

THE ROLE OF TECHNOLOGY PARKS IN ECONOMIC GROWTH – THE PERSPECTIVE OF STUDENTS OF ECONOMICS

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Purpose: The article aims to assess the knowledge and interest in the offer of technology parks by students of faculties offering theoretical and practical knowledge about starting and running a business.

Design/methodology/approach: A questionnaire plus the Pearson correlation coefficient and the T-Czuprow dependence coefficient were used to examine the relationship between the study variables.

Findings: Students are well acquainted with the offer of technology parks, while not sufficiently aware that these entities can provide them with support at the stage of setting up or developing their business activity.

Practical implications: Intensifying activities promoting the activities of the surveyed institutions at universities could activate entrepreneurial thinking and the involvement of academic youth.

Originality/value: The article highlights the important role of technology parks in supporting young entrepreneurs, which makes it a valuable source of information for those interested in starting their own businesses.

Keywords: technology parks, entrepreneurship, business, students, academic entrepreneurship.

Category of the paper: research paper.

1. Introduction

The main objective of technology parks is to offer a good location for technological and innovative companies in a particular area. Moreover, they provide businesses with the opportunity to make use of their infrastructure and take part in the unique and competitive environment that the park fosters. Due to the commercial nature of their business, the parks' offer is primarily aimed at long-established companies that are able to accept market rental rates, which are often very high. In view of the above, it would be necessary to verify how popular the services of such institutions are among young people who are about to start their own business. The study includes the opinions expressed by students of academic fields where the topic of starting and running a business is covered both in theory and practice. The aim of the research was to assess their familiarity with technology parks and their interest in the offer of such complexes. A survey questionnaire was used to verify this information. Meanwhile, in order to examine the relationship between the variables included in the study Pearson's contingency coefficient and Tschuprow's T correlation coefficient were applied.

2. Literature review

The prevailing dynamics of the market indirectly forces enterprises to embrace innovation as a means to ensure their long-term viability (Bańka et al., 2023). One of innovation-oriented institutions is technology park.

Technology parks are classified as innovation centres that fall into the category of business environment institutions. According to Polish law, a technology park is a cluster of separate real estate units with technical infrastructure, created in order to facilitate the flow of knowledge and technology between research units and entrepreneurs, where business owners using modern technologies are offered services in the scope of counselling in the creation and development of enterprises, technology transfer and conversion of research findings and development efforts into technological innovations, as well as to create opportunities for these entrepreneurs to conduct business activity through the use of real estate and technical infrastructure on a contractual basis (Ustawa z dnia 20 marca 2002 r. o finansowym wspieraniu inwestycji, Dz.U. Nr 41, poz. 363 z późn. zm. art. 2). These complexes strengthen their position in society and the economy by cooperating with institutions representing the science and business sectors (Skowron-Grabowska, 2020).

Other definitions relating to the business environment institution in question are given below.

Table 1.
Definitions of the technology park

Author	Definitions of the technology park
Petree et al., 2000	Institutions intended to facilitate the production and commercialisation of advanced technologies by creating synergy between research centres, educational institutions and technology companies.
Brezdeń et al., 2010	A separate scientific and industrial team formed with the participation of local government authorities, offering enterprises modern technologies and services in the field of consulting in the creation and development of enterprises, technology transfer and commercialisation of scientific research results, as well as providing real estate and infrastructure to these entrepreneurs.
Matusiak, 2010	Institutions that aim to optimise the conditions for the creation and development of innovative companies and technology transfer.
Nauwelaers et al., 2014	Instruments used in the process of technology transfer, actively supporting the process of commercialisation of knowledge and technology, serving as a link between innovative solutions developed in academic centres and their recipients – entrepreneurs (narrower approach). Institutions that promote the development of an innovative environment and have an important role of focusing on the multifaceted connections between the various actors that make up this environment.
Waligóra, 2015	One of the basic instruments of public authorities' innovation policies, whose primary goal is to increase a region's competitiveness by creating business environments that encourage investors to start and grow their businesses.
Kwieciński, 2018	The most extensive form of so-called business environment institutions, whose work is related to renting space for laboratory equipment, financial services, as well as modern business development services (construction of pro-innovation networks, company formation, patent and legal support).
Hunjet et al., 2018	A place where technology, entrepreneurship, knowledge, innovation and creativity come together to support the creation of visions, ideas and new values.
International Association of Science Parks and Areas of Innovation, 2023	An organisation managed by qualified professionals whose goal is to increase the prosperity of the community in which it operates by promoting a culture of innovation and competitiveness among entrepreneurs and knowledge-based institutions.
Mondal et al., 2023	Selected locations where new technology-based companies and other SMEs can connect and promote a culture of innovation.

Source: Own elaboration based on the subject literature.

Taking into account the definitions listed above, it can be pointed out that a technology park is an institution whose aim is to integrate the scientific community with the business environment, enabling cooperation between both parties, as well as helping them develop and strengthen their position. In particular, technology parks aim to support the optimisation of the conditions for technology transfer processes for young, innovative companies offering products that require high technological commitment, as well as for scientific institutions that intend to commercialise the results of their research. Such a complex generates a synergy effect as enterprises with high growth potential and scientific institutions are concentrated in a strictly defined area. Also, the park offers a wide range of business-related services.

Technology parks are considered to be among the most developed centres of innovation and entrepreneurship, both from an organisational and conceptual point of view. They are also often referred to as 'science parks', 'research parks', 'science and research parks', 'science and technology parks', 'industrial and technology parks', 'technopoli' or 'technoparks'. It is quite common for these institutions to perform the functions of other innovation and entrepreneurship

centres within a single structure (technology parks may house technology incubators, training and advisory centres, technology transfer centres and academic business incubators) (Płoszaj, 2013). Technology parks are usually located close to one or more universities and research institutions or are well connected to them. Thanks to this, enterprises intending to take advantage of the park's support services are at the same time drawn by the proximity of universities and scientific institutions, as well as the attractive location.

The present-day scope of the institutions in question harks back to the concept of industrial districts pioneered by British economist Alfred Marshall. It is believed that the first technology park established in the world was the Bohanson Research Park in Menlo Park, founded in the United States in 1948. The most famous one, however, is the Stanford Research Park, established three years later, located in Silicon Valley by Stanford University. Silicon Valley itself is the area where most of the world's technology companies are concentrated. The companies that were set up there benefited primarily from their close proximity to the university and the technology park, which allowed them to tap into the results of research carried out at these institutions, among other benefits. The pioneering role of the United States in the creation of technology parks is also reflected in their numbers, as half of them are located in the USA (Bartusik, Sołtysik, 2012). In Europe, the first technology parks did not begin to emerge until the 1980s.

The first European institution to operate in line with the principles of technology parks was the Technology Centre Ruhr in Bochum, Germany, established in 1981. However, many believe that Berlin's Centre for Entrepreneurship should be considered the first European technology park (Waniak-Michalak, 2015). The increased pressure on the participation of universities in industrial clusters has significantly accelerated the proliferation of the idea of technology parks (Protasiewicz, Trzaska, 2020). The increasing number of these institutions in European countries also stems from the fact that under its policy, the European Union holds and allocates a significant part of its budget to supporting and developing the innovation environment, including the development of intermediary institutions between scientific and industrial sectors. In 1984, the European Business & Innovation Centre Network (EBN) was established. At present, it comprises around 140 Business and Innovation Centres (BICs). The aim of this organisation is to support the development of innovative entrepreneurs, start-ups and SMEs (Protasiewicz, Trzaska, 2020). In the last two decades, the development of business environment institutions (including technology parks) has been dictated by European strategies: the Lisbon Strategy (e.g. strengthening support policies for businesses, especially for SMEs, support for innovative projects, reduction of administrative barriers, access to infrastructure for new companies, access to new technologies, promotion of the idea of innovation and research as well as access to funding) and the Europe 2020 Strategy (e.g. improvement of administrative conditions for conducting innovative activities by companies, innovative partnership at the EU level, strengthening the role of structural funds, development of rural areas, increasing investment in R&D and creation of mechanisms and

infrastructure enabling the transfer of theoretical knowledge to businesses, creation of national and regional innovation systems) (Protasiewicz, Trzaska, 2020).

It should be stressed that different terms for the institutions in question are used in various parts of the world. In the United States and Canada, the term 'research park' is commonly used, in Asia (e.g. Japan, China, Singapore, South Korea, the Philippines and Taiwan) call such a complex 'a technology park'. Meanwhile, in Europe science parks coexist with technology parks. While science parks are characterised by a smaller scale of operations, very strong links to academic centres and less frequent cooperation with industry, technology parks, which are much larger, are mainly focused on production (Marszałek, 2019).

The first technology park set up in Poland is Wielkopolskie Centrum Innowacji i Przedsiębiorczości S.A. [Greater Poland Center for Innovation and Entrepreneurship S.A.], established in Poznań in 1990 (Waniak-Michalak, 2015; Bąkowski, Mażewska, 2012). However, the development of these institutions in the country's economic conditions was initially very limited. Their focus was mainly on the problems of structural unemployment and initiatives aimed at supporting entrepreneurship rather than on taking innovative measures and commercialising research findings. With the stabilisation of the support system, parks became subjected to the rules of the market. As a result, the service offer was heavily commercialised (e.g. office rental) and also the functions of promoting innovation, marketing and supporting internationalisation were put in place. At present, in its policy, the EU places more emphasis on the effectiveness of business environment institutions rather than their quantity. This also applies to technology parks. Perhaps this is why a gradual decline in the number of these institutions has been observed since 2014. The figure below shows the number of technology parks operating in Poland between 1995 and 2021.

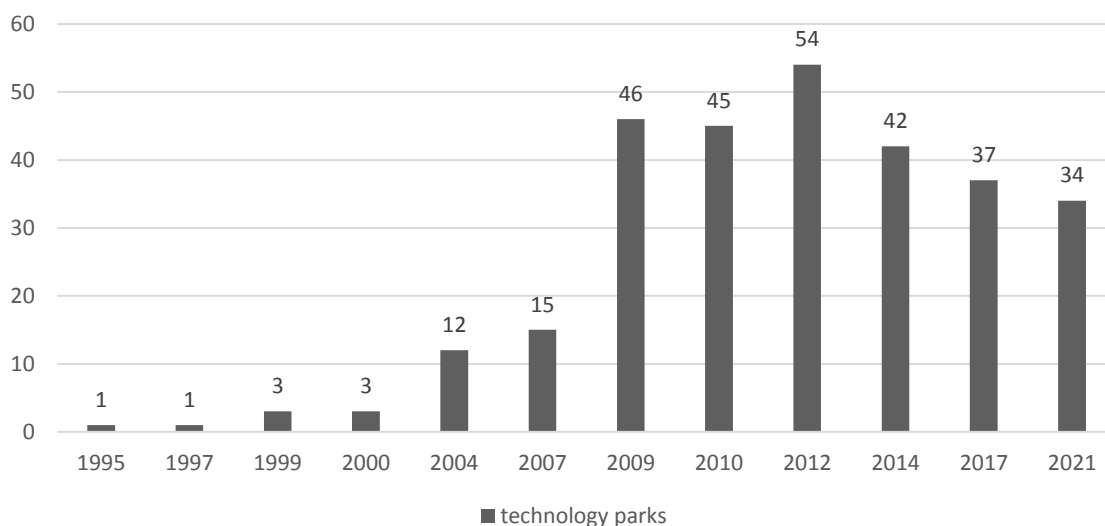


Figure 1. Number of technology parks operating in Poland between 1995 and 2021.

Source: Bąkowski, Mażewska, 2018.

Technology parks perform a number of different functions. These include as follows (Steruska et al., 2019; Błaszczuk et al., 2017; Mażewska, Tórz, 2019; Petree et al., 2020; Matusiak, 2008; Poznańska, 2001):

- start-up incubation – offering extensive assistance (including administrative support) to young enterprises (start-ups), mainly in the SME sector,
- enabling entrepreneurs to carry out R&D activities,
- cooperation with scientific entities and linking them with business,
- stimulating and managing the flow of knowledge and technology between scientific, research and development units and enterprises, e.g. through activities such as: assistance in establishing contacts between technology providers and recipients, preparation of an offer or request for technology, consulting regarding the process of implementing technology and assistance in advising enterprises on intellectual property rights,
- consultancy services (e.g. high-tech consultancy),
- adapting buildings (laboratories, workshops), land along with technical infrastructure (e.g. computer network, broadband internet) for the creation of new technologies and research,
- integrating companies with other entities – the creation of a business environment where companies support each other and exchange knowledge,
- contractual use of the university's scientific, engineering and IT resources,
- assistance in obtaining financing (e.g. cooperation with business angels or benefiting from venture capital),
- determining the scale of innovation of the companies located there,
- increasing the level of innovation in the region – encouraging innovative activities, the flow of information between the science and business sectors (e.g. the creation of spin-off and spin-out companies),
- promoting regions – the park can be viewed as a showcase for a given area, attracting investors, customers and future contractors.

The development of technology parks goes hand in hand with the growth of technopoly-oriented agglomerations and progressive specialisation of companies. The establishment of parks can be initiated by both public and private entities. Increasingly, EU countries are using public-private partnership institutions to set up such parks. Only a handful of technology parks operate without public support (Protasiewicz, Trzaska, 2020).

3. Methods

The survey was conducted in spring 2022 among students of the Faculty of Economics, Finance and Management at the University of Szczecin. 335 students from two fields of study took part in the survey, i.e. management (285) and entrepreneurship and investments (50 students), of which as many as 62.4% of respondents are considering starting their own business. These fields of study were selected for the study because of their profile partly related to setting up and running a business.

Entrepreneurship and investments are a practical field of study. The content of education in the field of study includes issues in the field of management and quality science, economics and finance as well as related disciplines. The students have an opportunity to learn practical skills with regard to starting and running their own business, developing a family business or pursuing the career of a local leader - a creator of economic ventures and initiatives undertaken within the local community. The practical profile enables education in line with the expectations of employers and with the participation of practitioners - entrepreneurs, managers and specialists. Graduates of the field of study are prepared to: establish and develop their own enterprise, take over a family business, work in managerial and specialist positions in small and medium-sized enterprises, in consulting companies and other organisations such as institutions supporting entrepreneurship, acting as a leader of local entrepreneurship, e.g. in the countryside, in a small village. The field of study is implemented in cooperation with entrepreneurs and local business support institutions. Students have the opportunity to become acquainted with the functioning of business in practice, including thanks to numerous visits by students to small and medium-sized companies, innovative forms of teaching are also implemented: theory combined with practice, meetings with entrepreneurs, decision-making games, case studies, work in small teams, creating original projects and many others.

The aim of study in the field of management is to acquire specialist knowledge in the field of management sciences, economics and related disciplines; shaping a critical understanding of phenomena as well as economic and organizational processes, as well as developing the ability to use methods and techniques necessary to solve problems and make decisions within the organisation. In addition, the studies are aimed at preparing graduates for the implementation of their own entrepreneurship, career development of specialists and managers in management structures. In the area of social competences, the studies are aimed at shaping ethical and social sensitivity, commitment and a sense of responsibility in the work environment and beyond, awareness of the need and development of personal development and lifelong learning skills. The studies programme includes both general managerial education (useful for running your own business and managing teams of people), as well as specialist management education. The knowledge acquired in the management field of study is of an applied nature and includes mainly theories and concepts describing and explaining the formation, functioning,

transformation, development and interaction of organisations, economic entities, but also organisations in the public and non-governmental sector. The graduate is prepared to work as an analyst and specialist, and to manage a small team of people in business and other organisations, as well as to run their own business.

The degree of studies is the criterion that divided the research group into two groups, which are almost equal in terms of quantity - 52.5% were first-cycle students and 47.5% were second-cycle students. In addition, 72.5% of the respondents are full-time students, and the remaining 27.5% are part-time students. 69.3% of respondents were female, while 30.7% were male. The aim of the study was to assess the familiarity with and interest in the offer of technology parks. It was also verified which areas of activity of business support institutions were indicated by students who are interested in using the services of the surveyed institutions. Students could choose from the areas of support most often offered by business environment institutions, namely: training and workshops, consultancy and individual consultations, promotion and advertising, obtaining grants for starting a business, assistance in applying for EU funds, access to current economic information, as well as various meetings and business and integration trips.

The survey questionnaire was directed to students electronically (students received a link that took them to the survey form). In addition to the key substantive part, the questionnaire contained important additional elements, such as: the title of the study, the name of the person or institution conducting the study, the purpose of the study and other explanations for the respondents. In the questionnaire form, mainly closed and semi-closed questions were used, as it limited the percentage of people resigned from answering the question. In addition, these types of questions made it easier to classify and analyse the data. A part of the survey form was also a metric, thanks to which it was possible to obtain the necessary information about the individual characteristics of the respondent, such as: gender, field of study, year of study. Collecting this data made it possible to analyse them in terms of selected characteristics of the surveyed students.

Pearson's correlation coefficient and T-Czuprow dependence coefficient were used to examine the relationships between the data being processed. The Pearson coefficient (r_{xy}) is a linear correlation coefficient that indicates the level of linear relationship between random variables. Its value falls within the closed interval $[-1, 1]$. The greater the absolute value of this coefficient, the stronger the linear relationship between the variables. 1 indicates a positive relationship, - 1 in turn indicates a negative relationship between the characteristics. 0 indicates the absence of a linear relationship (Zeliaś, 2002). The T-Czuprow coefficient (T_{xy}), on the other hand, is a dependency ratio that is used to measure the strength of the relationship between two nominal variables. It assumes values from the closed range $[0, 1]$. The closer the value of this coefficient is to one, the stronger the relationship between the examined characteristics (Domański, 2001).

The analysis contained in this article is part of a more extensive study on business environment institutions (Leoński, Tylżanowski, 2022; Tylżanowski, 2023).

4. Results

The surveyed group of students was asked to answer the question whether they would like to make use of the offer of technology parks if they were planning to set up a business or running one. Students had the opportunity to express interest (or disinterest). As many as 72.84% of students were familiar with the offer of technology parks, but only 36.12% of respondents were interested in benefiting from it. Students (in particular those pursuing studies in economics) should be familiar with the offer of entities that at some point may become one of their strategic partners facilitating the start or continuation of their own business.

The survey also asked which areas of operation pursued by business environment institutions the students would most like to benefit from when planning to run a business. The figure below details the percentage of these institutions' areas of support indicated by students who expressed an interest in using the services of technology parks.

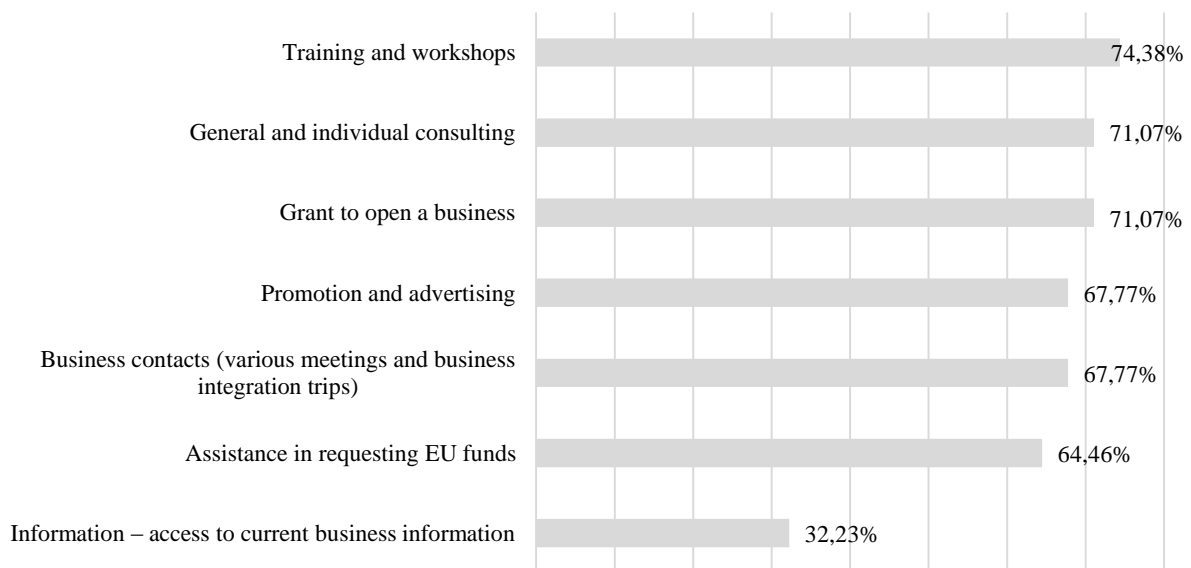


Figure 1. Areas of activity of business support institutions in the opinion of students who are interested in using the services of technology parks.

Source: Own study based on own research.

The area of activity that was considered key by students interested in using technology parks was training and workshops, indicated by 74.38% of respondents. Training and workshops should be an intrinsic part of the operation of any company that wants to grow and continuously raise its profile on the market. The next most important area for respondents is consultancy and individual consultations, as well as obtaining funding including, but not limited to, grants (71.07% of responses). Receiving non-repayable funds at the start of a business, i.e. at the time of its greatest capital intensity, is a great form of support for young entrepreneurs. Further areas of business environment institutions indicated as important are assistance in obtaining business contacts as well as promotion and advertising, indicated by 67.77% of students. It is worth noting that every company starting its activity should engage in adequate promotion in order to gain visibility on the market. Providing assistance in applying for EU funding was important to 64.46% of students. Access to information turned out to be the least significant area of business environment institutions' operations for the surveyed group of students (32.23% of responses).

The study carried out on a group of students from the Faculty of Economics, Finance and Management also examined whether the independent variables (gender, field of study, degree of study and mode of study) had an impact on the dependent variable (desired areas of support among those interested in using the services of technology parks). The table below shows the percentage of students' answers to the question concerning the dependent variable. Four criteria were taken into account: gender, field of study, degree of study and mode of study. In addition, the following table presents the values of correlation coefficients between the independent variables as well as between the independent and dependent variables.

Table 3.

Percentage of students who answered the question regarding the desired areas of support by gender, field of study, degree of study and mode of study

Criterion		Desirable areas of activity of business support institutions by students who are interested in using the services of technology parks [in%]						
		Training and workshops	General and individual consulting	Grant to open a business	Promotion and advertising	Various meetings and business integration trips	Assistance in requesting EU funds	Information - access to current business information
Gender	Female	80,25	75,31	75,31	70,37	69,14	70,37	33,33
	Male	62,50	62,50	62,50	65,00	65,00	52,50	30,00
Field of study	Management	72,90	69,16	70,09	68,22	66,36	64,49	31,78
	Entrepreneurship and investments	85,71	85,71	78,57	64,29	78,57	64,29	35,71
Degree of study	I	75,41	63,93	67,21	75,41	68,85	59,02	34,43
	II	73,33	78,33	75,00	60,00	66,67	70,00	30,00
Mode of study	Full-time	79,52	68,67	75,90	78,31	69,88	68,67	33,73
	Part-time studies	63,16	76,32	60,53	44,74	63,16	55,26	28,95

Source: Own study based on own research.

Table 4.

Values of Pearson's correlation coefficients between independent variables and values of T-Czuprow dependence coefficients between independent variables and the dependent variable

Criterion		The value of the Pearson correlation coefficient r_{xy} between the individual variants of the criteria (independent variables) when answering the question regarding the indication of the desired areas of business environment institutions by students who are interested in using the services of technology parks	The value of the T-Czuprow T_{xy} relationship between the criteria (independent variable) and the indications of desired areas of activity of business environment institutions by students who are interested in using the services of technology parks (dependent variable)
Gender	Female	0,9232	0,0259
	Male		
Field of study	Management	0,9138	0,0296
	Entrepreneurship and investments		
Degree of study	I	0,7709	0,0470
	II		
Mode of study	Full-time	0,6652	0,0595
	Part-time studies		

Source: Own study based on own research.

5. Discussion

The above summary indicates that there is a very strong linear relationship in the case of criteria such as 'gender' and 'field of study', whereas in the case of criteria such as 'degree of study' and 'mode of study' a strong relationship exists between the independent variables in response to questions regarding the indication of the desired areas of activity of business environment institutions by students interested in using the services of technology parks. This means that women responded very similarly to men. Students of general academic and practical programme profiles also gave largely comparable answers. Also, no significant differences were noted between the responses of undergraduate and graduate students or between the responses of full-time and part-time students. At the same time, very low values of Tschuprow's T correlation coefficient indicate that gender as well as field, degree and mode of study did not affect the answers provided by students.

The results of the study indicate that students are well acquainted with the range of services offered by technology parks, yet at the same time they are not sufficiently aware that these entities can provide them with support, both at the stage of establishing and developing their business. Intensifying efforts to promote the activities of the surveyed institutions at universities could encourage academic youth to think entrepreneurially and get involved. Regardless of their field of studies, programme profile or degree of study, students should be provided with the

opportunity to acquire knowledge and skills necessary to run a business on their own. They may be given practical information in this regard, for instance, during training courses run by representatives of entities such as technology parks, especially since training and workshops are the most preferred area of support by students interested in using the services of these institutions. Academic staff should also step up their efforts to increase students' interest in the offer of technology parks. The institutions under study can increase the likelihood that the businesses run by graduates in the future will be more technologically advanced and will expand their efforts towards innovation.

6. Summary

It bears strong emphasis that the role of technology parks in the innovation system is crucial, which stems from the fact that, for example, as non-state public sector entities they perform public utility functions and play a major part in linking the science sector with the business sector, increasing the efficiency of both parties. All entities potentially interested in innovative processes should participate in the creation and development of technology parks, namely: universities and other scientific institutions (fostering entrepreneurial and creative attitudes, providing innovative ideas, initiating commercialisation processes), public authorities (contribution in the form of buildings, roads, land, funds and ensuring favourable political and legal conditions), financial institutions and enterprises (supply of innovative ideas and capital).

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