

# ANALYSIS OF STRUCTURES FOR UNIVERSITY TECHNOLOGY TRANSFER. A CASE STUDY IN ROMANIA

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**Abstract:** *The purpose of this paper is to examine the relationships between the academic research and the social-economic environment in Romania, from the macroeconomic perspective of the structures for Technology Transfer specific to universities. In the first part, the study presents a general overview of Technology Transfer structures over the world, and in the second part, a global analysis of the university TT structures in Romania is performed. The findings can be useful to decision-makers in the Research and Innovation area of the Higher Education in Romania, to both the central coordination bodies of academic research and to the management of the higher education institutions. The methodology of the study consists of a general diagnosis based on scientific studies, official reports and universities' websites.*

**Keywords:** *academic innovation, technology transfer (TT), TT support structures.*

## 1. Introduction

The increasing interaction between scientists and the socio-economic environment is considered one of the features of modern innovation systems (Popescu, 2016). In connection with this idea, the Triple Helix model defines the interaction between universities, industry and public sectors as a key factor for the development of innovation (Etzkowitz, 2002). The Triple Helix thesis defines the shift from a dominating industry-government dyad in the Industrial Society to a growing triadic relationship between university-industry-government in the Knowledge Society. This approach brings a new perspective on academic research, corresponding to its expanded role.

The idea of including scientific research in the mission of higher education institutions dates back to the early 19<sup>th</sup> century (Etzkowitz and Leydesdorff, 2000). In the last decades, often at the initiative of national decision-makers, many universities have taken actions to develop a "third mission": to participate in economic and social

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development by promoting connections with knowledge users and facilitating technology transfer (Perkmann et al., 2013). The collocation „technology transfer” (TT) defines the relationship between science and industry and is primarily concerned with the application of research in economy (Popescu and Totu, 2014).

The effectiveness of TT actions increasingly depends on specific structures created to support TT, such as clusters, technology parks, business incubators, and TT offices (TTOs), more recently called Knowledge Transfer Offices (KTOs). These types of structures are briefly described below:

- *TTO*: a structural entity of the university or created with the participation of a university, responsible for the marketing of academic research findings.
- *Technology Park*: a non-profit organization, usually created in addition to a university in cooperation with companies, public administration authorities, employers' associations etc., whose main objective is the TT of research findings and their fostering through economic activities.
- *Innovative Cluster*: a modern form of organization conducive to technological transfer and innovation, which associates: universities or research institutes - as providers of innovative products, processes and services, industrial organizations (generally SMEs) - representing the demand for innovation; central, regional and local authorities with competencies in facilitating innovation processes.
- *Business Incubator*: a structure usually created by universities, sometimes within the TTO or technology park, geared toward speeding up the growth and success of new companies through support resources and services.

Given the importance of the support TT structures for improving performances in innovation at university, this paper aims to examine the relationships between academic research and the socio-economic environment in Romania, from the macroeconomic perspective of the specific university structures for TT. The specific objectives of the study are: 1) to describe the global scale evolution of universities TT structures in the context of open innovations and entrepreneurial universities; 2) to provide a global analysis of the TT governance and specific TT structures related to Romanian universities.

The methodology of the study consists of a general diagnosis, based on scientific studies, official information and reports from the Research Ministry and universities' websites.

## **2. General Overview of TT Structures over the World**

Numerous studies address the issue of the universities' participation in innovation from the perspective of TT structures. Some papers and books take the universities TT as part of a national and regional research system, others adopt the university perspective, and most of the publications include both perspectives. The review below focuses on the general evolution and monitoring of the university TT structures over the world, and it does not pretend to be exhaustive.

The first TTOs were created in the first part of the 20<sup>th</sup> century (in Germany and USA), but most of them are very recent (OECD, 2003). In this regard, Reichelt states that most TTOs are young, being 12 years old on the average in the USA, and less than 10 years old in European countries (Reichelt, 2018). Many researchers consider the Bayh Dole Act as a reference point for intensifying the development of this kind of structure. The Bayh

Dole Act was promulgated in USA in 1980, and defines a policy aiming to apply the results of the federally funded research more efficiently. As Mowery and Sampar say, Bayh-Dole was „a major catalyst to university– industry TT”. Based on this act, new policies have been adopted in other OECD countries in order to enhance university–industry TT (Mowery and Sampar, 2005). All over the world, universities have increased their involvement in patenting and licensing, and created internal TT structures in order to manage these activities. These changes are encouraged by public policies and strategies for Science and Technology, and for Higher Education systems. For example, in France, a 1999 law authorized the creation of TTOs in universities. Similarly, the first specialised incubators were created in Australia, in 1999 (Metrics for Research Commercialisation, 2015); in Japan, the presence of Technology Licencing Offices inside universities has increased since 2004 (Jofre, 2018), etc.

Nowadays there is a large variety of university TT structures, considering their administrative status, mission, activities and management (OECD, 2003; Trueman, Borrell-Damian and Smith, 2014). Studies on this topic reveal their dynamic character and the key success factors. Trueman and collaborators stress the new trend, from university internal KTO to external structures, which reaches to foster co-creative working environments, and favours the development of new models that are typically referred to as “clusters” (Trueman, Borrell-Damian and Smith, 2014). Bradley et al make an overview of TT models in universities and appreciate that most are characterized by linearity and formality; the authors propose an alternative view that includes academic entrepreneurship and open innovation principles (Bradley, Hayter and Link, 2013). York and Ahn state that there are specific features of the university TTOs, suited to their stage of development, and stress that their existing culture, environment and location must also be considered; their study has resulted in a range of key university TTO success factors (York and Ahn, 2012). In this regard, Reichelt says that „there are a number of purposes that university TTOs serve, and no two offices are identical” (Reichelt, 2018).

Both numerical growth and changes in university TT structures generate effects on the performance of the universities’ engagement in innovation. Numerous studies focus on the assessment systems developed in different countries to evaluate the TT activities performed by universities.

As the literature shows, the U.K, U.S., Canada, and Australia have been pioneers in measuring the potential returns from the TT activity (York and Ahn, 2012). In all these countries, there are national models and specific structures responsible for gathering and reporting information about the university TT (Rosli and Rossi, 2015; DeVol Ross and Ratnatunga, 2018; Langford, 2018; Jensen, 2009). In the European Union, TT structures and university innovation performance are also evaluated in the majority of member countries. The innovation system in higher education is different from one country to another, both in terms of organization and of the evaluation model (European Commission, 2010; Phillips, 2012), but there are also common recommendations on Knowledge Transfer Metrics for the public research organizations (European Commission, 2009).

It should be emphasized that the evaluation models generally refer to the university engagement in innovation and TT, but there are also studies focused on the evaluation of university TTO performances (Secundo et al, 2016; Gumbi, 2010, Tseng and Raudensky, 2014). According to Wang, measuring the outcomes of the TTO activities remains a challenging task (Wang, M. et al., 2003).

The above-mentioned facts illustrate the general interest in improving the performance of university engagement in innovation and the specific TT structures created for this purpose. It also shows the concern for the systematic evaluation and the reporting of the TT activities, which provides the necessary information for the continuous improvement.

### **3. Overview of University TT Structures in Romania**

The purpose of the analysis below is to make a macroeconomic diagnosis of the TT governance and TT support structures of Romanian universities. The analysis is based on official reports and other studies, and the data published on the websites of the universities, respectively.

In Romania, there are currently 103 universities, out of which 55 are public and 48 private ([www.edu.ro](http://www.edu.ro)). Technology transfer is an issue in all Romanian universities, but its priority varies. According to the National Education Law (Parliament of Romania, 2011), universities are classified into three categories: universities centred on education; universities of education and scientific research/ artistic education and arts; universities of advanced research and education. Higher education institutions with scientific research in their mission have the obligation to create structures to facilitate the management of research activities.

The national coordination of academic research activities is currently under the aegis of the Ministry of Research and Innovation (RandI Ministry), within which there is the Directorate for Innovation, TT and Research-Development, and Innovation Infrastructure. The RandI activity is based on strategies and plans, The National RDandI Plan for the period 2014 - 2020 being effectual (Government of Romania, 2015); it includes objectives and output indicators for RD and I infrastructure.

The evaluation of RandI structures is done through the National Scientific Research Council (CNCS), a consultative body of the RandI Ministry. Accredited TT entities constitute the National Innovation and TT Network (ReNITT). The creation of TT structures is based on national rules, which define the next types: innovative business incubators, TT centres, technology information centres, industrial liaison offices, scientific and technological parks (Government of Romania, 2003).

According to the data published on the website of the RandI Ministry, the ReNITT infrastructure comprises 50 TT organizations (TT centres, technology information centres, technology incubators and business incubators). Among these, only six are created by universities, the others being created by Chambers of Commerce, National Research Institutes and the Romanian Academy ([www.research.gov.ro](http://www.research.gov.ro)).

Analysing the data from the universities' website, it results that in all universities research appears as a distinct field of activity, with specific objectives and management body. Few universities have specific structures for innovation and TT (internally accredited): seven public universities, and one private university, respectively. These structures have different objectives and names, e.g.: TT and entrepreneurship, Office of Innovation and TT, Centre for TT and Knowledge, Technological and Business Incubator, etc.

Other TT structures created with the participation of universities, based on Government Decision No.406/2003 (Government of Romania, 2003), are technological parks and innovative clusters. The legal framework for the creation of technological and

scientific parks was created in 2002 (Government of Romania, 2002). According to the official data, there are four authorized Scientific and Technological Parks, created in partnership with universities. Regarding the innovative clusters, currently there are no synthesis data. In 2012, there were 47 clusters, 21 of these being members of the Cluster Association in Romania. In 2011, universities accounted for 11.86% of the cluster structure globally ([www.innoconsult.ro](http://www.innoconsult.ro)). With few exceptions, the universities' websites do not exhibit any information on their participation in collaborative structures such as technology parks and innovative clusters.

The TT support structures are funded from the universities' own funds, plus project funding and other external sources.

Regarding the results of the RDandI of the Romanian universities, the first observation is that they have not implemented methodologies and processes for the systematic assessment of university TT in order to reflect the dynamics and performances of these activities at national level. The statutory reports are incomplete or do not exist at some universities, an aspect also signalled in the Report on the Governance of the Public RDandI System in Romania 2007-2013 (UEFISCDI).

It should also be mentioned that the number of studies about university TT in Romania is very limited and mainly focused on topics such as: the need to adapt the European model of TT to the legislation and realities of Romania (Vac et al., 2015), proposal for improving innovation and TT policies in Romania (Caramihai et al., 2017). A global analysis of the Romania RDandI sector was made by the World Bank in 2011 (World Bank, 2018), and more recently a similar country report was elaborated (Curaj, 2015), but these reviews show several weaknesses of the governance of the RDandI national system and do not refer to university TTOs.

Regarding the situation of Romanian universities, from this point of view, the conclusions are as follows:

#### **Strong points**

- Innovation is one of the priority axes of the national strategy and policies both in the RDandI sector and in higher education, and these documents include objectives for TT infrastructure.
- The legislative framework is defined for the development of structures to improve the innovation of universities, the creation of TTOs and other structures favouring TT and entrepreneurship being regulated by specific laws.
- Programs and projects with national, European or other funding have been initiated, focusing on developing structures and mechanisms to improve the innovation performance of universities. TT structures of national interest are presented on the RandI Ministry website.
- In universities, there are TT structures that are not accredited, presented on the universities' websites. These structures cannot be confined in templates, an explicable situation given the different profile and other particular aspects of the research activities of each university.

#### **Weak Points**

- Centralized data at ministry level on TT structures are not up to date. With few exceptions, there is no data on the universities' websites concerning the affiliation to collaborative innovation structures, such as the technological park and the innovative cluster, or the activities carried out.

- There is no systematic evaluation of the RDandI performances of universities, as provided by the law of national education. The system of reporting the actions and results of the university TT is deficient, both at national and institutional level.

#### 4. Conclusions

The analysis carried out in this study is focused on university TT structures. Worldwide TT structures have been created to support the participation of universities in economic and social development, the most important being: TT and entrepreneurial centres or offices, technology parks, and innovative clusters. The results of these structures are monitored by universities, but there are also national and regional organizations created for this purpose. However, there are still few common formal review procedures established for TTOs.

The analysis of the situation in Romania regarding the support TT structures in universities shows that the legal framework and developed mechanisms that favour their creation, financing and functioning have been created. But the lack of information about the university TT activity and structures, the fact that their evaluation and reporting is not systematically performed, is a major deficiency. In the absence of measurement, the activity cannot be improved.

Taking into account these weaknesses, the implementation of evaluation and reporting systems for university TT activity and structures is a priority issue that will be a subject for future studies. Solving this problem is important for RDandI decision-makers in higher education in Romania, both for the central coordination bodies of academic research (RandI Ministry and National Education Ministry), and for the management of the higher education institutions.

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