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## THE ENGAGEMENT OF UNIVERSITIES IN ENTREPRENEURSHIP AND INNOVATION INFRASTRUCTURE IN POLAND<sup>1</sup>

### Summary

*Purpose* – The paper is intended to identify the role and activity of universities in building up business environment infrastructure in Poland. It analyses centres that support innovation processes and entrepreneurship co-established by higher education institutions, such as technology and academic incubators, technology transfer centres, and science and technology parks.

*Research method* – The research methods include: a critical analysis of subject-matter literature, the analysis of the existing data (reports and expert opinions), and three casual interviews with leaders of innovation and entrepreneurship centres in Poland.

*Results* – After a period of dynamic development (which ended in 2012), the number of business support institutions is declining. The trend is observed, in particular, amongst technology parks and incubators. On the other hand, the engagement of universities in the development of technology transfer centres is growing while the population of university start-up incubators remains stable. The number and power of entrepreneurship and innovation support centres are strongly correlated with the economic strength of regions and their position as academic centres. University and business collaboration has been expanding together with the density of regional relationships.

*Originality / value* – The article assesses the state and quality of operation of the academic business environment and its transformation in the last decade.

**Keywords:** business and innovation support institutions, universities, incubators, technology transfer centres, science/technology parks

**JEL Classification:** I230, O300, R100, D830

### 1. Introduction

Over the last two decades European universities have been heavily criticised for their performance. According to many observers, universities should be involved much more actively than ever before in development processes in their regions. In addition, higher education institutions are faced with new expectations, such as

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bringing their activities closer to the needs of the economy or engaging in building up the innovative capacity. As a result, the opinion that a traditional university model of an “isolated island of knowledge” fails to match the needs of contemporary economy has become rather common. Universities as we know them, focused on education and research, should expand their operations with new functions to be able to actively stimulate development processes by getting closer to market needs.

Hence, a question arises as to how universities may contribute to fostering innovation of an economy? Universities can address these issues by establishing innovation and entrepreneurship support centres that are best placed to build up collaboration-based relationships with the environment, facilitate knowledge and technology transfer and develop entrepreneurial attitudes.

The paper's aim is the identification of the role and activity of higher education institutions in the building of business support infrastructure in Poland. The analysis focuses on centres of innovation and entrepreneurship established at universities, such as: pre-incubators, technology and university start-up incubators, technology transfer centres, and science and technology parks. It theoretically explores possibilities to establish relationships between universities and their business environment providing the background against which we can discuss the current advancement of business infrastructure in Poland. The adopted research method is based on the examination of the existing data (statistical materials, reports, and expert opinions) combined with critical analysis of the subject-matter literature. The above methodology was supplemented with three casual interviews conducted with leaders of innovation and entrepreneurship centres in Poland (operating within the structures of the Polish Business and Innovation Centres Association (SOOIPP)).

## **2. Universities in the context of social and economic transformations: changes in the role**

Three principal models of universities have emerged over centuries. Medieval universities developed from the Latin model and focused on teaching, disseminating knowledge, and uncovering the truth. Latin was the universal language of instruction and access to education was the privilege of wealthy people. There were two operational models of medieval universities: the Bologna model focused on students and the Paris model founded on professors' authority and status [Leja, 2006, pp. 7-23; Wisseman, 2009, p. 21].

Deep social and economic transformations that took place over centuries triggered far-reaching changes in the operational pattern of the university setup. A new generation of universities emerged, often referred to as the Humboldtian Model, which started to develop in the 18th century (the University of Berlin was a classic example). It holistically combined studies with research and the main goal of this university model was stimulating the development of science and expanding the pool of knowledge. Characteristically, these institutions specialised in specific fields and areas offering mainly mono-disciplinary education. The model evolved greatly

over decades, however, the core idea of the Humboldtian Model of a university survived in Europe until the end of the 20th century [Sauerland, 2006, pp. 89-96; Nowakowska, 2012, p. 152].

Dynamic social and economic changes that materialised themselves at the turn of the centuries provided grounds for the deep criticism of the existing model adopted by European universities. Key transformations that forced the redefinition of the operational model of universities included: (1) the decline of large, centralised R&D laboratories in enterprises; (2) the increasing internationalisation of R&D activities; (3) the dynamic growth of knowledge-based services radically different from the traditional R&D effort; (4) the development of telecommunication technologies (which significantly expands the availability of knowledge and its resources) or (5) widening the interdisciplinary nature and increasing capital-intensity of research [Kwiek, 2015; Nowakowska, 2012, p. 153].

On the list of the most frequently mentioned barriers to the development of relations between universities and their social and economic environment we can find outdated regulations and management systems which strongly inhibit cooperation between universities and other entities, or weak incentives for establishing relations with business. Narrow specialisation of science at the expense of useful, transdisciplinary approach to research and education or too small outlays on science and higher education are also highlighted [Zarate-Hoyos, Larios-Meño, 2015, pp. 261-317; Ferreira et al., 2018; Marszalek, 2010, pp. 177-202].

### **3. Challenges facing universities – the idea of the 3<sup>rd</sup> generation university**

Social and economic changes together with the political debate have produced the new idea of a higher education organisation referred to as the third generation university. This university model provides new quality in the way of how scientific and educational institutions think and work, which offers wider opportunities of collaboration with business (mainly with local, small companies) and building up entrepreneurial skills amongst students, doctoral students and academic staff. According to the new approach, commercialisation of the results of research has become at least as important as teaching and research activities. The principal postulated changes and areas of university activities proposed for transformation include [Matusiak, 2010; Nowakowska, 2014, pp. 17-18]:

- a) re-orientation of education, developing entrepreneurial attitudes, and training human resources for the economy – more flexible educational offer and multidisciplinary education; developing the life-long learning model; enhanced institutional and sectoral mobility of students and academic staff; re-orienting education towards practical subjects and skills; practitioners' involvement in teaching, scholarships and internships, compulsory project-based classes in entrepreneurship;
- b) intensified technology transfer and commercialisation – greater business career path opportunities for academic staff and for ambitious graduates, motivation

schemes and regulations encouraging the establishing of spin-off and spin-out businesses; developing intellectual property management systems, collaboration with venture capital funds; motivation and financial incentive schemes encouraging to collaborate with business sector;

- c) engagement in developing business environment institutions – creating the institutional framework and entrepreneurship incubation schemes, support for infrastructure development (e.g. science and technology parks); development of technology transfer centres;
- d) changes in the awareness of scientific and research staff and in cultural patterns – promoting widespread approval and appreciation for entrepreneurial attitudes and reorientation of science and research ethos towards commercialisation of knowledge, as well as openness and engagement of the staff in business as the major criteria of success in science and professional advancement.

Discussions concerning the role of universities in economic growth are centred around two, sometimes contradictory, approaches to developing links between universities and business. The first one proposes tightening the links between universities and innovation departments in enterprises through networking, joint financing and carrying out research projects. The second approach focuses on making more effective use of ideas and research outputs generated at the universities through professional management of intellectual property, establishing specialised organisations working in the field of technology licensing, as well as the creation of spin off/out companies by scientific staff together with the development of commercial advisory services. The first approach respects the diversity in institutional logic of a university and an enterprise and stresses the need to foster relationships and collaboration between both institutions; the second one attempts to transform higher education institutions and bring them closer to the market by turning them into active business players and suppliers of innovative products and services [David, Metcalfe, 2007; Baaken et al., 2015, pp. 3-26].

#### **4. Universities' engagement in building business environment infrastructure: Polish experience**

In Poland universities differ significantly with respect to how they are managed, how they divide their efforts between research and teaching but, first and foremost, how much they link and interact with business. Over the last decade we could observe fundamental changes in higher education; new, multidisciplinary courses have emerged with more active teaching strategies and wider involvement of practitioners in instruction, as well as all forms of the dynamic growth of life-long learning. Yet, most Polish universities continue to offer theoretical courses and even though education in the field of entrepreneurship has gained in visibility, in most cases it constitutes a part of classical theoretical management courses.

Forms of activity connected with the dissemination of entrepreneurial and innovation-oriented attitudes amongst scientific staff are even less developed. Relationships between universities and local entrepreneurship milieus connected with knowledge and technology transfer and commercialisation are still at their early stages. Collaboration between managers from enterprises and universities focuses on educational aspects.

The development of a specific institutional infrastructure including university incubators, science and technology parks or technology transfer centres at universities or in their immediate neighbourhood is a strong and positive reflection of research staff and students' entrepreneurial approach. Such centres are expected to stimulate and organise science and business collaboration, pre-incubate and incubate innovative undertakings; bridge the financial gap for innovative initiatives; transfer technology and supply pro-innovation services; manage intellectual property in R&D organisations, and promote the achievements of scientific organisations. By creating the proper setting for interaction and collaboration and providing infrastructure necessary for technology transfer and commercialisation, universities exhibit maturity in creating relationships and links that stimulate economic growth. This infrastructure is often viewed as one of the principal measures of advancement of higher education institutions.

Amongst the diverse forms of institutions offering support to innovation and entrepreneurship processes, the following four: technology transfer centres, university startup incubators, technology business incubators, and science and technology parks base their operational logic on strong links with science and research circles. From the very beginning of the system transformation, the population of centres organised with the involvement of universities has dynamically evolved. Following the period of intense growth (1995-2010) we could observe little change in the number of the existing business environment institutions (table 1). In 2020 there were 32 technology parks (TP), 16 technology business incubators (TBI), 27 university startup incubators (USI), and 48 technology transfer centres (TTC). All of them employed in total more than 1,100 employees (in terms of full-time jobs) in 2013 [Bąkowski, Mażewska, 2014, p. 22]. Following the period of intense growth (1995-2012), a drop in the dynamics of changes in the number of business environment institutions could be observed. In the last decade, the number of institutions providing support to entrepreneurship and innovation efforts in the economy has significantly diminished (from 135 in 2012 to 123 in 2020) with a significantly varied situation of individual types of these institutions. A drop in numbers can be observed primarily in the group of science and technology parks and technology business incubators. In recent years, every fifth technology park and one in three technology business incubators have ceased to continue their activities. University startup incubators make up a relatively stable group while the number of technology transfer centres has been increasing. These last two types are components of business support infrastructure that is typical of universities and their growing number testifies to their maturity and stable position in academic circles.

TABLE 1

**The population of innovation and entrepreneurship centres  
in Poland in 1995-2020**

	1995	2000	2004	2007	2009	2010	2012	2015	2017	2020
Technology parks	1	3	12	15	23	24	40	42	39	32
Technology business incubators	4	-	-	16	17	20	29	24	22	16
University start-up incubators *	-	-	-	49	51	62	73	74	26	27
Technology transfer centres	1	10	16	23	23	26	38	42	46	48

\* without incubators within the Foundation of Academic Incubators of Entrepreneurship

Source: own elaboration based on: [SOOIPP, 2021].

The conducted casual interviews show that the awareness of the importance of having innovation and entrepreneurship centres in the regions and ensuring active commitment of the regional community, in particular of the university and local authorities, to the establishment of such institutions are the key determinants of their number. In those regions where the density and durability of regional relations increases (innovative milieu), the strength and activity of business environment institutions increases as well. The development of regional relations is perceived as a driving force for the development of academic business support institutions, while international relations are negligible.

Another fundamental aspect is the availability of external funding (regional and national) for creating and fostering such centres. European funds, the main source of financial support in the initial stages of life of these organisations, have played a major role in this area. Reduction in their allocations for the development of infrastructure offering support to business and innovation in the economy is viewed as one of the principal underlying causes of the shrinking number of such institutions.

The number and strength of business support institutions are clearly correlated with the economic advancement of a region and a strong position of universities based in it. In Poland, innovation and entrepreneurship centres can be found predominantly in regions whose economic performance is more than satisfactory, where the drive for innovation and new technologies is strong and higher education institutions are well developed. There are 7 regions (Małopolska, Mazowsze, Śląsk, Dolny Śląsk, Lubelskie, and Podkarpackie) which host a clear majority of such centres (chart 1). Business environment institutions and science and business collaboration are scarce in, underdeveloped regions which, in the long run, will further deepen regional development disproportions and innovation gap (in regions such as, e.g., Świętokrzyskie, Podlaskie, Opolskie, or Lubuskie).

**CHART 1**  
**Innovation and entrepreneurship centres in Poland in 2020**



Source: own elaboration based on: [SOOIPP, 2021].

Universities may engage in the development of business environment infrastructure in a number of ways and to a different extent. Currently, we can distinguish the following four forms of engagement of Polish higher education institutions [Matusiak, Guliński, 2010, p. 17]:

- a) direct, total engagement: an innovation centre established within the organisational structure of the university to carry out statutory tasks. TTCs established at universities are the most frequent reflection of this form of engagement;
- b) indirect, partnership model: a university is involved in the establishing of a centre and becomes a shareholder (usually a minority one) of its managing institution. A university may get involved through its foundations or associations;
- c) supporting model: a university is involved in the establishing of a centre, however, it does not become a part of the managing institution. Cooperation is based on a Cooperation Agreement which also allows for joint undertakings and representatives of the university are members of advisory bodies (e.g. Scientific Board of Technology Park);
- d) informal cooperation: science and research staff from the university take part in activities of the centre outside of their working hours at the university. This engagement is based on short-term job contracts (signed for a specific period or task) or remains “undeclared” in the sense that business operators

get access to the know-how acquired while performing duties as a member of staff of a scientific and research institution.

#### 4.1. Technology Transfer Centres

Technology Transfer Centres are the most popular university infrastructure type established to support relations between a university and business. Their goal is to transfer technology and commercialise knowledge generated by research teams. Crucial areas for TTC operations include: promoting research achievements, assistance in the commercialisation of knowledge and establishing new businesses (start-ups) to be able to place the newly developed technology on the market.

In Poland there are 48 TTCs. In most cases (ca. 80%) they are organisational units of universities or of the Polish Academy of Sciences and are directly subordinated to Rectors of higher education institutions. The rest are associations, foundations, or companies [Majczak, 2016, p. 85]. The scope of tasks and array of services offered by TTCs comprises mainly [Osiadacz, Gordon, 2011, pp. 11-54; Bąkowski, 2015, pp. 78-83]:

- a) developing legal regulations (e.g., rules of procedure) and supervising the protection and commercialisation of intellectual property created at the universities. Such legal and organisational arrangements have been developed and implemented by almost all TTCs that operate at universities;
- b) training courses and advisory services mainly in getting access to the EU funds, protection of intellectual property rights, writing business plans, and starting a business;
- c) innovation promoting services, assistance in establishing contacts with technology suppliers or buyers, drafting offers or business inquiries, assistance in negotiating and signing contracts between technology suppliers and purchasers.

In their operations, Polish TTCs follow two strategies. The first one focuses on the early stage of technology transfer and commercialisation and consists in providing advisory services, consultancy, and selection of innovative ideas, drafting cooperation proposals or assistance in establishing relations with economic operators. This is where the TTCs accomplish mostly “soft” effects. The second strategy draws on the research potential of a university through direct technology transfer to business and guarantees legal protection of intellectual property rights. This strategy produces “hard” effects of the commercialisation of technology [Bąkowski, 2015, p. 74]. Casual interviews confirm that TTCs at Polish universities are regarded as renowned institutions in the world of science with durable and visible effects of their effort materialised in commercialised technologies, sold licences or applications to Polish and European Patent Offices. These centres provide professional services, they have stable staff and funding mechanisms. TTCs in Poland have become integrated with the organisational structures of universities and are important links for building relationships with business environment.



#### 4.2. University start up incubators

University start up incubators are units established by universities to support the research staff and students in developing their own businesses. The activities of USIs focus on exploitation and commercialisation of knowledge available at the university by establishing spin off companies.

Most of the USIs in Poland are independent organisational units established by universities. They operate within foundations or associations created by higher education institutions or as parts of science and technology parks, in which the university has got its holdings. Their clients are mainly students and university graduates (ca. 80% of the population), while young researchers and doctoral students represent ca. 20% of USIs clients [Bąkowski, 2015, p. 65].

Main areas of assistance offered by the USIs in Poland include help in writing business plans and starting up a business (legal assistance) and help in the area of marketing, tax, and accounting. USIs also offer support services in business management, access to external resources (business angels, seed capital or loan guarantee facilities), and intellectual property protection [Siemiński, 2016, pp. 143-159; Swieczak, 2016, pp. 103-105]. The USIs report that they have helped to establish more than 700 start ups and the data from a follow-up monitoring exercise carried out two years after the end of the incubation demonstrate that almost all of them have survived until then on the market [Bąkowski, 2015, p. 65].

#### 4.3. Technology business incubators

Technology business incubators are established to assist innovative start-ups in reaching their maturity and becoming able to operate independently on the market. TBIs are the elements of business infrastructure that have been developing dynamically over the last decade. In Poland TBIs emerge as a result of one of the three principal mechanisms [Mażewska et al., 2011, p. 13]:

- by transforming traditional entrepreneurship incubators and expanding innovation activities;
- by transforming pre-incubators and university incubators;
- by establishing technology business incubators in technology parks.

In Poland there are 16 technology business incubators but their number has dropped recently. The evolving number of these institutions is due to organisational and legal changes and the absorption of technology incubators into technology parks (where they are discontinued as independent entities). Most TBIs in Poland are not run as independent legal and organisational entities. They usually operate within science and technology parks (almost half of all TBIs) or training and advisory centres (one third). Only 5 TBIs are independent organisational structures [Tórz, 2015, p. 46].

With regard to incubation activities, universities are viewed as the key partners for cooperation. Ca. 67% of TBIs declare cooperation links with universities based in their respective regions. Collaboration with other Polish universities is declared by 33% of the TBI, while 17% admit they cooperate with universities across the Euro-

pean Union [Tórz, 2015, pp. 52-53]. The scope and areas of cooperation with academic institutions focus mainly on partnership in the implementation of projects funded with external funds and using the university know-how in knowledge and technology management and transfer. Using university research infrastructure is another important area of cooperation.

Technology business incubators are a poorly developed structure in business environment infrastructure in Poland. They can be found only in 9 voivodeships. Surveys and analyses show that ca. 25% of technology business incubators in Poland are at the initial stage of development and their activity is limited to renting office space [Tórz, 2015, s. 53-54]. Respondents stressed that there are many incubators which, when faced with losing financial stability, decide to extend rent agreements with tenant companies beyond the incubation period. That significantly alters the TBI idea and profile.

#### 4.4. Science and technology parks

Science and technology parks are seen as the most advanced form of support to innovative economic operators. They offer comprehensive services to small and medium-sized enterprises, assist them in developing and implementing new technological solutions. Parks offer not just high quality space but also research infrastructure, a package of advisory services, access to venture capital, and science and research facilities [Matusiak, 2011].

STPs can be found in all voivodeships in Poland. Eighteen universities have holdings in technology parks and in two cases parks are companies owned exclusively by universities. Capital-wise universities are the second biggest investor in technology parks after local government authorities [Mażewska, Tórz, 2015, p. 30].

Universities are perceived by science and technology parks as the major partners. As many as 88% of parks cooperate with universities in their respective regions and 39% have links with universities across the country. STPs assess this cooperation as highly satisfactory. On average, the quality of cooperation with universities was rated 3.4 (on a scale from 0 to 5) and this is the highest score among all the partners cooperating with parks. Collaboration between parks and higher education institutions focuses primarily on the exploitation of knowledge resources through the cooperation with experts and specialists but also through using the research infrastructure and developing joint scientific and research projects [Mażewska, Tórz, 2015, p. 41; Sobkowicz, 2013]. Recently, Polish STPs have expanded their activities and upgraded professional advancement of their services. Science and technology parks are viewed as a stable component of the business environment, deeply rooted in the regional setting.

### 5. Conclusions

Higher education institutions have provided an unquestionable and valuable input in the development of entrepreneurship and innovation processes in Poland. They have greatly contributed to the emergence of specialised structures that

actively support businesses. The last decade witnessed significant changes in these entities and in the degree of the engagement of universities in their establishing.

The total number of business support institutions created in cooperation with universities is clearly shrinking; a drop can be observed in the numbers of science and technology parks and technological incubators while the group of university start-up incubators remains relatively unchanged. On the other hand, the number and position of technology transfer centres increases, making them the most popular structures providing support to university entrepreneurship and innovation deeply rooted in Polish higher education institutions. This is the way to foster typically academic institutions offering support to business, the majority of which are run independently by universities engaged directly at organisational, substantive, and financial levels.

The number and power of centres that support entrepreneurship and innovation strongly correlate with the economic strength of a region and its academic position. The regions in eastern Poland are poorly equipped with such centres in contrast with the well-developed regions with strong academic centres.

These institutions are local or regional by nature. They declare close relationships with operators based in the region rather than with operators at a national level. The scope of science and business collaboration exercised within the innovation and entrepreneurship centres covers an entire array of activities: from establishing partnership and multiple entity cooperation projects through the development of a system of advisory and training services to entrepreneurs up to incubation, technology transfer and commercialisation projects. The forms of cooperation are highly diversified and different for each centre depending on the specificity of the university, the awareness of the leaders, and regional needs.

From the point of view of the complexity of relationships between universities and business community, most Polish higher education institutions have gone through the stage of initiation and are stabilising and intensifying these relationships as well as conducted activities. Joint activities get increasingly more professional, the scope of assistance is expanding, and the effects of cooperation become more durable and visible in the economy. Universities are slowly re-orientating their activities towards the market. However, intensification of their efforts and relationships calls for considerable mentality changes, overcoming routine in action and doing away with stereotypes perpetuated in the mindset of academics and business practitioners.

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