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CONDITIONING OF THE PROCESS OF TECHNOLOGY TRANSFER FROM SCIENCE INTO BUSINESS IN POLAND

Summary: The goal of this paper is to specify conditions and to assess cooperation between science and business in Poland in terms of technology transfer. In the first part of the paper the author presents a model of evolution of universities which consists of three phases of their development. Special attention is paid to the idea of third generation university, which is open to partnership form of cooperation with enterprises, and for which the third purpose of its activity is the commercialization of technology. In the second part of the article the author focuses on the sources of barriers for cooperation between universities and business in Poland and tries to work over opportunities for improvement of mutual relations of both environments in terms of use of know-how within business in practice.

Key words: innovation activity, commercialization of results of scientific research, rules of efficient cooperation.

1. Introduction

In the economy of twenty first century a factor which decides about a success is the creation of efficient mechanisms of cooperation and the flow of know-how between main entities of social and economic life. Significant meaning is assigned to relation between universities and enterprises. Example of the Silicon Valley proved that provision of space, concentrated education infrastructure as well as scientific and industrial infrastructures constitute a basis for success in terms of creation of economy based on knowledge and stimulation of permanent competitive advantage¹. The goal of the article is to assess the cooperation between business and 'science' in Poland in terms of transfer of technology and to find the answer for the question on how the model of such cooperation can be extended. It is necessary since there is a great need in Poland for new foundations for business.

¹ M.H. Best, *Silicon Valley and the Resurgence of Route 128: Systems Integration and Regional Innovation*, [in:] *Regions, Globalization, and the Knowledge-Based Economy*, ed. J.H. Dunning, Oxford University Press 2002, p. 461; M. Miedziński, *Kalifornia – Singapur. Analiza porównawcza*, [in:] *Gospodarka oparta na wiedzy. Wyzwanie dla Polski XXI wieku*, ed. A. Kukliński, KBN, Warszawa 2001, p. 231.

2. Evolution of universities as significant entities of economy based on knowledge

Since the very beginning universities had fought a lot of problems until it was recognized that they could not constitute closed communities for whom the idea of scientific thought exchange and cooperation with external entities is not foreign. J.G. Wissema presents a model of evolution of universities which consists of three phases of their development: middle-ages university – also called ‘scholastic’, Humboldt’s university and university of third generation². Universities significantly changed themselves during the Renaissance and Humanism, in particular, since the printing became common. Serious barriers between scientist-tutors and students were replaced with common look for science by professionals and amateurs. Within the first years of the fifteenth century there became popular a new term *academia*, coming from Greek. The seventeenth century was dominated by mathematics and accurate observation of environment. Huge rebirth of science significantly skipped universities since it was known that development in new disciplines would endanger the disciplines already existing at universities. As an effect, the development of series of totally new applied sciences resulted in setting up a lot of schools specializing in – among others – engineering, forestry and veterinary sciences. Such schools were set up outside universities. Consequently, the church’s impact on universities was slowly – but irrevocably – reduced. Pure sciences must have ‘fought’ hard to be recognized as university disciplines. Specialized departments and institutes were outside a university before real departments of pure sciences were established. Humboldt’s university concentrated on surveys within which education was a part of a model close to middle-ages relations: master – assistant – student. However, the surveys were based on rationality and experiments instead of middle-ages belief in an authority. Although in the end of the nineteenth century contacts of science world with business world were more significant, in particular for departments which dealt with researches and worked over new technologies, there still existed a significant difference between universities and industry.

The end of the Humboldt’s model was stimulated by a mass inflow of students (mostly poorly prepared to deal with advanced science) and the development of bureaucracy. With reference to significant growth in state’s expenditure on universities and other schools, state and politicians became more interested in functioning of universities and they much more interfered in them. In the 60s of twentieth century there was established inter-disciplinary research. The late 60s and 70s of the twentieth century constituted a period of clear separation between purely scientific activity and survey programmes for practice purposes maintained by enterprises and special institutes financed by state administration. In the end of the 80s and the 90s of the

² J.G. Wissema, *Technostarterzy – dlaczego i jak?*, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2005, p. 21.

twentieth century many new trends appeared, which brought new challenges for universities and established new opportunities for them. In this context there must be mentioned a tendency, which began in United States where universities such as Massachusetts Institute of Technology and Stanford University became cradles of technological revolution. European universities have made efforts to follow this trend seeing a number of advantages for economy, which result from pro-market attitude of academic institutions and search for industrial use of results of research which was made. A second new trend, which significantly affects the higher education system as well as all fields of functioning of societies is globalization, enabling the share of know-how. World wide range of know-how flow results from the rapid growth of Information and Communication Technologies (ICT), Internet in particular. As a result of process of market opening there is the opportunity for free flow – within the international space of goods, services, capital and persons and the idea as well, born in human minds. ICT development makes these flows quicker and cheaper. Globalization results in the increased mobility of students and scientific personnel³.

J.G. Wissema states that the third generation university is just a present idea and current models of universities – quite close to this idea – are of temporary character. There exists a real probability that some universities (and schools) in the world, after a temporary period, shall not operate in accordance with the idea of third generation. Such universities will play a role of local education centres and a sort of a breeding ground, initial stops on the career path for the most ambitious students and scientists. J.G. Wissema thinks that the development of universities shall depend on their ability to convert into international centres of technology transfer, which should be defined as a group of institutions acting within the structure of a university or beyond it, however, within its close surrounding. On the international area such a group would be perceived as a leading one within a particular field of science. International centre for technology transfer should match, apart from science and research centres as well as enterprises, different financial institutions and service providers. Despite dynamic development of ICT it seems that it is still significant to provide space concentration of education infrastructure, together with research & development and industrial infrastructures. Geographical proximity enables frequent and direct contacts between particular actors of the process of technology transfer, which favor the exchange of know-how among them, their cooperation and the synergy effect. Apart from ambitions of winning a status of international centre for technology transfer, there can be enumerated the following features which distinguish universities of third generation from the presently existing temporary models:

- implementation of technology commercialization as the higher schools' purpose (apart from education and scientific research),
- apart from provision of mass education, creation and maintenance of elitist colleges for the most promising students and tutors who would run advanced trainings there,

³ Ibidem, p. 21-39.

- implementation of English as the basic language of communication,
- making assessment of quality of research by experts based on standard procedure instead of quantity criteria⁴.

3. Cooperation of science and business in Poland

A traditional model of a school activity assumes the autonomy of school, finance provided from state's budget and freedom of research. As an effect of this situation there is a pressure on basic research, making their results public due to publications, free access to know-how for all interested parties and the lack of interest in the implementation of results of research. In the traditional model a leading form of cooperation between universities and industry is a flow of people. It seems that the cooperation of science and business within a traditional model of university activity leads to many unfavorable phenomena such as: poor usage of university's potential, low efficiency of expense on research, extended theoretical programmes which practical use is very limited, as well as reduced opportunities for development of a university related to financial barriers⁵. From a report of the Ministry of Science and Higher Education concerning the cooperation of entrepreneurs and academic environment in Poland it results that opinions issued by both of these parties are much different. Some entrepreneurs who decided to cooperate with scientists have been disappointed with its effects. Some representatives of business complained – in their opinion – on poor competence of scientists or their too theoretical attitude to issues. On the other hand most interviewed scientists presented an opinion that they found a solution which may be implemented into commercial use by entrepreneurs. From the side of entrepreneurs who – before research – had never cooperated with academic environment, there was formulated an accusation of lack of legal regulations which would promote such a cooperation. Another reason for the lack of engagement into common projects was – in entrepreneurs' opinion – lack of relevant offers from scientists' side. However, when science centres were asked whether they – anytime – presented a concrete offer for cooperation for companies, 85% of the investigated centres answered 'yes'. Moreover, from the survey it results that scientists consider themselves to be more active in terms of looking for a way of commercialization of research than the business environment. In research workers' opinion there is poor awareness of benefits which could be obtained by entrepreneurs due to research projects. Among barriers which make cooperation of the two environments more difficult – the most often mentioned one by scientists – is the lack of competent agents whose main task would be to enhance communication between parties. The authors of the report pay attention to the fact that cooperation of science and business cannot

⁴ Ibidem, p. 40-47.

⁵ K. Santarek, *Zarządzanie technologiami*, [in:] *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, ed. K. Santarek, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008, p. 33.

succeed since there is a large discrepancy of interests and parties understand the purpose of common research differently. That is why – according to them – during a course of process of popularization designed to promote cooperation between companies and academic environment there must be special attention to communication between both groups in terms of their intentions and expectations⁶. This problem is signalled also by the authors of KPMG report, who explain the discrepancy between scientists' and entrepreneurs' opinions about their mutual cooperation, with a thesis that both these 'worlds' have much different priorities. Companies in Poland engage themselves in cooperation with science centres in order to solve a problem which is clearly defined while expectations of academic environment are much more often ambitious and directed into long-term cooperation⁷. Scientists, who declared that within 2 year prior to their survey had cooperated with entrepreneurs, were asked about a subject of research. Most tasks concerned technology improvements (42%) and work out new products or services (44%)⁸.

The authors of different papers agree on the fact that the success of the process of technology transfer depends on the quality of cooperation, even partnership between its participants. Common relations of partners should be based on:

- personal contacts,
- mutual understanding,
- mutual trust,
- looking for common interest,
- quick and efficient communication,
- share of risk⁹.

It seems that a basic factor conditioning the cooperation of both environments is a scientist's attitude, more accurately, whether a scientist is ambitious enough not to be afraid of verification of his/her scientific findings, within economic reality. Representatives of the academic environment are perceived in business world as a society interested only in the increase of their prestige and consequently, they focus on winning scientific titles only. There is a common opinion among entrepreneurs stating that scientists suffer from the lack of knowledge about business and market reality within which companies operate. Entrepreneurs are often discouraged from

⁶ *Bariery współpracy przedsiębiorców i ośrodków naukowych*, Ministerstwo Nauki i Szkolnictwa Wyższego, Departament Wdrożeń i Innowacji, Warszawa 2006, p. 8-19.

⁷ *Czy warto inwestować w innowacje? Analiza sektora badawczo-rozwojowego w Polsce*, KPMG, http://www.kpmg.pl/dbfetch/52616e646f6d4956343be24f32e766ccb107205ad9a356806fa32421947e6c48/raport_kpmg_czy_warto_inwestowac_w_innowacje_2009.pdf (as of 14.06.2009), p. 21.

⁸ *Bariery współpracy...*, p. 16.

⁹ A.H. Jasiński, *Badania nad procesami transformacji wyników prac badawczo-rozwojowych w innowacje*, [in:] *Innowacyjność 2008. Stan innowacyjności, projekty badawcze, metody wspierania, społeczne determinanty*, ed. A. Żołnierski, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008, p. 90.

cooperation due to university's red tape while entrepreneurs, who already started cooperation, complain about too slow speed of work of a science-related partner¹⁰. It will not be easy for Polish scientists to change such stereotypes. Academic environment for a very long period operated within reality not providing any encouragement to cooperate with business. The system of parametric assessment of science centres should be mentioned. Not so long ago it barely promoted actions in terms of economic practice. Thus, scientists concentrated on issues which could result in the development of their career paths, that is: scientific research and making results of their work public¹¹.

Table 1. Sources of barriers for cooperation between universities and business

Science – universities	Business – enterprises
<ul style="list-style-type: none"> • science requires freedom of research • orientation into science development (basic sciences) • criteria for results of work: recognition of environment, social prestige • purposes: scientific development, publications, quotations 	<ul style="list-style-type: none"> • formal procedures of business activity • orientation into development of new products • criteria for results of work: reaching a market, reaching business purposes • purposes: revenues from sales of new products, share in the market

Source: K. Santarek, *Zarządzanie technologiami*, [in:] *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, ed. K. Santarek, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008, p. 35.

4. Summary and recommendations

The growing level of competition in the global economy became the driving force for development of new forms of cooperation between science centres and industry. It concerns common research and development activity as well as new directions and forms of education, even teaching programmes dedicated for specified business needs.

Entrepreneurs and science environment in Poland too rarely make efforts in terms of common innovation activity. A basic difficulty results from the collision of expectations of a science centre, which creates and transfers knowledge, with entrepreneur's expectations, who is supposed to absorb it and use in practice. Meanwhile, the difference of interests and intentions from both sides results from different nature of research sphere and business. Cooperation is frequently disabled by mutual stereotypes. Due to them, a scientist is a theorist while an entrepreneur is somebody interested only in profit, for whom the development of science is absolutely

¹⁰ *Bariery współpracy...*, p. 14.

¹¹ *Raport o stanie sektora małych i średnich przedsiębiorstw w Polsce w latach 2006-2007*, ed. A. Żołnierski, P. Zadura-Lichota, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008, p. 228.

insignificant. Another factor which restricts the scale of technology transfer from science to business in Poland is communication barrier related to the lack of a system of efficient flow of information between these environments. Scientists suffer from the lack of knowledge concerning needs of an enterprise. The directions of research run by Polish universities are relatively rarely inspired by needs signalled by economy. The other problem is the issue of intellectual property and related to this issue the share of rights to elaborated technology and the share of profit generated from its exploitation. Finally, the cooperation of a university with industry is still frequently based on the engagement of particular persons – scientists, since organizational support by university is not provided. Generally, barriers for cooperation between science and business may be categorized in the following way:

- those relating from other mentalities and organizational behaviour,
- problems related to information flow and communication,
- issues related to finance,
- issues within legal regulations.

It seems that mentality-related barriers shall be the most difficult to overcome. Activities which aim to create new attitudes are long-lasting ones and in Poland all efforts made to become close to these environments appeared to be insufficient. All activities designed to increase in awareness of entrepreneurs in terms of opportunities for cooperation with science centres and potential benefits of such cooperation should become a priority. The elicitation of scientists and their will to meet business world's needs constitute a basis for cooperation. Profits are generated for both parties. University, apart from additional financial means for research, will obtain an image of a supplier of useful know-how which should attract students. Lecturers due to cooperation with companies will obtain new experience while students can count on apprenticeship and trainings. On the other hand, enterprises will satisfy their needs in terms of technology and attract the most talented students to work for them.

Making cooperation of science and business more efficient should be a subject of interest for all parties, including state administration. An active role of the state as an entity stimulating cooperation between universities and enterprises in terms of technology transfer should mean:

- increase in expenses on science and indication of the most important directions for research,
- development of scientific infrastructure,
- support for development of institutions which organize transfer of technology from university to business,
- support for mobility of scientists and students and for the development of international cooperation,
- development of new standards for assessment of university (external assessments, new criteria: results of implementation, number of patents).

Literature

- Barьеры współpracy przedsiębiorców i ośrodków naukowych*, Ministerstwo Nauki i Szkolnictwa Wyższego, Departament Wdrożeń i Innowacji, Warszawa 2006.
- Best M.H., *Silicon Valley and the Resurgence of Route 128: Systems Integration and Regional Innovation*, [in:] *Regions, Globalization, and the Knowledge-Based Economy*, ed. J.H. Dunning, Oxford University Press 2002.
- Czy warto inwestować w innowacje? Analiza sektora badawczo-rozwojowego w Polsce*, KPMG, http://www.kpmg.pl/dbfetch/52616e646f6d4956343be24f32e766ccb107205ad9a356806fa32421947e6c48/raport_kpmg_czy_warto_inwestowac_w_innowacje_2009.pdf (as of 14.06.2009).
- Jasiński A.H., *Badania nad procesami transformacji wyników prac badawczo-rozwojowych w innowacje*, [in:] *Innowacyjność 2008. Stan innowacyjności, projekty badawcze, metody wspierania, społeczne determinanty*, ed. A. Żołnierski, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008.
- Miedziński M., *Kalifornia – Singapur. Analiza porównawcza*, [in:] *Gospodarka oparta na wiedzy. Wyżwanie dla Polski XXI wieku*, ed. A. Kukliński, KBN, Warszawa 2001.
- Raport o stanie sektora małych i średnich przedsiębiorstw w Polsce w latach 2006-2007*, ed. A. Żołnierski, P. Zadura-Lichota, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008.
- Santarek K., *Zarządzanie technologiami*, [in:] *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, ed. K. Santarek, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008.
- Wissem J.G., *Technostarterzy – dlaczego i jak?*, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2005.

UWARUNKOWANIA PROCESU TRANSFERU TECHNOLOGII Z NAUKI DO BIZNESU W POLSCE

Streszczenie: Celem artykułu jest określenie warunków oraz ocena współpracy nauki z biznesem w Polsce w zakresie transferu technologii. W pierwszej części opracowania autorka przedstawia model ewolucji uniwersytetów, uwzględniający trzy etapy ich rozwoju. Szczególną uwagę poświęca ona idei uniwersytetu trzeciej generacji, który jest otwarty na partnerską współpracę z przedsiębiorstwami i którego trzecim celem działalności, obok edukacji i badań naukowych, jest komercjalizacja technologii. W drugiej części artykułu autorka koncentruje się na źródłach barier współpracy pomiędzy uczelniami a biznesem w Polsce i podejmuje próbę określenia możliwości poprawy wzajemnych relacji obu środowisk w zakresie aplikowania wiedzy w praktyce gospodarczej.