Challenges from the Past – Opportunities for the Future
Reflections on the Technology Transfer Process in Romania

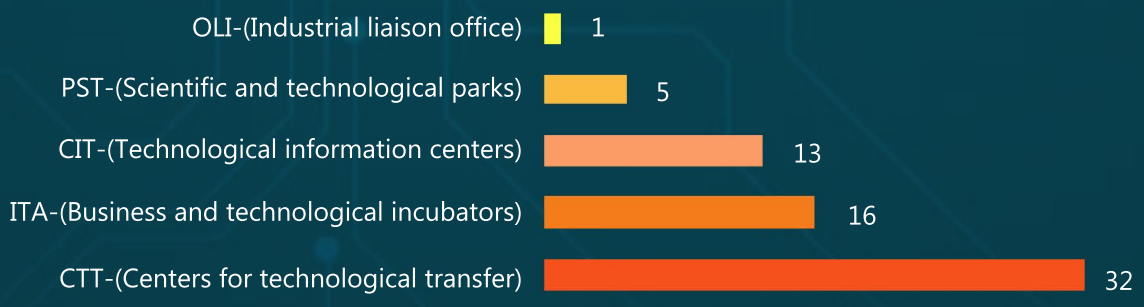
INTRODUCTION

Research and innovation are the growth engines of economic development. Cultivating an inclusive environment where science and entrepreneurship meet helps us ensure an innovation pipeline that views today's challenges as tomorrow's opportunities. Technology and knowledge transfer play a decisive role in driving this process by bringing academic and institutional research to the market as innovative products and services, generating economic growth and value for society.

Countries such as the United States, Ireland, Finland, Israel, all global innovation leaders, designed ecosystems to streamline technology transfer and turn research ideas into commercially useful knowledge. Several common factors underpin this success, including decades of continual investment and capacity building, a sound institutional framework, and clear and transparent procedures. These countries continuously support a mix of projects to ensure scientific and technological developments are accessible to users and convey value. In turn, commercialized research fosters the development of new enterprises and provides economic growth, job opportunities, and solutions to national and global challenges along the way. In many ways, the success of the innovation ecosystems in these nations stems from their clear focus on technology transfer.

Unlocking the potential of technology transfer is key to improving innovation in Romania. Global innovation leaders offer a proven model to follow, but it is necessary to leave space for experimentation and innovation, for new ideas and practice, for the Romanian context. For Romania, embarking on this path will plant the seeds of an innovative future.

Entities for innovation and tehnological transfer in Romania



ROMANIAN INNOVATION LANDSCAPE: A PATHWORK OF UPS AND DOWNS

Despite strong interest in entrepreneurship and robust science and technology research, Romania has the lowest rate of innovation according to the 2019 European Innovation Scoreboard. With a history of tremendous scientific and technological achievements, a strong natural capital endowment, and world class and creative human capital, Romania has a fertile landscape that must be nurtured by a clear innovation vision, a solid capacity to act, and inspired and inspiring leadership to develop a full-fledged innovation ecosystem.

The strengths of the Romanian research ecosystem include research into global challenges in environment, health, ICT, artificial intelligence, energy, and the circular economy, and a large number of highly skilled researchers supported by modern infrastructure, equipment, and technologies. To successfully exploit these strengths, Romania must capitalize on innovation trends emerging globally, as articulated in the European Commission's "100 Radical Innovation Breakthroughs for Europe (RIBRI)."[1] Romania's most pressing weaknesses include: low public investment comparing to the country's assumed target for 2020 – 2% of GDP; an inefficient support; a fragmented system; priorities that fail to consider market needs; few international connections; limited public resources distributed too widely to be impactful; regional disparities; lack of a critical mass in applied research and innovative research applications; brain drain; low private expenditure on research; and an inadequate intellectual property rights framework, which discourages private investment.[2]

Designing a functional technology transfer system has the potential to address many of these issues and improve innovation performance. The main question becomes: how should we transform the future of the Romanian landscape to make innovation the driving force of Romania's development?

[1] Leading innovation countries – e.g. Denmark, Netherlands or Sweden – used the RIBRI report, developed in part by UEFISCDI, to develop their national research agendas

[2] Knowing IPR Focus Group, Knowing IPR project, 29 March 2019, http://www.interreg-danube.eu/approved-projects/knowing-ipr

THE CHALLENGE: WHERE RESEARCH RESULTS DO NOT MEET MARKET AND SOCIETY

Several challenges have hindered the process of developing technology transfer infrastructure in Romania: a lack of specialized human capital; small public budgets allocated to research and development; limited access to financial and information resources; frail cooperation between research organisation and business actors; the long, expensive patent process; and a lack of visionary leadership capable of transforming the system.[3]

Since 2007, several important measures have promoted technology transfer, including substantial investment in infrastructure, technological services and equipment, and cooperation between SMEs and technology transfer entity. These measures are not enough. Overall, research results are not integrated into industry. **There is no clear national policy for technology transfer combining a system-wide approach to commercialisation of research and the human resources to deliver it. There are no policies enabling start-up, scale-up and entrepreneurial ecosystem developments following the European Commission's analysis and recommendations.**[4]

THE CONTEXT: INSPIRING THE FIRST STEPS FOR A MAJOR CHANGE

To change the Romanian technology transfer system, policy makers should capitalise on existing resources and take inspiration from international experiences. Following again the model of leading innovation nations, Romania should develop frameworks to pilot new practices and fund research that links academia with industry.

The **conference "Unlocking the Potential of Universities in Entrepreneurship,"** held on the 31st of October, 2019, investigated this complex and challenging endeavour.

[3] Knowing IPR Focus Group, Knowing IPR project, 29 March 2019, http://www.interreg-danube.eu/approved-projects/knowing-ipr
[4] European Commission, Specific Support to Romania Start-ups, Scale-ups and Entrepreneurship in Romania, 2017, https://rio.jrc.ec.europa.eu/en/policy-support-facility/specific-support-romania

Organized by the former Ministry of Research and Innovation (MCI) in partnership with the U.S. Embassy in Romania, the Politehnica University of Bucharest (UPB), the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) and the Association for Entrepreneurial Education, the conference provided a framework to gather reputable tech transfer professionals from the United States, Europe, and Romania. It convened policy and decision makers, professors and research entrepreneurs, technology transfer experts, legal experts, innovators, early stage investors and opinion-shaping actors who offered solutions to the many aspects of the problem. Conference participants suggested clear measures and international experts offered valuable insights to sketch the main recommendations to improve the framework for innovation in Romania.

The conference focused on two large themes: technology transfer and entrepreneurship education to identify possible solutions to develop innovation and entrepreneurship in Romania.

The reflections of the speakers highlighted various characteristics of the Romanian system as well as some of the hallmarks of designing a functional technology transfer system:

KEY INSIGHTS ON ROMANIA'S EXPERIENCE

- Romania is struggling to determine a coherent way to complete the technology transfer puzzle. Having recently managed the same process, Ireland can provide useful insights and examples;
- Romanian universities have different levels of technology transfer experience; however, they generally lack professionals and coherent strategic vision;
- Romanian universities prepare highly-educated young engineers and researchers, but they cannot capitalize on their innovation potential. There is an urgent need to develop a functional national technology transfer system.

KEY INSIGHTS ON VARIOUS INTERNATIONAL EXPERIENCES

- Ireland centralized technology transfer policy first produced results after 10 years of continuous support.
- In the United States, specialized technology transfer professionals focus significant resources on training and development.

[5] From November 2019, the Ministry of Research and Innovation (MCI) was transformed in the General Department for Scientific Research, Technological Development and Innovation within the Ministry of Education

- Technology transfer is a long-term process that produces major results after more than a decade of investments and efforts. While it does not necessarily produce economic growth immediately, it helps increase revenues, create new jobs, attract foreign investments, raise awareness, and create sustainable businesses. Finally, technology transfer changes the mindset and culture of students and researchers, encouraging education and research to remain at the cutting edge.
- The higher education system should approach entrepreneurial education explicitly, helping students become familiar with technology transfer elements (IP rights, patent process, licenses, contracts etc.) from the early stages of their education. Romanian universities must implement an IP policy that clearly establishes the intellectual property rights for new discoveries and technologies. Simple templates could simplify the technology transfer process for universities and facilitate dialogue and contracts with the business environment.
- Universities must encourage collaboration among young and experienced researchers to establish valuable networks of professionals.

OPPORTUNITIES AREAS

The problems | The strategy | The actions | Remember!

The problems:

The main issues to address in the technology transfer process are:
- Lack of a shared understanding of the technology transfer process and its results and benefits;
- Insufficient numbers of professionals to foster the technology transfer process and mediate the exchange between researchers and the economic and social environment; insufficient development of networks facilitating technology transfer; and
- Insufficient financing for technology transfer.

The strategy:

While previous funding programs have focused on infrastructure and tangible deliverables, it is time to focus more on intangibles, the knowledge, experience, and expertise to enable impact. At the same time, an analysis of the experience of other countries that faced the same challenges as Romania does today shows several critical issues that must be addressed to create a functional technology transfer process:

- Creating an institution to drive technology transfer in Romania, provide policy advice, and implement support programs;
- Training professionals in technology transfer. Their assistance is critical to ensure that research results become valuable and marketable products;
- Providing standardized templates of legal documents that would ensure an simple, predictable, and direct process for technology transfer; and
- Developing a strong institutional culture supporting technology and knowledge transfer.

Actions and targeted programs:

The following areas of opportunity, also highlighted by the developping Smart Specialization and Research, Development and Innovation strategies 2021-2027, offer possible solutions:

- Designing a national program to develop technology transfer expertise and human resources (around 300-400 persons);
- Offering grants for 500 innovative Romanian researchers to join intensive training programs in various international universities to improve their professional skills and establish new international connections.
- Developing a twinning program between Romanian and international universities and/or research institutes to provide innovators with international experience and best practices; and
- Designing a program to finance several Science Fest events to convene experts in technology transfer with business representatives, bringing visibility and awareness to R&D results and stimulating new opportunities for cooperation.

Remember!

Introducing technology transfer is a long-term process that may not see tangible results for 10 - 14 years. Making a fresh start is difficult. There will be challenges and complex problems. But without research commercialization and knowledge transfer, functional innovation ecosystems cannot emerge. For the future of the innovation landscape, it is critical that Romania remains dedicated to the process.
Romania needs the vision and determination to act now!

CASE STUDIES

CASE STUDY 1: IRELAND – KNOWLEDGE TRANSFER IRELAND (KTI)

Focus on professionalized technology transfer officers and a preeminent higher education system

About 20 years ago, Ireland started to implement a new vision to commercialize state-funded research. Enterprise Ireland[6] embarked on a long process of learning, shaping, and adapting innovation policies and strategies. Their efforts paid off 10 years later when the first results started to appear. While the process continued to mature as those working within the system became more experienced, progress continued, producing more successful innovation and technology transfer projects.

Knowledge Transfer Ireland (KTI) was created as the result of the recommendation from a Government-led task force that reviewed the state of business-research base engagement in 2012. KTI formally launched in May 2014 as a partnership between Enterprise Ireland and the Irish Universities Association. As the national office with oversight of the knowledge transfer system, KTI's mission is to make it simple for industry and entrepreneurs to benefit from Irish research and expertise. With funding from Enterprise Ireland, KTI supports technology transfer offices within Ireland's universities. Their experts support the knowledge transfer environment by reaching out to enterprises, by raising awareness of the benefits of working with the research base, and by making resources available to support that engagement.

[6] Enterprise Ireland is the government organisation responsible for the development and growth of Irish enterprises in world markets.

Allison Campbell – director of KTI @ "Unlocking the Potential of Universities in Entrepreneurship" Conference

Allison Campbell explained the ups and downs of the journey and stated that Irish national policy on research commercialization aims to "maximize the economic and societal benefits and returns to Ireland from its public investment in research." She also advised that, to measure the success of a technology transfer process, it is important to know the desired outcomes, including job creation, bringing investments into local business, creating a functional system in higher education, etc. In her opinion and based on her experience, a successful technology transfer process involves the following:

- A solid investment in professionals (technology transfer officers that connect the scientific, academic, and business environments),
- A clear strategy focused on specific outcomes. The more specific the expected results, the easier it is to formulate strategies and policies and measure the results,
- Simplified, easy-to-implemen,t and customized documents that make the technology transfer process predictable and able to deliver effective results.

These statements support the conclusion that a successful technology transfer process requires a central administrative organisation to direct and implement strategies and policies, make necessary adjustments, and continuously improvethe process.

For universities, the technology transfer process involves substantial investment; few universities worldwide profit directly from it. However, it is essential as an additional source of prestige, awareness, and funding programs, which attract the best professors and most talented students, thus increasing the quality of education and the university's ranking.

Campbell pointed that students are a great source of knowledge and technology transfer and that, although the process is long and sometimes not all ideas become patents or inventions, students must be continuously encouraged to present and debate their research. The pace of change in the world today has been accelerating at a rate that makes it difficult for industry to keep pace. Organisations can no longer react but instead must innovate, adapt, and advance technologically. To do so, they must have a clear focus on innovation and knowledge transfer. The higher education system should be agile, responsive, and focused on delivery, thus enhancing expertise for the private sector and producing high quality products and services. Innovative solutions for companies are an absolute necessity for the country's competitiveness in the world.

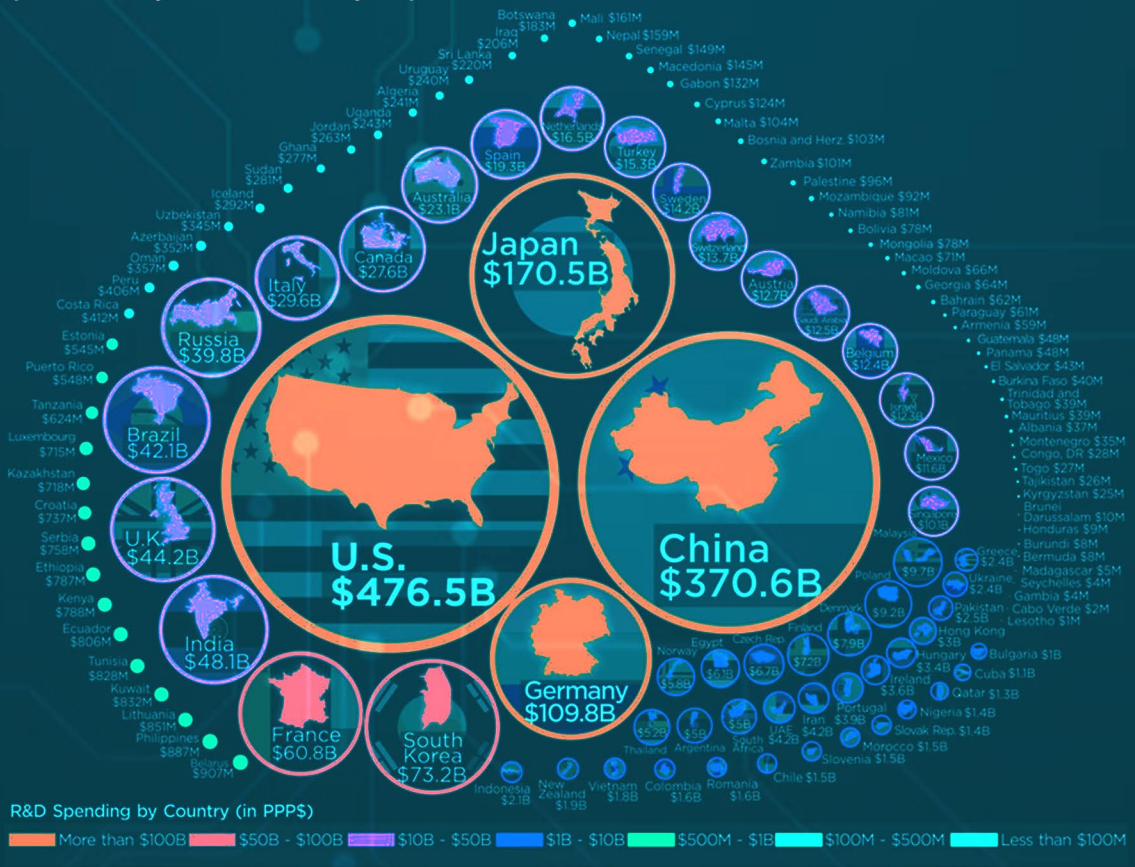
Today Ireland has one of the most efficient systems of technology transfer, described by Forbes Magazine as "one of the best countries for doing business

source: https://www.doingbusiness.org/content/dam/doingBusiness/country/i/ireland/IRL.pdf

CASE STUDY 2: USA – THE LAWRENCE LIVERMORE NATIONAL LABORATORY

Focus on implementing professional training for technology transfer officers

Clearly, the United States is a global force in research, development, and innovation. It has the largest budget allocated to R&D in the world ($476.5 billion),[7] the largest number of R&D-performing institutions, and ranks first in high-technology production, patents, and research publications. Of course, these features are supported by the country's political, economic, and social background. Its size and population mean that there is a huge domestic market capable of absorbing new technologies, interested in the latest developments and ready to test new ideas and prototypes. Thus, the U.S. market offers more opportunities for new high-tech products. There also certain advantages in having a large mass of highly educated researchers. They conduct an intense competition for research funds and, at the same time, are able to identify synergies and valuable collaborations projects with other R&D institutions.



source:https://www.weforum.org/agenda/2018/12/how-much-countries-spend-on-r-d?fbclid=IwAR2eFWoJjutWfvkdTAd3k3DuZoP6brlaPA-4sgXJNCdnxalfiQGEuI-K7rU

[7]Doing Business 2020, Ireland, https://www.doingbusiness.org/content/dam/doingBusiness/country/i/ireland/IRL.pdf

It is difficult, if not impossible, to compare the technology transfer process in the United States with any other around the world; however, it is possible to learn from their example and apply relevant insights to the local environment.

Elsie Quaite-Randall @ "Unlocking the Potential of Universities in Entrepreneurship" Conference

Elsie Quaite-Randall, an expert on technology transfer in the United States, presented some aspects of the technology transfer process from the state-funded laboratories to the business environment. First, she emphasized the importance of establishing patent ownership. IP rights are a key element in conducting a successful technology transfer process. Technology transfer centers are important resources that offer accurate and easy-to-understand information regarding the flow of the process, the stakeholders involved, IP rights, the patenting mechanism, the time and costs involved, and the expected results.

Capable and experienced technology transfer officers are essential, as they are the driving force behind the commercialization of the research results. The United States presently implements several programs dedicated to technology transfer officers to keep them connected to technological and scientific discoveries, to help them join groups dedicated to particular subjects and better understand the desires of their audience or customers.

Of course education plays a very important role; without highly educated researchers or professionals the rate of success is almost zero. State-of-the art equipment and technology cannot compensate for an intuitive, agile, and adaptive human mind. Romania must invest in quality education to develop the necessary workforce. One can measure the success of a technology transfer process by taking into account the number of patents and licenses, by counting the number of spin-off companies or simply by calculating the revenues. However, the true measure of success is the impact of innovation and research results on society and future generations.

WHAT'S NEXT?

Romania is close to end its framework programme for research, development and innovation for 2014-2020. In less than one year, the country will enter in a new strategic period, providing a huge opportunity to capitalize on strengths and address the challenges in research, development, and innovation to foster the innovation ecosystem.

Currently, the debate to shape the national agenda for smart specialisation and the strategic agenda for research, development and innovation, is on-going. What we do in the next strategic period will determine the course of Romania's innovation ecosystem. Applying the lessons gathered here will help ensure our success. Specifically, we should start working to design a functional technology transfer system by:

- Setting the right objectives and expectations in a visionary strategy;
- Using success stories to empower our efforts
- Creating the following to enable the technology transfer process:
    - institutional framework
    - leadership
    - community of experts
    - operational procedures: a set of template documents

DISCLAIMER

The paper is not an exhaustive technical report, but a series of documented reflections briefly prepared with the support of the former Ministry of Research and Innovation (MCI)[1] in partnership with the U.S. Embassy in Romania, the Politehnica University of Bucharest (UPB), the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) and the Association for Entrepreneurial Education, mapping some of the main challenges faced by the Romanian innovation ecosystem, as well as possible drivers for change in the next strategic period. The paper synthesises discussion during the conference "Unlocking the Potential of Universities in Entrepreneurship." It represents a background to reflect on how technology transfer could evolve in Romania's future and what the first steps for 2021-2027 might be.

[8] From November 2019, the Ministry of Research and Innovation (MCI) was transformed in the General Department for Scientific Research, Technological Development and Innovation within the Ministry of Education