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Developing and launching the INNOPENA Internet platform to unblock the flow of innovative solutions between R&D and industry in Poland¹

Research and development activity refers to the transformation of money into knowledge. Innovations refer to the transformation of knowledge into money.

Esko Aho, former Prime Minister of Finland

1. Introduction

The most important milestones in the progress of civilization are occupied by broadly understood technological innovations and achievements in technical sciences. They allow for production and refinement of new products and services.

Present key technologies are characterized by high expenditures on R & D, the complexity of solutions, decreased time to enter the market and shorter product's life cycle, rapid diffusion of innovation, rapid aging of investment and technology, and in the initial period by high financial and market risk. According to the global statistics, a given branch of industry is considered high technology if the expenditure

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on R & D exceeds the value of 5 % and even much more as in the case of biotechnology, nanotechnology, and pharmaceuticals. Companies specializing in such industries currently spend up to 20 % of the revenue coming from their use on R & D. Research and development activities last even several years. These conditions create a technological gap between the leading countries and those catching-up. In Poland, compared to most developed economies in the world, including some European Union countries, this gap is quite significant. Changing this state should be one of the most important objectives of the Polish economic policy as well as the scientific and technological one.

Poland is currently doing well with the economic crisis and challenges of new markets. The country's economy is more modern, innovative and competitive than a few years ago. But still the resources of research and development facilities and scientific institutes are not being utilized. Expenditures on R & D are small, which can lead to a trap of median income (approximately 70% of the average GDP *per capita* in the EU), or medium innovativeness and competitiveness. The article attempts to present the current situation the intensity of cooperation between the processing industries with the sphere of science, as the determinants of improvement. Data analysis involves several variables for Poland and in meso-scale for Greater Poland Voivodeship. The analysis used data based on GUS statistics (Science and Technology 2010, PNT-02 reports for the year 2010), survey data (Talaga 2013) and the international rankings. However, the main aim is to present a new and unique platform - INNOPENA ® which aims to facilitate cooperation between small and medium enterprises (SME) and the sphere of R & D based on the model of 'open innovations'.

2. Problems of low innovativeness and competitiveness of Polish industry

Poland's innovativeness in the macro scale has not been improving over the years. Poland belongs to a group of catching-up states among the other EU countries. Competitiveness, however, has been improving steadily and in 2011 Poland ranked 34th among 58 countries (World... 2010). Also the entrepreneurship of managers increased in 2010 (from 33rd position in 2008) to 6th position most probably due to good growth of GDP in 2009 and 2010 during the current economic crisis.

There is a widespread belief that the innovative activity of enterprises depends on available resources, among which financial ones play a major role. According to Central Statistical Office data, internal expenditure on research and development in 2009 totaled 9.07 billion zł. This represented 0.74% of GDP

or about 238 zł per Polish citizen (Rocznik... 2011). These expenditures situate Poland on the 22nd place in the EU. A very low share of expenditure on R & D in the structure of budget expenditure has been quite disturbing over the period of transition. It is several times lower than the Lisbon target for the EU (3%) and three times smaller than the average for the EU-27, which equals to 2.0% (Eurostat).

According to Bukowski and Śniegocki (2012) ... 'there, unfortunately, prevails a malicious conviction that the state does not have to spend more on research than it does today, because it is the role of the private sector ...'. Representatives of this view do not realize that public money serves as a point of ignition for private innovativeness through the development of technical infrastructure and research. When public funding of R & D exceeds the critical threshold of approximately 0.7% GDP, which is about 0.3 -0.4 %age points more than in Poland today, the tendency of companies to undertake risks linked to innovativeness increases greatly (Bukowski, Śniegocki 2012). It becomes necessary to increase investments in R & D in order to slowly move towards the average EU level.

The responsible management of innovativeness in Poland requires, in the next few years, to double the public expenditure on education and R & D. Just to ensure that every year it rises by nearly 1.5 billion zł which is about 0.1 % GDP. So, it is as much as it has been spent on preparations for the EURO 2012 in the last four years. Causes of low expenditures on R & D in Poland are believed to stem also from the absence of fiscal mechanisms to support research and development and the little importance of the state in creating innovation-friendly environment.

Not only the level but also the structure of expenditure regarding innovativeness is incorrect. The budget is dominated by 60.4%, while enterprises are only involved in 27.1%. The other shareholders are composed of foreign funds - 5.5%, higher education - 6.7% and private non-profit institutions - 03%. International statistics shows that highly innovative countries have an inverse investment structure with the dominance of private entities and only a few dozen % share the state budget. This is the case of Japan, the United States and many other countries (Zalewski, Skawińska 2011).

The lack of funding of the R & D sphere affects the number of professionals employed in this sector. In 2008 only 4.7 persons out of every 1,000 employees worked in research and development, while in Germany it was 13.4, in the UK - 11.7 and in Finland even 22.4. There has been a reduction in the number of individuals employed in research and development facilities in recent years. Krzysztof Kurzydłowski, director of the National Research and Development

Center believes that ‘... the number of scientists in Polish industry is dramatically low. You have to associate the leading companies with research centers ...’ (2012). More and more companies invest in ambitious projects.

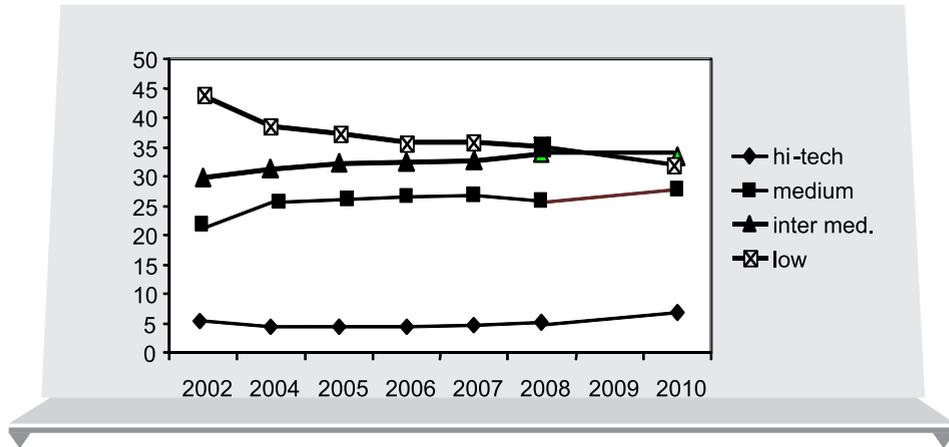


Figure 1. Structure of industrial output by level of technology

Source: own drawing based on Science and Technology, 2010

The weak financial situation of the research and development sector is reflected in the structure of sales in industrial processing. In 2009 the share of high-tech products amounted to 5.36% (slight increase compared to 2002), of medium high technology products - 26.3% (stagnation), of medium low technology - 33.75% (slight increase) and of low technology 34.6% (slight decrease). Favorable evolution of high-tech and inter-med is very slow (Fig. 1). Still more than 68% of all goods sold belong to a group of not modern goods, which indicates a high proportion of raw materials and low processed products in the volume of production.

Polish industrial enterprises purchased 463 licenses in 2009 but sold only 82. The Patent Office reported 2899 inventions and 1536 patents issued along with 431 protection rights. Per 1 million inhabitants in Poland there are only 3.61 of European patents, while in Sweden this number amounts to 280 and in Germany to 283. Poland occupies the last position in this ranking (Rocznik... 2010). The reason for this is the lack of culture regarding protection of intellectual and industrial property rights - proven by several years of follow-up reports, PNT-02 (Zalewski, Talaga 2011).

Greater Poland Voivodeship occupies places above the average in different rankings of innovation and investment attractiveness of Poland (e.g. Analiza... 2008; Zalewski 2011; Brodzicki 2010). It can therefore be accepted as a good regional representative of the whole country. Reports of the Central Statistical Office on the innovative activity for the years 2008-2010 were filed by 3479 manufacturing companies from Greater Poland. Out of them 559 subjects identified themselves as actively innovative. This shows an increase in the number of entities to fill the PNT-02 form as compared to 2006-2008, while there has been a reduction by 102 entities in the number of innovative enterprises.

Private companies dominate the group of innovative enterprises - 551. The numbers in terms of employment are nearly equal in the case of small and medium-sized entities (230 and 243 respectively).

The share of high technology companies in product and process innovations remains very low in relation to the years 2006-2008 - over 4%. Low technology enterprises dominate in the number of 258 (51%), while the number of medium-high and medium-low technology enterprises remains 26% and 19% respectively.

In light of the statements included in the report the information about the importance of various sources of information for innovative activity is very disturbing. For the biggest number of companies they themselves form the most valuable source of information. That means closing to the inside and insulation from the environment. Market and institutional sources are rated as 'irrelevant' by most companies. Institutes of the Polish Academy of Sciences, research and development units and universities are rated as an 'irrelevant' source of innovation by about 85% of companies. Even the scientific and technical societies are not considered by companies as partners and do not have any stimulating effect.

The level of protection of intellectual property remains an important factor in determining the degree of innovativeness. According to the data obtained from the Central Statistical Office (for 2008-2010) - 229 representatives of manufacturing companies in Greater Poland filed trademark applications in the Patent Office - 113 companies; industrial designs - 51 companies; designs - 29; inventions - 36 companies. A total of 39% of all innovatively active enterprises protect their technical ideas but only five companies (2%) belong to high technology sector.

Independent survey carried out in the summer 2011 on a sample of companies in Greater Poland (Talaga, Zalewski 2011) confirms the trends described above. Most companies (55 to 83%) after 2008 incurred no expenditure on various forms of innovative activity. The exception is the purchase of new machinery, equipment and software, in which 70% of enterprises invested. In the same period

at least 66% of companies were not strengthened by the activities that shape the innovative potential of employees (14 criteria), which is evaluated as average. Many respondents believe that they do not have to cooperate with similar entities in the region or with the science sector. For most of them the major sources of competitive advantage in the market will continue to be cost optimization, improvement of processes and products or introduction of new ones. Although these are the important sources of competitive advantage, entrepreneurs fail to acknowledge that the cost advantage loses its meaning. Only about 15% of respondents believe that they will need to change their business model in the future (see Chesbrough 2003). There is a lot of fondness for organic produce, conserving energy and other resources. But only 5% of the representatives of businesses acknowledge opportunities in product and service innovation for the elderly who constitute an increasing proportion of the population.

3. Position of Poland in European ranking for innovation

The above reasons form one of the main causes for Poland scoring 22nd in the European ranking for innovation - the so called Cumulative Index of Innovation in 2010 and 23rd in 2011 - among 23 EU countries (EIS 2010). This result allows one to place Poland among the states catching-up more innovative countries. Low innovativeness confirmed by the SII index, the structure of industrial output and the participation of high technology products in exports all affect the buggy position of Poland in terms of competitiveness of its economy. Poland ranked 34th in 2011 in the ranking of 59 world countries, which gives it a 14th place among the EU member states (World...2011).

The sources of innovation for companies are varied and it is worth paying attention to some of them. For most companies the important sources of innovation lay inside themselves, but they exist within the same group of enterprises only for a few firms. Unlike in many other countries, Polish companies do not utilize the achievements of science (universities, Academy of Sciences) and of research and development (R & D) units. The vast majority believes that PAN institutes, research institutes and universities are of no importance as a source of innovation (Zalewski, Talaga 2011). Only a few entities have recognized that these units have high or medium impact on innovation. Many companies also raise the important problem of the lack of qualified staff, information on markets and finding a business partner or a technology.

All the above confirm the existence of barriers that impede innovation and

inhibit the activity of almost 84% of enterprises. Without going into intricate and detailed analyses, it can be concluded that companies mostly rely on their own strength and resources in the development of inspiration. Thus, they remain closed for other companies of their group, as well as for competitors from other industries. Innovative activity is costly and often risky (also in financial terms). Approximately 25% of companies indicate that lack of their own or external capital, and the high cost of innovation form the most important obstacles to innovative activity. Also, about 25% of respondents indicated quite the opposite.

4. The barriers between science, R & D and businesses

There is a “wall” between enterprises and the sphere of science which often prevents collaboration, sharing of knowledge, ideas, concepts, information about technology markets and the demand for trained personnel. Documenting the gap in the science-industry co-operation should not be based solely on scientific and statistical studies. This problem is very actual as evidenced by the comments by politicians and especially entrepreneurs in recent months. On April 24, 2012 a list of 500 largest Polish firms was published (List ... 2012). In an interview on the key stakeholders who have a significant impact on the strategy of these companies none of the respondents mentioned universities, research institutes, NGOs, employers’ organizations. We must remember that “the sphere of science possesses knowledge but the key to its use lies in the realm of industry and in Poland there is a deep chasm between these spheres because businesses speak a completely different language than scientists. Cooperation does not belong to the strengths of the Polish society. Therefore, often the potential of an individual does not translate into innovativeness of the public. In addition, companies also rarely cooperate with each other” (Firmy... 2011).

There are various causes for the existence of this barrier separating the two areas. We express the view that the faster it falls, the better for the economy. So an ongoing search is taking place for appropriate tools that can be used to weaken and dismantle the barrier. It should be noted that these barriers also exist between business, academia and the third link in the triple helix of innovation (Etzkowitz, Leydesdorff 1997): national and local authorities. It is difficult to talk about a clear and effective scientific and industrial policy. The belief that “modernization aims to reduce the quantitative differences between us and the West and that concrete and steel are enough to turn Poland into a rich country” (Kurs... 2012) is not enough. Simple reserves of economic growth and competition in global markets are becoming exhausted.

Changing the rules of law in the sphere of economy, finance, education and the science sector is and will be essential to boost this cooperation. State, local government authorities, educational system should all work to improve education and the social capital in Poland. High social capital equals high level of trust, cooperation, integrity, loyalty, respect for norms, solidarity and participation (Badanie... 2011). Without these qualities it is difficult to talk about common construction of relationships and cooperation for the future. They form a source of information exchange needed for the creation of new products and innovations.

A lot has already been achieved to strengthen the Polish innovativeness. For example, Regional Innovation Strategies have been developed. About 61 institutions for technology transfer have been founded in Poland (the so-called science parks, technology, innovation and entrepreneurship incubators, centers of excellence) (Centers 2011). However, their effects for the growth of innovation are staggering (Benchmarking... 2010, Józefiak 2006). A similar situation is taking place in Greater Poland according to recent research (Skawińska, Zalewski 2012).

According to Jerzy Hausner (2012) "Poland is developing, but it is not using all the possibilities available. This is an extensive development. We are using the available resources obtained from the EU but we are not multiplying them. 'Poland 2030' report, just like the report of the European Union's development, is a vision for the future, but does not provide any means to achieve strategic goals. Jerzy Hausner holds a view 'that the EU money spent on innovation used to spoil the market and companies. We showed an extremely bureaucratic system apparently subordinate to the logic of effectiveness, the system of bureaucratic safeguarding. Money for innovative projects is spent on not innovative ones because they are preferred as those that do not generate any risk. "The creation of e-government system, which is to assist the decision making process constantly, is far from being accomplished.

The Internet as a tool for communication and information in the field of innovation has also been used. There are various online platforms run by central government ministries and agencies. At the local level such platforms have been established by city offices, marshals' offices, technology transfer units, etc. They conduct diverse and rich activity mainly in the field of information, training provision and advice, organization of competitions, trainings, databases etc.

Poland, however, lacks a web platform based on the concept of open innovation (Chesbrough 2003). The idea of open innovation is presented in figure 2. A few platforms around the world are based on such a scheme - Imocentivie (USA), Innoget (Spain), Prosans (France), Nine Sigma (Japan). The principle of their operation is based on the following: A company reports a specific need for an

innovative product, technology, process. Representatives of science and even certain individuals create innovative solutions by strictly defined guidelines. It is even better if such a solution is ready and waiting for the possibility of commercialization. This would speed up the implementation of innovative ideas into the economy.

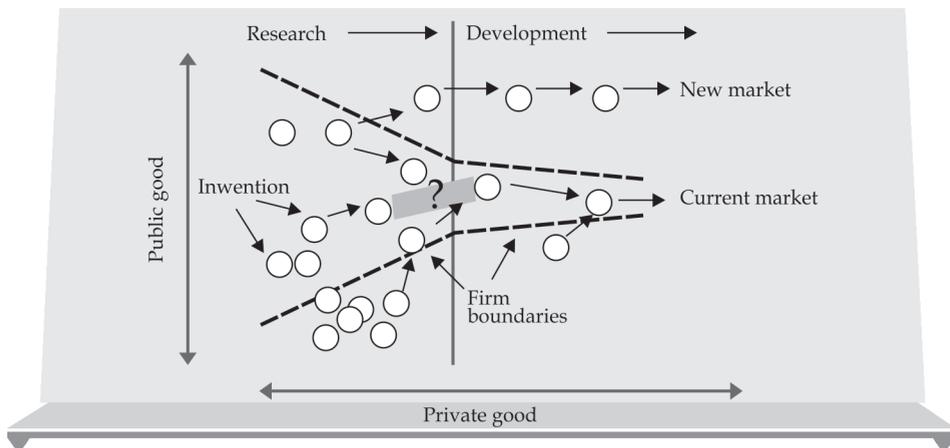


Figure 2. The idea of open innovation
Source: own drawing after Chesbrough 2003

This gap is to be filled by the INNOPENA® platform. It was built and launched at the University of Economics in Poznan, the project funded by the National Centre for Research and Development (NCBiR).

5. Platforma internetowa INNOPENA®

The word (acronym) INNOPENA® comes from the fragments of words in the name of the project. Its title is: „Developing and launching INNOPENA® Internet platform – INNOVATIONS FOR INDUSTRY AND SCIENCE for unblocking the flow of innovative solutions in the economy. Acronym INNOPENA® has a high level of positioning in search engines (e.g. Google) in the context of words like innovation.

The platform provides anonymity, safety, protection of intellectual property rights, business secrets and handles the entire procedure and all processes. Figure 3 shows the home page of the platform.

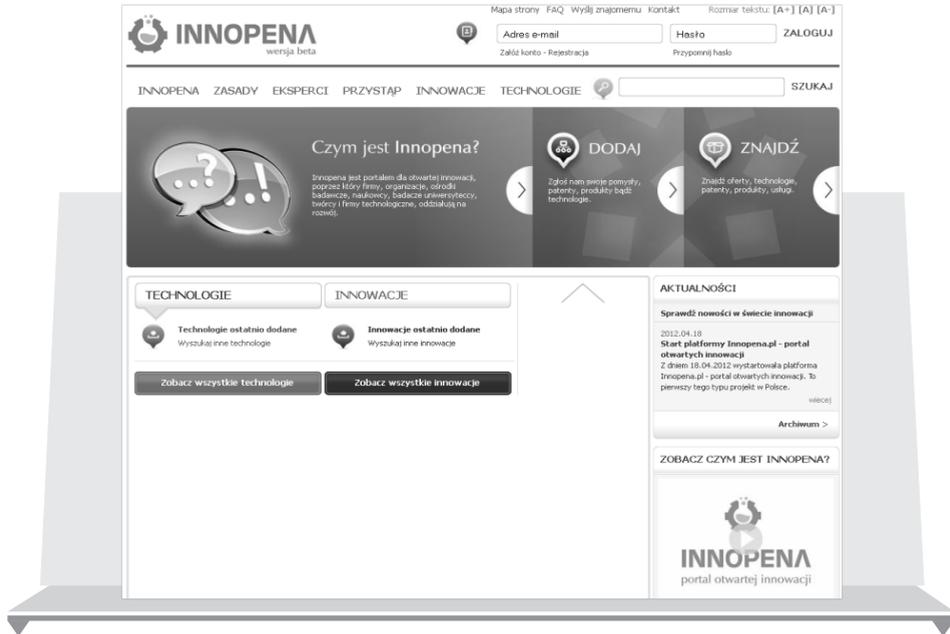


Figure 3. The home page of INNOPENA platform

The platform is to improve information exchange and communication between entities, especially small and medium size, mating the partners of economic sector with R&D (universities, Academy of Sciences, research and developments units) for mutual and faster completion of development and innovative projects in enterprises.

Through INNOPENA® it will become possible for companies to report problems with current business processes and search for ideas for new products, processes or organizational and marketing solutions. This will facilitate horizontal (inside a branch of industry) and / or vertical cooperation (between industries) for the exchange of knowledge, ideas, information about new and innovative ways of feasible solutions (in other firms / branches of industry). This will help to increase the competitiveness of enterprises.

Access to the platform is possible at two levels: a guest (see home page) or a registered user. Guests can learn and hear about the purposes of the platform, the rules and principles of its operation, about nominating the needs of entrepreneurs (called **seekers**) for new solutions and the technologies offered

for implementation by **Donors**. This information is provided in a keyword format and in a general fashion (without details). To supplement the common space in the platform there are: cloud tags, information about internships and practices for students, newsletter and e-learning module. After a separate log on to the latter module materials become available to extend the knowledge of innovativeness, competitiveness, entrepreneurship, commercialization of knowledge, etc. The current content of the module (8 subjects) will be expanded as user demand grows.

The second level of access to the platform makes full use of its resources after accession (registration) as a business, organization or an individual and determining the purpose (as a client in search of innovation, offering a solution to the donor, or both at once). Data from persons or companies are checked and then a contract is signed guaranteeing business data protection, commercial data protection, intellectual property rights, etc. Further communication takes place between the donors and seekers and experts. Only the registration allows the platform to carry out its mission, namely:

to provide an active assistance to entrepreneurs in developing cooperation and building a culture of openness and cooperation for innovation; The purpose of this activity is solving your problems with the cooperation and help of others - a method now recognized as one of the most effective for enhancing the competitive advantage of companies seeking partners and associating with those who can offer innovations.

Customers (K) refer to entrepreneurs seeking quick access to innovative solutions to their problems in the environment and those who encountered problems in their innovative activities – a problem they are unable to solve on their own (see figure 1). The question is whether the project should be stopped, abandoned, or is there a solution outside? For example, about 15% of the surveyed companies from Greater Poland in 2008-2011 abandoned innovative projects. The costs incurred were usually counted as a loss, and results rarely brought any profit. A spin-off business was not created in any case (Zalewski, In Press). Donors (D) - are persons and entities from the science sector (universities, R & D units, institutes), from business environment, other companies and individuals who are able to solve customers' problems quickly by taking part in "open innovation". Donors may know the solution to a similar problem in another area of production, process, organizational or marketing. They possess experience, fresh insights, imagination, knowledge; they love challenges and competition and can quickly find solutions in exchange for gratification, recognition and satisfaction.

The platform provides anonymity, safety, protection of intellectual property rights, business secrets and handles the entire procedure with proper agreements. A map of a part of one of the ongoing processes in which the company reports a need for an innovative solution is shown in figure 4.

After registration and logging a customer fills in an offer form briefly describing the problem and the amount of fee that they are willing to pay for a solution. Such an offer is posted on the platform and made available to interested donors. In the meantime the offer goes through an iterative process of validation (feasibility study) with the expert appointed by the platform. After the end of validation the offer awaits for response from the donor, who after registering and logging receives a complete and validated documentation of the problem and may proceed with implementation. The proposed solution may be consulted with an expert and / or customer in the iterative process (the 'negotiations room').

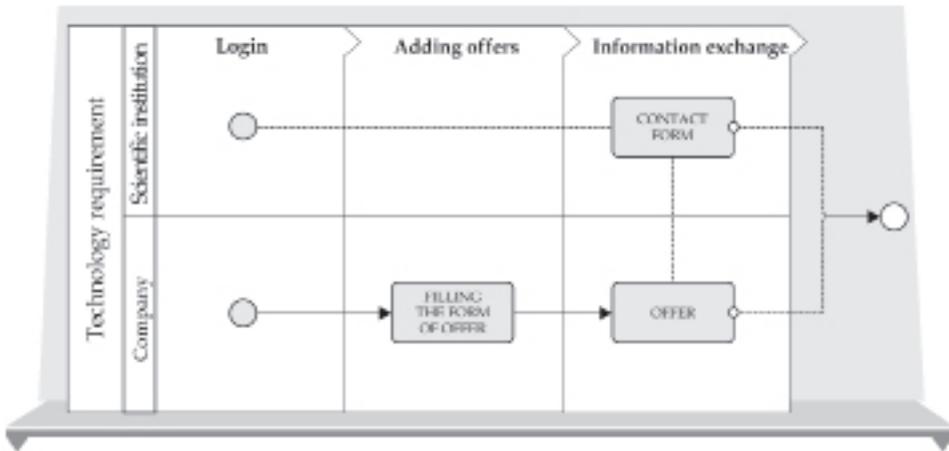


Figure 4. Map of processes in the customer (company) - donor relationship

Source: own study

During its initial operation INNOPENA ® platform will mainly aim at companies whose profile of production and innovation is similar to the interests and resources of expertise of the Faculty of Commodity Science of the EU in Poznań and commodity science environments in Kraków (University of Economics), Radom (Technical University of Radom), Olsztyn (University

of Warmia and Mazury), Gdynia (Naval Academy) and other affiliated in Commission of Commodity Science at Poznań Branch of Polish Academy of Sciences.

The expertise covers the following areas in particular:

- processing and food technology,
- food packaging materials,
- raw household chemicals and cosmetics,
- plastics,
- market research and development and testing of the marketing concept for
- new products,
- control of production processes,
- assessment of testing and inspection laboratories,
- validation of analytical methods,
- quality and environment management systems,
- safety in the food chain.

Conceptual and implementation works are complete. INNOPENA[®] platform is ready to tackle challenges at www.innopena.pl

6. Conclusions

The lack of co-operation and information exchange for fostering innovations between Polish enterprises of similar production (horizontal) or along value chain (vertical) and between industry and Universities, R&D sector has been observed and documented by various sources. This barrier hinder diffusion of innovations. To obey this problem, the innovative platform named INNOPENA[®] has been constructed and main pillars presented. This platform is supported by open innovation concept which could be used to increase the flow of science achievements into practice. From this point it is an innovation in Poland. The paper describes the main functions and processes occurring between actors: entrepreneurs seeking for innovation and scientists offering the solution. The platform is designated to support SME and respects property rights as well as confidentiality of all parties. The main challenge now is to inform all prospective users using various communication channels (Google Adwords, qr code, conferences, papers, journals and other means) about INNOPENA[®] platform finctions and services.

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Summary

Developing and launching the INNOPENA Internet platform to unblock the flow of innovative solutions between R&D and industry in Poland

This paper presents actual, unsatisfactory innovative activity of processing industry in Poland and one of its regions named Wielkopolska (Greater Poland). The analysis uses data from international and internal sources, as well as results of special research programmes. Various barriers were identified and particularly very low level of cooperation between enterprises and R&D sector represented by universities, institutes of Polish Academy of Science and others. The aim of this paper is to present newly established Internet platform INNOPENA®, which was built relying on the 'open innovation' concept. There is a hope, that this new instrument will improve cooperation for better innovation activity, especially in favour of small and medium enterprises.

Key words: innovation, open innovation, innovative platform, INNOPENA®.

Streszczenie

Opracowanie i uruchomienie platformy INNOPENA dla usprawnienia przepływu innowacji pomiędzy sektorem B&R a przemysłem w Polsce

W pracy przedstawiono niekorzystną i niską aktywność innowacyjną przemysłu przetwórczego w Polsce i Wielkopolsce, wykorzystując międzynarodowe i krajowe źródła wtórne oraz wyniki realizowanego programu badawczego. Zidentyfikowano w nim różne bariery i ich poziomy dla współpracy przedsiębiorstwami i sektorem B&R (uniwersytety, instytuty PAN i inne). Dla ich przełamania opracowano i zaprezentowano platformę INNOPENA®, którą zbudowano na paradygmacie innowacji otwartych. Jest prawdopodobne, że ten nowy instrument umożliwi lepszą współpracę zainteresowanych i wzmocni aktywność innowacyjną zwłaszcza w grupie małych i średnich przedsiębiorstw.

Słowa

kluczowe: innowacje, innowacje otwarte, platforma innowacyjna, INNOPENA®.

References

1. Analiza porównawcza innowacyjności regionów w Polsce w oparciu o metodologię European Innovation Scoreboard (2008), Inst. Techn. Eksploatacji-Państwowy Instytut Badawczy, Radom.
2. Skawińska E. (red.) (2011), *Badanie kapitału społecznego w Wielkopolsce: diagnoza stanu i perspektywy wzrostu*, Wyd. WSB Poznań.
3. Benchmarking of technological parks in Poland. (2010), Report for 2010. PARP, Warszawa.
4. Brodzicki T. (2010), *Ranking atrakcyjności inwestycyjnej województw Polski*, Instytut Rozwoju, Warszawa.
5. Chesbrough H. (2003), *Open Innovation: The Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Boston Mass..
6. EIS. (2010, 2011), *Innovation Union Scoreboard*.
7. Eurostat (<http://epp.eurostat.ec.europa.eu>).
8. Hausner J. (2012), *Zielona wyspa samozadowolenia, „Rzeczpospolita” 27.02.2012.*, s B6.
9. Etzkowitz H., Leydesdorff L. (1997), *In the Global Knowledge Economy: A Triple Helix of University – Industry – Government Relations*, Cassell, London.
10. Firmy muszą postawić na innowacje (2011), „Rzeczpospolita” 03.11, s. B 8-9.
11. Józefiak C. (2006), *Pobudzanie innowacji w : Raport o innowacyjności gospodarki Polski w 2006 roku*, red. T. Baczek, INE PAN Warszawa.
12. Kurs na południe czy na północ (2012), „Rzeczpospolita” 20.03, s. B8.
13. List (2012), *Lista największych polskich firm. „Rzeczpospolita” 24.04.2012.*
14. *Rocznik Statystyczny RP (2011)*, GUS Warszawa.
15. Talaga Ł, Zalewski R.I. (2011), *Innovativeness of manufacturing companies in the Greater Poland Voivodship in 2011*, *Towaroznawcze Problemy Jakości* No. 4(29), 9-21.
16. Talaga Ł. (2013), *Innowacyjność przedsiębiorstw przetwórstwa przemysłowego w Wielkopolsce w latach 2002-2010 w: Zalewski R.I. (red.), Nowe otwarcie na innowacje*, Komisja Nauk Towaroznawczych PAN Poznań.
17. *World Competitive Yearbook (2010, 2011)*, Institute of Management Development, Lozanna.
18. Zalewski R.I. (2008), *Rola i miejsce innowacji w burzliwym otoczeniu gospodarczym w: Żuchowski J. (red.), Filozofia TQM w zrównoważonym rozwoju*, Wyd. PIB Radom, 11-27.
19. Zalewski R.I. (2011), *Aktywność innowacyjna województw w Polsce w latach 2006-08, „Przedsiębiorstwo Przyszłości”, No. 4 (9), 16-30.*