

До визначених вище індикаторів були включені наступні: наукова діяльність (I_{ND_i}), рівень інноваційності (I_{PSS_i}), інвестиційні можливості (I_{IM_i}). В свою чергу запропоновані індикатори включають у свій склад ряд показників. Так, до складу індикатору наукова діяльність входять: обсяг наукових та науково-технічних робіт, виконаних власними силами підприємств; обсяг інноваційних витрат. Індикатор рівень інноваційності складається з: обсягу інноваційної продукції; кількості - освоєних нових видів продукції, виробництв нової техніки, впроваджених прогресивних технологічних процесів, введених в дію нових основних засобів. Індикатор інвестиційні можливості включає прямі та капітальні інвестиції. До результатів діяльності підприємств, які корелюються з вище визначеними індикаторами були включені наступні: обсяги реалізованої промислової продукції, фінансові результати, рентабельність операційної діяльності. При формуванні баз даних була використана інформація Державного комітету статистики України. Розроблена економіко-математична модель інноваційно-інвестиційного розвитку підприємств дозволяє розрахувати три варіанти прогнозу (оптимістичний, середньозважений, песимістичний) розвитку окремих галузей промисловості. Проведення оцінки можливих сценаріїв розвитку промислових підприємств є методичною підтримкою при підготовці та прийнятті управлінських рішень керівництвом структур різних рівнів та базою для визначення найбільш раціональної інноваційно-інвестиційної стратегії.

COOPERATION BETWEEN SCIENCE AND BUSINESS AS SOURCE OF DEVELOPMENT OF POLISH ECONOMY

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Modern economy increasingly depends on various forms of cooperation between enterprises, organisations of public or social nature¹ as well as between enterprises and higher education institutions. The opening for business concerns both scientists, PhD researchers and students. The idea constitutes an attractive way of self-development for the people and for schools it creates new areas of market opportunities. Setting up new businesses on the basis of new scientific discoveries is an everyday phenomenon in the developed countries of the Western Europe. Thanks to so-called spin-off enterprises the profits are shared between the inventors and schools alike.

In the European dimension transfer of knowledge is nowadays a tool to build economy based on knowledge. It composes the pillar for integration and

¹Łobos K., Cooperation between enterprises and public and social institutions as the source of opportunities for all branches of industry. Scientific Research of Wrocław University of Economics, Faculty of management 4, Theory of management, M. Przybyła (editor), Wrocław University of Economics, Wrocław 2010, pp. 179 – 187.

internationalization of scientific research, thus, the cooperation of scientific centres and enterprises constitutes the basic prerequisite for the civilization advancement for Poland. Conversely, lack of such transfer or its inadequate utilisation might inevitably result in squandering of the economic potential of Poland. In the paper, the authors touch upon issues concerning cooperation between research and development centres and enterprises, attempting to answer the question why the cooperation still does not achieve satisfactory level

The latest Innovation Union Scoreboard report shows that Polish entrepreneurs are still apprehensive about innovative solutions and too commonly walk the beaten track. Such a model allows to run a business at a descent level, yet it hinders success at the international arena. Polish government increases financing of research and development sector, it creates new research programmes for industries and it builds state-of-the-art laboratories. According to Prof. Barabra Kudrycka, Minister of Science and Higher Education, Polish science is becoming more and more prepared to engage into economic development of our country, however, as the eternal verity goes, the increase in supply will not be enough unless demand grows, i.e. industries' demand for the results of the scientific research².

According to Prof. Andrzej Jajszczyk, PhD. Eng, the Director of the National Science Centre "many enterprises are still in possession of basic reserves, therefore they may acquire innovations from foreign firms. It is cheaper to utilize something what has already been applied than search for something new. I am under the impression that Polish business matures for changes in the field and it shall soon support domestic innovations. For if we want to survive in the global market, we would need to invent new things. And now is the right time for that. That is not the matter of will or state mechanisms but – simply – the matter of the development of the economy"³.

Lack of demand for domestic innovations stems from the dependence of Polish economy on enterprises (corporations), which nerve-centres are located outside Poland in their home countries. As a result, it is not profitable for the corporations neither to create research centres within dependant markets because they already have such centres, of highest standards in their homelands, nor to invest into intellectual capital, which frequently is not of the highest world standards. And if it happens to be as such, they are usually employees assigned from the corporations' research centres. The above issue is explained with neo-technological theories of international trade and commerce, which place emphasis on the ramifications of technological advancement. The most widely know theories include: technology gap theory by Posner (1961), product life-cycle by Vernon (1966) and the theory of the economy of scale. Nonetheless, stimulating of the innovation capacities in Poland is not achievable without endogenous potential, so that the requirement of its enhancement seems justifiable.

² <http://www.nauka.gov.pl/ministerstwo/zdaniem-ministra/artkul/innowacje-to-odwaga-myslenia/>; dostep 15.02.2012

³ http://fakty.interia.pl/tylko_u_nas/news/dlaczego-polska-nie-jest-naukowa-potega,1706240,3439; dostep 11.10.2011

Due to dynamic economy of knowledge both the academic world and research and development centres face the challenge of development in the scope of 4 :

- capacity to transform knowledge into new products and services,
- creation of human resources capable of adapting to the changing market conditions,
- constant and lifelong studying and self-improvement,
- generation of the added value and integration with the socio-economic surrounding.

Let us hope, if other countries succeeded in the field of innovations, we shall succeed as well, despite the fact that Polish enterprises are far from being greatly innovative. Currently, Poland belongs in the group of five EU member states which spend on research and development the smallest amounts, merely as much as 0.56% of GDP⁵. On the other hand, the share of the export of products of the cutting edge technology in the export value in total amounts to mere 3%. That places Poland at the last position among the EU countries. Thus, the improvement of the cooperation between science and economy might be useful in bridging such negative trends.

What might be done to encourage entrepreneurs to utilise scientific potential of the higher education institutions? The authors are certain that we shall:

- utilise graduates' potential – increase of significance in relations with graduates,

- identify and analyse the opportunities to minimize legal, organisational, financial, competence, informational barriers deeply ingrained in the Polish higher educational system as well as barriers of mental, cultural, social and psychological nature related to still negative attitude towards risk-taking and unfavourable responses of the academic environment to commercial activities. It is necessary to, among other things, pursue a complex innovation policy, work out some market orientation among academic institutions, introduce legal order in the field of intellectual property protection, build the culture of academic entrepreneurship and, last but not least, improve staff competences indispensable in the innovation-based economy.

- strive to increase the number of projects completed within public-private partnership (PPP), which is effectively utilised in the countries of the Western Europe. The utilisation of the PPP model enables to put the scientific breakthroughs into practice which in turn benefits both the researchers and the entrepreneurs and, finally, the society which, thanks to commercialization of the researches, may derive from the boon of novel technologies and scientific achievements. Current solutions in the scope of PPP are optimistic in Poland, particularly at the local or regional level. Nonetheless, we shall consider how to intensify the PPP cooperation through legislative actions
- strive to create clusters as a stimulant of innovation and

⁴Between science and economy. The role of innovation centres in the technology transfer – conference materials, Polish Business and Innovation Centres Association, Wroclaw 14th May, 2010

⁵Meanwhile, in the highly developed countries the R&D expenditures exceed 3% of their GDP (e.g. Switzerland or Japan) or even almost reach the level of 4% of GDP (e.g. Scandinavian countries).

competitiveness⁶. Such clusters play a significant role in strengthening of the competitiveness of the economy both at national, regional and local levels. The presence of entities of academic circles in the cluster constitutes a favourable factor in its innovative growth, which enables transfer of knowledge, information and technology. That also allows to bridge the gaps in human resources resulting from the implementation of the innovations. The idea of clusters has been given particular attention in the EU initiative titled Regions of Knowledge. Thus, in order to provide entrepreneurs with the opportunities to utilise the resources available in the region, it is necessary to create and maintain research clusters which shall be defined as the agglomeration of research entities, enterprises, local authorities, support centres for entrepreneurship and innovation operating for the particular sector of science, technology or economy⁷. That is why the Innovative Economy Operational Programme (PO IG) within 5.1 priority and 5.2 operations is crucial for the development of clusters.

utilise the available European resources in an effective and efficient manner⁸.

For now, the cooperation between science and business resembles fire and water relationship. Both sides share stereotypical and detrimental prejudices such as “mad scientist” versus “undereducated entrepreneur”. Nowadays, the concept of academic entrepreneurship has been in its initial phase in Poland and only time will tell how it is going to develop in future.

The burden of responsibility for current situation shall be partially placed upon the state, which has not implemented a strategy to support innovations yet. The membership in the EU creates qualitatively new conditions, however, competitive advantage shall not be constructed upon cheap labour force, brain drain or upon fragmentary benefits based on compensation (imitation effect). Therefore, Polish government ought to formulate strategies and define which industries shall constitute the foundation of Polish economy and what Poland should be famous for in future, while bearing in mind we are not a super-state and we cannot afford to be innovative in all branches of industries or support all research and development centres. Poland shall aspire to attempt to engage into the transformation of civilization which shapes the new balance of power at the global dimension. The transformation which is based upon the innovative capacity to transmute knowledge into novel products, technologies and services as well as the capacity to bridge the information gap between science and business. Development trends of the highly developed countries indicate that competitive advantage constructed solely upon knowledge and innovation ensures sustainable growth and new, more efficient, jobs.

⁶ Główna C, Cluster Initiative as an intermediary in the knowledge transfer towards micro-enterprises [w:] Commercialisation of the scientific research findings and technology transfer centres, Information Processing Institute – Research Institute, Warsaw 2011, pp. 19 - 29

⁷ Poznańska K., Clusters as means of the increase in innovation and competitiveness of enterprises [w:] Research papers Collegium of Management and Finance, Research Journal 100, Warsaw School of Economics, Warsaw 2010, p.159.

⁸ For further information concerning the opportunities of financing cooperation between science and business within European funds for the years 2007 – 2013 please refer to M. Tokarski, Cooperation between science and business as source of innovation for enterprises [w:] Management as an intensifying factor for economic development, scientific editors J. Teczke, J. Czekaj, Cracow University of Economics Publishing House, Cracow 2010, pp. 137 – 139

Moreover, academic centres shall solicit the creation of a cooperation platform between firms, which would enable young scientists to participate in internships and the firms to work out prototypical solutions. What is more, the academic centres themselves shall perceive the development of a relationship with businesses as an opportunity to improve their budgets and to become independent from public financing.

Particular attention should also be paid to the fact that the new programming period of the European Union for the years 2014–2020, according to the European Commission plans, shall bring about extensive concentration of financial means earmarked for scientific research, development of innovations, transfer of technologies and commercialization of knowledge. That may, as we have seen in previous years, effectively motivate entities operating in the above sectors to intensify their activities in that scope.

КОМПЕНСАЦІЯ ВИТРАТ ВІД ВПРОВАДЖЕННЯ ІННОВАЦІЙНИХ РІШЕНЬ У ВИРОБНИЦТВІ МЕХАНІЧНОГО ПРИВОДУ

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Машинобудівний комплекс України є базовою з ключових галузей економіки України. Виробництво механічного приводу загальномашинобудівного (МП ЗМП) та спеціального призначення важлива складова цього комплексу. Технічний рівень МП істотно впливає на продуктивність машин та устаткування багатьох галузей народного господарства.

В умовах економічної кризи, що уразила багато країн, які займають лідируючі позиції в галузі машинобудування, істотне значення має пошук засобів на компенсацію витрат підприємства при впровадженні інноваційних рішень, спрямованих на підвищення технічного рівня МП.

Ефективним інструментом в умовах зростаючої конкуренції є впровадження при виробництві МП технічних рішень виконаних на рівні патентів.

Сучасне виробництво МП ЗМП (ГОСТ 25484) повинне передбачати постачання численним споживачам різних галузей виробів з високим значенням коефіцієнта корисної дії (ККД), що дозволить в процесі експлуатації знижувати витрати електроенергії.

Підвищення ККД мотор-редукторів планетарного типу в ході виготовлення запропоновано (патент України № 59421 від 10.05.2011 р.) здійснювати наступним чином: в корисній моделі поставлено задачу удосконалення відомого способу припрацювання планетарних двохступінчастих зубчастих редукторів (Авт. св. № 848809) шляхом того, що привод та навантажувальний пристрій періодично зміщують у площині, перпендикулярній осі обертання редуктора, із зміною величини і напрямку зсуву. Або також шляхом того, що зміна положення навантажувального пристрою і приводу щодо редуктора в площині, перпендикулярній його осі,