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TECHNOLOGICAL PARKS AS CARRIERS OF INNOVATIONS

PARKI TECHNOLOGICZNE JAKO NOŚNIKI INNOWACJI

Abstract: The aim of this article is an attempt of analysis and assessment of the operation of the technological parks as carriers of innovations. The method of analysis was used as a research method. The article includes the achievement of economic thought which refers to innovations. The essence, condition and structure of the technological parks were presented. Subsequently, the analysis of the potential, scope and results of national actions of the technological parks were conducted. The assessment of operation of the technological parks was carried out and conclusions concerning the perspective of this form of innovative activity were drawn in the final stage of the article.

Keywords: innovations, method of analysis, technological parks

Streszczenie: Celem niniejszego artykułu jest próba analizy i oceny funkcjonowania polskich parków technologicznych jako nośników innowacji. Jako metodę badawczą wykorzystano metodę analizy. W artykule przedstawiono dorobek myśli ekonomicznej odnoszący się do innowacji. Zaprezentowano istotę i rozwój inicjatyw parkowych oraz stan obecny parków technologicznych. Następnie dokonano analizy potencjału, zakresu i rezultatów działań krajowych parków technologicznych. W końcowym etapie dokonano oceny funkcjonowania parków technologicznych jako nośników innowacji oraz przedstawiono wnioski dotyczące perspektyw tej formy aktywności innowacyjnej.

Słowa kluczowe: innowacje, metoda analiza, parki technologiczne

Introduction

Contemporary economic development which is mainly based on knowledge pays specific attention to searching competitive advantages of business entities, regions as well as world economies in innovativeness. Presence and growing importance of numerous institutional forms of influencing the process of creation and commercialisation of new technologies in economy is the result of this pro-innovative orientation. Institutions which are intermediaries between education and economy act nowadays as a catalyst of creativity, innovativeness and entrepreneurship. Technology parks, which are created all over the world, are their crucial element. These parks are the most complex and organisationally and conceptually developed types of centres of innovations and entrepreneurship. The aim of their creation is to make one of the most complex institutional forms, i.e. increasing effectiveness of the use of findings of R&D work in economic practice more common.

The issue of innovativeness of Technology Parks is a leitmotif of this study. The attempt of analysis and assessment of operation of the Polish technology parks as innovation carriers is an adopted aim. The method of analysis was used as a research method to pursue the aim. The article includes the essence, state and structure of TPs. Subsequently, the analysis of the potential, range and results of national operations of TPs was conducted. The role of these parks taking into consideration innovativeness of the Polish economy emphasizing barriers of their functioning, use and development was assessed in the final stage. Moreover, the findings concerning perspectives of this form of innovative activeness taking into account the latest conditions referring to the connection of research on innovation with the results of its practical use were presented.

1. The essence and development of park initiatives as well as current condition of TPs

The creation of space of knowledge and business to optimise mechanisms of transfer and commercialisation of technology and what is most important, bringing innovations to the market is significant in the generation of innovations and development of companies which are based on them. Technology parks provide such opportunity.

Technology parks are a complex, organisationally and conceptually developed type of centres of innovations and entrepreneurship whose importance gradually increases in case of economy based on knowledge, creativity and innovativeness¹. Technology parks are a separate entity with aimed at the development of business entrepreneurs using modern technologies².

Systemizing the term of TPs for the purpose of this article, one should perceive it in the broad conceptual interpretation which includes: science parks, research parks, science and research parks, science and technology parks, industry and technology parks, technoparks or technopoles.

The idea of creation of TPs refers to a nineteenth-century concept of Marshall industrial estates³. The fact of concentration of technology parks, enterprises, and business related services on the closed area, produces synergic effects which in connection with R&D and venture capital provides grounds for creation and development of innovations. Thus, parks which are created in a dynamically growing economy are considered as the synonym of economy of knowledge and entrepreneurship which combine on one territory⁴:

- research institutions which offer knowledge, new ideas and technological solutions as well as innovative companies looking for new chances of development,
- rich business environment in terms of financing, consulting, trainings and supporting development of innovative companies,
- venture capital,
- high potential of entrepreneurship and good quality of infrastructure which foster business climate attracting creative and well-educated staff,
- governmental, regional and local programs of supporting entrepreneurship, transfer of technology and development of new technological companies.

In the international nomenclature, the term of TPs was created in 2002 by the International Association of Science Parks and accepted by the International Sum-

¹ K.B. Matusiak, *Strategiczne obszary rozwoju parków technologicznych*, PARP, Warszawa 2011, p. 9.

² M. Mażewska, A. Tórz, *Parki technologiczne*, [in:] A. Bąkowski, M. Mażewska (ed.), *Ośrodki innowacji i przedsiębiorczości w Polsce*, SOOliP, Poznań – Warszawa 2015, p. 26.

³ K.B. Matusiak (ed.), *Innowacje i transfer technologii. Słownik pojęć*, PARP, Warsaw 2011, p. 187.

⁴ Ibidem, p. 186-187.

mit of Business Incubation and Technology Park Associations. The IASP adopted the definition of a technology park as an organisation managed by qualified specialists whose aim is to increase, through promotion of culture of innovation and competition, among entrepreneurs and institutions based on knowledge, well-being of the community in which it operates. To achieve the purposes adopted in the definition, technology parks should stimulate and manage the flow of knowledge between academic centres, R&D units, enterprises and markets; facilitate creation and development of enterprises based on knowledge through spin-offs and spin-outs as well as add value to the enterprises through high-quality services and offering high-standard premises and facilities⁵.

Three stages (generations) of development of park initiatives should be indicated while conducting the analysis and assessing the development of TPs⁶.

Tps of the first generation were located on the territory of academic centres and R&D institutions or close to them. The aim was to achieve the effect of better commercialisation of scientific research orientation. The offer of premises and space in the surrounding was to decrease the distance between education and business using synergy which occurred because of the neighbourhood of the highest-class research institutions located at universities with business which provided finance for research works as well as rapid commercialisation of the findings. The income from the infrastructure offered by TPs was supposed to provide sustainability of funding of parks whereas dynamics of the companies located there was a pass of a modern university and region. Stanford Science Park and Cambridge Science Park constitute examples of TPs of the first generation. The effects of those actions drew attention of the authorities of the well-developed countries which wanted to use the parks as the means of innovative policy. As a result, regional and even national concepts of science and business zones, such as Sophie-Antipolis near Nice, Research Triangle Park in North Carolina or Tsukuba Science City were created. Those actions brought a completely new organisational and conceptual momentum. However, they frequently departed parks from their closeness to the scientific community causing "drift" of park concepts towards special economic zones. Concentration of TPs not on the premises which they had at their disposal but on the development of innovative business became a very positive aspect.

The second generation of technology parks was characterised by strengthening park concepts with a great availability of business-related services. Diversification of the offered services led to progressive specialisation of the parks, e.g. ICT parks, Me-

⁵ K.B. Matusiak, *Wpływ parków technologicznych na rozwój ekonomiczno-społeczny*, [in:] K.B. Matusiak, A. Bąkowski (ed.), *Wybrane aspekty funkcjonowania parków technologicznych w Polsce i na świecie*, PARP, Warszawa 2008.

⁶ K.B. Matusiak (ed.), *Innowacje...*, p. 188-189.

dia parks or Bio-parks⁷. As a result, services and equipment in this generation of development of TPs were suited to specific target industries whereas created programs of incubation and occurrence of new companies were connected with the regional structural policy. In such conditions, the parks of the second generation became specific centres of concentration of support services. Nevertheless, financing of the offered services, especially in case of developed incubation functions with a small coverage of expanses, made parks dependent on funds and public programs⁸. Thus, development of new, competitive business undertakings became a second-level task whereas park ideas became an element of a game for discounts and public grants. It caused that park initiatives became more and more often a method to participate in funding streams of economic policy causing disappearance of the aim, which accompanied during the creation of the parks instead of being generated from bottom-up ideas for development of entrepreneurship⁹.

The development of the third generation of TPs is connected with the increase of the number of innovative projects as a derivative of network system of cooperation whose basis is the integration of park functions with developing challenges of cities and regions. Parks are becoming specific centres of cooperation network which integrate regional systems of innovations¹⁰. Strengthening the system of innovations of the region, development of human capital and scientific output, development of contacts and networking and consequently, diffusion of knowledge, skills and strengthening competitive position of regional resources is becoming the role of the parks in the third generation of their development. A modern TP, strongly connected with the region, is to be a network broker which enables the companies located on its territory to develop the cooperation with partners in the financial, R&D or training sphere as well as helps go beyond regional market. Functioning of a technology park in this dimension is to strengthen endogenous economic potential of the region, creating its internal innovative abilities as well as improving its competitiveness. Multidimensional effects of functioning of a technology park, which appear as the result of mechanisms of interaction and synergy, are crucial to improve competitive position of regions¹¹.

2. The analysis of the potential, range and results of actions of the Polish TPs

The idea of creation of technology parks in Poland occurred in Poland in the mid 1980's. At the beginning of 1990's first initiatives in this area, inter alia, in Poznan,

⁷ Ibidem, p. 188.

⁸ K.B. Matusiak, *Strategiczne...*, p. 19-20.

⁹ K.B. Matusiak (ed.), *Innowacje...*, p. 188.

¹⁰ Ibidem, p. 188.

¹¹ K.B. Matusiak, *Strategiczne...*, p. 21.

Cracow, Gdansk, Lodz and Wroclaw appeared. However, those projects were not implemented that time. The first Polish technology park, named Poznan Science and Technology Park, was created in 1995 on the inspiration of Adam Mickiewicz University in Poznan. In August 1997, Technopark Łódź was built and two months later Krakow Technology Park with the status of special economic zone appeared. In 1998, Wroclaw Technology Park was created and took the legal form of the public limited-liability company [pl. spółka akcyjna].

In 2014, 176 active centres of innovation and business incubators which operated within 137 leading institutions were identified in total in Poland. This number includes:

- 42 technology parks¹²;
- 23 technology incubators;
- 24 academic business incubators;
- 46 business incubators;
- 41 centres of technology transfer.

The analysis of the potential, range and results of actions of TPs was conducted on the basis of the research which was carried out in 2014 by PARP. 33 TPs out of 42 which function in Poland were tested¹³.

Infrastructure resources of the analysed parks represent the area of 373,654 m². The usable area for lease which was offered by the parks constituted 154,490 m². 17 of the analysed centres had open spaces. On average, they devoted 1,347 m² to this type of activity. 52% of the analysed parks had their own laboratory and research infrastructure. These centres conducted research using their own laboratory space providing services for other entities. Whereas 17 of the parks had laboratory space for renting for park tenants. Over 860 persons were employed in the analysed parks. 75% of the investigated parks, except for the persons employed under a contract of employment, hired workers under a civil contract. In 2013, they hired in total 877 persons, giving an average of 43 persons for each analysed entity. Majority of parks showed that their workers shared their working time with other duties, implementing the tasks in other types of activity, e.g. technology incubators and business incubators. The level of this engagement hesitates from 10% to 60% of working hours of staff of the parks¹⁴. Financial independence in the form of own budget is a very important aspect of managing a technology park. 58% of the analysed parks had the budget which was formally devoted to their own activity, whereas 39% of the parks led their activity within the budget of the leading institution. The most important revenues in the structure of the operational budget of the parks include: 32.51%

¹² M. Mażewska, A. Tórz, *Parki technologiczne*, [w:] A. Bąkowski, M. Mażewska (red.), *Ośrodki innowacji...*, p. 28.

¹³ A. Bąkowski, M. Mażewska (ed.), *Ośrodki innowacji w Polsce (z uwzględnieniem inkubatorów przedsiębiorczości)*. Raport z badania 2014, PARP, Warszawa 2014, p. 35-52.

¹⁴ Ibidem, p. 35-52.

rental of usable areas for tenants; 22.02% national grants and projects; 14.58% revenues from the leading unit; 14.18% regional/local grants and projects; 10.00% revenues from other sources of the centre. It should be noted an increase outlays for companies that are innovative¹⁵.

Conducting the analysis of the range of the Polish TPs, one should take into consideration that providing services connected with the rent of the space on favourable terms to the tenants of the parks, i.e. mainly innovative and technological companies and creating the terms of availability for highly specialised equipment and software should be their domain. 1109 entities functioned within the analysed TPs. Microenterprises, with the number of 755 tenants, constituted the biggest group. Small enterprises had 218 tenants, while medium-sized enterprises 91. 81 spin-off companies and 28 spin-out companies as well as 80 companies with foreign capital functioned among the clients of TPs. TPs which had from 11 to 30 tenants constituted the biggest group with 39%. Basic services provided by the TPs include: consulting services, education and trainings. "Entrepreneurship and creation of a company" is a thematic block which is most often indicated in the offer of the analysed technological parks (82% at the consulting level and 61% at the training level). In case of consulting services, the offer referred in particular to the creation of a business plan and a business model as well as the access to the European funds. Training services were offered in these domains more rarely. The services related to the achievement of the financial support were another group of services offered by the TPs. In this domain, mainly the meetings of the tenants of the parks were arranged with business angels as well as with local and regional loan funds. And subsequently, they included actions connected with acquiring subsidies, grants, loans as well as establishing contacts with Venture Capital. From the point of view of this study and also development in a broad sense, pro-innovative services are a very important range of the services provided by TPs. They are provided for innovative companies, connected with the support of R&D, commercialisation of knowledge and technology, patenting, etc. Basic pro-innovative services in the analysed parks included: support for establishing contacts with suppliers or recipients of technologies (in over 50% of cases) as well as selection of innovative ideas (nearly 44%)¹⁶.

The results of operation of the TPs should be considered in the form of effects resulting from their tasks. In case of the range of content-related services, the activity of the parks is not high, on average 130 services per one park. The number of the organised business meetings for one park is 14 per annum. The analysis of data

¹⁵ B. Lublińska-Kasprzak, *Potencjał innowacyjności w przedsiębiorstwach i otoczeniu społeczno-gospodarczym. Dobrze przykłady, słabości, perspektywy na przyszłość*, [w:] P. Zadura-Lichota (ed.), *Innowacyjna przedsiębiorczość w Polsce. Odkryty i ukryty potencjał polskiej innowacyjności*, PARR, Warszawa 2015, p. 5.

¹⁶ A. Bąkowski, M. Mażewska (ed.), *Ośrodki innowacji...*, p. 35-52.

shows that, in general, parks did not monitor the activity of their tenants. They did not gather any data concerning the sustainability of the companies on the market, the number of innovative projects as well as awarded companies. Positive trends appear in the cooperation of TPs with universities (83%) in terms of using the knowledge of experts and specialists. Among the analysed parks, 75% cooperated with universities in terms of acquiring knowledge concerning technology and findings of the research. The cooperation of the analysed parks (67%) with territorial self-government units concerning the use of experts and specialists was also significant. However, the cooperation with other centres was at much more lower level. 24% of the TPs did not have any contacts with local companies and this percentage is growing to 51% in the group of contacts at the national level. The activity of parks at the international level is also very low, only 5 of them belonged to the international network of Business Support Institutions [pl. IOB]. The worst situation refers to the cooperation with financial institutions. 60% of the TPs have not cooperated with risk capital funds regionally, and 64% of TPs at the national level. At the regional level, there was the lack of cooperation with loan funds among 45% of the TPs¹⁷.

3. The assessment of the potential, range and results of actions of the Polish TPs as well as perspectives of development

During the process of assessment of the potential, range and results of actions of the Polish TPs, one should take into consideration that they should be a basic element of infrastructure supporting entrepreneurship influencing not only the region on which they are located but also the whole country and what is more important, they should create and dynamise the development of innovativeness.

On the basis of the conducted analysis of data from PARP research of 2014 one may indicate both positive and negative elements which determine innovativeness of the Polish TPs¹⁸.

Technical and computer equipment of the parks, human resources with a great participation of workers with factual knowledge as well as observed tendencies in the structure and range of the offered services towards creation of pro-innovative services may be included to the positive factors. Polish TPs take actions which monitor competitive environment and changing directions of subsidies of innovative actions as well as opportunities of development of innovative undertakings. This provides good prospects for the development of the park initiative. Over 45% of the total number of business entities which function within the analysed parks (501 tenants) are technological companies. 76% declare pro-innovative services. However, these services are not so desired as certification of solutions/technologies/parks

¹⁷ M. Mażewska, A. Tórz, *Parki technologiczne...*, p. 28-35.

¹⁸ A. Bąkowski, M. Mażewska (ed.), *Ośrodki innowacji...*, p. 35-52.

or market tests of prototypes of products/services but these are mainly services of support for establishing contacts with suppliers or recipients of technologies as well as services connected with the selection of the innovative ideas. There are positive trends in case of cooperation of TPs with universities¹⁹.

Weak activity of the parks in terms of content-related services may be involved to the negative elements which determine innovativeness of the Polish TPs.²⁰ Majority of the analysed parks do not hold ISO certificate or accreditation regarding provided services. TPs in Poland do not monitor effects of their activity and sustainability of their actions. The lack of monitoring means that managers have limited opportunities of making right decisions and taking innovative actions. It is confirmed by the data from the research in which the smallest amount of data concerned the sustainability of the companies on the market, number of innovative projects or awarded companies. The cooperation with other centres and institutions is a weak point of the analysed parks. It refers both to the intensity of cooperation and its range which is concentrated only on basic actions – using the advice of experts or partnership in the projects. The activity of the parks in international dimension is very low. It should be stated that the Polish TPs isolate from the external environment instead of cooperating with it to be innovative and development-oriented. In terms of financing the activity, the scale of providing support for the contacts with business angels was decreased by 19% and by 18% in case of assistance with the access to the seed capital²¹.

Taking into account both positive and negative elements which influence functioning of the Polish TPs the suggested directions of development of park initiatives to increase their innovativeness are as following²²:

1. Creation of new buildings, land properties and strengthening existing ones as well as development of technical infrastructure which is to develop innovations within TPs.

2. Concentration on innovative and promising industries such as eco innovations or implementation of specialist services such as prototype laboratories.

3. Increase of activity of TPs in terms of cooperation with research centres as well as increase of quantity of research and its commercialisation.

4. Development of training offer – development of creativity, readiness to search for original solutions, ability of cooperation through launching, e.g. a platform for technological or innovative trainings or training concerning creation of innovative business models.

¹⁹ Ibidem, p. 35-52.

²⁰ K. Szopik-Depczyńska, *Źródła finansowania projektów a innowacyjność przedsiębiorstw przemysłowych w województwie podlaskim*, Zeszyty Naukowe Uniwersytetu Szczecińskiego nr 855, „Finanse, Rynki Finansowe, Ubezpieczenia” nr 74, t. 2, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2015, p. 176.

²¹ A. Bąkowski, M. Mażewska (red.), *Ośrodki innowacji...*, p. 35-52.

²² Ibidem, p. 50.

5. Intensification of consulting services in terms of implementation of new products and services, industrial design, market analyses as well as determination of market potential and technical opportunities of development of industry, creation of a plan of implementation of innovations, assistance with implementation of technologies, in creation of a prototype, product or goods ready for tests.

6. Creation of culture of innovation, increase among entrepreneurs of understanding for the significance of innovations to lead business effectively, development of skills of planning and implementing innovative strategies.

7. Strengthening cooperation with external partners as well as starting new areas of activity.

Conclusion

In globalising economy which is activated by simultaneous processes of liberalisation and rapid technological progress, innovations become one of the main sources of the strong competitive position.

The presence, in social and economic life, of numerous institutional forms of influencing which involve technological parks has become the result of orientation on supporting innovativeness.

The parks are mainly to strengthen the system of innovation of the region, development of human capital as well as scientific achievement, development of contacts and network connections and as a result, diffusion of knowledge, skills and strengthening competitive position.

Are the Polish technological parks carriers of innovations? The presented analyses show that they are not. At least not to the expected level. The directions of development of park initiatives were indicated in the article on the basis of the analysis and assessment of the innovativeness of TPs. Nevertheless, one should remember that the created directions of development are neither a panacea nor a ready-made solution for innovative success but they only indicate chosen areas of necessary research.

Poland needs successive transfer from the model of development based on the ability to absorb and adopt innovative solutions created in leader countries to the strategy based mainly on the creation and implementation of own initiatives and new knowledge. The actions which have been taken so far do not bring expected results.

One should take into consideration that the current economic growth of Poland is based on low costs of work, internal outlet and EU funds. However, these simple reservoirs of growth will be exhausted in a few years and Poland may face the lack of opportunity to develop. Therefore, the development of Polish innovativeness in all possible fields, also through technological parks, is such an important aspect.

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