School of Social Sciences

Innovation Management and Entrepreneurship

Dissertation

“A roadmap for scientists to bring new inventions into the EU market”

Elena Gkantzou

Supervisor: Ioannis Vikas

Patras, Greece, June 2026

“A roadmap for scientists to bring new inventions into the EU market”

Elena Gkantzou

Supervising Committee

Supervisor:	Co-Supervisor:
Ioannis Vikas	Panagiotis Kotsios
Hellenic Open University	Hellenic Open University

Patras, Greece, June 2026

Acknowledgments

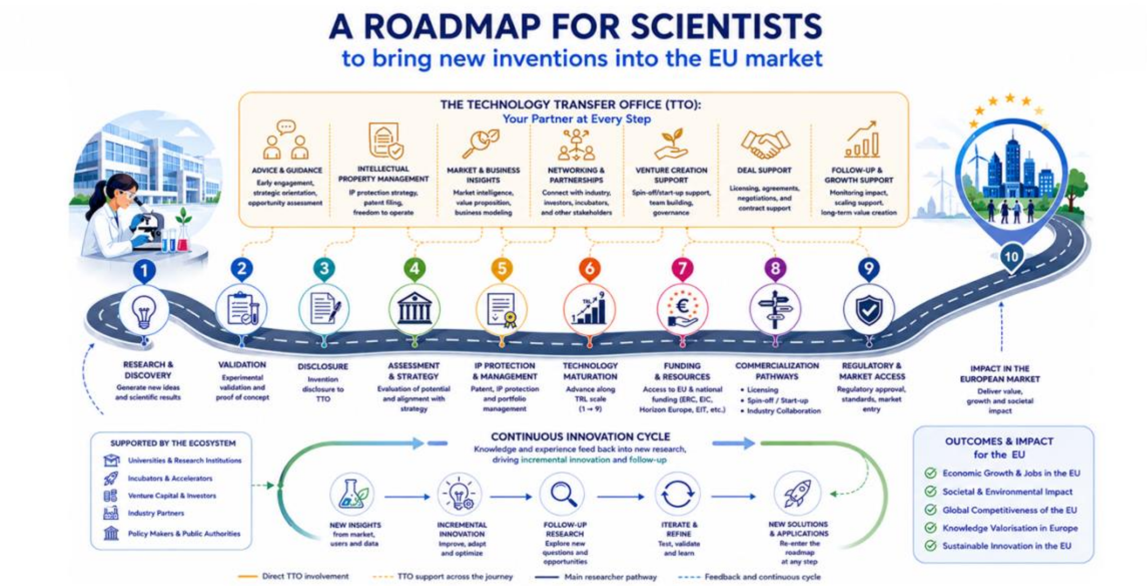
I want to acknowledge my supervisor Prof. Ioannis Vikas and deeply thank him for his understanding and support. I also want to express my deepest gratitude to my friend and colleague Giannis Koritdis that not only contributed to this thesis with an exclusive interview as a long-standing member of the PRAXI network of Greece, but also supported me and inspired me through our discussions on Innovation Management in academia. I would like to dedicate this thesis to all of my teachers of the 'Innovation Management and Entrepreneurship' Master's program who made this journey unforgettable.

Abstract

In the contemporary knowledge economy, research organizations are increasingly expected to do more than just produce peer-reviewed publications. Their results are also expected to circulate across firms, public authorities, civil society and users in ways that create measurable economic and social value. Throughout this process, the lead researcher is called to navigate the lab-to-market pathway, integrating with European Union (EU) processes. By the researcher's side, we will find the Technology Transfer Offices that act as the main character in showing the way to the entrepreneurship world: from Intellectual Property management to start-up creation. Alongside, the EU has provided with a number of mechanisms that will assist in market translation, from low to high Technology Readiness Levels. Several challenges are still underway and the venture capitalists, the regulatory bodies and the scientists themselves need to enhance their mutual communication and understanding for the pathway to smoothen and the technology to reach the desired destination.

Keywords

academic entrepreneurship, knowledge management, lab-to-market, technology transfer, Horizon Europe



Ένας οδικός χάρτης για επιστήμονες προς την προώθηση νέων εφευρέσεων στην Ευρωπαϊκή αγορά

Έλενα Γκάντζου

Περίληψη

Στη σύγχρονη οικονομία της γνώσης, οι ερευνητικοί οργανισμοί καλούνται ολοένα και περισσότερο να επιτελέσουν έναν ρόλο που υπερβαίνει την παραγωγή επιστημονικών δημοσιεύσεων υπό κρίση. Τα ερευνητικά τους αποτελέσματα αναμένεται πλέον να διαχέονται προς τις επιχειρήσεις, τους δημόσιους φορείς, την κοινωνία των πολιτών και τους τελικούς χρήστες, δημιουργώντας μετρήσιμη οικονομική και κοινωνική αξία. Στο πλαίσιο αυτής της διαδικασίας, ο κύριος ερευνητής καλείται να διανύσει την πορεία από το εργαστήριο στην αγορά (*lab-to-market*), ενσωματώνοντας τους μηχανισμούς και τις διαδικασίες της Ευρωπαϊκής Ένωσης (ΕΕ). Στο πλευρό του ερευνητή, βρίσκουμε τα Γραφεία Μεταφοράς Τεχνολογίας που διαδραματίζουν πρωταγωνιστικό ρόλο στην καθοδήγηση των ερευνητών: από τη διαχείριση πνευματικής ιδιοκτησίας μέχρι τη δημιουργία νεοφυούς επιχείρησης. Παράλληλα, η Ευρωπαική Ένωση έχει αναπτύξει ένα οικοσύστημα χρηματοδοτικών εργαλείων και υποστηρικτικών μηχανισμών που διευκολύνουν τη μετάβαση των τεχνολογιών από τα πρώιμα στάδια ανάπτυξης έως την εμπορική αξιοποίησή τους, καλύπτοντας ολόκληρο το φάσμα των Επιπέδων Τεχνολογικής Ετοιμότητας (*Technology Readiness Levels – TRLs*). Ωστόσο, μία σειρά προκλήσεων αποτελούν ακόμα εμπόδια στο δρόμο αυτό. Οι επενδυτές επιχειρηματικών κεφαλαίων (*venture capitalists*), οι ρυθμιστικές αρχές και οι ίδιοι οι επιστήμονες χρειάζεται να δουλέψουν προς μία αποτελεσματικότερη επικοινωνία/αλληλεπίδραση ώστε να ομαλοποιήσουν το δρόμο αυτό επιτρέποντας στις νέες τεχνολογίες να φτάσουν τελικά στον προορισμό τους.

Λέξεις – Κλειδιά

ακαδημαϊκή επιχειρηματικότητα, διαχείριση γνώσης, από-το-εργαστήριο-στην-αγορά, μεταφορά τεχνολογίας, Ορίζοντας Ευρώπη

Table of Contents

List of Figures

List of Tables

Introduction

In the contemporary knowledge economy, research organizations are increasingly expected to do more than just produce peer-reviewed publications. Their results are also expected to circulate across firms, public authorities, civil society and users in ways that create measurable economic and social value. Knowledge management is therefore necessary for the transition from laboratory discovery to market use. This transition is not a spontaneous event – it requires the identification of valuable knowledge, its protection, its translation into a form that external actors can understand, and its recombination with manufacturing, regulatory, financial and marketing capabilities. Recent literature on knowledge management and technology transfer shows that successful transfer depends on both codified knowledge, such as patents, prototypes and technical files, and tacit knowledge, such as the experience of the research team and the routines developed during experimentation (Barros et al., 2020, pp. 1587-1593; Stemberkova et al., 2021, pp. 3-6). This is especially important for scientific inventions, where the written disclosure of an idea rarely contains all the practical details needed to reproduce, scale and commercialize it.

The topic is also connected with academic entrepreneurship. Academic entrepreneurship does not only mean that a professor or researcher creates a company; it covers a broader set of activities through which scientific knowledge is transformed into usable technologies, services, processes or policy solutions. These activities include invention disclosure, patenting, licensing, contract research, consulting, start-up and spin-off formation, participation in accelerators, and long-term university-industry partnerships. A useful way to understand this field is as an ecosystem rather than a linear pipeline. The scientist, the research group, the Technology Transfer Office, the host institution, investors, firms, regulators and users all influence whether an invention will remain a scientific output or become an innovation with a market and societal role (Hayter et al., 2018, pp. 1043-1054; Compagnucci & Spigarelli, 2020, pp. 4-8). For this reason, the dissertation is organized as a practical roadmap: it follows the invention after it leaves the lab and explains the decisions that must be taken before market entry becomes realistic.

In different parts of the world we can observe successful technology commercialization ecosystems, functioning under diverse policies. For example, the United States is considered a global benchmark for university technology transfer. US successful innovation ecosystem is characterized by abudant venture capitalists willing to fund university research that have established an entrepreneurial culture and close collaboration between academia and industry with strong deal-flows. Another case is that of China that has experienced remarkable growth in technology transfer activities over the last years. China's lab-to-market ecosystem is driven by substantial government investment in research and innovation and several incentives that encourage universities to commercialize their research outputs. Chinese universities have significantly increased patent applications in strategic sectors like artificial intelligence and biotechnology(Chen et al., 2016; Gu, 2023). It would be also to look at the example of India that has recently emerged as a highly competitive innovation ecosystem. The estbalishment of innovation hubs and technology business incubators have strengthened university-industry relationship and accelerated the commercialization of publicly funded research(Ravi & Janodia, 2022).

Within the European Union, the policy response has increasingly focused on knowledge valorization, intellectual asset management and research impact. The EU does not only ask researchers to disseminate results; it also encourages them to think about exploitation pathways, standards, intellectual property strategy, societal uptake and industry-academia co-creation. The Council Recommendation on the guiding principles for knowledge valorization explicitly broadens the focus from intellectual property protection alone to the management of intellectual assets across the whole research and innovation ecosystem (Council of the European Union, 2022, pp. 3-7). A recurring concern is that Europe performs well in scientific production but has often struggled to convert public research into fast-growing firms, scalable products and global market positions. This issue is usually discussed as the European paradox, although recent studies show that the problem is more complex than a simple lack of commercialization. In several European countries important barriers are observed, such as fragmented innovation ecosystems, differences between national intellectual property rules, limited risk capital in some regions, weak incentives for academics, and the late involvement of users and firms in research projects (Fini et al., 2018; Nagar et al., 2024). Many inventions fail not because the science is weak, but because the team has not clarified ownership, market need, regulatory constraints, funding needs or possible partners early enough. These aspects will be discussed in the current thesis and potential solutions will be suggested.

Furthermore, Technology Transfer Offices (TTOs) are central actors in the lab-to-market roadmap. Their role is not limited to administrative support for patent filing. A well-functioning TTO helps researchers evaluate invention disclosures, organize confidentiality agreements, choose between licensing and spin-off formation, connect with companies, negotiate agreements and manage revenue-sharing rules. However, the literature also warns that TTO performance varies significantly between institutions and that the office can only be effective when it has specialized staff, clear institutional policies, access to external networks and the trust of researchers (Czarnitzki et al., 2016, pp. 134-139; Marin et al., 2024, pp. 3-8). The dissertation therefore treats the TTO as a guide and mediator, not as a substitute for the scientist's own strategic awareness. The purpose of the following sections is to give the lead scientist a realistic sequence of decisions from invention disclosure and patent protection to market access and follow-up innovation.

Methodology

For the present thesis, a literature search was performed in the databases SCOPUS, that includes journals from different publishing organisms, and ScienceDirect that includes journals from the Elsevier publishing house. These databases were chosen according to initial randomized search in a search engine.

An extended search was performed in the European Commission (EC) database, and especially the Funding and Tenders Portal where most of the content for Part 1 and 2 was sourced from. The aim was to get an overview on funding mechanisms in EU and especially the Horizon framework, and the degree to which these mechanisms are integrated in the EU universities and technology commercialization activities.

For Part 3 of this dissertation, the author visited a Technology Transfer Office and recorded an exclusive interview with an office member that kindly offered to answer questions about the office and the technology commercialization ecosystem in Greece. The specific questions and answers were later edited by the author and presented in this thesis in a written format.

In the context of the thesis, the author also attended a conference organized by the main technology transfer mechanism in Greece, the PRAXI network. The panel discussions were used for the content of Part 3 of this dissertation.

Results

The thesis is divided in three main sections to serve three different purposes:

Part 1 - A stepwise guide to technology commercialization, presents the main aspects of a technology commercialization process when the invention comes out of the lab. The aim is to offer the reader a stepwise concept on the actions that need to be taken to follow a lab-to-market pathway. The section also explains several terms relative to technology commercialization but a concise list with terminology is given in the Appendix.

Part 2 - The EU framework on technology development and commercialization explains in more detail the EU funding mechanisms and presents case studies of universities with successful commercialization ecosystems. These information could serve as an example for researchers and authorities in light of future changes/adjustments of current institutional culture.

Part 3 - The Technology transfer network in Greece gives an overview of the current situation around greek research landscape in terms of technology commercialization. The views of TTOs' members and venture capitalists are also presented.

Part 1: A stepwise guide to technology commercialization

1. An invention comes out of the lab – what is next

The lead scientist in a research project is usually the one person that have followed along every step of a process which ended up in an useful product, i.e. an invention. This should be the most suitable person to look further for the transition from scientific discovery to innovation exploitation. However, access to market cannot happen without recruiting other experts that will help in the different stages of the process to make the most out of the invention both for the scientists and for the general public. Although several people with different expertise would follow along, the lead scientist should be aware of the main steps that can be followed during this transition, and quite importantly, the ways to secure the intellectual rights once the invention gets out of the lab. In other words, the lead scientist will need to think as an innovator/entrepreneur/technology provider since the decisions made at this point will determine the successful implementation from lab to market.

The lead scientist in a research project is usually the one person that have followed along every step of a process which ended up in an useful product, i.e. an invention. This should be the most suitable person to look further for the transition from scientific discovery to innovation exploitation. However, access to market cannot happen without recruiting other experts that will help in the different stages of the process to make the most out of the invention both for the scientists and for the general public. Although several people with different expertise would follow along, the lead scientist should be aware of the main steps that can be followed during this transition, and quite importantly, the ways to secure the intellectual rights once the invention gets out of the lab. In other words, the lead scientist will need to think as an innovator/entrepreneur/technology provider since the decisions made at this point will determine the successful implementation from lab to market.

At the first stage, the research team should convert the experimental result into an invention disclosure. The disclosure is not the same as a scientific article. It is an internal, confidential document that records the technical problem, the proposed solution, the experimental evidence, the inventors involved, the funding source, the possible applications and any previous or planned public communication. This step is essential because universities and research organizations often need an internal record before they can assess ownership and decide whether patent filing or another form of protection is appropriate. The disclosure should be prepared before conference abstracts, thesis uploads, posters, preprints or informal presentations to companies, because premature public disclosure can become prior art and can weaken novelty in Europe (European Patent Office, 2024a, sec. 3.3.002). In practical terms, the lead scientist should collect laboratory notebooks, dates of conception and reduction to practice, experimental data, drafts of manuscripts, project agreements and the names of all contributors before contacting the TTO.

A useful early question is whether the invention is a research result, a technology, or already a product concept. The distinction matters because each category requires different resources. A research result may demonstrate a new mechanism or phenomenon, but it may still lack reproducibility outside the laboratory. A technology is more concrete because it offers a technical route to solve a problem, although it may still need prototyping, validation and scale-up. A product concept goes one step further: it connects the technology with a specific user group, performance requirement, price range, regulatory route and competitive alternative. Many scientific teams overestimate the commercial maturity of an invention because the proof-of-principle worked under controlled conditions. Technology transfer studies emphasize that the early gap is usually not only scientific; it is also organizational, financial and market-related (Boguszewicz-Kreft et al., 2021, pp. 2-6; Barros et al., 2020, pp. 1594-1599). For this reason, the first assessment should examine evidence, not enthusiasm.

After enough experimental results are gathered and validated internally, the invention can be evaluated further for three main characteristics: *applicability* - how feasible is it to apply the invention in a real-life situation, *scalability* - how feasible is it to scale up the processes involved in the development of the invention, and its *market relevance* - would it be successful as a marketed product? The research team must discuss on the commercial potential or which is the societal/industrial need the generated knowledge is addressing. Although this discussion usually precedes the actual experimentation, at this stage there should be actual numbers and market information presented on the table that would determine if the further exploitation is worth it. At the same time, there should be a careful consideration of which or how much of the research findings should be published to avoid compromising later steps of the innovation exploitation process. In several European universities and research institutions scientists can refer to the Technology Transfer Offices (TTOs) (or other innovation support units) to get advice on commercial potential, intellectual property opportunities, and selecting suitable exploitation pathways. Supportive information can also be found in the EU valorization policy of Research and Innovation.

The EU knowledge valorization policies and directives include activities like commercialization, licensing, spin-off creation and strengthened collaboration between academia and industry. More on the EU policies and guidelines will be discussed in Paragraph 5.

A simple readiness diagnosis can help the lead scientist decide what to do next. The team should ask whether the invention has been reproduced by more than one researcher, whether the protocol depends on expensive or rare materials, whether performance has been compared with existing solutions, whether the target user has been identified, and whether there is any obvious regulatory or safety issue. These questions are not intended to discourage patenting. They help identify what information is missing before an investor, company or public funding body can take the invention seriously. In many EU projects this logic is expressed through Technology Readiness Levels (TRLs), where early research sits at low levels and market deployment requires later validation, demonstration and system integration (**Figure 1**). The lead researcher does not need to become a business specialist at this stage, but should be able to explain why the result is technically distinctive and why an external actor would invest time and resources in it.

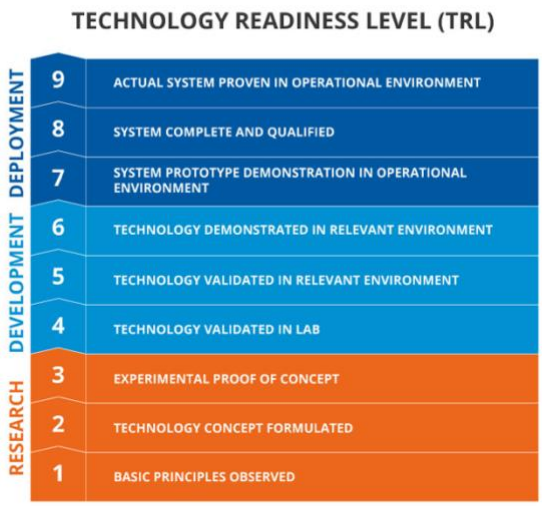


Figure 1. Technology Readiness Levels (TRLs) as a framework for assessing the maturity of a scientific invention from basic research and proof of concept to validation, demonstration and deployment in an operational environment. Source: [***https://www.twi-global.com/technical-knowledge/faqs/technology-readiness-levels***](https://www.twi-global.com/technical-knowledge/faqs/technology-readiness-levels)

Having generated a bigger picture on the market access pathways and the invention's potential, the lead researcher is usually faced with three main pathways. The first direction is to license the invention to an established company that has all the necessary means of accessing the market: manufacturing at scale, regulatory compliance, marketing strategies, and distribution channels. A licensing agreement offers the benefit of retaining intellectual property ownership, even receiving royalties, but avoid the access-to-market steps, thus the researchers remain focused on academic activities.

A second pathway is to establish collaborations with industrial partners or investors to further develop the technology. Usually, the academic funding is enough only for reaching low Technology Readiness Levels (TRLs), so it is imposing to secure further funding for an invention to advance in a marketable technology. In many cases nowadays, a research project starts after having agreed already with a small or bigger company for future exploitation, as it is very often required from EU funding schemes in order to receive financial support. However, for those projects or ideas that are incubating within laboratories and showing great promise without prior agreement with external collaborators, an investor or innovation intermediate can help in further advancing the technology. These collaborative agreements will not only provide additional financial resources, but also valuable technical expertise and market knowledge that are often unavailable within the academic environment. Such activities may include validation, prototyping, scale-up, and regulatory testing before market entry.

As a third option, the lead scientist may consider starting a spin-off or start-up company based on the invention (see Table 1 for terminology explanation). If the scientist chooses to stay connected with the academic environment, i.e. not start an independent company, there are several academic entrepreneurship schemes that can be applied and are increasingly encouraged across European institutions. Incubators, accelerators, mentoring schemes, and seed funding opportunities are some of them and can be accessed mainly through the TTO offices, as it will be discussed in Paragraph 6. The case of engaging in academic entrepreneurship requires that the scientist will devote more time in business development activities like team formation, strategic planning and fundraising.

Sometimes, scientists lack institutional support, resources or are simply not interested in engaging in lab-to-market activities, so another option to assign or sell intellectual properties rights directly to external organizations. Research teams and lead scientists that are choosing this pathway, are usually publishing to the scientific community only part of the findings, communicating mostly the theoretical part of the project and its potential. Common cases falling within this direction are the ones where big companies have signed agreements with academic laboratories and the invention follows directly the path from the lab to the company's hands, without involving the academics in further technological advancements.

A typical example is a sponsored research collaboration in which an academic laboratory develops a compound, prototype or analytical method under contract with an industrial partner. The company may then take over optimization, regulatory testing, manufacturing and distribution, while the university retains only the rights defined in the agreement. This arrangement can be efficient when the firm already has the complementary assets needed for market entry, but it may also reduce the research team's influence over future development if the contract does not reserve access to data, publication rights or follow-up collaboration (Teece, 2018, pp. 1372-1376).

Consequently, a scientific discovery has to be carefully validated and a decision-making process has to be established within the research team in order to successfully transition from laboratory environments to commercially viable and socially impactful innovations within the European landscape.

The final decision at this stage is whether to pause publication until protection has been considered. This is often difficult in academic environments because publication is central to career progression, thesis completion and grant reporting. Nevertheless, a short delay may protect the long-term value of the invention without preventing later dissemination. The usual practice is to file before the public disclosure and then publish once the filing date is secured. This does not mean that every invention should be patented. Some outputs may be better protected through copyright, trade secrets, database rights, open-source licenses or rapid dissemination, depending on the type of result and the intended impact pathway. What matters is that the decision is deliberate. The lead scientist should avoid treating commercialization as something that begins after publication; in many cases, it must be considered before the first public communication.

2. Establishing Intellectual Property rights

Intellectual property (IP) rights describe the formal legal means of identifying and registering in a public repository the rights of a knowledge and innovation process, and can include patents, copyrights, or trademarks. Intellectual property protection serves not only as a legal mechanism but it can be also exploited as a strategic tool to facilitate technology transfer, to attract funding and enable the commercialization of research outcomes. The most common method for protecting knowledge and innovation in academia is the filing of a patent. A patent is an exclusive right granted for a technological innovation - a product or a process - that provides a new way of doing something or offers a new technical solution to a problem. To get a patent, the owners must disclose technical information about the invention in a patent application. Once filed, these information will be publicly available.

The first and foremost reason for filing a patent is to protect an invention, but several other advantages may come along. Firstly, patents reflect the research team's capacity to generate innovation. It is a straightforward way for a lead researcher to get at the forefront of a research field. Additionally, the visibility and reputation of the research team can quickly rise through patent citations. Showcasing patents filing in research proposals to attract funding can lead to higher success rates. Last but not least, the legal monopoly that is secured through patent filing for a period of 20 years gives time and space to the research team for further exploitation of their invention to generate innovation.

Some important information here is that different countries will have different requirements for filing a patent, so the inventors should request information from the local authorities or choose to file a patent under the requirements of a broader region, for example European Union. It is also important to mention that there is currently no "world patent" and most patents are filed in regional patent offices like the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO). There are also some treaties aiming to facilitate a patent application in multiple countries simultaneously, like the Patent Cooperation Treaty and the Paris Convention for the Protection of Industrial Property. The primary organization responsible for patent protection in Europe is the European Patent Office (EPO) which, operates under the European Patent Convention (EPC). The patents that are examined and granted by the EPO can be subsequently validated in participating member states. Additionally, the European Union introduced the Unified Patent Court (UPC) and the Unitary Patent System to simplify patent filing and administrative complexity across participating member states.

In technology commercialization, intellectual property should be understood as part of a wider intellectual asset strategy. A patent may protect a technical solution, but it is only one element of the asset base that makes an invention exploitable. The full asset base may include experimental datasets, software code, biological materials, protocols, know-how, trademarks, design rights, regulatory documentation, customer feedback and collaboration agreements. The EU's recent approach to knowledge valorization uses the broader term intellectual assets exactly because research outputs often create value through combinations of protected and non-protected knowledge (Council of the European Union, 2022, pp. 6-8). For a lead scientist, the practical implication is that the patent filing should be coordinated with data management, publication strategy, confidentiality, partner selection and future product development. A patent filed without a clear exploitation plan may become an expensive certificate rather than a tool for market access.

Inventorship and ownership should also be separated conceptually. Inventorship concerns the persons who made a creative technical contribution to the claimed invention. Ownership concerns the legal person or organization that has the right to exploit or transfer the patent. In university settings these categories may not coincide. A researcher may be an inventor, but the institution may own the rights because the invention was created during employment, through institutional resources or under a funded project. The TTO must therefore review employment contracts, project agreements, institutional rules and collaboration agreements before filing. This review is not a bureaucratic detail. If ownership is unclear, the patent may become difficult to license, investors may hesitate, and disputes may arise after the invention becomes valuable. Studies on academic entrepreneurship show that patent-right allocation and entrepreneurial support can shape researchers' incentives and the eventual transfer route (Czarnitzki et al., 2016, pp. 131-138).

Before filing, the research team and the patent attorney normally conduct a prior-art search. The purpose is not only to check novelty, but also to understand the technological landscape in which the invention will compete. Prior art includes patent documents, scientific articles, conference proceedings, theses, web pages and any public disclosure that makes the invention available before the filing date. A good search can reveal whether the invention should be claimed broadly or narrowly, whether the team should focus on a particular application, and whether there may be freedom-to-operate concerns. Freedom to operate is different from patentability: an invention may be patentable and yet still risk infringing earlier patents if it uses protected components or processes. For academic teams this distinction is often unfamiliar, but it becomes crucial before commercial manufacturing, clinical trials, industrial scale-up or licensing negotiations.

The European patent route requires strategic choices about timing and geography (**Figure 2**). Filing first at the national level, at the European Patent Office or through an international PCT route may lead to different costs, deadlines and territorial options. There is no single world patent, and protection must eventually be pursued in the countries or regions where market access, manufacturing, competitors or investors make protection worthwhile. The PCT route can be useful when the team needs additional time to evaluate commercial interest before entering national or regional phases, while a European application may be more efficient when the intended market is mainly within Europe (WIPO, 2024; European Patent Office, 2024b). Since June 2023, the Unitary Patent and Unified Patent Court have also added another strategic option for certain EU countries by offering uniform protection and a centralized litigation route for participating member states (European Commission, 2024). The best choice depends on budget, business model, and expected market geography, not only on legal availability.

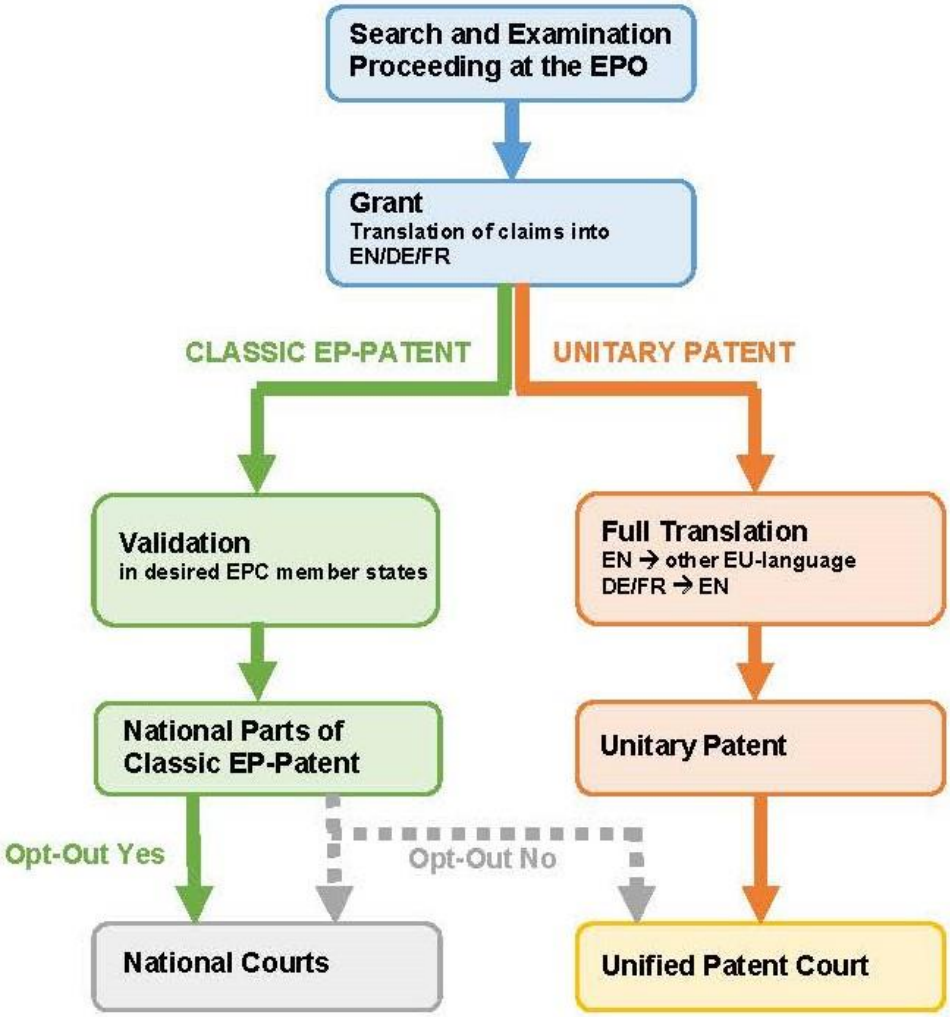


Figure 2. European patent protection routes after examination and grant by the European Patent Office: comparison between the classic European patent and the Unitary Patent pathway. Source: [*https://wbetal.de/en/overview-european-unitary-patent-system/*](https://wbetal.de/en/overview-european-unitary-patent-system/)

2.1 Legal patentability tests in the European Union

In the European region, a patent is granted by the European Patent Office (EPO) after all the requirements set by the European Patent Convention (EPC) are satisfactorily addressed in the patent application. These requirements or legal tests are assessed by the EPO during the examination process. The four main legal tests are and explained in more detail in the following paragraphs.

The first and foremost test is about *a patentable subject matter*, referring to the technical character of the application. The invention must have a technical character and provide a solution to a technical problem. A scientific discovery alone (or a theory, mathematical method, business method, etc.) will not be patentable, but a practical technological application derived from that discovery may satisfy the technical character requirement. Secondly, the *novelty* of the invention is satisfied if it has not been previously disclosed publicly before the filing date of the patent application. Public disclosure refers to activities like scientific publications, conference presentations, websites, or commercial use. This requirement has to be carefully considered by the lead researcher, who has to decide on early publication of the results or prioritize the patent filing. A third requirement is about the *inventive step*. The invention must include procedures that are not obvious to a person skilled in the relevant technical field. So, the invention should demonstrate a sufficient level of innovation beyond current state-of-the-art and not be a combination or modification of existing knowledge. Another requirement to be met is the *industrial applicability*. The suggested technology should be able to be manufactured at scale or, in general, used in some form of industry. This requirement ensures that patent protection is granted only to inventions with potential to produce tangible technical outcomes. Apart from addressing the main requirements, it is important that the patent application is sufficiently disclosing all the information needed for a skilled person to reproduce it. This is after all the fundamental principle of the patent system: the researcher is granted exclusive rights in exchange for public disclosure of technical knowledge.

The legal tests for patentability should not be treated as abstract legal language. They can be translated into practical research questions. Patentable subject matter asks whether the invention is a technical solution, not merely a discovery, theory or business idea. Novelty asks whether every element of the claimed invention has already been made available to the public. Inventive step asks whether the claimed solution would have been obvious to a skilled person in the technical field. Industrial applicability asks whether the invention can be made or used in an industrial context. These tests show why the claim language is so important. A discovery in itself may not be patentable, but a device, method, composition, process or use derived from it may be. The lead scientist can support the patent attorney by explaining the technical problem, the differences from prior art and the experimental evidence showing that the solution works.

The European system is strict regarding public disclosure. Unlike the United States, Europe has very limited grace-period exceptions. A poster, oral presentation, preprint, thesis repository upload, website text, conference abstract or public demonstration can damage novelty if it makes the invention available before the filing date. This rule is particularly important for doctoral and postdoctoral researchers, because they may be under pressure to submit abstracts, defend theses or place preprints online. The TTO should therefore be informed at an early stage and not only when a manuscript is ready. Good practice is to prepare a short internal disclosure first, allow the TTO and patent attorney to review it, file if protection is justified, and then proceed with publication. This approach protects both academic dissemination and commercial potential.

Another practical issue is sufficiency of disclosure. The application must describe the invention clearly enough for a skilled person to carry it out. This requirement can be challenging when a scientific result depends on tacit laboratory know-how, unpublished negative results or experimental conditions that are not obvious from the manuscript. The research team should therefore provide detailed protocols, examples, comparative data and alternative embodiments where possible. Weak or overly speculative drafting may lead to narrow claims or later validity problems. From a commercial perspective, the patent should also protect the commercially meaningful version of the technology, not only the first laboratory version. This is one reason why early contact with possible users or industry experts can be valuable, provided confidentiality is managed correctly.

2.2 Duration of patent protection in the European Union

According to the European Patent Convention (EPC), A European patent grants the holder exclusive exploitation rights for a period of twenty years from the filing date of the patent application. During this period, the inventor maintains a legal monopoly, preventing third parties from manufacturing or commercially exploiting the patented technology without authorization. Importantly, this protection period applied to any patent generated within EU, being universities, research organization or private companies. Consequently, academic patents fall within the same regulatory framework as all other, industrial-level, patents. In certain sectors, like pharmaceuticals, supplementary protection mechanisms may be necessary in order to extend exclusivity beyond the 20-year term, due to the lengthy regulatory approval procedures that these products have to go through.

However, the 20-year patent term should be interpreted realistically. Although the term is counted from the filing date, commercial development may consume a substantial part of that period. In life sciences, medical devices, energy technologies and advanced materials, the path from filing to market may include years of optimization, regulatory testing, certification, scale-up and investor due diligence. Therefore, the value of the patent depends not only on the formal duration but also on how quickly the team can move from invention to validation. If the application is filed very early, the team may secure priority but may also begin the clock before the technology is mature. If it is filed too late, disclosure or competitor activity may destroy novelty. This timing problem is one of the most difficult issues in academic commercialization and should be discussed with the TTO and patent attorney.

2.3 Filling a patent in Greece

Another option for an inventor is to file a patent locally at his country and not go for a regional patent. However, the countries that fall within broader regional unions will most probably have the same or very similar requirements, with the difference that the patent is not taking the regional accreditation and thus can only maintain patent rights in a national level. In Greece, patent applications are evaluated by the Hellenic Industrial Property Organization (OBI), which constitutes the official body responsible for granting intellectual property rights, including patents. The Greek patent law on Technology transfer, Inventions and Technological Innovation, law 1733/1987, regulates ownership, technology transfer, and patent exploitation activities within the country. Additionally, Greece recognizes Utility Model Certificates, which provide a simplified form of protection and can be used for inventions with lower inventive complexity. This strategy can be used for specific technological improvements or incremental innovations.

Under the Greek patent law an invention is patentable when it satisfies the requirements of novelty, inventive step, and industrial applicability, aligned with the European patent framework. Any specific requirements have to do with the filing process not the main eligibility criteria, and are summarized in Table 1. The filing procedure in Greece includes specific administrative timelines. Following submission, the applicants are granted a 4-month period for corrections or provide missing information. Subsequently, OBI conducts the examination on novelty and inventive-step and issues a search report, after which applicants are given a 3-month period to submit their comments before the final report report is issued and the patent is granted.

***Table 1**. Main requirements and procedural stages for filing a patent application in Greece.*

Stage / requirement	Main content	Procedural significance	Indicative timeframe
Patentability requirements	The invention must be new, involve an inventive step, and be susceptible of industrial application.	These are the main legal criteria that determine whether an invention can be protected by a Greek patent. They are broadly aligned with the European patent framework.	Before and during filing
Subject matter of the application	The invention may concern a product, a process, or an industrial application. Discoveries, scientific theories, mathematical methods, business methods, and presentation of information are not considered patentable inventions as such.	This step helps distinguish between scientific knowledge and a technical invention that can receive legal protection.	Before filing
Main filing documents	The application must include the applicant's details, a description of the invention, one or more claims, and a request for the grant of a patent.	These elements establish the formal basis of the patent application and define the requested scope of protection.	At filing
Supporting documentation	The application may also include drawings, an abstract, explanatory	These documents support the technical understanding	At filing

	material, authorization documents where necessary, and proof of payment of the required fees.	and administrative completeness of the application.	
Completion or correction of the application	Missing drawings, supporting documents, incomplete data, or errors in the filed material may be completed or corrected.	This stage allows the applicant to make the application complete after its initial filing. If the application remains incomplete, it may be treated as not filed.	Within 4 months from the filing date
Initial examination by OBI	OBI examines whether the application concerns patentable subject matter and whether it falls within excluded categories.	This stage functions as an initial screening before the preparation of the search report.	After completion of the application
Search report	OBI prepares a search report based on the description, claims, and drawings. The report identifies prior art relevant to novelty and inventive step.	The search report helps assess whether the invention appears to satisfy the legal requirements for patent protection.	The search fee must be paid within four months from the filing date
Applicant's comments	The search report is communicated to the applicant, who may submit comments.	This gives the applicant the opportunity to respond to the findings of the search report before the final report is issued.	Within 3 months from notification of the search report
Final search report and grant	OBI prepares the final search report and grants the patent after completion of the required procedure. The patent is then recorded in the Patents Register and published in the Industrial Property Bulletin.	This is the final administrative stage through which the patent is formally granted and made publicly available.	After completion of the previous stages

Note: *Adapted from the provisions of Greek Law 1733/1987 on technology transfer, inventions and technological innovation, as presented by the Hellenic Industrial Property Organization (OBI).*

For academic researchers, another consideration should be the specific conditions that apply to the host institution regarding ownership rights. Inventions developed within universities or publicly funded research institutions may partially belong to the host institution according to the specific institutional regulations. Some specific conditions may also apply according to the funding source that led to the technological development, so the lead researcher should also pay attention to the funding agreement. In any case, the lead scientist should collaborate with their host institution's TTO to establish a patenting strategy and work together on maximizing licensing opportunities and revenue potential.

For Greek researchers, a national filing through the Hellenic Industrial Property Organization (OBI) can be useful when the intended protection is initially domestic, when costs must be controlled, or when the team needs a first priority date before deciding on broader protection. Greece is also part of the European patent system, so the lead scientist should compare the national route with a European or international route depending on the expected market. A Greek filing may be appropriate for early-stage inventions with uncertain commercial geography, but it should not be assumed to provide protection in other countries. The geographic scope of protection must match the expected exploitation path: manufacturing location, target market, competitor activity and possible licensees. If the invention is likely to be used in multiple EU countries, the team should discuss early whether a European route, and potentially unitary protection for participating countries, is more suitable.

In practice, the scientist should not try to manage Greek patent filing alone. The required documents, drawings, claims, fees, timelines and corrections need coordination, and the wording of claims can determine the strength of future protection. The TTO can help the researcher collect information for the patent attorney and align the application with institutional ownership rules. When the invention is publicly funded, the funding agreement may also impose obligations related to result ownership, open access, exploitation, reporting or access rights for project partners. This is particularly relevant for EU-funded projects where results may be owned by the beneficiary that generated them, but other beneficiaries may have access rights under specific conditions. Therefore, Greek national filing should be part of a broader institutional and contractual analysis, not a detached administrative step.

2.4 Summary

Academic culture emphasizes publication and dissemination of research results, however a careful consideration of patent filing would offer greater advantages for the research team and the invention itself. Thus, the timing of patent applications for scientists is particularly important so as not to invalidate patentability with premature publication. The patent filing should be done even before conference abstracts or public presentations. Technology Transfer Offices play a fundamental role in supporting researchers in this process, including patentability assessment and coordination with patent attorneys. A common practice in European universities is that publicly funded research is institutionally owned, while the lead researcher may receive a percentage of future revenues generated through commercialization agreements. Private or EU funded research will include specific measures for possible patents so the specific conditions of the agreement have to be checked by the research team beforehand.

Apart from patents, other confidentiality mechanisms and internal agreements should be considered during the early stages of invention generation and commercialization. The non-disclosure agreements (NDAs) are commonly used in the premature stages among academics and industrial collaborators or other external stakeholders to prevent disclosure of potentially patentable information. Such agreements are strongly encouraged in academic environments where scientific communication and collaboration are especially important. Confidentiality tools are useful only when they are used early and consistently. An NDA should be signed before non-public technical details are shared with companies, investors, consultants, external laboratories or potential co-developers. However, an NDA should not create a false sense of security. Some firms hesitate to sign broad NDAs before they know the field of the invention, and some discussions may involve information that is already public. The lead scientist should therefore learn to distinguish between a non-confidential teaser and a confidential technical disclosure. The teaser can describe the problem, the general advantage and the stage of development without revealing enabling details. The confidential disclosure can then follow once the TTO has approved the interaction and an agreement is in place. This staged communication protects the invention while allowing the team to test market interest.

To conclude with, the European Union emphasizes on intellectual asset management as a central pillar of innovation and knowledge valorization. Universities and research institutions are nowadays expected - and sometimes required if they want to secure funding – to not only generate scientific knowledge but also contribute to economic growth and innovation ecosystems. The directives mention that effective IP management is necessary for the societal and economic value generated through the EU funded schemes. Therefore, IP protection should not be viewed by the researcher merely as a legal formality, but rather as a strategic step of innovation managements. Effective IP protection enable scientists and institutions to secure competitive advantage, and attract further funding. Importantly, IP protection will open the road for the successful transition from the research laboratory to the European market.

3. Accessing the market

Once intellectual property rights have been secured, the next step is to access the market, i.e. transform a laboratory achievement into a commercial innovation. Accessing the market is a multiparametric process that entails entrepreneurial characteristics, like strategic partnerships, regulatory awareness, initial capital, and an understanding of market needs. At this point is where many scientific inventions lag behind despite their high technological potential: because of insufficient resources for market access. Of course, it's not only the responsibility of the lead scientist but academic institutions, technology transfer offices and EU organizations should play a key role in supporting technology commercialization. Thus, depending on the available recourses and institutional support, there are different commercialization pathways that researchers and inventors may pursue.

To start with, one straightforward option is to sell the invention/IP to a private organization, usually an established company that will use the invention for its own interest. In such cases, the ownership of the technology is permanently getting out of the inventors hands in exchange for financial compensation. So, this is an on/off option that will bring direct economic return but no other future benefits. If the inventor/scientist is interested in keeping the rights of the invention and benefit from it in the long run, there are two main pathways to follow: collaboration with an established company or establishment of a start-up or spin-off company based on the academic invention.

3.1 Licensing agreements with established companies

Collaboration with established companies usually involves licensing agreements where the patent owner grants commercial exploitation rights accompanied by financial agreements (royalties, milestone payments, etc). Established firms offer manufacturing infrastructure and distribution networks that can significantly accelerate commercialization, while the inventor keeps the intellectual property rights, leading to both recognition and financial benefits. This option is particularly attractive for researchers that prefer to focus on academic activities rather than engaging in entrepreneurship. This kind of collaborations can also become long-standing with profound benefits for all parties.

Licensing agreements can be exclusive, non-exclusive or limited by field of use, geography or application. Exclusive licensing may be necessary when the licensee must make substantial investments in development, regulatory approval or manufacturing. A firm will rarely invest heavily if competitors can receive the same rights immediately. Non-exclusive licensing can be more appropriate when the technology is a platform, research tool or enabling method that can be used in many fields without requiring one firm to control the entire market. Field-of-use licensing is particularly useful for academic inventions because the same core technology may have applications in healthcare, food, energy, environmental monitoring or digital services. The institution can license one field to one company and another field to another company, increasing diffusion while preserving strategic flexibility.

The financial structure of a license is usually more complex than a single payment. It may include upfront fees, annual minimum payments, milestone payments, royalties on sales, sublicensing income, patent-cost reimbursement and obligations to develop the technology within a defined period. These clauses protect the university from a situation in which a company takes a license but does not commercialize the invention. The agreement may also include diligence obligations, reporting duties, audit rights, publication clauses, confidentiality terms and termination conditions. The lead scientist may not negotiate the legal terms directly, but should understand them because they affect future research collaboration, access to materials, publication timing and the possibility of developing improvements. In academic settings, a license should protect both commercial incentives and the continuing research mission of the university.

Examples show why licensing is often attractive for early-stage academic inventions. A university-developed diagnostic marker may need clinical validation, regulatory documentation and distribution through medical channels; an established diagnostics company can provide these complementary assets more effectively than a small laboratory. A new membrane material may require pilot-scale production, reliability testing and customer qualification in industrial facilities; a manufacturing partner can provide the equipment and market access. A software algorithm may require integration with existing platforms and user support; a specialist company may already have the customer base. In each case, the academic team contributes the protected invention and technical know-how, while the company contributes development capacity and route to market. This division of labour follows the logic that innovators often need complementary assets to capture value from technology (Teece, 2018, pp. 1372-1381).

A similar option is to engage in joint ventures or strategic partnerships, where academics and private parties will co-develop technologies and share commercialization risks. This goes the other way around also - often it's the industrial organization that will reach out to the academic institution for product development. These collaborative agreements are most common in sectors characterized by high technological complexity, such as biotechnology, energy technologies, and advanced materials. In such cases, the established company chooses to invest less on internal R&D activities but rather take advantage of the highly specialized and motivated personnel that can be found at the university laboratories.

Joint ventures and strategic partnerships differ from ordinary licenses because the parties actively co-develop the technology and share a larger part of the risk. They are common in fields where the invention is promising but not ready enough for direct licensing. For example, a biotechnology company may collaborate with a university laboratory to optimize a candidate molecule; an energy firm may test a new storage material under industrial conditions; or an advanced-manufacturing firm may co-develop a prototype machine with a university engineering group. These arrangements can provide the laboratory with access to equipment, data, industrial feedback and funding. They can also generate new intellectual property, which means the agreement must define ownership of improvements, publication rights and future exploitation. Without these terms, collaboration can become a source of conflict once the technology starts to show commercial value.

Business angels and venture-capital investors can also support early commercialization, although their role differs from that of an industrial licensee. Angels often invest earlier, may bring sector experience and networks, and can help a team refine the business model before larger funding rounds. Venture capital funds usually enter when the opportunity can scale and when the team can show a path toward significant market growth. Research on digital start-ups shows that external finance is not only money; it can shape governance, strategic focus and growth routines, especially when ventures move from start-up to scale-up stages (Cavallo et al., 2019, pp. 24-31). For academic teams, this means that investor selection should not be based only on valuation. The right investor should understand the technology, tolerate scientific uncertainty and help build the managerial capacities that the research team normally lacks.

3.2 Establishment of start-up companies based on academic inventions

A start-up is a young innovative company created to develop and commercialize a business opportunity under conditions of uncertainty. A spin-off, in the academic context, is a more specific type of venture that is created to exploit knowledge, technology or intellectual property originating from a university or research organization. The founders may include researchers, students, external entrepreneurs or a combination of these actors. The university may hold equity, license intellectual property to the new venture, provide incubation support or remain involved through sponsored research. This distinction is important because not every start-up is a university spin-off, and not every academic spin-off is managed by the inventor. In many cases, the best structure combines scientific founders with an experienced business lead.

Academic spin-offs have been recognized as important mechanisms to drive innovation within Europe. In this model, it's usually the lead scientist that obtains an entrepreneurial role and participates actively in business development, fundraising, product development and marketing procedures. Several universities have adopted policies to encourage academic entrepreneurship through incubators, accelerators, mentorship, and seed funding programs, as it will be discussed further in Part 2.

Spin-off formation is attractive when the invention is too early, too novel or too platform-based for an established company to license immediately. A new venture can focus entirely on developing the technology, applying for grants, attracting investors, conducting customer discovery and building a team around the invention. It may also preserve a stronger connection between scientific development and market feedback. However, the model is demanding. The lead scientist must decide whether to become a full-time entrepreneur, remain an academic scientific adviser, or support the venture through a limited role. This decision affects conflicts of interest, time allocation, academic duties and expectations from investors. Studies of academic spin-offs show that motivation matters: some ventures emerge from opportunity, while others are created because no established firm is willing to take the technology forward (Civera et al., 2020, pp. 1-6). Both types can survive, but they require different support mechanisms.

Examples of academic spin-off pathways vary by sector. In biomedical technologies, a spin-off may be created around a patent portfolio and seek proof-of-concept or translational funding before negotiating with pharmaceutical or medical-device companies. In clean technologies, a spin-off may build pilot installations with municipalities, utilities or industrial partners. In digital technologies, the venture may move faster if the research output can be converted into software and tested with users. In food science or materials science, the route may involve formulation, shelf-life testing, scale-up and compliance with safety requirements. The common feature is that the venture becomes a vehicle for learning. It tests whether the invention can survive contact with users, regulations, competitors and costs. This learning process is often as important as the original laboratory result.

3.3 European structures to support market entry

Initiatives under European funding schemes, like the Horizon Europe and the European Innovation Council (EIC), also consist supporting mechanisms to bridge the gap between laboratory research and market entry. These initiatives support technology maturation (TRL levels), scale-up activities, and commercialization management. The European Institute of Innovation and Technology (EIT) promotes entrepreneurial ecosystems and university-industry collaborations through innovation communities that connect researchers, companies, investors, and research institutions. An important note here is that this ecosystem extends beyond funding mechanisms alone. Several innovation intermediaries like innovation hubs and science parks provide researchers with essential skills for market access and entrepreneurial training. Researchers can find there infrastructure, mentoring, networking events, access to investors, etc. These structures are increasingly integrated in not only European but also regional level to facilitate knowledge transfer and enhance commercialization opportunities for academic institutions.

An example of a European structure functioning as a bridge between applied research and industrial commercialization is the Fraunhofer-Gesellschaft, commonly known in English as the Fraunhofer Society(*Fraunhofer*, 2026). It is a leading organization for applied research, headquartered in Germany that incorporates 74 institutes and research units spread throughout Germany, the United States and the United Kingdom, each focusing on different fields of applied research. The Society plays a pivotal role in innovation by focusing on cutting-edge technologies that will be transferable to industry. The research activities focus on the major challenges faced by the industry and society and aim to deliver answers to central questions of today's time by putting innovation into practice. To achieve this, the Fraunhofer is working hand in hand with industrial partners, with a high share of industrial revenue, i.e. raising at least two-thirds of its contract research budget competitively from private-sector contracts and public project funding. According to the information provided on their website, in 2025 industrial revenue alone accounted for 966 million euros. The Fraunhofer model has been proven a successful lab-to-market process and has been driving innovation for 75 years.

In an effort to further advance start-up support mechanisms, the Fraunhofer Society implemented the SPREAD2INNO project, during 2023-2025. The acronym refers to *spreading the global potential of developing innovation ecosystems to strengthen innovation in regional and local businesses*, and the primary focus was to promote start-ups in less innovation-intensive regions of Europe and integrate them into European innovation networks. The Fraunhofer institute for Production Systems and Design Technology collaborated with partners from 6 European countries and developed a scalable model that promotes young, innovative companies and strengthens regional and European innovation ecosystems through intensive trainings, feasibility studies, and targeted networking events.

Trade fairs and exhibitions can also support market entry when used strategically. Events such as the Hannover Messe exhibition, sectoral biotechnology meetings, food innovation fairs or deep-tech investor events allow research teams to observe competitors, understand industry language and identify firms that are actively searching for solutions. However, public exhibitions require caution before patent filing. The team should present protected information, non-confidential advantages or already filed technologies, not enabling details that could compromise novelty. Once IP is secured, fairs can help test the value proposition, collect feedback and identify pilot customers. They are especially useful when the invention is difficult to explain only through a paper and benefits from demonstration, prototype handling or direct comparison with existing industrial equipment.

3.4 Barriers in accessing the market

Despite the several mechanisms on an institutional and European level, the number of inventions that achieve market access in the first place or revenue generation in a secondary phase, is still quite limited in the European academic landscape. European universities and research institutions rank quite high in scientific performance but demonstrate rather weak commercialization performance. This "European paradox" is a result of combined organizational/educational, financial, and institutional barriers that emerge throughout the innovation process.

As a first note, academic research lacks market orientation. Scientists are evaluated primarily for their publication output and scholarly impact, so commercial potential comes later, if ever, in the research planning. Consequently, the vast majority of research output has been developed without consideration of customer needs or market demands leading to technically successful inventions that fail to become market successful products. Even when the invention reaches a market phase, if the business model comes very late in the process, the chances of successful implementation are low. Furthermore, proposals under European funding schemes do not usually require strategic planning of the proposed research, including defined market problems. The lead scientist will usually aim for funding of low Technology Readiness Levels (TRLs) since these projects receive funding based on groundbreaking research ideas without necessarily showing the potential to cover real market or societal needs. Even if some European frameworks require to refer to the exploitation plan of research results (more on this topic in Part 2), it is usually enough to showcase the potential for basic dissemination activities and science communication events, rather than presenting the potential positioning in the market and an initial strategic planning.

Secondly, researchers are primarily trained to conduct research and generate knowledge rather than engage in commercialization activities. The transition from laboratory discovery to market deployment can be quite complex and requires certain entrepreneurial competencies. Although it is understandable that scientists should be focused in their primary research work, the involvement in basic business-related operations could unlock further opportunities for research and development. Indeed, history has shown that scientists that were involved in entrepreneurial activities were able to reassure long-term funding and reputation that led to further inventions and incremental innovation. For example, Herbert

Boyer was a biochemist and one of the pioneers of recombinant DNA technology. He co-founded the company Gegentech in 1976 in collaboration with the venture capitalist Robert Swanson. Gegentech became one of the world's first biotechnology firms, transforming recombinant DNA technology from a laboratory breakthrough into commercially available therapeutics(*Genentech: Our Founders*, n.d.; Hardymon, 2012). The involvement of the scientist Boyer in entrepreneurial activities not only attracted substantial venture capital funding but opened the road for continuous investment in biotechnology research. Follow-up inventions and products such as recombinant insulin and other therapeutic proteins found were successfully marketed(*NIH, Genome*, 2013). Last but not least, after Gegentech, a model for academic entrepreneurship was established. The new organizational model, that was later followed by many, integrated academic research, patenting, venture capital, and lab-to-market product development. The attempt of Boyer and Swanson to create a new venture around the invention itself rather than license the technology to an existing corporation, became the blueprint for today's university spin-off model that has been embraced around Europe. Another example is that of Prof. Robert Langer (MIT) who is considered one of the most productive scientists in the history of engineering sciences and pioneer in the fields of tissue engineering and controlled drug delivery. He has co-authored more than 1500 patents and involved in 30 spin-off companies, some of which quite renowned like the Moderna company (COVID-19 vaccine)(*Langer Lab*, n.d.). Prof. Langer has engaged in successful entrepreneurial activity without negatively affecting his scientific output. He remained an active academic researcher but with commercialization activities that generated revenue and industrial networks(Abramo et al., 2018; Thomas et al., 2020).

A further barrier is the valley of death between proof-of-concept and commercial validation. Public research funding often supports scientific exploration, while private investors and firms usually want stronger evidence before committing resources. The result is a gap where the invention is too applied for basic research funding but too immature for market finance. Proof-of-concept grants, translational funds and innovation vouchers can reduce this gap, but they are not always available or sufficient. The lead scientist should therefore plan development milestones carefully. Instead of asking broadly for commercialization funding, the team should define the next value-creating experiment: for example, prototype durability, pilot-scale production, customer testing, toxicology, regulatory classification or software integration. Precise milestones make the invention easier to evaluate and finance.

Institutional incentives can also slow commercialization. Academic promotion systems still reward publications, citations, grants and teaching more consistently than patents, licenses, start-ups or industry engagement. Even when a university officially encourages entrepreneurship, researchers may fear that commercial activity will be perceived as less scholarly or will reduce time for publications. This tension is well documented in the literature on the third mission of universities, which shows that knowledge transfer must coexist with teaching and research rather than appear as an additional unfunded obligation (Secundo et al., 2017, pp. 230-236; Compagnucci & Spigarelli, 2020, pp. 8-14). For the lead scientist, this means that commercialization should be integrated into the research agenda, not treated as a separate activity after the project ends.

Another barrier is the lack of entrepreneurial and regulatory literacy among scientists. Many researchers can describe the technology accurately but struggle to explain the business model, customer segment, reimbursement route, certification pathway, manufacturing cost or competitive advantage. This does not mean that scientists should become full-time managers. It means that they need enough literacy to ask the right questions and to collaborate effectively with TTO officers, lawyers, investors and industrial partners. Short training programs, mentoring schemes and participation in incubators can be useful when they are connected to the actual invention. Generic lectures are less effective than applied support that helps the team prepare an invention disclosure, build a market brief, conduct customer interviews and understand the logic of licensing or spin-off formation.

It is also important to mention that there is a cultural barrier related to risk. Scientific culture often rewards caution, precision and peer validation, whereas entrepreneurial action requires decisions under uncertainty. A laboratory team may continue improving the technology indefinitely because more data can always be generated. Market access, however, requires a moment when the team tests the invention outside the laboratory. This does not mean rushing to market prematurely. It means designing controlled external validation steps, such as confidential industry feedback, pilot testing, prototype demonstration or user interviews. Incremental exposure to the market helps the team learn without losing scientific rigor. The most successful commercialization efforts are not those that abandon academic standards, but those that combine evidence-based science with early and structured learning from the environment in which the invention is expected to operate.

Other barriers in accessing the market include financial constraints, intellectual property management, administrative procedures and regulatory complexity, and also insufficient university-industry collaboration mechanisms(Battaglia et al., 2023; Sideri & Panagopoulos, 2016).

4. Incremental innovation and follow-up steps

Incremental innovation begins once the team recognizes that the first invention is rarely the final marketable solution. The original patent or prototype may open the commercial pathway, but follow-up experiments are needed to adapt the technology to user needs, cost constraints, regulation and production conditions. These follow-up steps may include improving performance, reducing material costs, simplifying the protocol, increasing durability, adapting the invention to different applications, or integrating it with existing systems. From a knowledge-management perspective, this stage is important because the team moves from creating knowledge to repeatedly refining and applying it. The invention becomes a platform for learning rather than a fixed result (Barros et al., 2020, pp. 1598-1603).

The lead scientist should distinguish between one-time exploitation and a long-term innovation trajectory. Some inventions are best commercialized once, through assignment or a narrowly defined license. Others can generate a stream of improvements, new applications and follow-on patents. A sensor technology, for example, may first be developed for environmental monitoring and later adapted for food safety or medical diagnostics. A material may first be used in one industrial process and later modified for another. A software method may begin as a laboratory tool and later become part of a platform service. The decision depends on the breadth of the technology, the strength of the research team, the interest of partners and the institution's willingness to maintain a portfolio. Follow-on innovation can increase value, but it also requires long-term coordination.

A practical follow-up plan should include technical, commercial and IP milestones. Technical milestones might involve reproducibility, miniaturization, pilot production, validation under real conditions or compliance testing. Commercial milestones might involve customer interviews, letters of intent, pilot agreements, pricing analysis or identification of a first beachhead market. IP milestones might involve filing improvements, extending protection to additional territories, reviewing freedom to operate, registering trademarks or deciding which know-how should remain confidential. These milestones should be connected. For instance, if customer interviews reveal that a smaller device is necessary, the technical team may redesign the prototype and the IP team may consider whether the redesign supports a follow-on patent. This coordinated approach prevents the common problem of parallel activities that do not inform each other.

Long-term support from the TTO is especially valuable during this stage. After the first filing, the TTO can help monitor deadlines, evaluate invention improvements, negotiate amendments to licenses, manage conflicts of interest, and connect the team with proof-of-concept funding or investors. The TTO can also help decide whether to continue patent prosecution in additional regions. Filing in more countries should not be automatic. It should be based on the location of potential customers, competitors, manufacturing partners and expected revenue. If the invention is only likely to be commercialized in Europe, a broad global filing strategy may waste resources. If the technology has global relevance or if major competitors operate in the United States, China or Japan, a wider strategy may be justified. Geographic expansion should therefore follow commercial evidence.

Incremental innovation also requires attention to standards, regulation and sustainability. A technology may be technically functional but commercially blocked if it does not fit accepted standards, safety rules or sustainability expectations. Early awareness of these requirements can guide experiments and reduce later redesign. For EU-based researchers, this is becoming increasingly important because innovation policy is linked with environmental performance, responsible research and societal benefit. Sustainability should therefore be considered not as a final communication claim but as a design parameter. Questions such as energy use, material sourcing, waste, recyclability, user safety and social acceptability may shape both product development and market positioning. If these issues are addressed late, they may become barriers; if addressed early, they can become part of the value proposition.

Part 2: The EU framework on technology development and commercialization

5. Inventions exploitation under EU research and innovation programs

The European Union has developed an extensive public funding ecosystem, that is actually one of the world's largest and most integrated. Different funding schemes have been developed through the years to serve technological development, innovation and commercialization. The European research policy has evolved over the past decades from primarily focused on funding scientific excellence to a more comprehensive innovation ecosystem aiming to encourage the transition from basic research to products and services capable of generating economic and societal value. This approach seeks to both strengthen the competitiveness of European economy and address major societal challenges. The different instruments, organizations and funding schemes are designed to support technology maturation and knowledge transfer for market deployment. The European Commission defines knowledge valorization as "*...the process of creating social and economic value from knowledge by linking different areas and sectors and transforming data, know-how and research results into sustainable products, services, solutions and knowledge-based policies*.(Scherer et al., 2022)" This is a concept that extends beyond commercialization of a technology but incorporates all the different mechanisms along this process, i.e. technology transfer, licensing, spin-offs, start-ups, regulatory frameworks, and innovation for societal impact. In this realm, Horizon Europe, EU's main funding program that will be explained in the following paragraphs, approaches commercialization as a non-optional aspect, thus exploitation of research outcomes has become an integral component of the expected project planning(*Horizon Europe Support for Knowledge Valorisation | European Research Area Platform*, n.d.). In other words, the researchers-applicants are now expected to consider market impact already from the early stages of research design.

5.1 The Horizon Europe instrument

Horizon Europe is the European Union's flagship research and innovation program, with a budget of €93 billion for the period 2021-2027. The proposal for the future Horizon Europe Framework Program was already presented in 2025 with a proposed €175 billion budget. Horizon Europe was designed to support the entire innovation cycle, from frontier research to industrial deployment. The program is structured in three main pillars and a special fund for widening participation and strengthening the European research area (**Figure 3**). According to the Mid-term review report of 2024(*Horizon Europe - Research and Innovation - European Commission*, n.d.), half of the budget was allocated to Pillar II: *Global Challenges and European Industrial Competitiveness* that includes different research sectors and the Joint Research Center, which incorporates research facilities in different parts of Europe and exploitable research outcomes to be directly incorporated in the regulatory frameworks of European Union. A special fund was also allocated to the Next Generation Europe (NGEU) program dedicated for recovery from the COVID-19 crisis.

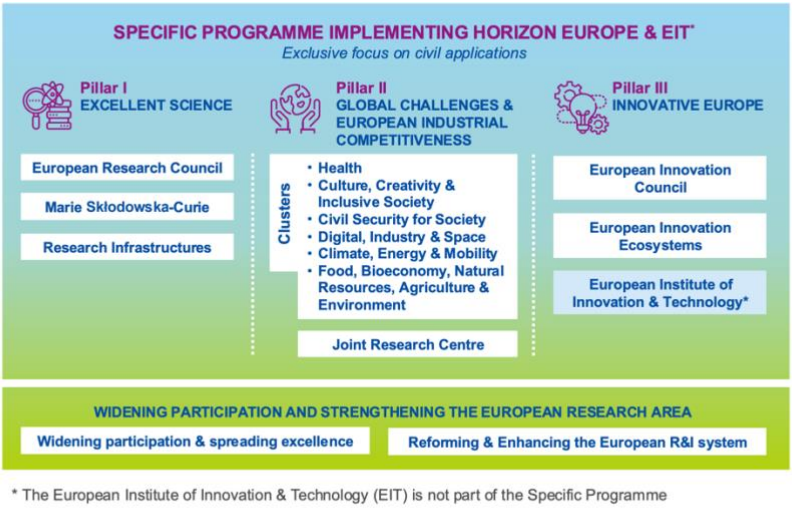


Figure 3: The Horizon Europe structure. Adapted from https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

Pillar II refers to industrial competitiveness, thus it is directed to applied research and direct exploitation, while the consortiums that apply in this instrument are usually quite broad and interdisciplinary, covering many parts of the European area. On the other hand, the European Innovation Council (EIC) instrument may be of particular interest for a lead scientist with a smaller team, directed to scientific excellence but supporting market-directed innovations also. The EIC is the most targeted instrument among researchers because it includes different stages according to the maturity of the proposed technology. The EIC provides funding through three complementary schemes according to the TRL level of the proposed technology(*European Innovation Council (EIC) | Research and*

Innovation, n.d.): **EIC Pathfinder**, which supports early-stage groundbreaking research (TRL 1-4) that should be collaborative - at least 3 partners each established in a different Member State or Associated country (see Appendix for more information). The partners can be legal entities like universities, research organizations, SMEs, start-up companies, industrial partners or natural persons; **EIC Transition** is the instrument that refers to more mature technologies (TRL 3-6) and can be used to facilitate the maturation and validation of promising technologies meaning that it is restricted to applications that include results from earlier stage instruments, like the EIC Pathfinder. EIC Transition is addressed to single applicants or small consortia (max 5 partners); the third scheme is called **EIC Accelerator** and refers to start-ups and small and medium enterprises (SMEs), helping them to scale up innovations and navigate the market through a combination of grants and equity investments (TRL 5-9). More specifically, eligible applicants are single start-ups or SMEs (including spin-outs), small mid-caps (fewer than 499 employees) in need of rapid scale up of the TRL 9 activity, or natural persons and legal entities willing to set up an SME or a mid-cap. Mid-caps can apply but for investment only.

Regarding Pillar I of Horizon Europe, the ERC funding schemes and the Marie Curie Actions are very often chosen by lead-researchers as a high-gain and long-term funding opportunity(Innovation, 2021). The ERC gives the opportunity to the researcher to self-define the research topic, encouraging ground-breaking research that will offer Europe the leadership to emerging technological fields. The available data refer to some 80% of ERC-funded projects leading to scientific breakthroughs or major advances. With an ERC, a lead researcher can built his/her own research team from scratch and gain significant visibility in the research community. Marie-Curie actions (MSCA) also enhance the visibility of the team/teams that are involved and are particularly designed to facilitate mobility around Europe and knowledge exchange. Obtaining a personal MSCA gives the scientist increased career prospects and exposure to international experience. Collectively the Pillar I instruments are oriented to scientific excellence and, although it is sometimes necessary to refer to the market perspectives of a potential product, it is usually the case that only basic research is conducted through these funding schemes. Of course, the research outcomes of these actions are innovation-driven and of the highest quality so they can be later exploited for further advancements that would eventually reach the market. However, we have witnessed remarkable examples of lead researchers that started from an ERC or Marie Curie action and ended up with a spin-off company, proving the potential of innovation-driven funding schemes of Horizon Europe. For example, Dr. Georgios Skretas obtained a Marie Curie International Reintegration Fellowship which gave him the opportunity to start his own research team and work on his vision about protein misfolding diseases (PMDs), establishing a start-up company soon after under the name ResQ Biotech(*Our Team | ResQ Biotech*, n.d.; *ResQ Biotech: Ποια Είναι η Startup Που Παράγει Καινοτομία Και «θεραπεύει» Ασθένειες - Οικονομικός Ταχυδρόμος - Ot.Gr*, n.d.).

As an integral part of Horizon Europe, the European Institute of Innovation & Technology (EIT) was established to strengthen collaboration between universities and research organizations with businesses and investors(*EIT*, n.d.). The institute has created Knowledge and Innovation Communities (KICs) among leading companies and research labs to promote entrepreneurial education, technology transfer and start-up creation(*EIT*, n.d.). Essentially, the EIT integrates education, research, and business activities leading to sustainable innovation ecosystems that will accelerate the commercialization of scientific discoveries. The EIT community has established a wide network of collaborators across Europe that offer entrepreneurial education courses and business creation or acceleration services. **Figure 4** demonstrates the results of these activities. These data indicate the strong efforts that are going on lately in the European landscape towards technology commercialization and linkage of academia with industry, so a lead researcher should be encouraged to reach out to these organizations and share his/her vision, even if the technology is not quite mature yet. The example of Dr. Skretas we discussed previously shows just that: his technology on engineered microbial cells to function as a discovery platform for putative drugs against PMDs turned into a start-up company quite early after establishing his research group and is still looking for seed funding and other funding mechanisms. It may be evolving slowly, but the company is out there trying to navigate the market landscape.

Figure 4: The European Institute of Innovation & Technology (EIT) at a glance. The presented data have resulted from EIT's wide range of innovation and entrepreneurship activities across Europe(*EIT*, n.d.).

5.2 Practical information for the researcher

Having explained the fundamental instruments of the EU research and innovation funding schemes, let us now dive deeper into practical information for the researcher that seeks to engage in EU-level research proposals. In the following paragraphs we will introduce the specific parts of a research proposal according to the EU templates and explain in more detail some parts that need special attention and are not part of the scientific component. Table 2 summarizes the most useful links on exploitation of research results within EU that are not extensively discussed in the following paragraphs.

***Table 2**: Exploitation of research results within EU – Useful links*

Resource	**Purpose**	**Exploitation function**	**Link**
Horizon Results Platform (HRP)	Promotes Key Exploitable Results (KERs) from Horizon projects and facilitates matchmaking with investors, companies and public organizations.	Commercialization, licensing opportunities, industrial partnerships, visibility of research outputs.	https://horizoneuropencpportal.eu/store/horizon-results-platform
CORDIS (Community Research and Development Information Service)	Repository of EU-funded research projects, publications and project outcomes.	Dissemination of results, identification of exploitable technologies, partner search and benchmarking.	https://cordis.europa.eu/
European IP Helpdesk	Provides free guidance on intellectual property management for Horizon Europe participants and SMEs.	Patent strategy, IP ownership, licensing, consortium agreements, commercialization support.	https://intellectual-property-helpdesk.ec.europa.eu/regional-helpdesks/european-ip-helpdesk_en

Horizon Results Booster	Offers expert services to improve dissemination, exploitation planning and market uptake of EU-funded research.	Business planning, exploitation strategy, market analysis and communication support.	https://www.horizonresultsbooster.eu/
Innovation Radar	Identifies high-potential innovations and innovators emerging from EU-funded projects.	Increases visibility of market-ready technologies and connects innovators with investors and industry.	https://digital-strategy.ec.europa.eu/en/policies/innovation-radar
Horizon IP Scan	Free IP assessment service for SMEs participating in collaborative EU research projects.	Early-stage IP assessment and commercialization planning.	https://intellectual-property-helpdesk.ec.europa.eu/services/horizon-ip-scan_en
European Innovation Council (EIC) Business Acceleration Services	Supports EIC beneficiaries through investor networking, corporate partnerships and commercialization services.	Scale-up support, investment readiness, access to industry and international markets.	https://eic.ec.europa.eu/eic-funding-opportunities/bas_en
EU Funding & Tenders Portal	Central entry point for EU research and innovation funding opportunities and project management.	Access to funding calls, project implementation, dissemination requirements and exploitation obligations.	https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home

5.2.1 National contact points

To start with, it is important to mention that researchers are supported by National Contact Points (NCPs) that are specialized in the different Horizon instruments. The network of NCPs is the main structure that provides guidance and practical information on all aspects of participation in Horizon Europe. More specifically, a researcher can use the following services from an NCP(*EU Funding & Tenders Portal*, n.d.): 1) guidance on choosing relevant Horizon Europe actions, 2) advice on administrative procedures and contractual issues, 3) training and guidance on proposal writing, 4) distribution of documentation (forms, templates, guidelines, etc), 5) assistance to search for a collaborator/partner. NCPs are established and financed by governments of the 27 EU member states, but also in the associated and non-associated countries (see Appendix for more information). The NCPs was an action of EU to facilitate support on the spot and in applicants' own language. However, the NCP systems can vary from one country to another, being either highly centralized or decentralized networks, and also on the type of hosting organizations, from ministries to universities, research centers or even special agencies and private consulting companies. Figure 5 shows the NCPs specific part of the EU Funding & Tenders portal and instructions on how to navigate.

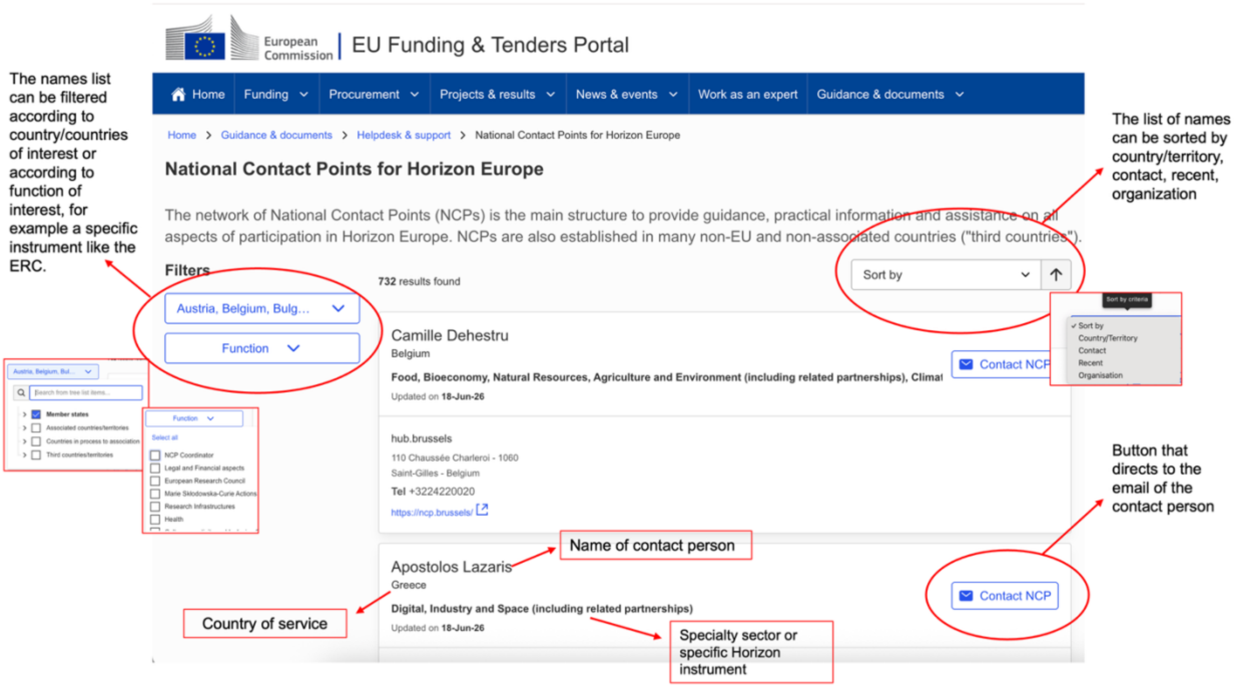


Figure 5: The National Contact Points (NCPs) section of the EU Funding & Tenders portal. The main action buttons are designated in red circles and explained in red squares.

5.2.2 Essential characteristics of a Horizon EU research proposal

Nowadays, the proposals under the Horizon Europe framework have turned into specifically-structured manuscripts, following pre-specified templates with strictly enforced cross-cutting priorities evaluated across the three core pillars: Excellence, Impact, and Implementation. Although the different calls may include more or less parts in their templates, these core pillars are to be followed in order to structure a successful proposal. Each pillar/section contains sub-sections again pre-arranged in the provided templates that the authors should carefully address. These sections fall out of the strictly scientific content and address general challenges and obligations that all EU researchers should comply with(*Horizon Europe Work Programmes - Research and Innovation*, n.d.; *Open Science - European Commission*, n.d.).

Section 1: Excellence

In simple words, this section introduces the main idea of the proposal, the theory behind it, the reasons why it should be funded, and the specific objectives that will make it happen. Here, the researchers must explicitly elaborate on the following:

The Gender dimension. The European Commission (EC) requires specific statements about both the gender balance in the team (mentioned in Section 3: Implementation) and the gender dimension in terms of research content. The authors must outline how biological sex or socio-cultural gender affects their proposed technology. If this is not relevant with the research content, the authors have to provide a rigorous justification.

Interdisciplinarity. A special part of the proposal has to elaborate on the interdisciplinary nature of the project, i.e. the different technological disciplines it will involve and the contribution of the research teams from the different countries/organizations. The EC values multi-angled problem-solving as a necessary trait for true market translation. Moreover, the integration of Social Sciences and Humanities (SSH) dimension ensures that the researchers will evaluate user behavior, public acceptance, and economic viability of their technology already from the early stages.

Open Science. This is a contractual obligation. Researchers are actually evaluated on how early and widely they plan to share knowledge. It is mandatory to follow *Open Access* publication schemes for all peer-reviewed publications that will result from the project and ensure that the data management will follow FAIR principles(Wilkinson et al., 2016) (Findable, Accessible, Interoperable, Reusable).

Section 2: Impact

In this section the EC expects to see an initial lab-to-market plan, i.e. the specific impact of each project action, the measures to empower the key actors, and a path towards innovation commercialization. Obligatory elements in this section are:

Intellectual Property Rights management. The researchers have to state any existing patents that will be integrated in the project and any potential patents that are expected to be generated during the project. They have to detail ownership models and access rights among partners. The EC is applying the model *"as open as possible, as closed as necessary"* – meaning that Open science is strongly encouraged with the aim to share knowledge but careful consideration on IP strategy should be paid if this will facilitate market access(*Open Science and Intellectual Property Rights*, n.d.).

Exploitation and Dissemination measures: In this part of the proposal template, the authors have to specify their planned dissemination activities, like participation in scientific conferences, publication plans, or potential new collaborations. A good idea is to also mention target audiences (e.g. industry partners, policymakers, end-users), the specific communication channels that will be exploited, and last but not least a concrete timeline that will also indicate future scaling of the technology after the EU funding ends.

Section 3: Implementation

In this section the researchers are evaluated for the actual execution plan of the project. A specific work plan (in the form of a Gannt chart) is to be presented and allocation of resources should be briefly presented in numbers and staff. This is also the part where the scientific work packages (WPs) are presented (see Appendix for terminology). Here, it is obligatory to include:

Gender balance. In this section the gender balance refers to the operational team. The authors mention specifically the number of male and female actors involved and are scored on the gender balance when identically scored proposals have to be ruled out (higher score when 50% or more of WP leaders are women).

Quality of the consortium. The authors must convince on the consortium complementarity and ideally involve small and medium enterprises (SMEs) or corporate partners to show the willingness on market push. A balanced consortium that matches academic depth with industrial capability is a crucial success factor.

5.2.3 The 'Impact' part of the proposal – Why it matters

As part of this thesis, it is quite relevant to discuss in more detail about the 'Impact' part of EU project proposals. It is also quite pertinent to face this section as the *market pathway* once the idea shapes into a technology. In this section, there is available space to elaborate on any different exploitation pathways, dissemination strategies and IP management that can collectively serve as a ticket to access the market. Nevertheless, the most often encountered 'Impact' section is one with a superficial checklist-ticking tasks and describing intentions rather than strategic planning. Indeed, scientists don't usually pay much attention in this section, while it is more often than not to delegate this task to a third-party consultancy. The market pathway may seem secondary to the scientific parts, but it is nowadays impelling to pay more attention in this matter when the competition is getting higher and higher and the EU requests real, marketable technologies to rise.

As a first argument, researchers should keep in mind that the evaluation mechanisms have evolved to identify outsourced language and generic language that indicates lack of careful planning. It is crucial that the authors identify Key Exploitable results (KERs) from the very start of the project and map out concrete exploitation pathways, for example direct commercialization, a joint venture, standardization strategies, or licensing. Furthermore, showing a calculated market size and competitor analysis will give a clear message that the authors understand the ecosystem they are entering.

Importantly, the lead researcher should not disregard the 4-year post-project legal obligations when signing a Horizon Europe Grant Agreement. As part of the agreement, the beneficiaries have a strict obligation to exploit the results up to four years after the project end date by all means. If they don't manage to proceed with commercial exploitation one year post-project, they must use the Horizon Results Platform to publish the results for third-parties to exploit them. Thus, a weak plan at the proposal stage may bring compliance failures later.

Last but not least, researchers should be aware of the possibilities that a good exploitation plan will offer them for follow-up funding. In other words, the initial research grant is just the beginning of a long technology exploitation pathway and in this journey there are several supporting mechanisms from the EU that has taken care of building a pipeline to bridge the lab-to-market gap. Showing an active exploitation mindset will offer the opportunity for further funding to advance one's results into marketable technologies, with instruments like the EIC Transition and Accelerator that we discussed in the previous paragraphs. Even if a second-stage proposal fails to secure EU funding through the Accelerator programs, it is important to dedicate efforts to explaining the exploitation strategy in order to acquire the 'Seal of Excellence'. The European Commission not only scores the proposals by numbers but offers detailed feedback and the 'Seal of Excellence' to proposals of high value that should be supported by national funding programs. It is actually the EU way of encouraging the governments to fund worthy projects so that they don't get lost and may prove more competitive in the near future. So, the rejected applications from EU may be granted in a national level through 'mirror' funding mechanisms that the governments are obliged to provide in the context of their EU compliances. The national Technology Transfer Offices (TTOs) also run these accelerator programs and other activities that encourage technology commercialization. There is even the possibility that if a lead researcher is highly rated in a national program showcasing a solid commercialization strategy, he/she can completely bypass the initial, highly competitive short-proposal stage of the EIC Accelerator.

6. The role of the host institution: Commercialization ecosystems around EU universities

The need to produce more marketable technologies through EU funding mechanisms has inevitably led to the active participation of host institutions. As discussed previously, the researcher alone would not be able to deal with the overwhelming processes that accompany lab-to-market processes, so a well-structured support mechanism that comes directly from his/her host institution will be of utmost importance. It is actually often encountered that researchers working for universities and research organizations that do not invest in technology transfer mechanisms lag behind in technological production and knowledge sharing. The products stay in the lab and they are only known through scientific publications. A well-organized technology transfer facility in the research organization itself can not only boost technology commercialization of existing inventions but motivate scientists to exploit technologies and services that they hadn't previously thought of getting out in the world. One step further, the TTOs or other transfer mechanisms can create a so-called commercialization ecosystem that will embrace the research institution and act as the direct connection to market.

The Bayh-Dole Act of 1980 in US allowed universities to keep ownership title to their innovations and thus increased commercial outcomes from university-base research(Grimaldi et al., 2011). This is when Technology Transfer Offices were first established, with many other countries quickly following the US example. Since then, numerous studies are dealing with the role of the the host institution in technology transfer and whether actual outcomes are coming from publicly-funded research or direct industrial funding(Belitski et al., 2019). For the US case, it has been reported that innovation is actually fueled by government-funded research which in turn fuels corporate research. L. Fleming et al. were based on bibliometric linkages across a big number of documents for patented innovation and proved that federal research drives innovation and ultimately leads to jobs, industrial competitiveness, and overall entrepreneurial success(Fleming et al., 2019). In the following paragraphs we will examine case studies of European universities that have successfully established commercialization ecosystems with high rates of technological products output.

KU Leuven (Belgium) is consistently ranked high in European Innovation and is considered a leading entrepreneurial university(Steenkamp, 2023). Its ecosystem is managed by *KU Leuven Research & Development (LRD)* established as early as 1972 but has greatly evolved since then supporting researchers for patent protection and licensing negotiations, spin-off creation, collaborations with industry, and possibilities for access to investment capital(*KU Leuven Tech Transfer Office*, 2026). The university also operates dedicated programs such as the *Entrepreneurs-in-Residence* and the *Gemma Frisius* Fund, which give the opportunity to the researcher for entrepreneurial mentoring and seed financing for technology-based ventures. Moreover, KU Leuven ranks as a top-recipient higher education institute for Horizon Europe funding and this way has managed to built industrial partnerships early in the research cycle. LRD doesn't purely rely on venture-backed spin-offs but prioritizes corporate research collaborations with intensive licensing strategies. Importantly, according to the university statistics more than half of KU Leuven's professors are collaborating with the LRD, indicating the huge number of researchers that come into contact with the world of business(*KU Leuven Tech Transfer Office*, 2019). Beyond isolated events and funds, KU Leuven has taken care of cultivating a local innovation ecosystem involving research institutes, venture capitalists, science parks, and industrial partners under the label "Leuven Knowledge Region". This is a great example of an 'integrated approach' that can give a bright example to other EU universities.

ETH Zurich is also among the highest ranking institutions on technological innovation within EU, maintaining a high number of industry collaborations mainly in biotech fields, like pharmaceuticals and advanced manufacturing, but was also quick in integrating robotics and artificial intelligence in its main research activities. ETH Zurich consistently ranks as Europe's leading university in patent protection and technology licensing and its reputation for research excellence has reached an international level(*ETH Transfer IP & Licensing | ETH Zurich*, n.d.). The commercialization framework of ETH is highly centralized, managed by *ETH Transfer* which prioritizes technical readiness and deep-tech focus (AI, robotics, and biotechnology). The mechanism of ETH Zurich focuses on providing an incubation system ensuring that spin-offs are heavily backed by proof-of-concept grants and founder-support networks before they take the leap to the market. This mechanism is what gives ETH spin-offs a survival rate of 93% five years after incorporation. A characteristic metric for ETH's commercialization activity is that in 2024 alone ETH spin-offs attracted CHF 425 million in investment capital(*Start-up Boom Thriving | ETH Zurich*, n.d.).

The case of University of Cambridge is maybe one of the most advanced commercialization ecosystems around an academic institution. The commercialization activities at the University of Cambridge are coordinated by Cambridge Enterprise, which is of course much more than a technology licensing office. Cambridge Enterprise provides commercialization services including IP management, consultancy support, seed funding, and venture creation. More or less these activities are covered by other model universities also. What makes the 'Cambridge phenomenon' is the heavy investment on private venture networks. Cambridge Enterprise has launched the initiative *Leaps* which connects Cambridge-born companies directly to global investment hubs like London(*Cambridge Enterprise Builds London Launchpad for next Generation of Deeptech Founders - Tech.Eu*, n.d.). That was achieved due to the trustworthy reputation of Cambridge Enterprise after the companies it is supporting have collectively raised over £4.9bn since 1995. Cambridge University is actually playing a vital role in driving UK economy while at the same time addressing pressing societal challenges(*Cambridge Leads in Spinouts Success in 2024, New Report Reveals – Cambridge Enterprise*, n.d.). And this is exactly where any EU academic institution should position itself - responsible to deliver innovation-led economic growth for the country.

The following Table (**Table 3**) summarizes the performance metrics of the case studies mentioned in the previous paragraphs, highlighting the differentiating factor of success for each case.

Table 3: *Performance indicators in academic technology commercialization of the universities KU Leuven, ETH Zurich, ad University of Cambridge.*

Institution	Technology Transfer Infrastructure	Commercialization Performance	Entrepreneurship & Industry Support	Notable Features	Differentiating success model
KU Leuven (Belgium)	KU Leuven Research & Development (LRD)	• >150 active spin-off companies • One of Europe's oldest and most successful university TTOs	• Entrepreneurs-in-Residence program • Gemma Frisius Fund (seed investment) • Extensive industrial licensing program	Considered a European benchmark for university technology transfer, with long-standing collaborations with industry and strong regional innovation networks.	**High-volume corporate research partnerships coupled with Horizon Europe funding**
ETH Zurich (Switzerland)	ETH transfer	• 615 cumulative spin-offs (end of 2024) • 37 new spin-offs in 2024 (43 in 2023) • 86% of spin-offs remain active • CHF 425 million invested in ETH spin-offs during 2024	• Pioneer Fellowship deep-tech incubator (146 fellowships awarded) • ETH Entrepreneur Club • Student Project House (>500 student projects in 2024) • AI Launchpad and Innovation Series	One of Europe's strongest deep-tech commercialization ecosystems, with a particularly high concentration of AI, robotics, engineering, and biotechnology ventures.	**Centralized founder support that results in incredibly high five-year startup survival rate.**
University of Cambridge (UK)	Cambridge Enterprise	• 20–25 new companies created annually • 372 patent applications (2024–25) • 874 commercial and research licenses signed • 2,771 researchers supported annually • £4.3 million invested in 32 spin-outs (2024–25) • Portfolio companies raised approximately £402 million in 2024–25	• >95 entrepreneurship programs and innovation groups • Technology Investment Fund • Consultancy services (>500 agreements annually) • Cambridge Innovation Capital partnerships	Internationally recognized Cambridge innovation cluster ("Silicon Fen"), linking academia with more than 5,500 knowledge-intensive companies.	**Acceleration of supported companies scale-up via global fincancial hub integrations (*Leaps*)**

Part 3: The Technology Transfer network in Greece

Greece is one of EU's member states and although actively participating in almost all the instruments of the Horizon Framework, with. multiple successful (funded) proposals, the lab-to-market activities of the country remain especially weak. In the following paragraphs we will navigate the Greek ecosystem around technology commercialization, and mainly the role of the Technology Transfer Offices. The last section will deal with observable challenges as viewed by the TTO's members and the Greek venture capitalists that are collaborating with academia.

7. The PRAXI network: Interview with an office member

The PRAXI Network (the greek work *praxi* means action, coming from the verb *prato - πράττω* meaning 'to take action') is the main organization in Greece that connects academic institutions with industry. It is also the national contact point for EU networks, including the Horizon activities. The services to academics include consulting, information, education and networking(*Home - Praxi Network*, n.d.). The offices of the PRAXI network were strategically chosen to be hosted within the leading academic and research institutions of the country to facilitate academics support and enable more effective technology transfer management. The employees of the PRAXI network get to have 'an insider's look' in the research and development activities so that they provide the optimum support to the scientist. In the context of the present thesis, a member of the PRAXI network provided an exclusive interview that gives an overview of the activities of the PRAXI network, the situation with technology transfer activities in Greece, and the possibilities for a scientist that aspires to be involved in a lab-to-market process.

Question 1: Mr. Kortidis thank you very much for accepting me in your office and offering your time for this interview. For formal reasons, let me introduce once again the purpose of this interview. So, my name is Elena Gkantzou, I am a student at the Master's program "Innovation Management and Entrepreneurship" of the Hellenic Open University and this is an exclusive interview in the context of my dissertation "A roadmap for scientists to bring new inventions into the EU market". The aim of the interview is to give information for the technology transfer activities in Greece and especially the role of the PRAXI network in these activities. We also hope to offer some directions to the researchers on how to navigate the lab-to-market processes and inspire more scientists to engage in entrepreneurial activities that will enrich the technology commercialization landscape of the country. So, my first question would be to briefly describe the PRAXI network, what was the need that led to its founding, what services does it provide, and of course where can we find you.

Thank you Ms. Gkantzou for accommodating in this so interesting research you carry out of the Greek innovation ecosystem and how well in connected with the industry/market via the assistance of the TTO of the country. One the biggest in terms of number of working staff and oldest TTO in Greece is the one that I have the honor to be part of. The TTO of the biggest research center of Greece, PRAXI Network. PRAXI Network functions as a unit of the Foundation for Research and Technology – Hellas (FORTH), the largest and most well organized, equipped and staffed research center in the country, with research successes that render it among the top in Europe. PRAXI Network has presence in 6 cities in the country: Athens, Thessaloniki, Heraklion, Volos, Patras, Ioannina.

It started out in 1991 as a partnership between FORTH and SEV Hellenic Federation of Enterprises with the mission to link industry with academia. Since then, PRAXI Network has introduced important initiatives aiming at the technological cooperation enhancement between Greek and foreign enterprises and organisations. Since 1998 the General Secretariat for Research & Technology in Greece appoints PRAXI Network as the National Contact Point (NCP) for the 5th, 6th and 7th Framework Programmes for Research and Technological Development and Horizon 2020, rendering it an official entity for information and advisory support for EU-funded research programmes.

PRAXI / HELP - FORWARD Network is a technology transfer organization with long-standing experience in the exploitation of research results and the provision of specialized innovation support services to SMEs and research organizations. Its mission is to enhance the competitiveness of Greek SMEs and research organizations by creating links between research and industry, promoting innovation and entrepreneurship as well as fostering transnational cooperation.

<u>Question 2</u>: How would you rate the connection between industry and academia in Greece?

I see Ms. Gkantzou you try to hit the target even from the first attempt. Very nice and full of meaning question. Before answer to your question, I would like to create the foundation of my reply, and give you slightly the whole picture of the Greek ecosystem of Technology

Transfer and connection with the market (I prefer the terms market instead of industry and you will understand later on my statement the reason) in Greece.

The technology Transfer in Greece although where established in research and academic institutions in Greece for more a decade now, I will take the accountability of my statements and say more than two decades, it was procedure that was carrying out not from experts but from some Researchers or/and Professors that have the wiliness (as an offer to their organizations but not as a profession, receiving salary) to do it because either they have the vision that the progress of the research is going to the point that experts have to take over and assist with their expertise to exploit the market and connect it with the research/academic achievements. Or, they were privileged and at the institutions where they studied or/and worked abroad, they saw how the TTO operates and really adding value for the market and the society and decided to involve their selves at the TTOs when they returned back to Greece.

The TTOs in Greece, received for first time governmental grant funds only in 2022-2024, to hire experts and start developing the mentality in the research and academy community that the future of our organizations is not to do only research for the research, publish paper and produce students. The new (but not so new wave…. decades ago, has started abroad, especially in USA, and UK) is the knowledge valorization, which is not something more of except of our researchers' publishing articles or patents, is to try to launch spin-off based on this gained knowledge (patents) and licensing. With other words, aligned with the needs of the market, listen the needs of the market and in the end of the day contribute in the real market.

Just one more sentence for this period 2022-2024. The grant was enough to establish officially TTOs in all the Greek organizations and to hire staff. Only a few things happened in the direction of patenting technologies, create spin-offs and making licensing. Official statistics from GSRI (General Secretariat for Research and Innovation) have not announced yet despite the fact that have passed two years now.

The 2025 was the year that all these staff from the TTOs of Greece, left their jobs because the lack of funding of TTOs. Only in the beginning of 2026 there was the new call for TTO funding and currently we are sitting where the new funding released and 6 TTO Networks have been created comprised by 36 organizations. All these 36 TTOs where looking for experts' staff from the market to start from scratch the operation of the offices.

I am sorry for this long introduction but I pretty sure that now I have drowned the whole picture of the TTO ecosystem in Greece. And definitely will be easier to receive my reply to your question. Actually, I strongly believe that the response has already provided. Let me express it with a solid message.

The connection between market and innovation is extremely poor. As to be more accurate I cannot know exactly the whole Greek ecosystem but working in PRAXI Network, coordinator of the TTO Network – TETRIS, a consortium of 8 different TTOs of Greece from the 36 that exist total in Greece, I have a relevant picture of the reality. Nevertheless, because there are so often events where the 6 national TTOs meet and exchange practices and a little bit of their achievements in numbers, the connection between market and innovation I can repeat that is poor. And immediately, I explain shortly the reason that I say is poor.

There are not licensing, if there are they are very few, and there is not an official way to learn about this, event if you used the subscribed software which monitors the patent pool of the country.

About pivot/exist of spin-offs, for the best of my knowledge for the last 10 years, have happened less of 5 cases. And again, it is unknown the value of the exist.

Requests for co-developing are event less, for 5 cases in the last 10 years.

Last, I would like to mention that despite the fact there are more than 40 Venture capitalists with incubators, accelerators in Greece the last years, by their statements are struggle to find spin-offs and start-ups to invest.

This is the reality in Greek ecosystem currently, unless something drastically will happen and change the momentum.

Question 3: What do you think would help to enhance the interaction of academia and industry in Greece and how would a lead researcher benefit from such an interaction?

I want in this point to congratulate for your nice and to the point questions because reflets exactly that you have comprehended the obstacles of the market-innovation path in Greek system.

In your question what would be done as to be helped the research/academia to improve the connection to the market I would answer to you that needs first of all governmental funding support. The TTOs have to receive constant funding to start operating their offices with *provided services equal quality with these of the TTOs of the rest of Europe (for example the Innovation Ecosystem of Ireland, France, Belgium, etc) which have to show us so many good practices. It is not necessary to re-invent the wheel. Without proper operational TTO with constant providing services to the research/academia any actions from TTO to benefit the organizations will be just a firework. It has been happening until now and it will continue if there is funding to build the person capacity of the offices and create well established operation procedures.*

In the second part of your questions of how the Lead researcher/academic could be benefited from this connection between the market and the research, the answer goes further that the operation of the TTOs, to the policy making of the country in this topic, how they want to be our research in the future. What I want to say with other words.

Definitely, I can see a direct benefit for the Lead researchers when it will be established the well paved path in this direction. The researcher easily will not just produce knowledge for the knowledge and later on will request from the TTO to find a way to valorize the research achievement. The researcher will know from the conceptualization of his/her idea in which direction will go the investigation. Making patent for the portfolio of a spin-off, making proof of concept for later to licensing the patent and go for co-developing, will know and will not be frustrated how will fund the particular research idea – directly the market will fund it maybe (and not just the researcher will transfer – "scarify" budget of other funded projects), will be able to have PhD candidates and MSc students for these projects (Industrial PhD and MSc), and maybe will be a career solution for some hundreds currently PostDocs who will not obtain Research positions any soon if there is the potentiality of being CSO or CEO, or COO for the spin-off.

<u>Question 4</u>: Let's talk numbers. How is the technology transfer landscape of Greece shaped today (patents filing, spin-offs, seminars, etc).

Very nice question too Elena. I jump directly to the answer this time. As I was saying earlier there are not statistics that are gathered from one organization and every year to make the annual report and inform everybody. As to find these number that you are asking it needs personal research.

Every year the European Commission release an annual report for the Intellectual Property (IP – with other words the filed patent for each European country). If I remember correctly, *it needs cross check, in Greece all the filed patent for the year 2024 were 145 patents. For 2025 is not announced yet. Also, OBI releases every year the number of the patent filed in Greece. It is almost rare a patent produced from Greece not to be filed also in OBI, hence the number that I mentioned before is also for the patents filed in Greece, approximately 145 for the year 2024. If you will ask me for the other countries id Europe, I will tell you, we are sitting one position before the last.*

Regarding, the Spin-offs. As somebody to find how many still operational spin-offs exist in Greece has to visit all the TTOs' websites of the country and gather the declare numbers. I said earlier alive spin-offs, because the website maybe is not updated and some of these spin-offs have already terminated their operations. Another source which can use to find the spin-offs of Greece can be the Elevate Greece platform. Approximately, the current spin-offs in Greece (and alive) are not more 50 companies.

Last, you asked me about seminars, I will need to clarify regarding the seminars, with attendance certification or simple seminars provided from the different TTOs? Regarding, these ones with certification, there is not even one single seminar in Greece with attendance certification provided from TTO. In case that there is any, the certification is unauthorized, it is like webinars from the Coursera platform.

Seminars, generally provided from TTOs can find almost 1 or 2 per every week in a big variety of subjects in the field of TTO operations. From IP protection and strategy, pre-seed funding resources, venture capitals with equity, and many other subjects. A very good way to follow these and be informed about is to follow the LinkedIn site of the TTOs. PRAXI Network is one of the TTOs of the country that does very often seminars open to everyone to attend after registration to LinkedIn.

<u>Question 5</u>: My last question will have a different character. Since I happen to be a laboratory scientist myself I vey well know the frustration a researcher can go through when navigating in the world of research and development. Adding entrepreneurial activities to this already stressed routine would be the last of our thoughts. What would you advise a lead researcher that wants to be involved in a lab-to-market process but doesn't know where to start. And after all, is is worth it?

Elena you have to know that deeply understand what you are describing, because I was myself in the research sector, inside the laboratories, under the pressure of the production *of the results, the manuscripts to be accepted, the deadlines of deliverables for the projects, the writing of proposals, for a period of 13 years before make the turn in my carrier and join the TTO of FORTH/PRAXI Network.*

I will give you firstly this statement: of course it is worthy to start the journey to explore entrepreneurship. I am a Materials Scientist and never had - until I joined the TTO - any education to the subjects of TTO. After four years, and after many personal hours of reading and attending seminars and webinars, I believe that I have created the crucial foundation to be productive staff of TTO and in a position to handle a big variety of different tasks in the TTO. Hence, it is crystallized to say it worth and I will give you my perspective why it worth.

The researcher will not become an entrepreneur and we don't want to transform the researcher to entrepreneur. There is not somebody better than the researcher/founder with more passion and knowledge to describe, communicate and make the business development than the researcher/founder. But the founder needs the support either of the TTO or/and from COO and CFO for his/her spin-off.

In well personnel developed TTOs with average 15 dedicated personnel to do the technology transfer, the support that can provide to the researcher who wants to establish a spin-off is from the very begging until to the pivot, exit, or licensing. In this path, the things for the researcher/founder are easier and in the natural procedure when to bring on board the CEO and CFO, COO. Then the researcher can continue having time for his research in the lab.

On the other hands, when the TTO is not so well personnel equipped, like in the Greek reality, more and more responsibilities are no the shoulders of the researcher/founder. The solution to bring on board a very capable CEO increases the running costs of the spin-off that still struggles to overtake the valley of death and there are strong odds the spin-off does not survive in the second year of its existence. In some cases, the personnel in the position of CxO become partners of the spin-off. We have seen, the result of these cases to be an extra reason the spin-off not to survive. As the VCs, Business Angels and the other pre-seed funds highlight, in a spin-off company the most important thing, more than the funds, is the team. In case, the CxO personnel will leave the spin-off earlier, the odds of the spin-off to survive makes so little.

Closing, I will give some tips for the potential researchers to enter the fascinating world of entrepreneurship. It is not enough to have the most innovative idea/solution, is it something that the people out there would like to buy? How many you believe that can buy it? It is your idea/solution easily copy (like the app in android)? Do you explore out there if there are other companies that would like to co-develop the technology you suggest?
All these are the questions that are looking for answers from a researcher/founder of a spin-off before start the journey of entrepreneurship. And the TTO are here to provide any possible assistance to answer those.

Thank you for the opportunity of this beautiful conversation. I hope I helped with my replies.

8. Challenges

The PRAXI network organized a conference in June 2026 with the topic 'Early Stage Finance and the role of Technology Transfer Offices' where several panels took place including people with diverse roles in academia, industry and regulatory bodies. The different sub-topics in which the panels were invited to discuss included: challenges in organization and function of TTOs in Greece, challenges in attracting investments in new technologies in Greece, early stage finance mechanisms and incubators, licensing mechanisms, and also a pitching session where lead researchers had the opportunity to pitch on their advanced TRL invention and receive feedback from investors and experts. The event was attended by TTO members from all over the country, venture capitalists, and academics and was considered especially successful in connecting the different parts and communicating the challenges that hold the country behind in the EU technology commercialization ecosystem. In this section of the thesis, it is important to demonstrate the challenges that are faced right now in Greece and hinder the lab-to-market processes, as they were communicated earlier this year in the PRAXI conference.

To start with, we can discuss the opinions of venture capitalists (VCs) and the conclusions they came into when they visited different academic institutions in the country. The VCs expressed their concerns that the researchers cannot handle pitching sessions or discussions about their primary research focus. They lack communication skills and very often they can't support their technology/invention to make it seem important or marketable. They shift the focus to other activities of the lab, in an effort to be inclusive but this ends up in missing the main point and passing a message to the non-expert. Another important finding was that in many cases there is no distinct lead-researcher role. The lab functions under the general supervision of a university professor that is not willing to sacrifice academic time to deal with entrepreneurship activities. At this point, it was highlighted that the TTOs should engage more in 'teaching' scientists how to communicate with VCs in order to smoothen the processes. One specific capitalist mentioned that during her visit in an academic laboratory she met exceptional scientists with achievements that would be highly competitive if disseminated internationally, but the researchers themselves only cared for a scientific publication and the academic position that this could secure for them. In her own words: *it is understandable, but this is only the one side of the coin.* However, there were also cases where although the researchers understood the need to commercialize their inventions, they didn't know the 'what and how'. This is where it was highlighted again that the TTOs are failing to attract and educate researchers. Another problem mentioned is that of the deal-flow. The laboratory facilities in Greece were characterized quite competitive but there is an issue in accessing and utilizing them after a spin-off is created. The deal-flow gets also stuck due to lengthy administrative processes or lack of attention from the researcher to speed up the processes. For the VC the time is precious - there have to be timelines for a spin-off to be created and run, so as not to lose another investment that would bring revenues faster. The technology may also lose its value after a while so one has to be spart and take advantage of any opportunity for funding, even in the early stages of technology development. VCs emphasized exactly this - they want to be approached even if there not enough data yet. The earlier they get into discussions, the mor effective solutions they can find. Another point made by VCs is that researchers need to overcome the limiting beliefs that the Greek capitalists will invest abroad or that they are not worth enough to approach a VC. They also mentioned that researchers are quite hesitant to deal with IP management due to the big costs they have to cover if they want to go for EU-wide patenting. Another issue that was raised is that of the lead researcher being a university professor that is inflexible and cannot lag behind in his/her academic activities, while in successful examples like the UK, there is fluidity in an academic's responsibilities and this way the technology commercialization is greatly facilitated. For a VC it is also a drawback to see people hired at the spin-off with limited contracts, 'just to fill in' and not people with specific knowledge that will dedicate their full time in the company. This is generally an issue in Greece, even for the TTOs personnel, that people are hired with very limited budget, usually using some short-term co-fund from EU. These people spend big part of their time to be trained and then they have a specific window of time to run a process. This way of dealing with personnel is bringing more problems than solutions. Having said that, we can now examine the points brought by the TTOs members in the dedicated panel.

From a TTO member point of view, the personnel issue mentioned before is one of the biggest. Several members from different institutions mentioned that they are in shortage of personnel and they end up loaded with an incredible amount of responsibilities that are not executed properly. Apart from the personnel, the TTOs mentioned rigorously the lack of national funding in the form of a standard mechanism and not opportunistically. This national funding mechanism would actually support the technology transfer in the country, according to the example of other successful institutions abroad. There is also the issue with the defective legal framework around TTOs. These offices do not have established supervision and function mechanisms and they are under the authority of any university board member takes over the assignment of the institution's TTO. This person is changing regularly so there is not actual guidance according to the needs of the specific university. The TTO members are left with messy administrative work, insufficient budget, and complaining researchers. On the TTO member-researcher relationship, it was discussed that researchers are coming with 'big ideas' and due to the lack of entrepreneurship basics they cannot understand how their idea would or would not serve the society or the VC that would invest in it. It was highlighted that the scientists need to be closely related with the actual societal needs and of course again to hire more research personnel so that a scientist can invest time in getting to know 'the outer world'.

In general, all sides highlighted the need to be more connected with the government mechanisms so that the state understands the strategic importance of the research facilities and the role they could play in driving the country's economic growth. For example, there was a suggestion for creation of a body dedicated in diagnosing societal needs in the context of evidence-based policies. The incorporation of artificial intelligence and big data would also be of utmost importance. The main conclusion/suggestion towards researchers, regulatory bodies, and TTO members was that we need to get away from the concept of IP rights per se and see the patented inventio as strategic decision-making tool.

Discussion

Combining the information presented in Parts 2 and 3 of the thesis, we can recognise specific problems in the lab-to-market pathway that involve all actors and different stages of the process. Figure 6 summarizes the problems recognized and the suggested solutions.

The first and most important actor is the lead researcher. The lead researcher is the person who is accountable for the developed technology and is also usually the head of the research lab or facility. It has been argued though that the increased number of responsibilities on one person causes problems in the interactions with the TTO's members, venture capitalists, and any other stakeholders, including interactions with the society. In this case, it is suggested that a person close to the lead researcher could take more responsibilities and work full time in the project so that there is always a person to reach and the processes run smoothly. A Postdoctoral researcher is usually the person closest to the lead researcher that can take over such responsibilities.

Regarding the TTOs role, several difficulties have been reported to impair their work but in terms of connection with the rest actors the main issue is the limited connection with lead researchers. For example, one of the success factors of the KU Leuven TTO which was presented in Part 2 was the active communication with the majority of researchers and professors of the university. On the other hand, the TTO members in Greece hava reported difficulties in reaching out to a greater number of researchers. Often researchers do not even know who to reach out to or where to find the TTO. For such cases, it is advisable that the TTOs, especially in regions where their prescence is limited, should establish fixed info events at the beginning and end of the academic year so that these events get popular among the scientific community.

The next important actor is the scientist behind the technology development. All the people working on ideas and implementation that constitute the research team. These people, each one with a greater or smaller role, should actively participate in the lab-to-market processes starting from understanding industrial and societal needs. It has been observed that scientists are often too bounded by academic culture and interact minimally with stakeholders outside academia. A solution here lies in seeking external validation even for bare ideas or initial-stage prototypes through communication events for the public or more specific meetings with venture capitalists for initial discussions. Actually, during the PRAXI network event, it was mentioned by a TTO member that a communication event organised in the university led to the development of an entirely new product after the questions posed by citizens. Adding to this, the VCs panel expressed their strong willingness to meet researchers in their premises and initiate brainstorming discussions even if the technology is immature.

Coming to the authorities role, this is divided in two main actors: the EU and the local governements. In Part 2 of the thesis it was discussed about the European framework on research funding, revealing a powerful mechanism that covers all Technology Readiness Levels (TRLs) and many resources allocated exclusively to technology commercialization. Nevertheless, it is still not requested – not attempted to empower the 'Impact' section of project proposals with solid dissemination and commercialization plans. This culture leads to important amount of funding for basic research (bold ideas) that never reaches the market. Indeed, the data presented in a EU report earlier this year (February 2026, covering data since 2022) reveal that while EU benefits greatly from world-class research and strong industries, EU as a whole can do better at transforming scientific output into leadership in innovation and entrepreneurship(*Horizon Europe Work Programmes - Research and Innovation*, n.d.). The allocation of funding in more lab-to-market initiatives rather then excellence programs could contribute to establishing a commercialization-based approach to more scientists. At a local level, it has been reported that the lack of a solid R&D funding scheme by the government rather than scarce, short-term funding programs could greatly support the local universtities and TTOs to engage in advanced research and marketing activities.

The last milestone would be to enhance the idea of lab-to-market at the very core, meaning the education system. It is a common truth that researchers nowadays are mostly or solely in many cases trained to conduct research, generate data and knowledge to gain publicity in their field and potential academic benefits. However, this culture contributes to the complete disconnection of academia and market. Conversely, an entrepeurship-basics course was integral part of young researchers education (e.g. PhD students) it could make an impact in the way they are nurtured towards developing lab-to-market mindsets.

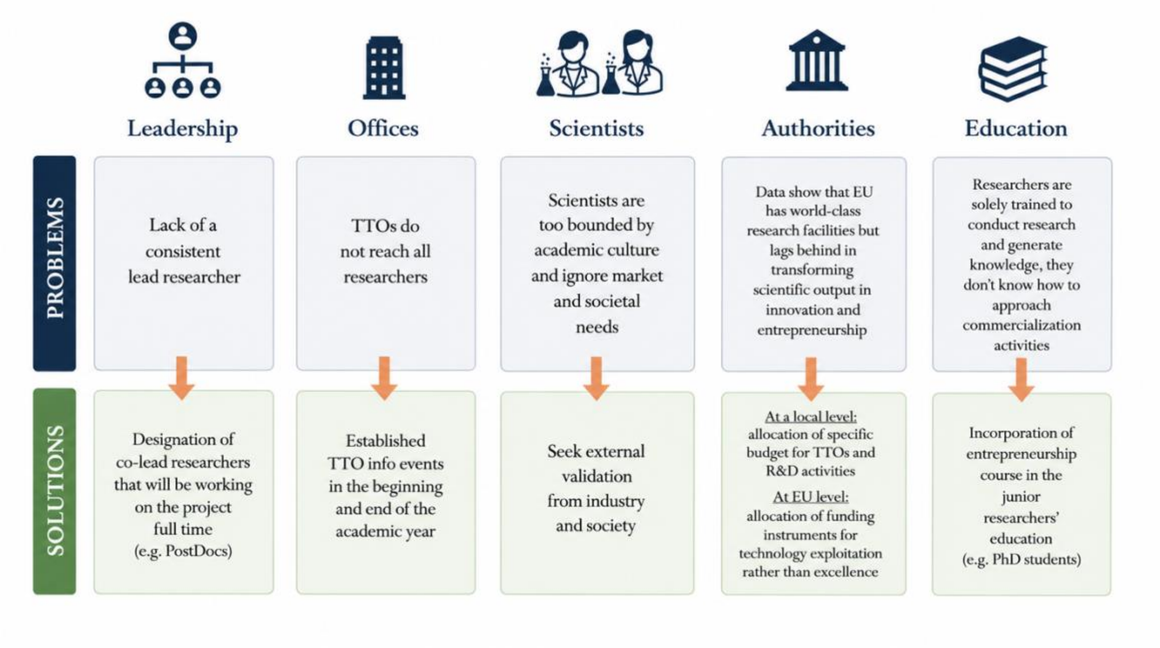


Figure 6: A summary of recognised problems and suggested solutions in the lab-to-market pathway.

Conclusions

The present thesis tried to give the reader an overview of mechanisms, examples, and opportunities when walking the lab-to-market pathway. It is understandable that the amount of information may be overwhelming but a step-by-step approach can greatly transform the way researchers are viewing technology exploitation. The Technology Transfer Offices are the main actor in this process and bare a huge amount of responsibilities, as the main linkage between academia and industry.

In the context of innovation management, the establishment of Intellectual Property (IP) rights can play the role of the essential link between scientific discovery and market value creation. However, it has been highlighted that both the researchers and the authorities need to overcome the concept of IP rights per se and see it as a strategic development tool.

Although universities and research organizations around the world have followed the US example and established technology transfer mechanisms (TTOs, science parks, incubators, university venture funds, etc), we are still talking for organizational insufficiencies and poor academia-industry communication(de Wit-de Vries et al., 2019; Good et al., 2019). Cultural differences are often spotted in literature as the reason behind poor academia-industry collaboration: project goals, visions on research activities, expected outcomes, allocation of time and resources, management styles, social conducts, different language and time perception. <u>In principle, it sounds rational</u>: academia and industry are different by definition and should stay that way in order to reassure freedom of knowledge. <u>In practice, it has to be addressed</u>: TTOs primary role was exactly this - to address practical difficulties and find a common language between the opposing parts. Essentially a lawyer with a higher cause: to lead the roadmap from lab-to-market.

References

Abramo, G., D’Angelo, C. A., Ferretti, M., & Parmentola, A. (2018). An individual-level assessment of the relationship between spin-off activities and research performance in universities. *R and D Management*, *42*(3), 225–242. https://doi.org/10.1111/j.1467-9310.2012.00680.x

Barros, M. V., Ferreira, M. B., Prado, G. F., Piekarski, C. M., & Picinin, C. T. (2020). The interaction between knowledge management and technology transfer: A current literature review between 2013 and 2018. The Journal of Technology Transfer, 45(5), 1585-1606. https://doi.org/10.1007/s10961-020-09782-w

Battaglia, D., Paolucci, E., & Ughetto, E. (2023). Hurdles in University-Industry Technology Transfer: Why Research-Based Inventions are Not Transferred to the Market? *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT*, *71*, 13415–13427. https://doi.org/10.1109/TEM.2023.3269731

Belitski, M., Aginskaja, A., & Marozau, R. (2019). Commercializing university research in transition economies: Technology transfer offices or direct industrial funding? *Research Policy*, *48*(3), 601–615. https://doi.org/10.1016/J.RESPOL.2018.10.011

Boguszewicz-Kreft, M., Kreft, D., & Zurek, J. (2021). Technology transfer steps towards the commercialization of research results. WSB Journal of Business and Finance, 55(1), 1-12. https://doi.org/10.2478/wsbjbf-2021-0003

Cambridge Enterprise. (2024). Retrieved June 20, 2026, from https://www.enterprise.cam.ac.uk/news/cambridge-leads-in-spinouts-success-in-2024-new-report-reveals/

Cavallo, A., Ghezzi, A., Dell'Era, C., & Pellizzoni, E. (2019). Fostering digital entrepreneurship from startup to scaleup: The role of venture capital funds and angel groups. Technological Forecasting and Social Change, 145, 24-35. https://doi.org/10.1016/j.techfore.2019.04.022

Chen, A., Patton, D., & Kenney, M. (2016). University technology transfer in China: A literature review and taxonomy. The Journal of Technology Transfer, 41(5), 891-929. https://doi.org/10.1007/s10961-016-9487-2

Civera, A., Meoli, M., & Vismara, S. (2020). Engagement of academics in university technology transfer: Opportunity and necessity academic entrepreneurship. European Economic Review, 123, 103376. https://doi.org/10.1016/j.euroecorev.2020.103376

Compagnucci, L., & Spigarelli, F. (2020). The third mission of the university: A systematic literature review on potentials and constraints. Technological Forecasting and Social Change, 161, 120284. https://doi.org/10.1016/j.techfore.2020.120284

Council of the European Union. (2022). Council Recommendation (EU) 2022/2415 of 2 December 2022 on the guiding principles for knowledge valorisation. Official Journal of the European Union, L 317, 141-148.

Czarnitzki, D., Doherr, T., Hussinger, K., Schliessler, P., & Toole, A. A. (2016). Knowledge creates markets: The influence of entrepreneurial support and patent rights on academic entrepreneurship. European Economic Review, 86, 131-146. https://doi.org/10.1016/j.euroecorev.2016.04.010

de Wit-de Vries, E., Dolfsma, W. A., van der Windt, H. J., & Gerkema, M. P. (2019). Knowledge transfer in university–industry research partnerships: a review. *Journal of Technology Transfer*, *44*(4), 1236–1255. https://doi.org/10.1007/S10961-018-9660-X/FIGURES/3

EIT. (n.d.). Retrieved June 17, 2026, from https://www.eit.europa.eu/about-us/eit-glance

EIT. (n.d.). Retrieved June 17, 2026, from https://www.eit.europa.eu/global-challenges/about-our-knowledge-and-innovation-communities

EU Funding & Tenders Portal. (n.d.). Retrieved June 18, 2026, from https://ec.europa.eu/info/funding-tenders/opportunities/portal

ETH transfer IP & Licensing | ETH Zurich. (n.d.). Retrieved June 20, 2026, from https://transfer.ethz.ch/learn/patents.html

European Innovation Council (EIC) | Research and Innovation. (n.d.). Retrieved June 13, 2026, from https://projects.research-and-innovation.ec.europa.eu/en/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters/european-innovation-council-eic

European Commission. (2024). The unitary patent system. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

European Innovation Council. (2025). EIC funding opportunities: Pathfinder, Transition and Accelerator. European Commission.

European Patent Office. (2024a). European Patent Guide: How to get a European patent (24th ed.). European Patent Office.

European Patent Office. (2024b). Guidelines for Examination in the European Patent Office. European Patent Office.

Fini, R., Rasmussen, E., Siegel, D., & Wiklund, J. (2018). Rethinking the commercialization of public science: From entrepreneurial outcomes to societal impacts. Academy of Management Perspectives, 32(1), 4-20. https://doi.org/10.5465/amp.2017.0206

Fleming, L., Greene, H., Li, G., Marx, M., & Yao, D. (2019). Government-funded research increasingly fuels innovation. *Science*, *364*(6446), 1139–1141. https://doi.org/10.1126/SCIENCE.AAW2373

Fraunhofer. (2026). https://www.fraunhofer.de/en/about-fraunhofer.html

Genentech: Our Founders. (n.d.). Retrieved June 7, 2026, from https://www.gene.com/about-us/leadership/our-founders

Good, M., Knockaert, M., Soppe, B., & Wright, M. (2019). The technology transfer ecosystem in academia. An organizational design perspective. *Technovation*, *82–83*, 35–50. https://doi.org/10.1016/J.TECHNOVATION.2018.06.009

Grimaldi, R., Kenney, M., Siegel, D. S., & Wright, M. (2011). 30 years after Bayh–Dole: Reassessing academic entrepreneurship. *Research Policy*, *40*(8), 1045–1057. https://doi.org/10.1016/J.RESPOL.2011.04.005

Gu, J. (2023). Commercialization of academic patents in Chinese universities: Antecedents and spatial spillovers. Heliyon, 9(3), e14601. https://doi.org/10.1016/j.heliyon.2023.e14601

Hardymon, F. T. N. (2012). “Kleiner-Perkins and Genentech: When Venture Capital Met Science.” *Harvard Business School Case 813-102*. https://www.hbs.edu/faculty/Pages/item.aspx?num=43569

Hayter, C. S., Nelson, A. J., Zayed, S., & O'Connor, A. C. (2018). Conceptualizing academic entrepreneurship ecosystems: A review, analysis and extension of the literature. The Journal of Technology Transfer, 43(4), 1039-1082. https://doi.org/10.1007/s10961-018-9657-5

Horizon Europe - Research and innovation - European Commission. (n.d.). Retrieved June 12, 2026, from https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

Horizon Europe support for knowledge valorisation | European Research Area Platform. (n.d.). Retrieved June 13, 2026, from https://european-research-area.ec.europa.eu/horizon-europe-support-knowledge-valorisation

Horizon Europe work programmes - Research and innovation. (n.d.). Retrieved June 18, 2026, from https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/horizon-europe-work-programmes_en

Innovation, E. C. D.-G. for R. and. (2021). *Horizon Europe, pillar I - Excellent science – Driving scientific excellence and supporting the EU’s position as a world leader in science*. Publications Office of the European Union. https://doi.org/doi/10.2777/456952

KU Leuven Tech Transfer Office. (2019). Retrieved June 20, 2026, from https://lrd.kuleuven.be/en/news/ku-leuven-research-development-launches-100th-spin-off

KU Leuven Tech Transfer Office. (2026). Retrieved June 20, 2026, from https://lrd.kuleuven.be/en/spinoff

Langer Lab. (n.d.). Retrieved June 7, 2026, from https://langerlab.mit.edu/langer-bio

Marin, J. R., Bergek, A., & Hellsmark, H. (2024). University technology transfer offices' capabilities in technology commercialisation: The case of university spin-offs. The Journal of Technology Transfer. https://doi.org/10.1007/s10961-024-10120-7

Nagar, J. P., Fini, R., & Hsu, D. H. (2024). ERC science and invention. Research Policy, 53(7), 105032. https://doi.org/10.1016/j.respol.2024.105032

NIH, Genome. (2013). https://www.genome.gov/25520305/online-education-kit-1976-first-genetic-engineering-company

Open science - European Commission. (n.d.). Retrieved June 18, 2026, from https://rea.ec.europa.eu/open-science_en

Open Science and Intellectual Property Rights. (n.d.). Retrieved June 18, 2026, from https://openscience-ipr.eu/

Our Team | ResQ Biotech. (n.d.). Retrieved June 17, 2026, from https://www.resqbiotech.com/our-team

Praxi Network. (n.d.). Retrieved June 20, 2026, from https://praxinetwork.gr/en/home/

Ravi, R., & Janodia, M. D. (2022). University-industry technology transfer in India: A plausible model based on a cross-sectional study. Journal of the Knowledge Economy, 13, 2462-2482. https://doi.org/10.1007/s13132-021-00747-4

ResQ Biotech: Ποια είναι η startup που παράγει καινοτομία και «θεραπεύει» ασθένειες - Οικονομικός Ταχυδρόμος - ot.gr. (n.d.). Retrieved June 17, 2026, from https://www.ot.gr/2024/08/26/epixeiriseis/startups/resq-biotech-poia-einai-i-startup-pou-paragei-kainotomia-kai-therapeyei-astheneies/

Scherer, J., Weber, Stephanie., Alveen, Patricia., Sweeney, Eugene., Neisius, Katrin., Haardt, Jakob., Sagias, Ioannis., Oliveira, C., & Dechamp, J.-Fancois. (2022). *European IP Helpdesk : successful valorisation of knowledge and research results in Horizon Europe : boosting the impact of your project through effective communication, dissemination and exploitation*.

Secundo, G., Perez, S. E., Martinaitis, Z., & Leitner, K. H. (2017). An intellectual capital framework to measure universities' third mission activities. Technological Forecasting and Social Change, 123, 229-239. https://doi.org/10.1016/j.techfore.2016.12.013

Sideri, K., & Panagopoulos, A. (2016). Setting up a technology commercialization office at a non-entrepreneurial university: an insider's look at practices and culture. *The Journal of Technology Transfer 2016 43:4*, *43*(4), 953–965. https://doi.org/10.1007/S10961-016-9526-Z

Start-up boom thriving | ETH Zurich. (n.d.). Retrieved June 20, 2026, from https://ethz.ch/en/news-and-events/eth-news/news/2025/01/start-up-boom-thriving.html

Steenkamp, R. J. (2023). Technology transfer perspectives: the KU Leuven case study. *South African Journal of Industrial Engineering*, *34*(2), 49–60. https://doi.org/10.7166/34-2-2836

Stemberkova, R., Maresova, P., David, O., & Vagner, L. (2021). Knowledge management model for effective technology transfer at universities. Industry and Higher Education, 35(5), 1-15. https://doi.org/10.1177/0950422220978046

Tech.eu. (2026). Retrieved June 20, 2026, from https://tech.eu/2026/06/04/cambridge-enterprise-builds-london-launchpad-for-next-generation-of-deeptech-founders/

Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. Research Policy, 47(8), 1367-1387. https://doi.org/10.1016/j.respol.2017.01.015

Thomas, V. J., Bliemel, M., Shippam, C., & Maine, E. (2020). Endowing university spin-offs pre-formation: Entrepreneurial capabilities for scientist-entrepreneurs. *Technovation*, *96*, 102153. https://doi.org/10.1016/J.TECHNOVATION.2020.102153

Wilkinson, M. D., Dumontier, M., Aalbersberg, Ij. J., Appleton, G., Axton, M., Baak, A., Blomberg, N., Boiten, J. W., da Silva Santos, L. B., Bourne, P. E., Bouwman, J., Brookes, A. J., Clark, T., Crosas, M., Dillo, I., Dumon, O., Edmunds, S., Evelo, C. T., Finkers, R., … Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data 2016 3:1*, *3*(1), 160018-. https://doi.org/10.1038/sdata.2016.18

World Intellectual Property Organization. (2024). PCT - The international patent system. WIPO.

Appendix: Terminology and definitions

Term	Definition
TRL (Technology Readiness Level)	A nine-level scale used by the European Commission to measure the maturity of a technology, from basic scientific principles (TRL 1) to commercially proven systems (TRL 9).
SME (Small and Medium-sized Enterprise)	An enterprise employing fewer than 250 people with annual turnover ≤ €50 million or balance sheet ≤ €43 million (EU definition).
Start-up	A newly established company developing an innovative product, technology or business model with strong growth potential.
Spin-off	A company established to commercialize research results originating from a university or research organization while maintaining formal institutional links.
Spin-out	A company created from an existing organization (often a university) to independently commercialize intellectual property or technology. The term is often used interchangeably with *spin-off*, although "spin-out" typically emphasizes greater institutional independence.
EIC (European Innovation Council)	The EU's flagship programme supporting breakthrough innovation through Pathfinder, Transition and Accelerator funding instruments.
ERC (European Research Council)	European funding body supporting frontier research based exclusively on scientific excellence.
Mid-cap (Small Mid-cap)	Companies employing fewer than 500 employees. Under certain EIC programmes, small mid-caps may be eligible for investment support.
Non-EU Country	A country that is not a Member State of the European Union.
Associated Country	A non-EU country that has concluded an association agreement allowing participation in Horizon Europe under conditions similar to EU Member States.
Non-associated Third Country	A country outside the EU that has not concluded an association agreement with Horizon Europe. Participation is generally possible but funding eligibility may be restricted.
Third Country	Any country that is neither an EU Member State nor, depending on context, an Associated Country.
Work Package (WP)	A coherent set of project activities grouped around a common objective, with defined tasks, milestones, deliverables and responsibilities.
Deliverable	A tangible project output submitted to the European Commission, such as a report, prototype or software package.
Milestone	A predefined checkpoint indicating successful completion of a significant stage within a project.
Deal Flow	The pipeline of potential investment opportunities identified and evaluated by investors, incubators or technology transfer offices.
Evidence-based Policy	Public policy developed using robust scientific evidence, data analysis and systematic evaluation rather than solely political considerations.
Incubator	An organization providing early-stage companies with workspace, mentoring, networking opportunities and business support.
Accelerator	A structured programme offering intensive mentoring, investment access and business development services to rapidly growing start-ups.
Technology Transfer Office (TTO)	A university or research institution office responsible for protecting intellectual property and facilitating commercialization through licensing or spin-offs.
Knowledge Valorisation	The process of creating societal or economic value from research results through commercialization, policy, education or societal uptake.
Intellectual Property (IP)	Legally protected intangible assets such as patents, copyrights, trademarks and trade secrets arising from creative or scientific work.
Proof of Concept (PoC)	Activities demonstrating the technical and commercial feasibility of an invention before large-scale investment.

Author’s Statement:

I hereby expressly declare that, according to the article 8 of Law 1559/1986, this dissertation is solely the product of my personal work, does not infringe any intellectual property, personality and personal data rights of third parties, does not contain works/contributions from third parties for which the permission of the authors/beneficiaries is required, is not the product of partial or total plagiarism, and that the sources used are limited to the literature references alone and meet the rules of scientific citations.