions/technologies/research results in the future, as well as from the corporate sector.

Operator: Polish Agency for Industry Development

- **Grants for Eurogrants**. Supporting the growth of innovation and internationalization of Polish SMEs and research organizations by increasing the participation of these entities in EU programs managed centrally, i.e. by the EC.

- **Smart Path**. Support for comprehensive projects of enterprises and their consortiums as part of the implementation of the R&D&I process. Comprehensive projects meet the needs of entrepreneurs in the field of: R&D work, implementation of innovations, development of R&D infrastructure, internationalization, development of

competences of employees and company managers, digitization and greening of enterprise activities.

Operator: Ministry of Science and Higher Education

- **Implementation Doctorate**. The subject of the program is to create conditions for the development of cooperation between entities of the higher education and science system with the socio-economic environment, conducted within doctoral schools and consisting in educating doctoral students in cooperation with entrepreneurs who employ them or other entities, which will result in the implementation of the results of the research conducted by PhD students in scientific activities.

- **Dual Studies**. HEIs may offer dual programmes, i.e. programmes with the participation of employers and bodies granting licences to practise a specific profession, conducting examinations for obtaining licences, a professional self-government body or an economic organisation. Employers can co-create study programmes, organise internships together with the university, and conduct theoretical and practical classes.

5. THE INNOVATION ECOSYSTEM OF ROMANIA

5.1 Introduction

Romania is an emerging innovator with performance at 33.1% of the EU average. Performance is below the average of the emerging innovators and is increasing at a rate lower than that of the EU, specifically by 8.5 percentage points. Consequently, the country's performance gap with the EU is becoming larger.

Despite these challenges, Romania has several relative strengths. Broadband penetration is notably high, and the country excels in the export of medium and high-tech goods. Knowledge-intensive services exports are robust, trademark applications are frequent, and Romanian publications are among the most cited.

However, there are also significant weaknesses. The population with tertiary education is relatively low, and there are few business process innovators. Innovative small and medium-sized enterprises (SMEs) collaborating with others are limited, job-to-job mobility of human resources in science and technology is low, and employment in innovative enterprises is not as high as it could be.

Since 2016, Romania has seen strong increases in broadband penetration, the number of most cited publications, and public-private co-publications. Conversely, there have been strong decreases in environment-related technologies, the number of doctorate graduates, and non-R&D innovation expenditures.

Since 2022, there have been strong increases in broadband penetration, the provision of ICT training by enterprises, and the number of most cited publications. However, there have been significant decreases in venture capital expenditures, environment-related technologies, and sales of innovative products.

The National Strategy for Research, Innovation, and Smart Specialization (SNCISI) is developed by the Ministry of Research, Innovation, and Digitization (MCID), which serves as the coordinator for research-innovation and smart specialization policy in Romania. MCID also oversees national funding programs associated with Research, Development, and Innovation (RDI) and regulates the legal framework related to these processes, while also acting as the intermediary research body for the Operational Program for Smart Growth, Digitalization, and Financial Instruments 2022-2027.

The regional smart specialization strategies (RIS3) are developed by Regional Development Agencies (ADR), which fulfill the functions of planning and programming at the

regional level. They draft regional development plans and programs according to the law and manage the funds. ADRs also act as management authorities for the regional operational programs for the period 2022-2027.

The common, cross-cutting priorities are: human resources in the act of research – in terms of developing, retaining, and attracting talent to create the critical mass necessary for integrated scientific sustainability at the level of Romanian society; continuous improvement of research infrastructure – to be prepared for the challenges of open science, supporting frontier scientific experiments and providing technological and certification services; supporting innovation in the private sector, partnerships, and technology transfer; concentrating RDI resources and capabilities in functional innovation ecosystems around smart specializations and industrial transitions, which support partnerships between research organizations and the private sector, international collaboration, and the creation of start-ups and high-growth enterprises.

The SNCISI is strongly aligned with the National Strategy for Sustainable Development of Romania 2030, directly contributing to the goal of "Strengthening scientific research, modernizing the technological capacities of industrial sectors; encouraging innovations and significantly increasing the number of employees in research and development, and increasing public and private expenditures for research and development". Furthermore, through the Specific Objective - Connecting research and innovation activities with societal challenges - the Strategic Research Agenda, SNCISI supports the contribution of science and research to addressing sustainable development challenges, with the content of this agenda representing a contextualization of these challenges for Romania.

5.2 Challenges to be addressed

- OW FUNDING FOR RDI (Low level of direct Funding for RDI, limited usage of fiscal incentives for R&D, low efficiency of the public allocation for RDI, limited competitive funding based on rigurous institutional evaluation)
- POLICIES (fragmentation of governance, policies/lack of efficient coordination, limited evidence based policy making, limited evaluation of the RDI programmes)
- LOW LEVEL OF COLLABORATION (PUBLIC-PRIVATE, PRIVATE-PRIVATE)
- LOW INTEGRATION IN ERA. DISCONNECTION FROM INTERNATIONAL RDI TRENDS (Economic, human capital, education and training, legislation, limited financial support)
- LOW CULTURE FOR INNOVATION

5.3 Strengths and points to be improved in recent years

Strengths and areas for improvement in recent years in Romania regarding the increasing of the national innovation system are:

- Increasing the number of researchers in Romania's RDI ecosystem through training and attracting talents (especially young) to research.
- Ensuring the adequacy of the legislative, institutional, and procedural framework regarding the research and innovation system.
- Developing an "Advanced Studies and Research Platform" in the form of a virtual network that brings together medium to long-term research projects (e.g., 5-7 years), coordinated by top international researchers. These projects aim to create and develop research groups with international performance and potential for excellence.
- Modernizing and efficiently using of RDI infrastructure to facilitate open access and ensure its sustainability, thereby multiplying and disseminating RDI knowledge and results throughout the economy.
- Strengthening funding mechanisms and increasing investment in research and innovation.
- Enhancing coordination and alignment of research and innovation efforts across different sectors and stakeholders.
- Addressing gaps in research infrastructure and facilities to ensure they meet the needs of researchers and innovators.
- Promoting a culture of innovation and entrepreneurship to encourage more startups and innovative ventures.
- Improving of the regulatory and legal framework to support innovation and protect intellectual property rights.

5.4 Intellectual Property at National Level

5.4.1 Copyright and Industrial Property Agreements

The only authority in Romania that manages granting of industrial property protection is the State Office for Inventions and Trademarks (OSIM).

OSIM offers specialized services by granting industrial property rights, promotes industrial property, ensures Romania's cooperation in international relations, in accordance with the treaties, conventions and agreements in the field, to which our country is a party.

Invention patents are regulated by Law no. 64 of October 11, 1991* regarding patents, published in the Official Gazette of Romania, Part I, No. 613 of August 19, 2014.

According to this law, the right to the patent belongs to the inventor or his successor in rights. If the invention was created by several inventors, each of them has the quality of co-author of the invention, and the right belongs jointly to them.

A patent may be granted for an invention whose object is a product or a process, in all technological fields, provided that it is new, involves an inventive activity and is susceptible to industrial application.

The invention patent gives its holder an exclusive right to exploit the invention for its entire duration.

The right to the patent, the right to grant the patent and the rights arising from the patent may be transferred in whole or in part. The transfer can be made by assignment or license, exclusive or non-exclusive, or by legal or testamentary succession.

Service inventions are regulated by Law no. 83/2014 regarding service inventions, published in the Official Gazette of Romania, Part I, No. 471/2014. The law applies to inventions created by an individual inventor or a group of inventors, the individual inventor or at least one member of the group of inventors is an employee of a legal entity under public or private law.

Higher education in Romania is regulated by the Higher Education Law no. 199/2023 which contains provisions regarding the conduct of the education process and the scientific research activity within the universities.

According to this law, "the mission of higher education is to generate, certify and transfer knowledge, through:

-scientific research, development, innovation and technological transfer, through individual and collective creation, relevant to the progress of knowledge and the socio-economic environment;"

"Art. 109. 2) The institutions of higher education that have assumed scientific research as their mission have the obligation to establish technical-administrative structures, which facilitate the management of research activities and research-development projects carried out by the staff of the institution of higher education.

Art. 20. In order to fulfill the objectives arising from the assumed mission, any higher education institution can include the following organizational components: ... experimental

stations or other entities for production activities and knowledge and technology transfer, competence centers...

Art. 18. In accordance with the provisions of the framework code of university ethics and deontology approved by Government decision, higher education institutions adopt their own code of university ethics and deontology, which is part of the university charter and includes, mandatorily: a) educational, administrative and technical measures taken to guarantee the originality...of research projects, inventions and patents, articles, books..."

The framework for initiating the intellectual property protection process is based on the provisions of the following documents:

- Higher Education Law no. 199/2023;
- OG no. 57/2002 on scientific research and technological development;
- Law no. 319/2003 regarding the staff status of research-development-innovation (CDI).

The legal framework regarding intellectual property rights includes:

- Law no. 64/1991 on patents, republished;
- Law no. 129/1992 regarding the protection of designs and models, republished;
- Law no. 8/1996 regarding copyright and related rights, republished;
- Law no. 84(r2)/1998 on trademarks and geographical indications, republished;
- Law no. 16/1995 regarding the protection of topographies of semiconductor products, republished;
- Law no. 350/2007 regarding the protection of utility models;
- Ordinance no. 52/1997 regarding the legal regime of the franchise, republished;
- Law no. 255/1998 on the protection of new varieties of plants, republished;
- Law no. 83/2014 on service inventions.

Within the George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Târgu Mureș, The Scientific Research and Technological Development Unit – UCSDT is the technical-administrative structure, which includes research centers, laboratories and research and innovation departments. Its main objective is the creation of a research core, innovation and technology transfer of the university by integrating fundamental, translational and applied research ideas from the university and organizing research and innovation structures in an integrative way.

The Scientific Research and Technological Development Unit (UCSDT) includes structures of UMFST G.E. Palades Tg. Mureș within which research and innovation activities are organized, research projects are carried out and the implementation of research and

innovation programs is monitored. When it comes to research results, these are capitalized and data and information are provided not only for courses and scientific publications but also for the University's scientific events.

The steps taken to grant a patent include:

- Completing the documentation related to the patent application;
- Submission of documents to OSIM;
- Maintaining the link with the patent office;
- Issuance of the patent by the patent office and its publication in the Official Bulletin of Industrial Property;
- Establishing the way in which the patent can be capitalized, as well as the manner and conditions under which the researcher/inventor will be able to benefit from this capitalization, in accordance with the legal provisions in force.

Further exploitation of the invention can be achieved by:

1. Licensing;
2. Assignment of the patent;
3. Establishment of "Spin-off";
4. Technological transfer.

5.4.2 Framework of Know-how Transfer Agreements

In the Romanian legislation, the know-how is defined by art. 7, item 17 of the Tax Code, as any information regarding an industrial experience, commercial or scientific information which is necessary for the manufacture of a product or for the application of an existing process and the disclosure of which to other persons is not permitted without the authorisation of the person who provided this information. To the extent that it comes from experience, know-how is what a manufacturer cannot know from the mere examination of the product and the mere knowledge of the progress of the technique.

The know-how is protected by the provisions of Article 2, paragraph 1, letter b of the Law no. 11/1991 on combating unfair competition, according to which it constitutes unfair competition, and the following commercial practices of the undertaking and/or the employee which are contrary to fair practices and the general principle of good faith and which cause or are likely to cause harm to other undertakings, shall be prohibited, as follows: misappropriation of the clientele of a competing undertaking by a former or current employee, by using information which he was aware of at the time of the act that it

represented trade secrets or confidential information and whose disclosure could significantly harm the interests of that undertaking.

By trade secret, within the meaning of Article 11, ptc. 3 of Law no. 11/1991 on combating unfair competition, is understood the information that cumulatively meets the following requirements:

- they are secret in the sense that they are not, as a whole or as their elements are presented or articulated, generally known or easily accessible to persons in the circles dealing with them, normally, the type of information in question;
- they have commercial value in that they are secret;
- have been subject to reasonable measures, under the circumstances, taken by the person legally in control of the information in question, to be kept secret.

As regards criminal liability, the acts of disclosure, acquisition or use of trade secret by third parties as a result of commercial or industrial espionage are sanctioned, whether this affects the interests or activity of a legal person and the disclosure or use of trade secrets by persons empowered by the legitimate holders of such secrets to represent them before the authorities public or public institutions, if this affects the interests or activity of a legal person.

Regarding the transfer of know-how, it is regulated by the provisions of Ordinance no. 52/1997 on the legal regime of the franchise. The transfer of know-how can be done through the franchise, which is a system of marketing of products and/or services and/or technologies, technologies, based on a continuous collaboration between legally and financially independent natural or legal persons, whereby a person, called a franchisor, grants another person, called a franchisee, the right and obligation to operate a business in accordance with the franchisor concept.

This right authorises and obliges the franchisee, in return for a direct or indirect financial contribution, to use the trademarks of products and/or services, other intellectual or industrial property rights protected, protected, the know-how, the copyright and the insignia of the traders, benefiting from a continuous contribution of commercial and/or technical assistance from the franchisor, the, within and for the duration of the franchise agreement concluded between the parties for this purpose.

5.4.3 Framework of Spin-offs

Establishment Process and Institutional Framework of a Spin-off

A spin-off, or start-up, is a company created through a formal transfer of intellectual property or technology from a research institution or university, such as UMFST, to a newly established firm. In Romania, this process is governed by Law 31/1990 on companies. A spin-off occurs when a company transfers all or part of its assets to a new or existing entity, distributing new shares of its business.

The process involves several steps. First, the spin-off plan is drafted, which includes the names and addresses of all companies involved, the conditions of the spin-off, and details on the distribution of shares and liabilities to the new entities. Next, the signed plan is submitted to the Trade Register, which then forwards it to the competent court. The plan is published in the Official Gazette or on the company's website. Finally, creditors have the right to object to the plan, making it advisable to consult a lawyer specialized in commercial litigation to handle potential objections.

Right to Participate in Spin-offs

According to Law 31/1990, administrators participating in the spin-off must prepare a detailed written report explaining the legal and economic basis of the spin-off, including the exchange rate of shares and distribution criteria. Within three months of the plan's publication, the general meeting of each participating company must decide on the plan.

Relations Between Spin-off and the University

The university's relationship with the spin-off involves formal agreements for the transfer of intellectual property and technology. This relationship ensures the university's involvement and stake in the new company's success.

Legal Assistance

Given the complexity of the spin-off process, it is recommended to seek legal assistance. Lawyers specialized in corporate and commercial law can help draft necessary documents, represent the company in front of authorities, and manage any objections raised during the process.

This streamlined and legally compliant approach ensures that the spin-off process is executed efficiently and effectively, fostering innovation and new business ventures.

5.5 Searching for Good Practices at National Level

5.5.1 Support programs of the academic sector for the commercialization of research results

The most important national program that has boosted the development of commercialization, technology transfer, and intellectual property management at Romanian universities and research units is the **National Plan for Research, Development, and Innovation 2022-2027 (PNCDI IV),** developed and managed by the Ministry of Research, Innovation, and Digitalization (MCID), the main instrument for implementing the National Strategy for Research, Innovation, and Smart Specialization 2022-2027 (SNCISI).

PNCDI IV is multi-annual, ensuring transparent and predictable funding for the national RDI system, with the aim of modernization, consolidating excellence, and increasing its relevance to the economy and society.

PNCDI IV is structured into 10 funding programs:

1. **IDEAS Program** - Aims to stimulate excellence in fundamental and frontier research.
2. **Human Resources Program** - Seeks to attract exceptional researchers (doctoral students, postdoctoral fellows, young researchers) to the national research system, develop generations engaged in the European and international scientific environment, and reward individual research performance.
3. **Performing Research Organizations Program** - Aims to stimulate the institutional performance of public research organizations.
4. **Core Program** - Seeks to increase the institutional capacity of national research and development institutes to solve socio-economic problems specific to their fields of activity.
5. **Performing Research Infrastructures Program** - Focuses on the integrated development and efficient use of public research infrastructure.
6. **Challenges Program** - Aims to increase the contribution of research and development activities to addressing societal challenges established in the Strategic Research Agenda.
7. **Partnerships for Innovation Program** - Aims to carry out joint research and innovation projects based on partnerships between the business environment and public/private RDI sectors, support economic actors' access to RDI services, and support the development of innovation ecosystems.

8. **European and International Cooperation Program** - Seeks to increase the competitiveness of the national research system internationally by stimulating participation in the EU's framework program for research and innovation and through bilateral/multilateral cooperation in research and innovation.

9. **Strategic Interest Research Program** - Aims to support the participation of Romanian research organizations in international scientific programs in areas of strategic interest.

10. **Science and Society Program** - Seeks to develop the dialogue between science and society by opening the research and innovation system to citizens.

PNCDI IV aims to create the premises for ensuring the framework for investments in RDI, encouraging partnerships between public and private actors to transfer research results to the market, stimulating institutional performance, and promoting international collaborations.

"This is a 60 billion lei plan for the period 2022-2027, with program closures by 2030. It is the first national plan that integrates all funding instruments for Romanian research, and it was a struggle to agree on this form with all research organizations and all involved actors. The European Commission told us: you have brilliant minds, but you do far too much fundamental research that does not translate into concrete results for the economy. Through this national plan, we have an additional emphasis on technology transfer and stimulating partnerships between national research institutes, research organizations, and the Romanian private sector, as well as on stimulating international partnerships through which Romanian research entities can access funds available through the Horizon Europe programs. The program encourages retaining Romanian talent in research in Romania, the return of researchers who have left abroad, and attracting foreign researchers."

Incubator of Innovativeness

The program that suport the creation of innovativeness Incubator are funds through the Regional Operational Program 2014-2020, Priority Axis 2 - Improving the competitiveness of small and medium-sized enterprises, Investment Priority 2.1B - Business Incubators.

According to the response provided by the Ministry of Economy, Entrepreneurship, and Tourism (MEAT), the business incubators in Romania authorized under Law no. 102/2016 are as follows:

1. Business Incubator - "Galeria Hub-Pol de Competitivitate Timpuri Noi" - Bucharest

2. Business Incubator - "Incubatorul de Afaceri Sfantu Gheorghe" - Sfantu Gheorghe

3. Business Incubator - "Ilfov Business Hub" – Ilfov
4. Business Incubator - "Harghita Business Center" - Odorheiul Secuiesc
5. Business Incubator - "Creativ Industries HUB-Iași" – Iași
6. Business Incubator - "Centrul de Afaceri Tehnologic și Incubator de Afaceri" (CATTIA) – Brașov
7. Business Incubator - "Incubatorul de Afaceri Cont Consulting" – Brașov
8. Business Incubator - "NEO IDEAS CONNECTED" - Piatra Neamț
9. Business Incubator - "INCUBCENTER" - Târgu Mureș
10. Business Incubator - "ARC PARC" – Dej
11. Business Incubator - "Incubatorul de Afaceri Inovative" – Brăila
12. Business Incubator - "Business Incubator Specific to a Sector (IT)" – Constanța
13. Business Incubator - "Business Incubator Specific to a Sector (CREATIVITY AND INNOVATION)" – Oradea
14. Business Incubator - Mixed Portfolio Incubator "HUBIT" - Bucharest.

The project had a significant impact on the development of teams and the commercialization process at Romanian universities. The projects funded numerous pre-implementation works, initiated cooperation between science and business, and improved the staff's competence in commercialization, technology transfer, and intellectual property management. As a result, we have developed a methodology that can be implemented in any scientific and research unit.

5.5.2 Support programs to encourage academic-business collaboration

Romania has several support programs and initiatives to encourage academic-business collaboration, focusing on innovation, entrepreneurship, and technological development. Here are some of the key programs and structures:

1. Innovation and Entrepreneurship Centers

- Innovation and Entrepreneurship Centers (IEC) in Universities: Many Romanian universities have established IECs to foster a culture of innovation among students and faculty. These centers provide support for developing business ideas, offer mentorship, and facilitate connections with industry partners.

2. Competence Centers

- National R&D Institutes and Competence Centers: Romania has various national research and development institutes that serve as competence centers in specific fields, such as IT, biotechnology, and energy. These centers often collaborate with universities and industries to drive applied research and technological advancements.

3. Technology Parks

- Technology and Science Parks: Romania hosts several technology parks that provide infrastructure and services to tech-based companies. Examples include:
    - INMA-IT Technology Park in Bucharest: Focuses on IT and communications.
    - Tetapolis in Cluj-Napoca: Aims to support tech companies and startups through access to research facilities and business support services.

4. Technological Innovation Hubs

- Digital Innovation Hubs (DIHs): These hubs, part of the EU initiative, provide access to the latest knowledge, expertise, and technology to support digital transformation. They offer services such as prototyping, testing, and experimentation, as well as funding advice and access to finance.

5. Business Incubators at Universities

- University-based Incubators: Many universities have established incubators to support student and faculty startups. These incubators provide office space, mentoring, networking opportunities, and sometimes seed funding. Examples include:
    - Techcelerator: Associated with several universities, it supports tech startups through mentoring, networking, and investment.
    - Spherik Accelerator: Linked with Babeș-Bolyai University in Cluj-Napoca, it focuses on early-stage tech startups.

6. Industrial PhD Programs

- Industrial PhD Programs: These programs aim to bridge the gap between academia and industry by allowing PhD students to work on research projects directly relevant to industrial needs. Such programs typically involve a partnership between a university and an industry player, providing students with practical experience and companies with cutting-edge research.

7. Government and EU-funded Programs

- Operational Program Competitiveness (POC): Funded by the European Union, POC supports R&D activities, technological development, and innovation. It aims to enhance the competitiveness of the Romanian economy by promoting cooperation between research institutions and businesses.
- Horizon Europe: As part of the EU's Horizon Europe program, Romanian entities can participate in various projects and consortia that promote innovation and collaboration between academia and industry.

8. Specific Examples of Programs and Initiatives

- Research, Development and Innovation (RDI) Programs: Managed by Romania's Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), these programs fund collaborative projects between universities and businesses.
- EIT Digital Hub in Bucharest: Part of the European Institute of Innovation and Technology, this hub focuses on digital innovation and entrepreneurship, providing support for startups and scaleups.

These initiatives and programs aim to create a dynamic environment where academic research can directly contribute to industrial innovation and economic growth in Romania.

6. GUIDING PRINCIPLES FOR KNOWLEDGE VALORISATION IN THE EU

6.1 Context and Scope

In 2008, the European Commission adopted a recommendation on managing intellectual property in knowledge transfer activities and established the Code of Practice for universities and other public research organisations (C(2008)1329). An update was necessary to enhance the focus on maximizing the value of all knowledge assets generated by various actors in a dynamic research and innovation ecosystem.

On 2 December 2022, the Council adopted a new recommendation on guiding principles for knowledge valorisation (Council Recommendation (EU) 2022/2415), which supersedes the 2008 Commission recommendation and the previous Code of Practice for universities and other public research organisations. This update addresses new challenges and developments, including increasingly complex knowledge value chains, emerging market opportunities created by new technologies, novel forms of collaboration between industry, academia, and the public sector, citizen involvement, and issues related to research and innovation foreign interference and reciprocity in managing intellectual assets in international cooperation.

Knowledge valorisation is the process of creating social and economic value from knowledge by linking different areas and sectors and transforming data and research results into sustainable products and solutions that benefit society in terms of economic prosperity, environmental benefits, progress and better policymaking.

Knowledge valorisation represents a paradigm shift aimed at creating value from existing and future research, innovation, and knowledge assets, including tacit knowledge. This approach will benefit policymaking and introduce new ways to monitor and evaluate research and innovation through advanced indicators and measurement tools. It will influence research funding and enhance the value of scientific research and its outcomes.

Successful knowledge valorisation necessitates active participation from the research and innovation ecosystem, as well as users and beneficiaries of this knowledge, focusing on societal benefits through the use and re-use of knowledge. It extends beyond mere dissemination, involving comprehensive management of intellectual assets, which include patents, copyrights, trademarks, publications, data, know-how, and more. Effective valorisation demands broad management strategies and the promotion of specific skills to fully leverage these intellectual assets.

Openness as a principle enhances value creation, with tools for intellectual asset management fostering better use of research results, thus contributing to innovation and increasing the value of scientific research. The principle of 'as open as possible and as closed as necessary' underlines the balance needed in managing intellectual assets for socioeconomic benefits.

Entrepreneurial practices and skills, along with engagement with citizens, civil society, and policymakers, are essential for successful knowledge valorisation. Transforming knowledge into new value—whether through incremental or disruptive innovations, evidence-based policymaking, or enhancing citizens' wellbeing—requires proactive and collaborative efforts throughout the valorisation process. This process can also inspire changes in educational systems to better develop the skills, competences, and attitudes necessary for creativity and societal value creation.

Entrepreneurial processes and methods, such as experiment-based discovery and co-created actions, necessitate social-entrepreneurial skills to facilitate knowledge spillovers beyond commercialization. Utilizing open coordination networks and tools from the European Education Area strategic framework will further stimulate knowledge valorisation and skill development.

Guiding principles for knowledge valorisation involve developing, using, and managing entrepreneurial practices and skills at all societal levels, in both private and public sectors. Policymakers must align their objectives and implement new approaches to support these principles, aiding Member States in effectively fostering knowledge valorisation.

The guiding principles for knowledge valorisation in Recommendation proposed by the European Commission therefore concern policy initiatives aimed at all categories of ecosystem actors involved in R&I activities, such as:

- academia, universities, research and technology organisations and other public research organisations, as well as academies and learned societies
- civil society organisations, citizens and non-governmental organisations
- private investors, funding and investment organisations including foundations and charities
- individuals, e.g. innovators, researchers, scientists and students
- industry including small and medium-sized enterprises (SMEs), start-ups, spin-offs, scale-ups and social enterprises

- intermediaries (e.g. knowledge and technology transfer professionals, incubators, science parks, regional, national and European innovation hubs, IP experts, consultants and innovation support professionals, science communication and policy engagement teams, knowledge for policy / science advice organisations, citizen engagement professionals etc.)
- national, regional and local authorities, policymakers and public and private service providers (e.g. hospitals, public transportation and energy providers)
- private research organisations
- research and innovation infrastructures and state-of-the-art pilot facilities
- standardisation bodies.

The guiding principles are formulated to be applicable to all or most of the categories above. Their implementation should be tailored to specific target groups through Codes of Practice, which will be co-created with stakeholders. These Codes of Practice may focus on specific themes, such as intellectual assets, academia-industry collaboration, or academia-public sector collaboration, or they may target particular actors, such as knowledge transfer professionals, start-ups, or companies of various sizes. The Codes of Practice will benefit from exchanges with the European Institute of Innovation and Technology (EIT) Community.

6.2 Guiding Principles

The guiding principles are non-binding. Therefore, their application should align with international and national legislation, as well as EU law (including State aid rules). These principles should be considered when striving to make the EU legal framework conducive to knowledge valorisation. They must be implemented with the broadest societal benefit in mind, contributing to a sustainable society in line with EU guidelines for addressing foreign interference in research and innovation (R&I).

Knowledge valorisation is a complex process that requires substantial resources to develop and maintain the necessary skills and scalable capacity within the EU. Continuous and increased investment is needed to support the growth of knowledge transfer and brokerage professionals who serve as intermediaries among research and innovation stakeholders. It is crucial to foster strong university-based regional innovation ecosystems that encourage SMEs, as well as to promote proactive engagement among start-ups, scale-ups, and companies of all sizes. Industrial partners should also be persuaded to embrace risk-taking.

Therefore, it is recommended that Member States and the European Commission apply the following guiding principles for knowledge valorisation:

1. *Knowledge valorisation in research and innovation policy*

   (a) Ensure that Union, national and regional support structures are in place to help organisations become aware of the scope of this Recommendation on knowledge valorisation, assess its implications for them, where appropriate mobilise financial and non-financial resources to put this Recommendation into practice and develop the necessary strategies and practices to implement and publicise it.

   (b) Ensure that value creation policies and practices are defined, implemented, shared and publicised at relevant organisational level.

   (c) Ensure that publicly funded R&I activities consider the broadest possible societal use and valorisation of intellectual assets generated by R&I activities while taking into account sovereignty issues and involving all ecosystem actors.

   (d) Strengthen structures, processes and practices in the use of research results and scientific knowledge for designing and implementing public policies and developing and revising standards.

   (e) Promote equality, diversity and inclusion as well as avoid gender bias in knowledge valorisation objectives and activities and the people involved in such activities, for example through diverse research teams and R&I content that reflect the perspectives, behaviours and needs of diverse groups in society.

2. *Skills and capacities*

   (a) Promote the development of the competences, skills and capacities needed to support knowledge valorisation operations involving all stakeholders, from students, researchers and inventors to entrepreneurs and professional intermediaries, and from knowledge users to policymakers.

   (b) Ensure that mobility schemes are in place between academia, industry and the public sector to facilitate skill development and cross-fertilisation of competences, culture and practices, also as a life-long learning process, among knowledge valorisation actors at Union, national and regional levels.

   (c) Ensure that the tacit knowledge of those generating the intellectual assets is recognised as one of the elements in the valorisation process. It is important to promote participatory collaboration approaches that make it possible to include talents, skills and tacit knowledge in innovation and valorisation

(d) Encourage and facilitate multidisciplinary and interdisciplinary collaboration going beyond technological areas and involving disciplines such as social sciences, the humanities and the arts, as well as co-creative approaches.

3. System of incentives

(a) Develop and put in place a relevant and fair system to incentivise all R&I ecosystem actors, in particular researchers, innovators, students and the staff of universities and public research organisations, to learn, apply and practice knowledge valorisation, as well as to attract and retain talent.

(b) Provide measures for businesses, particularly SMEs, civil society, citizens, end-users and public authorities to be active partners in co-creating value-adding innovation, thereby improving access to and the use of knowledge, increasing skills acquisition and encouraging joint experimentation.

(c) Encourage, support and incentivise organisations that undertake knowledge valorisation to collect, share and use metrics that improve learning and the performance of knowledge valorisation actors in the Union.

4. Intellectual asset management

(a) Ensure that policies and practices for intellectual asset management are defined, implemented, shared, publicised and promoted in all organisations involved in knowledge valorisation.

(b) Raise awareness among universities, research organisations, public authorities and businesses of the importance of managing intellectual assets in an international environment, while taking into account sovereignty issues.

(c) Ensure that intellectual assets developed by publicly funded R&I activities in the Union are managed and controlled in such a way that the socioeconomic benefit, including contribution to sustainability for the Union as a whole, is taken into account and maximised.

(d) Increase awareness and uptake of intellectual asset management practices and tools in Open Science as well as in Open Innovation to facilitate the use of results and data for innovation.

(e) Increase efficient management of intellectual assets, for example by supporting active portfolio building and by promoting platforms linking offer and demand for intellectual assets, in order to maximise value creation for all involved.

5. Relevancy in public funding schemes

(a) Consider how to strengthen the application of knowledge valorisation principles in publicly funded research.

(b) Consider specific funding schemes to complement research funding in order to ensure that knowledge valorisation is incentivised early on in research, including support to intermediaries.

6. Peer learning

(a) Promote and support national and transnational peer learning processes and practices for disseminating and encouraging the sharing of best practices (15), case studies, role models and lessons learned and for developing common specifications for knowledge valorisation.

(b) Benchmark successful knowledge valorisation organisations, ecosystems and initiatives in order to develop and promote common concepts, models and incentives to serve as a guide for assessing and implementing knowledge valorisation management and processes. Also, use the expertise, networks and lessons learned from relevant organisations, such as the European Union Intellectual Property Office, the European Patent Office, the Enterprise Europe Network, European Institute of Innovation and Technology and their knowledge and innovation communities and other international, European, national or regional organisations.

(c) Encourage universities and public research organisations to pool their resources, expertise, data and infrastructure across disciplines, countries and regions to promote more peer-learning practices.

7. Metrics, monitoring and evaluation

(a) Promote collaborative efforts to adopt common agreed definitions, metrics and indicators, encompassing the variety of valorisation channels, to help improve the Union's knowledge valorisation performance, taking into consideration the contextual differences between Member States and knowledge valorisation actors and the specificities of different sectors.

(b) Ensure that the monitoring and evaluation practices used to assess and evaluate knowledge valorisation operations are aligned with the wider ERA monitoring framework and minimise the administrative burden on Member States and stakeholders, while developing synergies with other relevant ERA policy actions.

7. E-LEARNING IN THE CONTEXT OF KNOWLEDGE VALORISATION

7.1 Context and Institutional Approaches

E-learning plays a crucial role in supporting knowledge valorisation and R&D commercialization by facilitating flexible and scalable knowledge transfer. The SUCReD consortium institutions have adopted different approaches to e-learning, reflecting variations in regulatory frameworks and technological infrastructure.

At UMFST and UoI, there are no specific regulations governing e-learning, but both institutions use platforms such as Moodle and Blackboard to facilitate online courses for students and researchers. At UoI, all professors are free to create courses for undergraduate and postgraduate students without restrictions. Meanwhile, CUT operates the DELTA e-learning center, a Moodle-based platform that allows employees to develop and implement courses. However, certification through this system is not automatic, and courses developed externally must be built using Moodle, Navojki, or Fedex mechanisms to be transferred to DELTA. Discussions are currently underway at CUT to integrate e-learning into doctoral and second-degree programs.

Institutions such as Kinno, CreateHub, and Iceberg do not have specific regulations governing e-learning. Despite the lack of formal guidelines, Iceberg has expressed interest in utilizing e-learning to support partner training efforts.

7.2 E-Learning Implementation and Certification Approaches

Institutions within the consortium have different approaches to certification and course registration. UMFST and Iceberg require certification for the completion of the entire course, while UoI prefers certification by specific chapters. CUT also supports full-course certification but allows users to access materials without undergoing mandatory assessments. Kinno has suggested a module-based certification system to improve flexibility and ease of implementation.

The registration process also varies across institutions. In most cases, registration is required only once for the entire course. However, UoI follows a different approach, requiring separate registrations for individual course chapters.

Regarding the implementation of e-learning courses, UMFST and UoI have determined that the entire course is best suited for both students and researchers, including master's and PhD students. At UMFST, the course is a mandatory part of the curriculum for Junior Research Academy (JRA) students. CUT is evaluating its integration into doctoral and second-degree

programs, while Iceberg plans to use the full course to train its partners on commercialization processes.

Some institutions have also considered selectively assigning course materials. Kinno has indicated a possible need for modular course assignment when working with researchers individually. However, CreateHub and Iceberg do not require selective assignment of parts of the course.

7.3 Best Practices and Challenges in E-Learning for R&D

Several institutions have developed infrastructure and strategies to enhance e-learning for knowledge transfer and commercialization. UMFST has established a dedicated studio for producing video content to support e-learning initiatives. CUT's DELTA e-learning center has facilitated the development of various supplementary courses. Additionally, UoI and Iceberg intend to leverage e-learning to educate their partners and students on R&D processes and commercialization strategies.

Despite these advancements, several challenges persist. Many institutions lack clear regulations and structured policies for e-learning, leading to inconsistencies in implementation. Certification approaches vary significantly, making standardization difficult. Platform compatibility remains a concern, as different institutions rely on distinct e-learning systems, which may not always support seamless course transfer. Furthermore, the level of integration into research programs varies, with some institutions still exploring whether to make courses compulsory or optional within their academic frameworks.

Finally, resistance to digital learning methods and the absence of dedicated frameworks for integrating e-learning into commercialization processes hinder broader adoption. Overcoming these challenges will require better coordination between institutions, improved standardization in certification and registration processes, and a stronger emphasis on adapting e-learning to the specific needs of researchers, students, and commercialization professionals.

8. OVERALL CONCLUSION AND DISCUSSION

The analysis of the innovation ecosystems in Greece, Poland, and Romania reveals a common set of challenges and areas of progress, reflecting the complexity and diversity of innovation landscapes across Europe.

One of the most significant common challenges is the insufficient public and private sector investment in Research and Development (R&D). In all three countries, fragmented funding mechanisms and the low utilization of available fiscal incentives compound this issue. Poland and Romania, in particular, suffer from limited competitive funding based on rigorous institutional evaluations, further exacerbating the problem. The lack of substantial investment stifles the potential for innovation and limits the capacity for these countries to compete on a global scale.

Excessive bureaucracy and fragmented governance are also significant hurdles. In Greece and Poland, lengthy administrative processes and inadequate legal frameworks impede innovation efforts. Romania faces similar issues with policy fragmentation and a lack of efficient coordination. These bureaucratic challenges create barriers to effective implementation and slow down the progress of innovation projects, discouraging enterprises from engaging in innovative activities.

Poor collaboration between universities, research institutions, and businesses is another recurring problem. Greece and Poland highlight the need for improved cooperation between science and business sectors, while Romania struggles with limited public-private and private-private partnerships. This lack of collaboration hinders knowledge exchange and the commercialization of research, which are essential for a vibrant innovation ecosystem.

Human capital issues, including the "brain drain" phenomenon and low mobility of human resources in science and technology, are pressing concerns for these countries. All three nations experience difficulties in retaining and attracting talent, which is crucial for sustaining their innovation ecosystems. The outflow of skilled professionals undermines the development of a robust research and innovation infrastructure, leaving these countries at a disadvantage.

Cultural and educational barriers also impede progress. Socio-cultural attitudes against risk-taking and insufficient education focused on innovation are prevalent, particularly in Poland. Romania faces challenges in developing a culture of innovation and entrepreneurship, with a relatively low population possessing tertiary education. These barriers prevent the formation of a supportive environment for innovation and entrepreneurial activities.

Despite these challenges, each country has made notable strides in establishing supportive policies and institutions. For example, Greece has the Hellenic Foundation for

Research and Innovation, Poland has developed the National Document on Innovation, and Romania has the National Strategy for Research, Innovation, and Smart Specialization (SNCISI). These frameworks aim to enhance coordination, support technology transfer, and improve funding mechanisms, thereby laying the groundwork for a more cohesive and effective innovation strategy.

Significant improvements in research infrastructure and ICT have also been observed. Greece has created new research infrastructures, Poland is enhancing IT tools for managing innovative activities, and Romania has seen strong increases in broadband penetration and ICT training provision. These advancements are crucial for supporting innovative activities and ensuring that researchers and enterprises have access to the necessary resources and tools.

Increased scientific output and high citation rates are strengths shared by these countries. Greece and Romania have particularly notable increases in public-private research co-publications and highly cited publications. This scientific productivity underscores the potential for these countries to contribute significantly to global research and innovation if supported by appropriate policies and investments.

The rise of start-ups and innovation districts in Greece, the establishment of tools for presenting research and development potential in Poland, and efforts to create high-growth enterprises in Romania highlight the growing dynamism within their innovation ecosystems. These developments suggest a positive trend towards more entrepreneurial activities and the commercialization of innovative ideas.

To overcome financial barriers, comprehensive strategies to increase direct R&D funding, better utilization of fiscal incentives, and the creation of competitive funding based on rigorous evaluations are crucial. Simplifying administrative processes and developing clear, efficient legal frameworks can significantly reduce the bureaucratic burden and accelerate innovation activities. Additionally, developing tools and initiatives to foster collaboration between academia and industry, such as innovation clusters and technology transfer offices, can enhance knowledge exchange and the commercialization of research.

Addressing the "brain drain" by creating attractive conditions for researchers, enhancing education in innovation, and promoting a culture of entrepreneurship are vital. Establishing mentoring programs and providing professional development opportunities can further support this goal. Fostering pro-innovative attitudes through education at all levels and promoting awareness about the importance of innovation can help build a robust culture that supports risk-taking and entrepreneurial activities.

In conclusion, while Greece, Poland, and Romania face significant challenges in their innovation ecosystems, targeted policy measures, enhanced infrastructure, and improved collaboration between stakeholders hold the potential to drive substantial progress. By

addressing these common issues, these countries can better align with EU innovation standards and contribute to a more integrated and competitive European innovation landscape.

Regarding national-level best practices, Greece, Poland, and Romania have made significant strides in developing frameworks and initiatives to advance the commercialization of research results and enhance academic-business collaboration. Each country has crafted unique approaches that not only address their specific needs but also contribute to the broader European innovation landscape.

In Greece, the commitment to fostering innovation is clearly demonstrated through several notable initiatives. The gnΩsi Technology Transfer Network, managed by the Foundation for Research and Technology - Hellas (FORTH)/PRAXI Network, exemplifies a robust framework for promoting research innovation across Greek universities and research institutes. This network provides comprehensive services, including intellectual property protection, technological breakthroughs, and business community interactions. The SCIENCE AGORA Technology Transfer Hub further supports this by offering extensive support in intellectual property management, business acceleration, and skills development, thus facilitating the transition of research ideas into commercial ventures. Additionally, the “Archimedes” Center for Innovation and Entrepreneurship at the National and Kapodistrian University of Athens bridges the gap between academia and industry through personalized consulting, entrepreneurship training, and networking opportunities. Greece's focus on strategic collaborations and funding is also reflected in initiatives like the “Centres of Competence” and the “Research-Innovate 2021-2027” Action, which aim to enhance innovation in Greek SMEs and support entrepreneurial ventures. The ambitious Thessaloniki Innovation & Technology Center (Thess INTEC), which aspires to become one of Europe’s largest Science and Technology Parks, highlights Greece’s dedication to attracting substantial investments and fostering a vibrant innovation ecosystem.

Poland’s approach to fostering innovation and commercialization is equally robust. The "Incubator of Innovativeness" program, which has been operational since 2014, has played a crucial role in supporting commercialization, technology transfer, and intellectual property management at Polish universities and research units. This initiative has funded numerous pre-implementation works, initiated science-business collaborations, and enhanced staff competencies in these areas. Poland's commitment to innovation is further evidenced by programs such as Erasmus+ InnHUB, which focuses on developing vocational education and training programs, and the LIDER program, which supports young scientists in managing research projects with practical applications. The Science4Business initiative aims to improve the effectiveness of Technology Transfer Centers and Special Purpose Vehicles within research organizations, promoting the commercialization of R&D results. Programs like FIRST

TEAM and Proof-of-Concept (PoC) provide essential support for young scientists and research teams, while the "Research Infrastructure of the Modern Economy" emphasizes the commercialization of R&D results and innovation management. Additionally, Poland's targeted programs like PRIME and InnoLab enhance the business competencies of research teams and develop new methods to support innovation, respectively. The BRidge UP program supports R&D projects by newly established technology companies, and the Smart Path program aids comprehensive projects in R&D, innovation implementation, and internationalization. The Implementation Doctorate program fosters collaboration between higher education institutions and the socio-economic environment, highlighting Poland's commitment to bridging the gap between academia and industry.

Romania's initiatives reflect a similar commitment to enhancing its innovation ecosystem. The National Plan for Research, Development, and Innovation 2022-2027 (PNCDI IV), managed by the Ministry of Research, Innovation, and Digitalization (MCID), is pivotal in modernizing and enhancing the national RDI system. With a focus on technology transfer, private sector partnerships, and international collaboration, PNCDI IV integrates ten funding programs aimed at improving fundamental research, promoting business-public RDI collaborations, and engaging the public with science. The Incubator of Innovativeness program, funded through the Regional Operational Program 2014-2020, has led to the establishment of numerous business incubators across Romania, significantly impacting the commercialization process at universities. Romania's landscape is further enriched by Innovation and Entrepreneurship Centers (IECs) at universities, which foster a culture of innovation and provide mentorship and industry connections. The country also hosts various technology parks, such as INMA-IT in Bucharest and Tetapolis in Cluj-Napoca, which support tech-based companies. Digital Innovation Hubs (DIHs) offer access to cutting-edge technology and funding advice, while university-based incubators like Techcelerator and Spherik Accelerator provide crucial support for tech startups. Industrial PhD programs bridge the gap between academia and industry, allowing students to work on research projects directly relevant to industrial needs. Additionally, government and EU-funded programs, such as the Operational Program Competitiveness (POC) and Horizon Europe, facilitate R&D, technological development, and international collaboration, creating a dynamic environment for innovation and economic growth in Romania.

Overall, Greece, Poland, and Romania have each developed effective strategies to enhance their innovation ecosystems through targeted programs that support the commercialization of research and foster academic-business collaborations. These initiatives reflect a shared commitment to bridging the gap between research and practical application, driving economic growth, and addressing societal challenges. By learning from each other's experiences and continuing to build on their respective strengths, these countries can further

advance their innovation landscapes, ultimately benefiting both their national economies and the broader European research and development community.

References

Directorate-General for Research and Innovation (European Commission). (2020). *Research & innovation valorisation channels and tools: Boosting the transformation of knowledge into new sustainable solutions*. Publications Office of the European Union. https://data.europa.eu/doi/10.2777/480584

Directorate-General for Research and Innovation (European Commission), Vladimirova, I., Lalov, A., Pavlova, A., Salle, E., Kiss-Galfalvi, T., & Pottaki, I. (2022). *From research results to innovative solutions: Mapping national and regional programmes and initiatives in R&I valorisation : report on dissemination and exploitation practices in Member States and associated countries*. Publications Office of the European Union. https://data.europa.eu/doi/10.2777/777941

Council Recommendation (EU) 2022/2415 of 2 December 2022 on the guiding principles for knowledge valorisation. (2022). In *OJ L* (Vol. 317). http://data.europa.eu/eli/reco/2022/2415/oj/eng

Guiding Principles for Knowledge Valorisation and implementing Codes of Practice—European Commission. (n.d.). Retrieved July 23, 2024, from https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/eu-valorisation-policy/knowledge-valorisation-platform/guiding-principles-knowledge-valorisation-and-implementing-codes-practice_en

Intellectual, industrial and commercial property | Fact Sheets on the European Union | European Parliament. (2024, April 30). https://www.europarl.europa.eu/factsheets/en/sheet/36/intellectual-industrial-and-commercial-property

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