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TECHNICAL UNIVERSITY OF LODZ

**Contemporary and future
trends in management**

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This is a very interesting and important
document which contains a great deal of
information regarding the activities of
the various groups and individuals
mentioned in the title. It is a
very valuable source of information
and should be read carefully.

The following information is taken from
the report of the committee.

The committee has found that the
activities of the various groups
mentioned in the title are of a
very serious nature and should be
taken into consideration by the
proper authorities.

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very serious nature and should be
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1. The first group mentioned in the
title is the "X" group. This group
is composed of individuals who are
active in the field of "X".

2. The second group mentioned in the
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ANALYSIS OF TECHNOLOGICAL PARKS SERVICES IN THE CONTEXT OF THEIR EFFECTIVENESS

Anna Ludynia

1. Introduction

Technology Parks in Poland are still a new institutional phenomena which needs time to be able to shape the basis for the development of knowledge-based economy. They are very beneficial to Polish and foreign investors . The most favorable factors are: ready - technical and business infrastructure including contacts and inter-institutional information base, network of scientific institutions and high quality services for the investment process.

The aim of this paper is to present the structure of service offered in science and technology parks as compared to the needs of innovative businesses. Implementation requires the following analysis, the characteristics of Polish and European companies, and presentation of the rules of the European scientific and technological parks. Considerations for the effective operation of technology parks will be complemented by information from the selection process for these businesses which have a significant impact on the preparation of the offer of services.

The conclusions of this analysis will help answer the question whether the technology parks as instruments of innovation policy will support the development of competitive knowledge-based economy, and whether in fact they are the basis for cooperation between science and business.

2. Innovative features of polish and european companies

38.8% of companies across the European Union were recognized in 2006. as innovation. Germany occupied a leading position in the ranking of innovative European companies, which in the structure of all its companies 62.6% of individuals classified as innovative. The leading positions occupy among others, Belgium, Austria, Luxembourg, Sweden. Among the new EU member states, only Estonia and Cyprus are the countries where the number of innovative firms is above the average number of companies across the European Union. The other new EU members and also the United Kingdom, Italy, Spain, Holland have a number of innovative businesses below the European average.

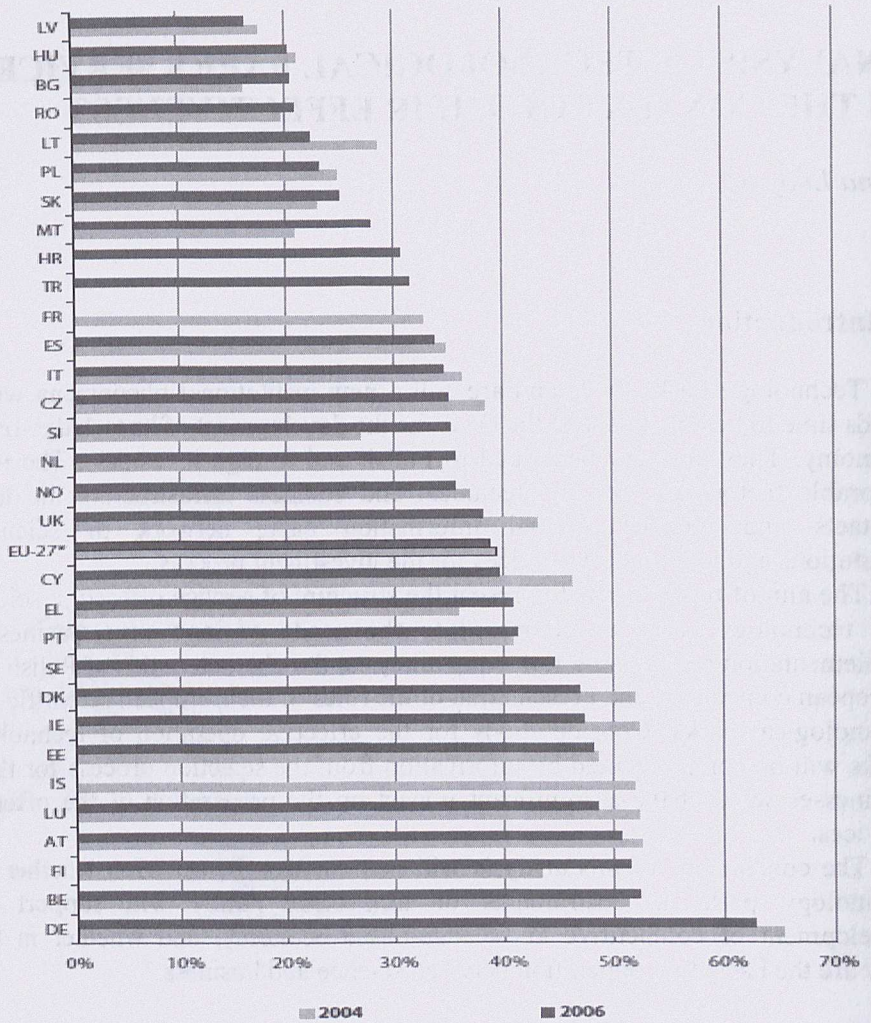


Image 1. Innovative enterprises in Europe between 2004 -2006 as a percentage of all firms in the country

Source: *Science, technology and innovation in Europe* ", Eurostat Pocketbooks, 2010

In most countries (in which data are available), the share of innovative enterprises was higher for the manufacturing sector than for the service sector. In addition, there are more innovative companies among large and medium-sized enterprises than among small enterprises.

Table 1. Division of innovative enterprises according to their size in 2006

	Total	10 to 49 employees	50 to 249 employees	More than 250 employees
EU-27	38.9	34.4	52.3	70.1
BE	52.2	48.6	62.3	81.5
BG	20.2	17.0	26.4	52.7
CZ	35.0	28.9	48.6	70.4
DK	46.9	42.3	59.7	81.2
DE	62.6	57.3	71.9	87.4
EE	48.2	43.0	64.4	85.2
IE	47.2	42.7	62.5	74.9
EL	40.9	37.3	55.7	73.6
ES	33.6	30.0	48.6	72.0
FR	:	:	:	:
IT	34.6	31.3	54.2	69.2
CY	39.5	35.0	56.6	82.1
LV	16.2	13.1	23.7	48.4
LT	22.3	18.3	39.1	58.8
LU	48.5	43.6	56.1	83.3
HU	20.1	15.6	31.6	55.5
MT	28.0	22.3	45.7	77.8
NL	35.5	31.3	49.2	65.5
AT	50.6	44.0	71.1	82.8
PL	23.0	15.5	37.7	64.1
PT	41.3	37.3	56.7	78.5
RO	20.7	17.2	26.6	41.6
SI	35.1	27.7	51.3	76.9
SK	24.9	19.1	33.7	56.2
FI	51.4	46.9	61.2	83.0
SE	44.6	40.5	56.9	74.2
UK	38.1	36.0	45.0	52.3
HR	30.6	25.4	42.6	58.3
TR	31.4	29.7	37.2	43.6
NO	35.5	31.9	48.1	57.3

Source: Science, technology and innovation in Europe ", Eurostat Pocketbooks, 2010

Noteworthy is the fact, that innovative firms are more interested in developing R & D activities within their units than to use them outside.

An interesting phenomenon among the many innovative European companies is the fact that most enterprises make innovations to improve the types of products and services and their quality and then in the process innovations, to increase the efficiency and flexibility of production and services. In addition, research carried out by the Community Innovation Survey show that the biggest obstacle in the development of innovation in the enterprise is the cost actors (second place is occupied by market factors and factors related to knowledge and information flow) [6].

The results of studies on innovative activity of Polish enterprises present a lower percentage of them, in the years 2006-2008 (in the industry - 21.3%, services 15.6%) than in the period 2004-2006 (in the industry - 23.2%, in services - 21.2%) [2]. For comparison, the European average in this area is 38.8% and in Germany the figure is 62.6%.

Table 2. Companies that have introduced innovative products and processes in% of total enterprises in the period 2006-2008 according to size classes

Description	Companies employing		
	10-49	50-249	above 249
Total industry	14,6	32,7	60,7
Mining	9,6	24,3	46,9
Manufacturing	14,7	33,0	60,7
Manufacture and supply of electricity, gas and water	11,3	30,3	63,4
Total service sector	12,5	25,0	47,7
Wholesale trade and commission trade, excluding motor vehicles and motorcycles	10,4	21,5	41,4
Transport, supporting transport activities and activities of travel agencies	8,2	13,8	38,3
Post and telecommunications	26,1	47,9	95,2
Financial intermediation	34,7	44,1	62,0
Computer Science	27,3	53,7	67,4
Activities in the field of architecture, engineering and technical testing and analysis	13,7	26,5	52,4

Source: "Innovative activities of enterprises in the years 2006 to 2008." Central Statistical Office, the material for the press conference 23.09.2009

The above summary of the data shows that the most innovative companies operate among large enterprises employing over 249 people, both in industry and services sector. Dominant position in the structure of innovative companies is taken by postal services and telecommunications, and the second place there are companies in IT services. In the industrial sector the most innovative activities are taken by companies producing and supplying electricity, gas and water.

The Characteristics of Polish innovative enterprises require analysis of the structure of the investment made in product and process innovation.

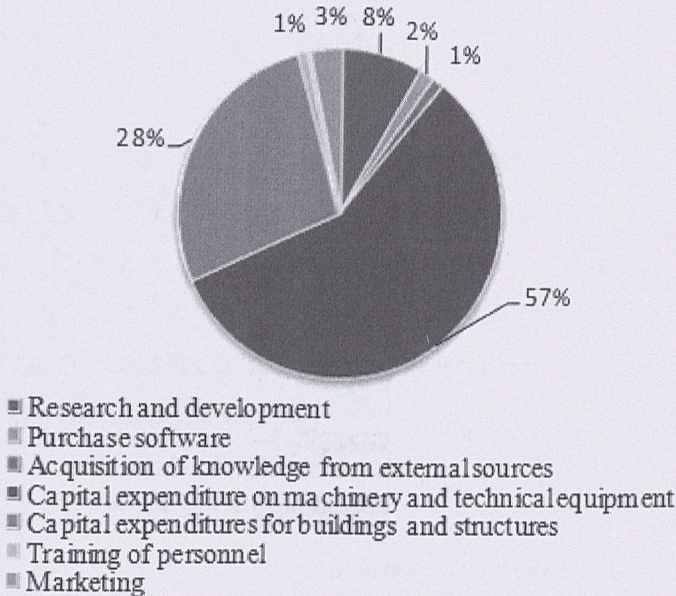


Image 1. The structure of expenditures on innovation activities in the field of product and process innovation in industry according to type of innovation activity in 2008

Source: "Innovative activities of enterprises in the years 2006 - 2008", GUS, the material for the press conference dated. 23.09.2009

These data show that in both industrial and service sector, the largest share of expenditures are the costs incurred in the machinery and technical equipment, 56.6% in industry and 48.7% in services. However, on the second position there are expenditures on buildings and structures - 27.2%. Only 8.1% of expenditure was allocated to research - and development.

In the process of development of innovative enterprises it is often desirable to cooperate with other organizations and institutions of economic and scientific environment.

In the years 2006 - 2008 among all industrial companies only 8.3% worked with other entities in the development of its innovative activity and the size of the service sector accounted for 6.6% level. In relation to the year 2004 - 2006, these values decreased significantly since then, they were at 11,1%.

Studies show that willingness to cooperate increases according to the size of the enterprise, where collaborated 3.8% of industrial enterprises employing 10-49, 14.9% of the number of employed 50 – 249, and 40.5% of the number of industrial enterprises that employed more than 249, and respectively 4.5%, 11.8%, 34.4% of service companies.

In the above analysis there is an important type of institution with which the unit has been cooperating in the development and innovative activity.

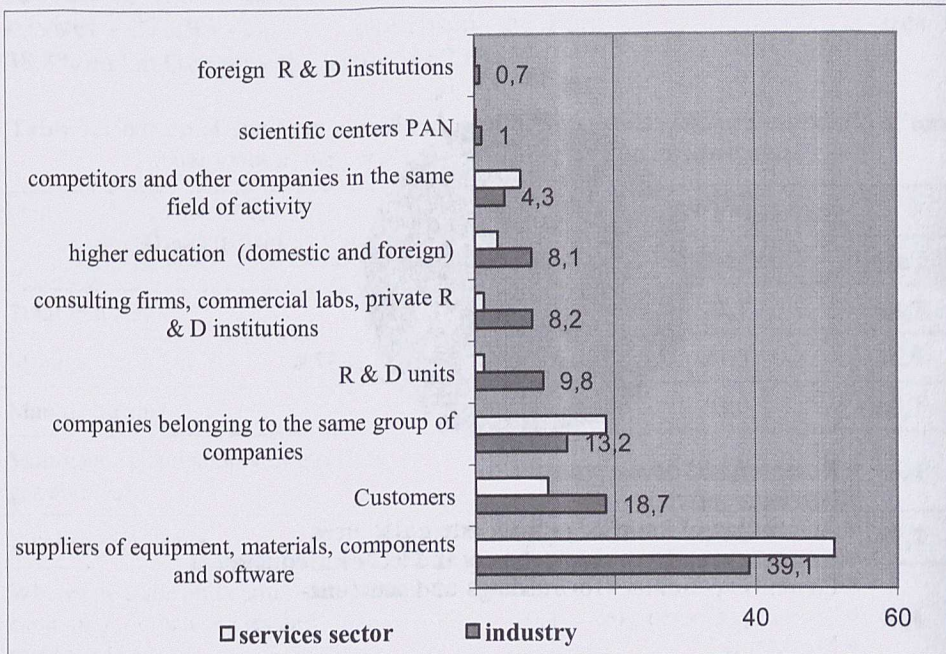


Image 2. Types of partner institutions with whom cooperation was assessed as the most beneficial for business innovation (in 2006-2008)

Source: "Innovative activities of enterprises in the years 2006 - 2008", GUS, the material for the press conference dated. 23.09.2009r.

The most desirable and beneficial to innovative businesses was the cooperation with suppliers of equipment, materials, components and software. This fact is confirmed by 39.1% of companies from the industrial sector and 51.1% of companies from the services sector. Customers have important role in cooperation - 18.7%, and for businesses in the service sector - firms belonging to the same group of companies (18.8%) [2].

3. Rules for selection and specification of innovative companies in the technology parks

The primary objective of the establishment of technology parks is to increase the efficiency of research and development in business practice and create an innovative environment at the interface between science and business to find a competitive advantage for countries and regions.

Thus, defined objectives require to specify rules for the selection of enterprises for technology parks of which most characteristic should be

innovation and technological nature of the operation. Additionally there are also other aspects examined such as: environmental impact, conducting their own research or outsourcing, manufacturing, or service nature of the business.

The vast majority of parks in the world has strict rules for the adoption of enterprise. 70% of the parks determined technology as a basic criteria for admission to the park, and 36% determined the environment to be the criteria [3].

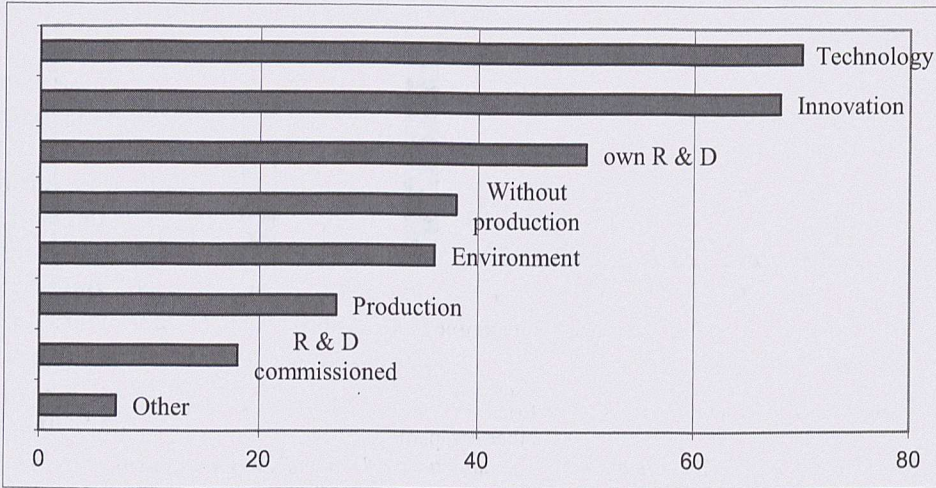


Image 3. Percentage of parks in the world using different criteria for acceptance of companies
Source: Facts and Figures and Technology Parks In The World, IASP General Survey 2006 - 2007

However, in the selection of future tenants in the Polish science and technological parks there are the following requirements:

- innovative nature of the project - 100% of parks,
- realistic business plan - 92% of parks,
- potential for growth - 62% of parks,
- potential opportunities to invest in the park - 54% of parks,
- company is developed on the basis of knowledge transfer from research institutions - 54% of parks,
- profile of industry preferred by the park - 46% of parks,
- international cooperation - 15% of parks,
- franchise business - 15% of parks [3].

The effectiveness of technology parks, and thus promoting the development of such enterprises that will drive the development of knowledge-based economy, depends largely on the business profile of companies invested in them.

Among Polish companies located in technology parks service firms are dominant in relation to production. In almost half of the service sector companies there are entities engaged in information and communication, particularly those operating in the high technology and software providers. A large share of them are consulting and research firms, many of which carry out

work in the field of natural sciences and engineering. The manufacturing sector is a large share of firms producing machinery and equipment of which two thirds are using advanced technologies. Summing up, companies operating in the area of high technology make up half of the surveyed enterprises. However, it must be presumed that the remaining part was adopted in order to supplement scarce aspects of the park [5].

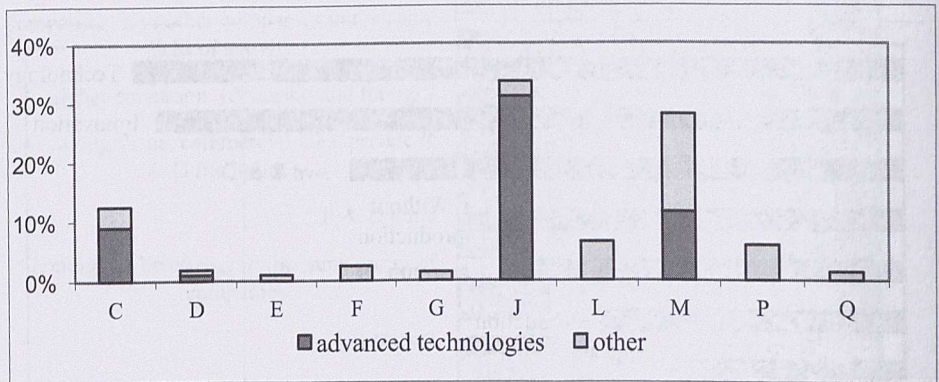


Image 4. The structure of the sample firms according to PKD sections of parks compared to other companies

According to the PKD classification: C - manufacturing, D-manufacture and supply of electric energy, E - supply and sewerage, waste management and remediation activities, F - construction, G -wholesale and retail trade, J - information and communication, L-activities related to real estate, M-business consulting, scientific and technical-education, P- education, Q - health care.

Source: D. Pelle, M. Bober, M. Fox, "Technology parks as a policy instrument to promote innovation and diffusion of knowledge." IBS, Warsaw 2008

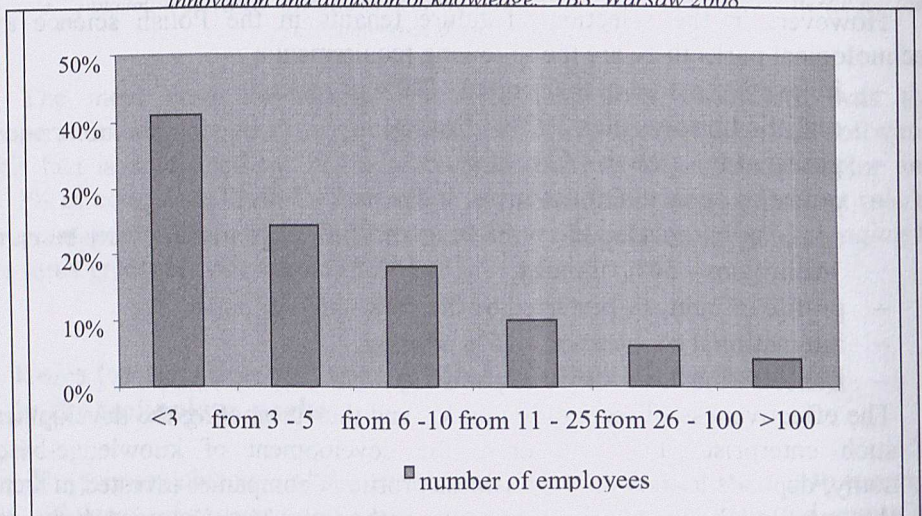


Image 5. The size of companies in technology parks

Source: D. Pelle, M. Bober, M. Fox, "Technology parks as a policy instrument to promote innovation and diffusion of knowledge." IBS, Warsaw 2008

From the standpoint of number of employees in companies operating in technology parks, the very small companies play a dominant role (below 3 or from 3 to 5 employees) and small firms (from 6 to 10 employees).

4. Analysis of business services for companies operating in technology parks

The primary initiative of the majority of Polish technology parks are incubators, which offer favorable conditions for small businesses with innovative ideas.

Technology parks offer includes services such as: financial intermediation, hiring of technical infrastructure, computer networks, preparing databases, rental of seminar rooms and video conferencing. At present, most parks are concentrating their efforts on issues of infrastructure, so e.g. the construction of buildings, parking areas, conference rooms, laboratories. However, it is also important that efforts were focused on the organization of services for companies with advanced technologies.

All business services in both European and Polish technology parks, are divided into:

- strategic services,
- auxiliary services.

An important part of the offer at any Technology Park is an availability of services the deal with possibilities for analysis to conduct analysis of research - development by companies operating in the park, as well as by external bodies. It is therefore important that surfaces in the laboratory were fully equipped for the nature of the audience or specialization park.

In the current policy of parks there are used two types of strategie:

- parks can create their own laboratories which are used by research teams of enterprises, scientific institutions that cooperate with the park,
- parks benefit from the research laboratories owned by universities or research institutes.

Table 3. The range of support services in the technology parks in Europe

Support services for technology parks in the world	% parks in the world offering the service
1. Rooms for meetings	87
2. Cafes	82
3. Conference rooms	79
4. Catering	75
5. Hour front protection	71
6. Access to public transport	62
7. Restaurants	56

Support services for technology parks in the world	% parks in the world offering the service
8. Individual electronic security system	55
9. Video conference rooms	52
10. Common system of protection for electronic	48
11. Secretarial services	44
12. Event planning	43
13. Public relations services	39
14. Sports facilities and leisure activities	38
15. Banks	35
16. Medical services	35
17. Kindergarten	26
18. Golf	23
17. Travel agency	23
18. Botels	21
19. Stores	18
20. Protection during working hours	6

Source: Facts and data - IASP, 2007

Table 4. The range of services in strategic science parks - technology in the world

Strategic services in technology parks in the world	% of parks that offer a service
1. Management support	73
2. Access to seed capital	71
3. Consultation regarding intellectual property	64
4. Networking wewnątrzparkowych	64
5. Training	60
6. Legal services and accounting	58
7. Availability of laboratories	56
8. Marketing and promotion services	55
9. Networking outside the park	53
10. Services for the development of tenant	53
11. Support corporate activities	34
12. Self-seed	30

Source: Facts and data - IASP, 2007

In Europe, approximately 80% of the Technology Parks have in their territory the testing laboratories, and 27% of technology parks maintains the university centers of economic cooperation. Research and laboratory services are

an important part of business parks offer, therefore 63% of the parks in Europe declare cooperation with research units.

In Poland we have the first examples of the construction of research laboratories in technology parks. They are located in technology parks in Poznan, Wroclaw and Gdynia. Another such project is in progress also in other parks on Polish territory. In the case of existing laboratories, they are owned by institutions managing a park. So, in Wroclaw there is a high vacuum laboratory, there are optical and electronic systems which are used mainly by companies operating in the park. In Poznan there are laboratories for chemical analysis, ¹⁴C Radiocarbon Laboratory, Laboratory for Language and Speech Technology, which are oriented to customers outside the park in the country and abroad. Technology Park in Gdynia has microbiology and biotechnology laboratories, and prototype.

Investment project for the construction of research laboratories requires a large financial expenses. It is important that a rapidly aging equipment and maintenance costs of such laboratories are very high. Therefore, venture investment activities in science - research require prior identification of the market for such services and the conclusion of the previous agreements with prospective purchasers, so as not to generate additional risks to the business parks [4].

Services for technology transfer and commercialization is a measure of the effectiveness of each technology park. Such services include work on:

- strategic advice on gaining competitive advantage,
- analysis of customer expectations,
- analysis of the company's technology position and access to new technology,
- monitoring of technological change,
- analysis possibilities of commercialization of knowledge,
- protection of intellectual property rights, patenting, the negotiation and conclusion of agreements for technology transfer,
- support in obtaining financial resources,
- skills development and innovative culture.

These actions require the construction of a network of experts and consultants, which is a several - year - process. Therefore, technology parks that want to offer such services, usually have a network of scientific institutions that address the needs of innovative companies in the technology park [4]. The priority activities of Polish science parks - is a technology networking between science and business.

The average Polish Technology Park cooperate with an average of six scientific entities. Forms of cooperation between scientific individuals and technology parks are as follows:

- organization of training courses, seminars and conferences - 100% of parks,
- submission of joint projects under the EU funds - 85% of parks,

- cooperation with the Technology Transfer Centers - 54% of parks,
- participation universities representatives in the authorities in the park - 54% of parks,
- joint implementation projects - 54% of parks,
- student organization - 54% of parks,
- classes for students in entrepreneurship and technology commercialization - 46% of parks,
- common laboratory science and research - 39% of the parks.

Services in the field of technology transfer and commercialization have a particular significance. However, in this process, managers of parks observe numerous difficulties and obstacles:

- lack of legal procedures for technology transfer,
- aversion to the commercialization of scientific research achievements,
- lack of projects for commercialization [3].

5. Assessment of parks business perspective

The effectiveness of the park can be measured by economic success of both companies and the park. Evaluation of the success of the park prefers market success of companies in the Park, which reveals the growing level of sales, profits, new products and permanent jobs. In the success of companies created this way is the result of effective support from the park, which is associated with the creation of value-added.

Companies operating within technology parks benefit from the offer of services depending on their needs. Technology parks offer depend on the level of development of the park, the direction of his specialization, and the demand for specific services from companies.

According to the survey, the services offered by the park use only half of all enterprises and two thirds of high-tech companies. The biggest interest among the services offered by the park is to help to establish trade contacts. Every fourth company points out to the help of the park to reach new markets as a key factor in its development. Little interest is shown for services related to management consulting and support of administrative and accounting services. Polish innovative companies operating in technology parks are rarely interested in services regarding scientific and technological support and technology advice, in contrast to companies with high technologies. This fact can be explained by a poor offer in this area in large part of technology parks [5].

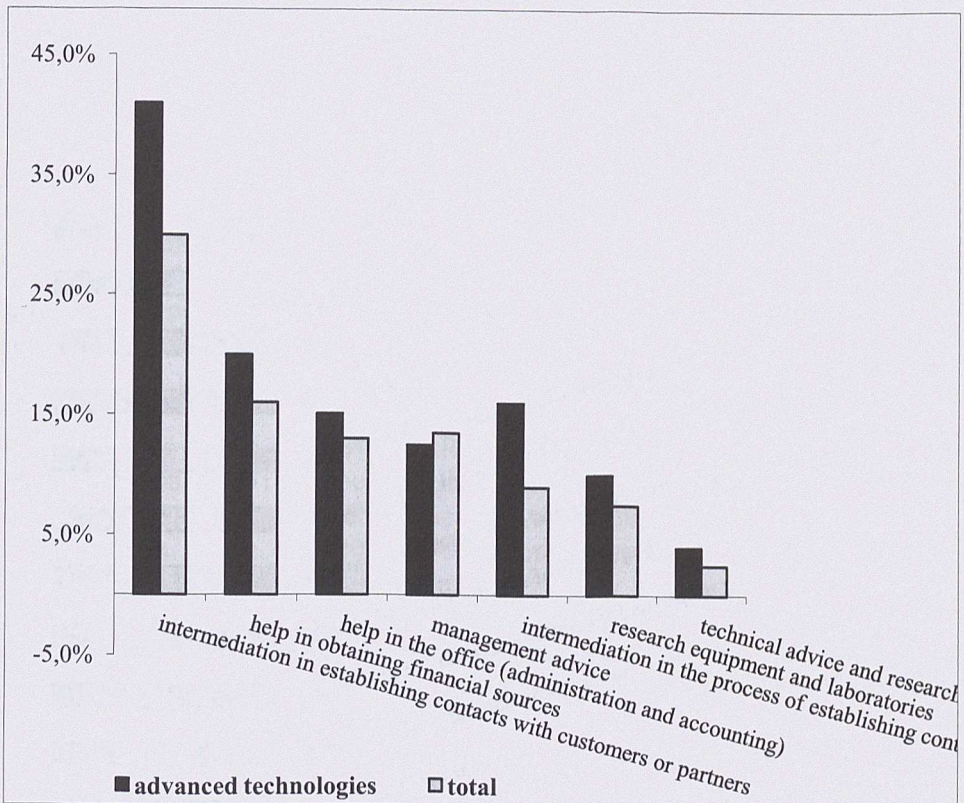


Image 6. Demand for services provided by technology parks

Source: D. Pelle, M. Bober, M. Fox, "Technology Parks as a policy instrument to promote innovation and diffusion of knowledge." IBS, Warsaw 2008

Evaluation of the effectiveness of technology parks requires analysis of the quality of services that are offered to customers. The chart below covers a range of different services which are maintained in Polish scientific-technological parks, and their assessment by traders using them.

These test (Image 6) results show that the most popular and top rated services are: the creation and launch of the company (41%), and services regarding the promotion, advertising, marketing and legal services (33%).

Most negative assessments relate to services from the market analysis 36%, the quality of accounting services (35%) and quality of contacts between companies and researchers (34%).

The studies of quality of services have also shown, that half of innovative firms located in technology parks considers the proposed business services as the ones meeting their demands.

More than half of the companies (54%), has not cooperated with other companies functioning in the park [1].

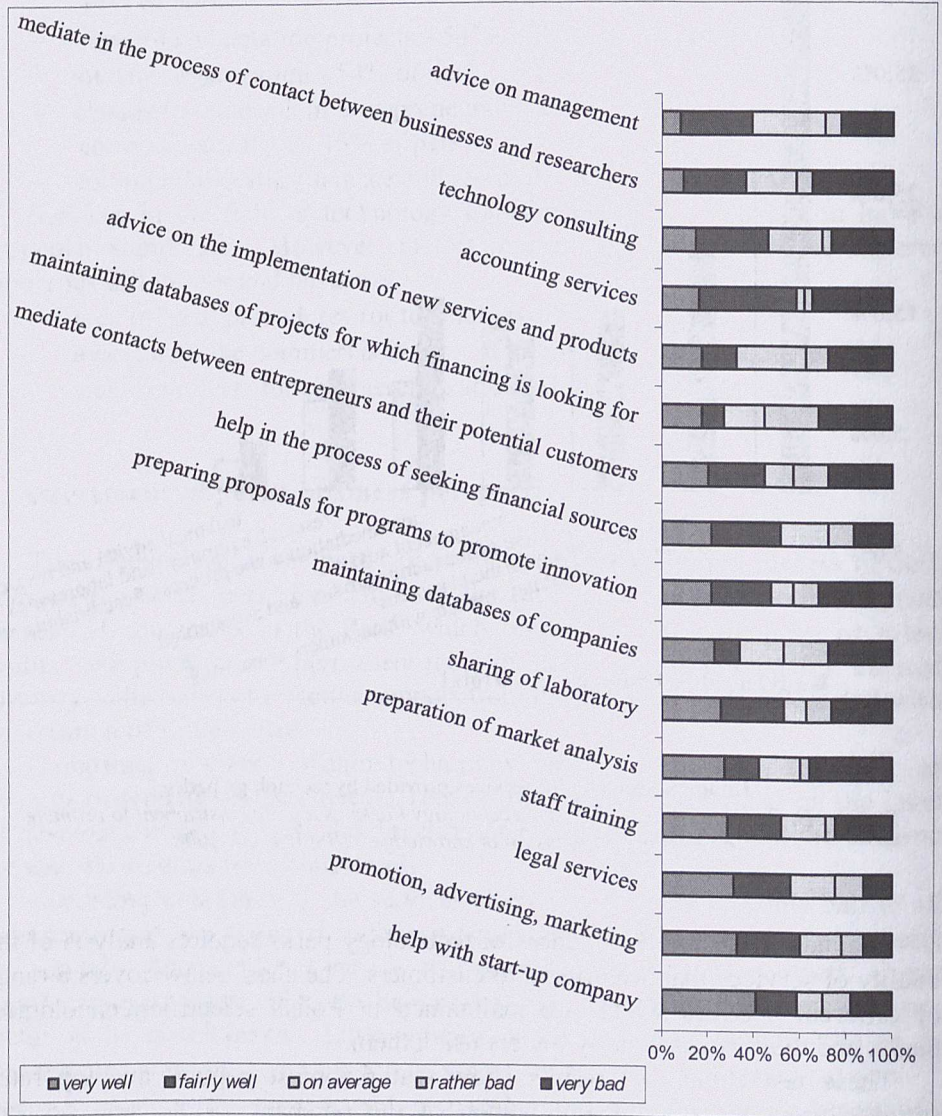


Image 7. Evaluation of the quality of services offered by technology parks
 Source: "Benchmarking technology parks in Poland. Results of the study." PARP, Warsaw 2008

6. Summary

Summarizing the above considerations it can be concluded that the offer of Polish technology parks services is tailored to the needs of their tenants. Business services are much more varied and correspond with the structure of the companies that operate in scientific and technological parks.

In addition, research has shown that technology parks have the largest percentage of companies from the industrial processing, communications, information and research. Usually these are small firms, mostly employing up to ten people. At the same time research has shown that what is very important, half of the companies operating in the parks belong to the advanced technologies.

According to the survey of PARP in 2008. the majority of companies in technology parks, 51.5% believe that the offer of services suited to their demands parks. The proposed services have proved to be inadequate only for 8.5% of firms. While, over 20% have been mildly satisfied, or have been unable to assess the level of their satisfaction.

Although the offer of services in these economic units is considered to be well adapted to their needs, that fact does not mean that this will promote the competitiveness of supporting the Polish economy. This statement is based primarily on the following facts:

- in technology parks there are only about 50% of technology companies,
- range of business services in most parks do not apply to promote technological development of enterprises,
- most of the technology parks are mainly directed to infrastructure investments enterprises declare the low level of cooperation with the scientific - research units and universities,
- cooperation with the Technology Transfer Centers on Universities exists only in 54% of parks,
- innovative companies in technology parks are rarely interested in services for scientific and technological support (just outside of high-tech companies),
- companies in the parks are mainly interested in the activities of a business.

Noteworthy is the fact that the Polish economy is characterized by low innovation firms (20%). Research and development is being developed to the greatest extent for the largest enterprises. Expenditures on innovation activities mostly have affected the purchase of machinery, equipment and investment in buildings and structures, while only 8.1% of expenditures was allocated for research and development.

Therefore, it can be postulated that the technology parks as instruments of policy of the growth of innovation and competitiveness of the economy, for that moment do not fully meet its functions, which should be a beneficial and rewarding cooperation between science and business.

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ROLE, ACTION AND SUCCESS OF POLISH TECHNOLOGICAL PARKS IN THE PROCESS OF BUILDING A KNOWLEDGE - BASED ECONOMY

Anna Ludynia

1. Introduction

The aim of the considerations set out in the article is to show that the construction of knowledge-based economy requires a particular focus on the development of centers that create a pro-innovation environment, yet they are a barometer of the trends taking place in the process of creating competitiveness of the economy. Science and technology parks are considered as the most advanced institutional form, which is responsible for operation between science and business. The sphere of activities between the scientific - research units, and enterprises at the moment is based on the weak interaction and the value of mutual communication. Economic success depends on the intellectual resources of the potential for commercialization, the potential of entrepreneurship and the level of confidence in the scientific and business communities. The success of any project, also in the form of technology parks doesn't depend on attractive modern buildings but on the dynamic development of innovative companies. Another issue which is closely linked to the situation in which science and technology parks operate, is the size and structure of funding for the activities of science and research. Building an innovative economy requires the creation of human resource capacity at the level of research units, which in turn will be reflected in the activity centers of innovation and technology transfer such as science and technology parks.

2. Expenditures on science and research and their structure in the process of building the competitiveness of the economy

Building a competitive European economy based on knowledge is a basic element of the so-called Lisbon Agenda, adopted by the leaders of the European Union in 2000. Ambitions of the European Union members are focused on: jobs creation and accelerated economic growth. Both elements are to be executed in the environment of the knowledge based economy. Why? Because the future and the power of economies in the world are in the innovative activity.

The development of technology and the desire to break the barriers of technology leads to increased economic competitiveness through better use of

production factors with particular emphasis on man as an element which leads to an increase in value-added of venture.

The key importance of the research and development in the process of increasing the competitiveness of the country is in a growing understanding which in turn creates a different system of activities. This phenomenon shows the direction of development of the modern world and the realities of the near future in which the company will compete, and what will characterize economic leaders in the world.

Units of research and development (R & D) in accordance with the Act on research and development units of 25 July 1985, as amended, they are state-owned entities, separated in legal, economic and organizational terms, set up to conduct research whose results should be applicable to specific areas of the national economy and social life [6].

Table 1. Number of units and investment on research and development activities by the types of of units and categories of expenditures in mln. zł (current prices)

Description	2000	2006	2000				2006			previous year = 100
	No. of Units		Expenditures							
			Total				from this			
			current		investment					
		mln zł	in percent	mln zł	in percent	mln. zł				
Overall	860,0	1085,0	4796,0	100,0	5892,8	100,0	4789,5	1103,0	122,9	
Scientific and research development units	321,0	313,0	2449,6	51,1	2841,6	48,2	2408,6	433,0	116,0	
Scientific centers of PAN	81,0	81,0	550,1	11,5	793,3	13,5	661,8	131,5	144,2	
research institutes	58,0	59,0	496,2	10,4	712,3	12,1	591,1	121,2	143,6	
independent research establishments	23,0	20,0	53,9	1,1	81,0	1,4	70,7	10,3	150,3	
R & D units	222,0	200,0	1869,6	39,0	1970,4	33,4	1674,9	295,5	105,4	
research institutes	137,0	137,0	1617,5	33,7	1676,1	28,4	1436,8	239,3	103,6	

central laboratories	11,0	12,0	24,4	0,5	40,5	0,7	19,8	20,7	166,0
R & D centers	74,0	51,0	227,7	4,8	253,8	4,3	218,3	35,5	111,5
Other	18,0	34,0	29,9	0,6	77,9	1,3	71,9	6,0	260,5
Units of learning service	18,0	31,0	13,8	0,3	33,5	0,6	28,1	5,4	242,8
Development units ^b	402,0	573,0	791,6	16,5	1171,4	19,9	935,5	235,9	148,0
Universities	114,0	147,0	1512,4	31,5	1827,0	31,0	1400,1	426,9	120,8
Other units	5,0	21,0	28,7	0,6	19,3	0,3	17,2	2,1	67,2

^a excluding depreciation and amortization of fixed assets

^b operators involved in R & D activities along with their core business, for the most part there are industrial enterprises, with own research and development.

Source: Science and Technology. Information society., CSO, Information and Statistical Papers, Warsaw 2007

As seen above in 2006. 1085 units functioned running development and research activities, including: 313 were scientific and research - development units, 573 economic entities engaged in R & D activities along with their core business and 147 -universities.

In Poland the share of total expenditure on R & D in GDP accounted for 0,63% in 1995., 0,56% of GDP in 2006. and 0, 57% of GDP in 2009 [12].

In the process of building knowledge-based economy, in addition to outlays for science and research their structure is important. The table below shows that expenditures on applied research, which are accomplished in the economic reality, are relatively lower in comparison to the development and basic researches.

Table 2. Structure (%) current outlays on R & D by type of activity in 1995-2006

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Basic research	36,4	33,1	33,9	34,5	36,2	38,5	37,9	38,8	38,8	39,5	37,4	36,5
Applied research	26,8	28,9	27,9	25,8	24,5	24,9	25,7	25,4	25,7	25,2	24,2	24,6
Development work	36,8	38	38,2	39,7	39,3	36,6	36,4	35,5	35,5	35,3	38,4	38,8

Source: *Science and Technology in 2006, GUS, Information and Statistical Papers, Warsaw 2007*

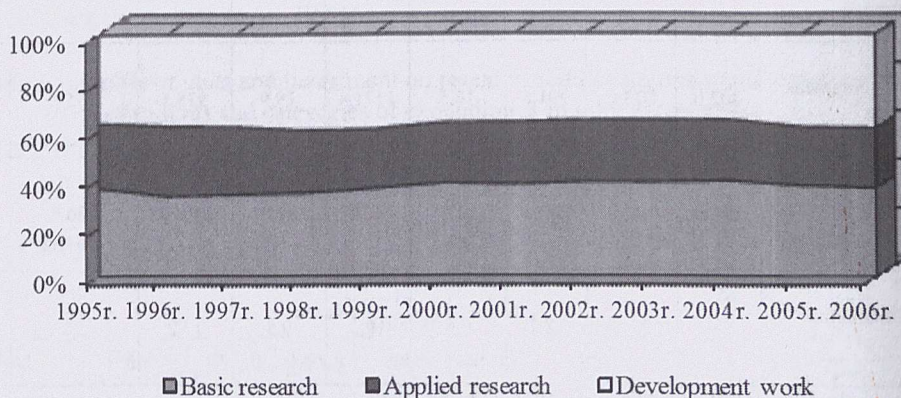


Image 1 The structure of the types of research conducted in the years 1995 to 2006

Source: *Science and Technology in 2006, GUS, Information and Statistical Papers, Warsaw 2007*

In developed countries such as Switzerland, Iceland, France level of spending on R & D is 2 - 3% of GDP at an average 1.85% for the European Union (EU27) [10]. However, in this area Scandinavian countries (Sweden, Finland), Asian countries such as Japan, South Korea and the United States keep the lead. Detailed data for the countries of Europe and the world are located in the Image 2.

It is also an indication on the fact that Poland is in the group of industrialized countries, which in the structure of expenditures on R & D, has the largest share of the state. In almost all developed countries in Europe, these proportions are reversed. This means that companies in these countries spend more on research and development than in Poland. Sweden, which has the highest share of expenditure on R & D to GDP ratio, has the lowest share of the state in the above expenses. A similar situation is in Switzerland, Japan and the United States. This fact is illustrated in the Image 3.

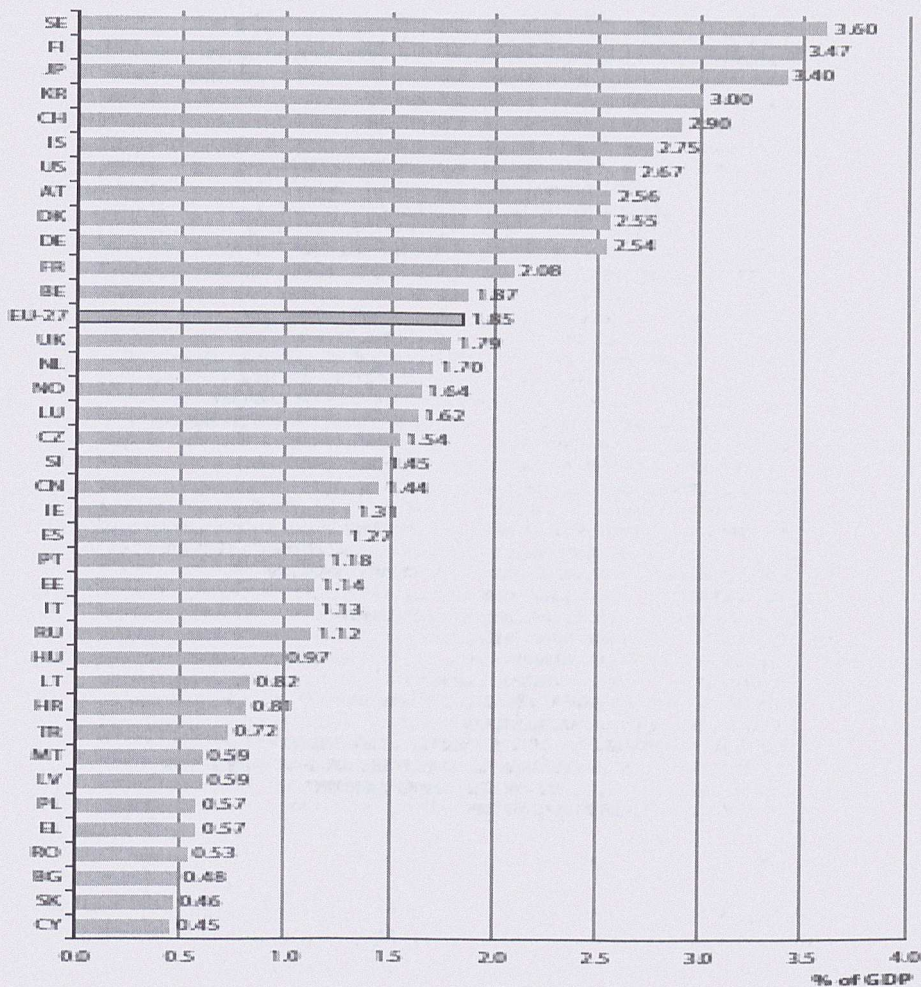


Image 2. The share of expenditure on R & D relative to GDP in 2009.
European countries and the world

Source: Science, Technology and Innovation in Europe., Eurostat, 2010

In view of these considerations, it is also noteworthy the growth in expenditure on R & D in Asian countries such as, for example, China, Malaysia, South Korea and Singapore. In the case of China in relation to gross domestic product in 2006, these expenditures were on a level 1.42% (10-years earlier the rate was 0.57%). Singapore and Malaysia also recorded a similar upward trend. Employment in this sector is also steadily increasing. And so: in 2006 per million.

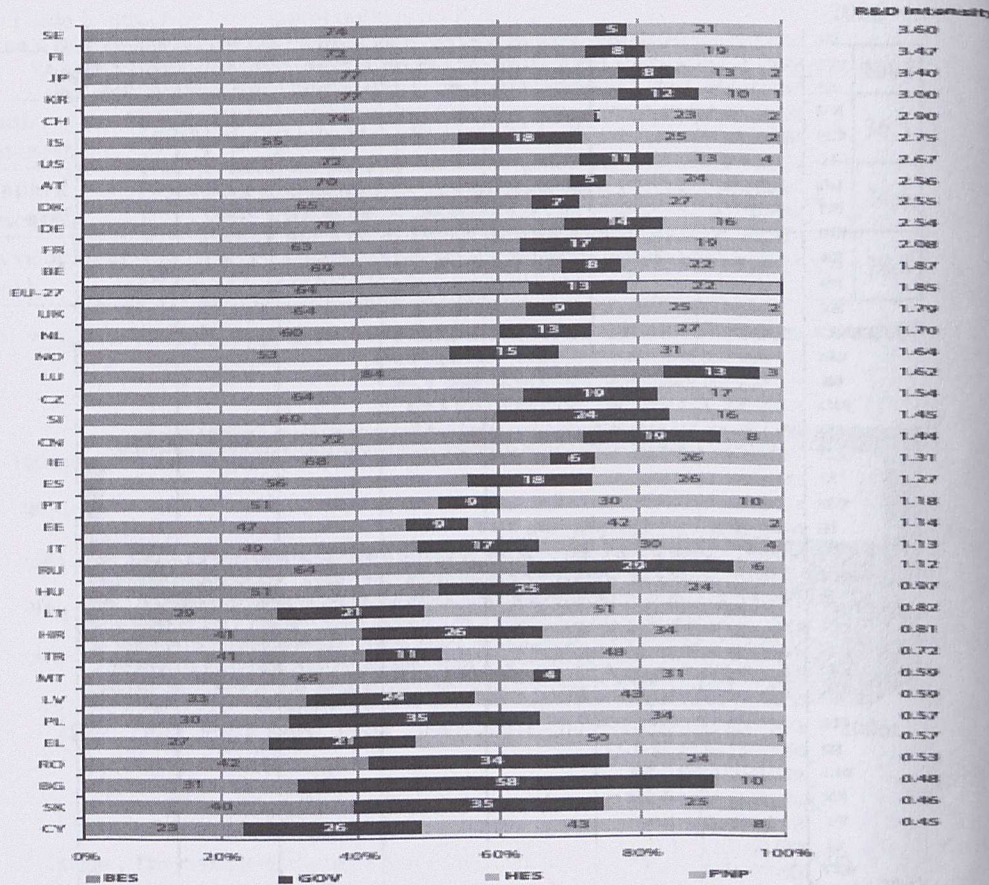


Image 3. Share of individual operators in the process of investment in R & D
 BES - Business companies, GOV - the public sector, HES - academic units, PNP - non-profit entity
 Source: Science, technology and innovation in Europe., Eurostat, 2010

South Koreans accounted for up to 4,162 scientists, more than in Western European countries such as France or Germany. This increase is related both to an increase in the number of native, well-educated professionals, as well as enhanced recruitment among the scientific communities of other countries. Both phenomena are also linked with the inflow of foreign capital to allow investment in the countries of the region [7].

In conclusion we can say that investment in R & D in Poland, which are the engine of economic competitiveness, are very low in relation to GDP. There is a predominance of state funding for research instead of the enterprises and there is very low share of expenditure on applied research in business practice.

3. Innovative companies and competitive economy based on knowledge

Analysis of these macroeconomic data for the Polish investment in R & D does not present a good situation, and the further development of such a trend will result in technological stagnation and slowdown in economic growth.

According to Eurostat, dated. 10.11.2010r., In the European Union average of 52% of production and service resulted in innovative activity (between 2006-2008). The highest share of innovative firms have Germany (80%), Luxembourg (65%), Belgium and Portugal (by 58%), Ireland (57%). The lowest share of innovative enterprises was recorded in Lithuania 24%, Poland (28%), Hungary (29%), Latvia (30%) and Bulgaria (31%).

These values will not be surprised if we consider that 52% of companies operating in Poland, are building their competitive position based on the price, and only 0.2% - offering innovative products and services [Examination of the 'Monitoring the condition of SMEs 2008 ', PKPP Leviathan]. There increases, in fact, the tendency of companies to introduce the practice of new innovative solutions (for example: using modern technology, modern management methods, expertise and skills, high quality products and services), but the scale of innovation is still low. As a result, over 51% companies recognize that they are more price competitive than companies operating in the European Union. While only 20.3% of companies believe that their quality is superior, 12.3% - have an advantage in terms of innovation of products and services, and 10.7% - have an advantage in terms of promotion and distribution. Meanwhile, building a competitive position based on the price is not a strategy for the future. Restructuring of costs has its limits. Expectations of consumers are changing. They expect products and services with better performance characteristics and quality that do not adversely affect the environment, and create opportunities for a better life [11].

Although these figures at this time are not satisfactory, companies in Poland are engaging in innovative projects. They invest in research, and use actively the funds (also from the European Union), run their own labs, and create platforms of scientific and production structures. But often such companies have high expectations of the institutional environment and innovation policy instruments. There is a feeling that the allocation of public and private funding is not oriented to the needs of the most innovative companies. Innovation policy is seen as incoherent and unable to take into account the dynamic changes taking place. You may notice a lack of ability to take advantage of the multiplier mechanisms that result from the activities of large corporations in research and innovation [1].

Modern innovation policy as understood by highly developed countries is a policy intellectually and technologically advanced. Fundamental research, applied research and modern technology is a showcase of a country progressive, modern, with future prospects. These countries include countries with an established democracy and a broad back-institutional, which is used to increase living standards and economic development [3].

One of the instruments of state policy innovation is the creation and operation of technology parks, which are organized economic entities to support the development of enterprises operating in particular in sectors where there are innovative and technologically advanced products or services.

The primary objective of technology parks is to intensify cooperation and flow of knowledge and the creation of formal and informal links between research institutes and enterprises. Otherwise formulated, technology parks act between business and research centers and provide a means for the transfer and use of modern technology. And so they are the instrument, which will stimulate investment in research and development of the private sector and so to say an element, which in Poland is a very weak link in the process of building a competitive economy.

In addition, Technology Parks are designed to contribute to the development of small and medium-sized companies with innovative projects. Depending on the scale of their operations, the effects of such actions can be seen at the local or regional level. In these parks, there are three types of policies: regional policy, technology policy and industrial policy. The purpose of each of them is to promote innovative entrepreneurship and promoting the development of high technology.

4. The legal - organizational activities grounds for technology parks in Poland

Technology Park is an organized center for innovation, which aims to support providers of technologically advanced products or services. In Polish law there is no specific legislation on the principles of establishing and conducting the business of such entities. Park managing bodies, which are companies, are created in general, under the provisions of the Act of 15 September 2000. Code of Commercial Companies¹. They may constitute an establishment of foundations or the university. In this case, the creation of such a center of innovation for education is subject to the Act of 27 July 2005. Law on Higher Education² in the case of the foundation - the Act of 6 April 1984. on Foundations³.

Scope of business technology parks is not regulated and depends on the provisions contained in the founding agreements, regulations and considerations of internal units.

In Poland there is no single organizational form of technology parks. It gives them access to the business resulting from regional economic conditions, social and cultural conditions and seek the path of their own development.

¹ Coll. Laws 2000, No. 94, pos. 1037, as amended

² Coll. Laws 1984, No. 21, pos. 1997, as amended

³ Coll. Laws. 2005, No. 164, pos. 1365, as amended

Therefore, freedom of organization of these units allows you to create different kinds of entities such as research parks, industrial, scientific - technological, industrial - technological, etc.

Despite the lack of clear regulations in Polish law regarding the legal and organization form of technology parks there are definitions of the technology park and an industrial park.

According to the Act of 20 March 2002. on financial support for investment⁴ technology park is defined as a set of separate buildings and technical infrastructure, created for the purpose of knowledge and technology between enterprises and scientific - research units.

The fundamental task is promoting a restructuring process, business development and local labor markets [13].

5. The importance of success of technological parks in the region

Competitiveness of enterprises and their sustainable development is based largely on new technological developments, manufacturing or organizational. The level of innovation in the economy determines the economic position of enterprises. Since only 1 / 3 of Polish enterprises are competitive in international markets thus increased efforts are required to increase innovation. Large role in these plans remain in business institutions.

To the most common forms of pro-innovation regional institutions includes:

- training and counseling,
- centers of technology transfer and innovation,
- credit guarantee institutions and loan funds,
- incubators,
- science and technology parks.

As can be seen from the above, technology parks are one of many instruments supporting innovation economy.

In Europe and overseas, technological parks have not always enjoyed great popularity among private companies. Until 1987, only 4% of European companies joined the park. The period of greatest flourishing of the parks and investing in new companies in their areas occurred in the year 1996 - 19.5% of today's businesses and in the year 1997 - 18.4%.

In Poland, the biggest interest of the business activities in technology parks started since 2004. Development of initiatives park was the stronger, the more there was the possibility of financing their investment activities and advisory services from European funds. This aspect entails some risk, because the attitude of business parks to subsidize funds only leads to the so-called. initiative pseudopark [4] which in the future will eliminate them from the functioning of

⁴ Coll. Laws 2002, No. 41, item 363 as amended.

the market . Therefore, it is important to answer the question, what are the past successes of technology parks in Poland and abroad.

The prosperity of technology parks depends largely on external conditions and on how to manage this type of unit. Previous experience in Poland and around the world shows that there is no single universal model of the park, or organizational template ensuring success.

There are factors which have a significant impact on the the level of development of a technology park: the attractiveness and economic potential of the region, the relationship between the park and others in the region and outside the region, the policy of selection of the companies in the technology park.

Technology parks in underdeveloped regions affect the development, but the regions highly developed support activities of the parks and their development. Moreover, the success of the park depends on companies that operate in it and their choice in the selection process. So, particularly the fact if this choice is thoughtful and consistent with the policy of regional development.

The primary role of all parks is to stimulate innovative activities in the region and to promote awareness of the use and development of new technologies and production techniques. Such action is possible at the interface between science and business. Hence, technology parks, among others pursue the following tasks:

- provide space and technical infrastructure to conduct business (laboratories, office space, magazines, production halls),
- provide services to support innovation activities (such as accounting, marketing),
- mediate the contacts between academic environment and business people,
- provide advisory services related to, ex: transfer and commercialization of knowledge.

Analysis of the experiences of the impact of technology parks in the development of the region shows that the key to success or failure is the institutional environment in which it operates the park. In the process of creation and analysis of activity it is not appropriate to compare the technology park with schemes operating in the U.S. Park's success depends on the specific circumstances of the region and its infrastructure. Also relevant is the fact that the activities of the park are seen only in the long term and on this basis to assess the actual success or failure in its business [8].

6. Practice mode and success of the Polish Technology Parks

The first Polish technology park was established in 1995. under the name of the Poznan Science and Technology Park, within the statutory and economic activities of the Foundation University Adam Mickiewicz. Currently, there is 45

distinguished technology parks in Poland, which are divided into the following categories:

- group I - advanced organizational parks with a full range of business office (5 parks),
- group II - parks in the early stages of development (12 parks),
- group III - parks in preliminary-phase of adaptation (10 parks),
- group IV - parks in the design and preparation of the organization (21 parks).

The average technology park in Poland is characterized by the following data.

1. Surface - 58 hectares.
2. Development area - 20 ha.
3. Number of firms -24.
4. Average number of employees in enterprises parks - 611.
5. Number of small technology companies - 8.
6. Annual budget (in million. zł) - 9.
7. Covering the budget revenues by rent and service charges -56%.
8. Number of cooperating R & D units - 6.
9. Employment in managing the park - 17 [6].

The primary initiative in the majority of technology parks are incubators, which offer favorable conditions for small businesses with innovative ideas.

An important element of the parks attractiveness are counseling services, mortgage brokerage, leasing, infrastructure, computer networks, seminar rooms and database. Until now, most of the parks focus their efforts on infrastructure issues. However, it is also important that efforts are focused on the organization of services for companies with advanced technologies.

If we take into account that the majority of Polish technology parks are under development, it is clear why we don't have many examples that demonstrate their overall success, which means the full realization of their mission.

But you can certainly find a lot of projects and activities that show a lot of involvement in the future, which will achieve progress in economic development.

It is a great success to create an innovative environment where the local authorities, business institutions, enterprises and scientific institutions will be involved. Bełchatów Industrial and Technology Park Sp. z o. o. is an example of such a model of the interactions between different institutions where the shareholders are local governments, Municipal Development Foundation Kleszczow, BOT Power Station SA, Brown Coal Mine "Bełchatów" SA and the Technical University from Lodz. Maintaining balance in the shareholder structure was a factor of the success because the dialogue between the various partners allows for the transmission and adaptation of innovation.

An important factor for success is the proper selection of companies to technology parks, this means that companies must adopt a specific profile. An example of success in this regard is the Technology Park from Kraków, where the competitions are carried out on business plans and technology projects,

through which the selection is run of individuals with the highest potential and most likely the staying power on the market.

The success of the park is also in its range of services, both those of strategic importance and additional services. Thus, Experiment Science Center was established in the Pomorski Science and Technology Park, whose mission is to promote learning among children and adolescents. However, in Nikel Technology Park there was created a nursery for companies operating in the park as the form of additional service.

Since the basic operation of science parks - is a technology transfer and commercialization of technology, so the offer for patent information found high recognition among companies of the Pomorski Science and Technology Park. Advisory services in patent law and protection of intellectual property rights have had a great success.

Another example of the success of technology transfer was the project "Fire - up" achieved by the Toruń Technology Park, which was designed to support innovative companies from the University of Nicolaus Copernicus. Therefore, organizational and legal procedures have been prepared which can regulate the process of commercialization of research results at the University of Nicolaus Copernicus. These documents include "rules of the management and use of intellectual property and legal protection of intellectual property of the University of Nicolaus Copernicus" and "Regulations of the creation of spin-offs in the University of Nicolaus Copernicus".

Cooperation and construction of cooperative networks between institutions and enterprises in the region achieves the success of any science and technology park. Some of the parks operating in Poland understand the benefits that result from such cooperation and, therefore, take many different types of initiatives that stimulate the cooperation of companies located in the park as well as cooperation with other partners in the region. An example of such collaboration is the Technology Park from Kraków and Technology Park from Tarnów which, by the Regional Development Agency in Tarnow, are involved in the International Cluster of Innovative Technology "Minatech". An interesting proposal has also been prepared by Podkarpacki Science and Technology Park, which operates within the structure of the Rzeszów Regional Development Agency. Namely, it is a Investor Service Centre, which also is a partner of the Polish Agency of Information and Foreign Investment. As part of this project there has been prepared base of information about the investment areas, office space and warehouses, as well as all procedures related to investment process. The analysis of all scientific and technological parks shows that every eighth company carries out research and development, and the best units are those entities from 40 - 60%. This element is an important indicator of efficiency, which shows the mission of technology parks, which will improve in the near future due to the completion of many infrastructure investments in R & D.

In science and technology parks there have currently been recorded 17 patent applications with the Polish Patent Office, 7 in the European Patent Office (EPO) and 16 trademarks. Eleven business parks have been awarded at

international exhibitions, and 39 for national exhibitions and competitions. (These data is not fully complete due to lack of data collection in technology parks) [2].

In recent years show more and more the specific specialty of technology parks. Developing profiles of specialization is visible at a time of selection of entities applying for a place in the park, and specific grid links with scientific bodies and development services for a particular type of company. Most specialty parks (65%) are related to the IT, health and medical engineering (48%) and biotechnology (36%).

7. Analysis of barriers in the process of development of polish science and technological parks

The potential activation of innovative entrepreneurships are the most common problems and barriers to development of parks. In this process the interest in problems of the scientific community is absolutely necessary. Opinions of managers of technology parks show the closure of the environment for commercial activities based on knowledge [5].

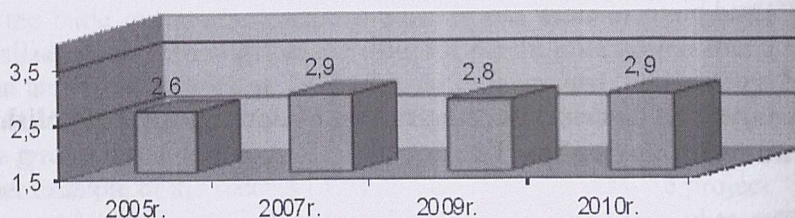
Table 3. The main barriers to the development of Polish technology parks in the years 2004-2010

Specification	2004	2005	2007	2009	2010
Legal restrictions and lack of procedures for technology transfer	no data	2,6	2,9	2,8	2,9
Lack of cooperation with the scientific community	2,4	3,0	2,5	3,1	2,8
Lack of funds for equipment and adaptation of buildings	2,8	3,1	2,0	2,7	2,6
The reluctance of the scientific community to the commercialization of scientific achievements	2,8	2,4	2,8	2,5	2,5
There are no projects for commercialization	2,8	3,0	2,6	2,5	2,6
The bad economic situation in the region	4,0	2,1	1,6	2,1	1,7

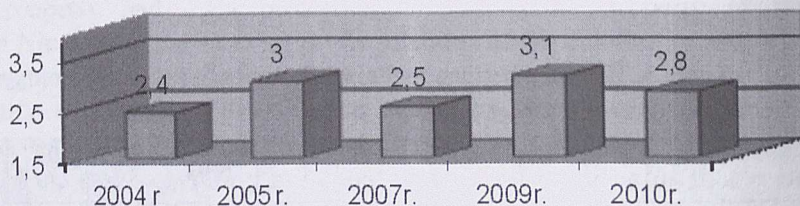
Source: K.B. Matusiak, Innovation and entrepreneurship in Poland. Report 2010, SOOIPP, Warsaw, 2010; (ratings were made on five-point scale, where 1 is the lowest and 5 the highest score)

The effectiveness of each park, to a large extent depends on the generated mechanisms for transfer of technology from research centers to business. As it has been previously presented, the average Polish technology park has at least

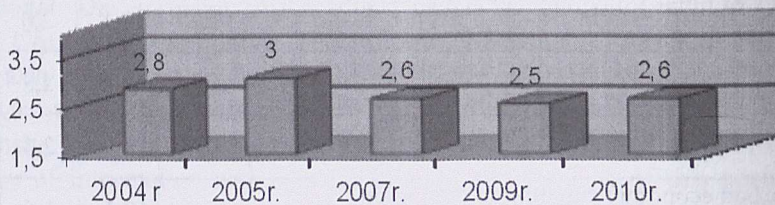
six links with research institutes or universities. Cooperation between these parties concerns joint projects with European funds, seminars and conferences. There is worse level of cooperation with universities cell technology transfer, with realization of implementation projects, and with use of laboratory space and scientific research.



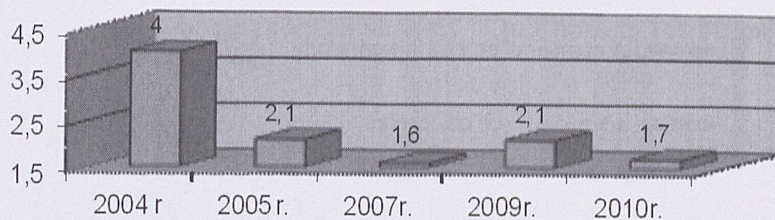
■ Legal restrictions and lack of procedures for technology transfer bd



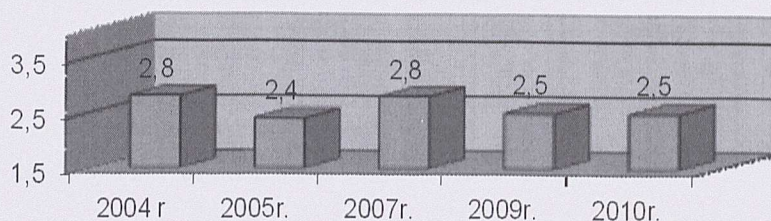
■ Lack of cooperation with the scientific



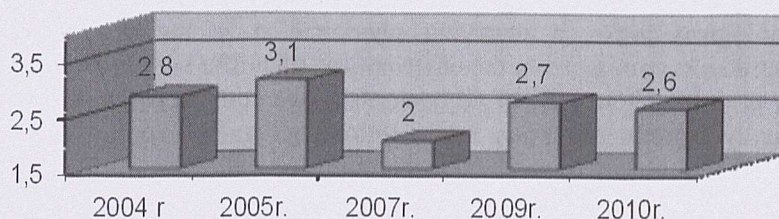
■ There are no projects for commercialization



■ The bad economic situation in the region



■ The reluctance of the scientific community to the commercialization of scientific achievements



■ Lack of funds for equipment and adaptation of buildings

Image 4. Analysis of the factors limiting the development of technology parks in Poland
 Source: K.B. Matusiak, *Innovation and entrepreneurship in Poland. Report 2010, SOOIPP, Warsaw, 2010*; (ratings were made on five-point scale, where 1 is the lowest and 5 the highest score)

Average Technology Park in Poland is co-working with about 26 business institutions. These include academic institutions (8.5), local and regional operators (6.3), government ministries and agencies (4.4) and support institutions (7). The group of partners from science and research among universities and research and development units. However, quite rare are the units of the Polish Academy of Sciences.

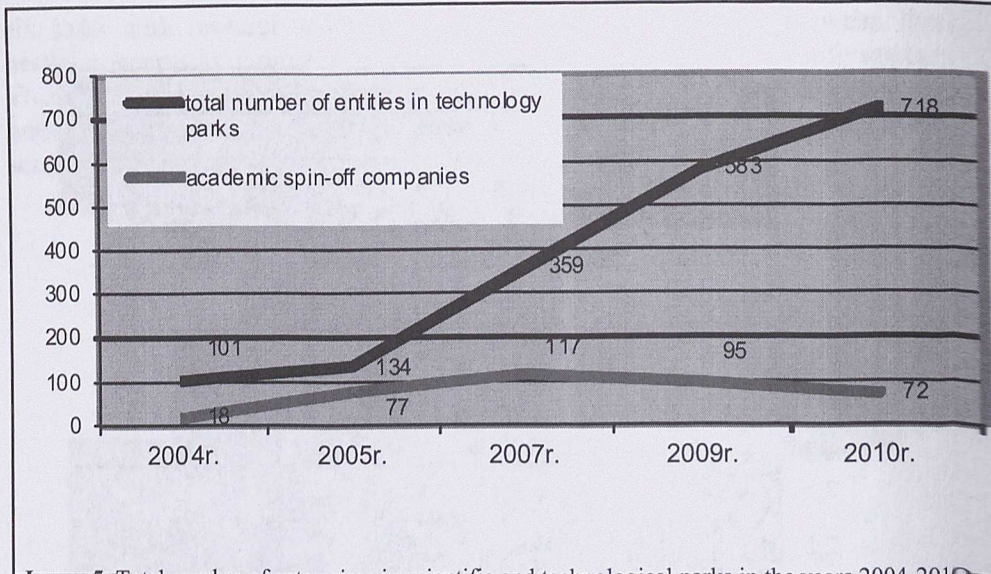


Image 5. Total number of enterprises in scientific and technological parks in the years 2004-2010
 Source: Source: K. B. Matusiak, *Innovation and entrepreneurship in Poland. Report 2010*, SOOIPP, Warsaw 2010

The highest utility is attributed to the cooperation with units of local and regional (4.2 on a five-point scale), the Polish Agency for Enterprise Development (4.1 p) and higher education institutions (4p).

Despite the dynamic growth of enterprises in the Polish scientific and technological parks, a worrying phenomenon is the decreasing share of entrepreneurs coming from the environment scientific and research environment. They now constitute 10% of all businesses operating in parks, and their number gradually decreases as shown by the following data sets.

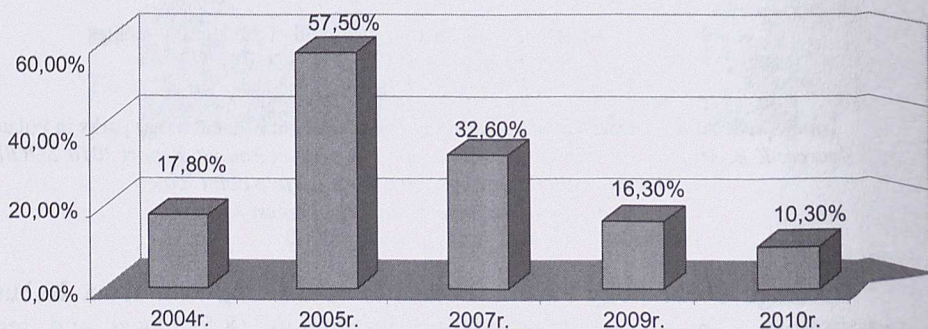


Image 6. The share of innovative enterprises, spin-off companies including technology parks in the years 2004-2010

Source: K. B. Matusiak, *Innovation and entrepreneurship in Poland. Report 2010*, SOOIPP, Warsaw 2010

Alarming phenomenon produces an analysis of priorities in the business of technology parks.

Table 4. Types of priority activities in technology parks in the years 2005-2010

Description	2005	2007	2009	2010
The development of an attractive location for business	3,9	3,8	4,1	4,5
Fill the prepared area in the park	3,4	3,8	3,2	4,4
Support and incubate new technology companies	4,4	4,6	4,4	4,3
Construction of learning networks – business	4,9	4,5	4,3	4,2
Attracting investors to the region	3,6	3,7	3,6	3,9
Creating new jobs	3,9	4,3	3,8	3,7
Transfer and commercialization of new technologies from science to business	4,4	4,1	3,6	3,5
Cluster development and construction of networks	-	3,1	3,9	3,4
The development of specific innovative services	-	-	3,4	3,4
The development of modern products which are not manufactured in the region	3,2	3,1	3,1	3,1

Source: K. B. Matusiak, Innovation and entrepreneurship in Poland. Report 2010, SOOIPP, Warsaw 2010

The main goal of park projects is to create a favorable conditions for technology transfer and commercialization, support the development of innovative companies and assist in the development of new products not manufactured in the region. However, data from the table above indicate a change in the nature of the pro-innovation into the business. This means that the actions which are the basis of the knowledge economy are weakened.

However, more and more efforts are directed to develop an attractive location of parks, maximum use of the Park area which translates to his financial advantage, and to attract foreign investors. Such trends threaten the mission's innovative technology parks and regional competitiveness.

8. Summary

In conclusion the above analysis it can be stated that investment in R & D in Poland, which are the engine of economic competitiveness, are very low in relation to GDP. There is a predominance of research funding from of state. Another issue is the low share of expenditure on applied research in business practice. This situation is reflected in the performance of the parks - technology. The effectiveness of these units depends on the level of cooperation with research centers. Cooperation between scientific - research units, and scientific and technological parks operates mainly in soft projects, namely the organization of training courses, conferences, seminars and joint projects with European funds. However, there is weak operating efficiency of transfer and commercialization of research.

Despite the short history of operation, the Polish science and technological parks are successful in the development of pro-innovative business environment. Nevertheless, research and development units need to be more involved in building a knowledge-based economy and direct efforts to pro-market studies.

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