THE APPLICATION OF NEW MANAGEMENT CONCEPTS TO STIMULATE COOPERATION BETWEEN UNIVERSITIES AND BUSINESS

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Abstract

The purpose of the article was to show the importance of cooperation between universities and business in stimulation of innovativeness of enterprises and problems and obstacles in this field in Poland. First of all current activities at universities are directed mainly to the transfer of technology from universities and should do more to stimulate the propensity to adopt the innovation process by companies. The use of new management concepts, described in the article, may contribute to the intensification of the cooperation and increase of its effectiveness and quality in stimulating innovation of enterprises and the economy, by which universities can become growth poles such as Stanford University in the USA.

Key words: cooperation of university and business, innovativeness, new management concepts

1. Introduction

In Poland there is poor cooperation between universities and enterprises, which translates to a poor use of proinnovative institutions. This poor cooperation is largely due to the low overall innovation activity of companies. By stimulating business innovation universities can influence regional development and thereby become growth poles. Innovation is essential for the competitiveness of companies measured by indicators such as profitability, market share, or the share of exports in sales. The cooperation of science and business stimulates innovation especially the introduction by firms of "new to the branch" products and services which are

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more based on research and development (Wojnicka, 2004). Innovative industries and innovation-related activities in enterprises, as measured by total factor productivity (TFP) are the main source of productivity growth and the economic growth of regions (Solow, 1988; Wojnicka-Sycz, 2013). Thus, universities cooperating with businesses in the field of innovation, as well as stimulating innovation awareness through education can become growth poles.

Still, this impact is too weak in Poland, due to the very poor co-operation of universities with firms and too weak its focus on promoting innovation. Universities often represent a passive attitude, they are only receiving external signals, but do not try to shape the demand for cooperation by promoting of innovativeness and by active formulation and showing the firms their offer. In addition, there are numerous organizational barriers that make cooperation with universities too expensive for companies and time-consuming. Universities generally do not have a strategic approach to cooperation with business, do not see their role in terms of stimulating innovation, they have no coherent marketing offer for businesses. Existing proinnovative institutions at universities often complain about the lack of demand, and they should more try to influence the demand by formation of technological awareness and innovative activity of enterprises and the public (CEBBIS, 2011).

Moreover, in the literature there is lack of interdisciplinary and holistic approach to cooperation between universities and business, especially with regard to construct and support of innovative attitude of enterprises, as well as to regional development. In these fields achievements of management sciences (particularly new concepts of management) are not fully taken advantage of. Therefore, in this paper the authors propose a combination of knowledge on management concepts and theories of innovation and using it to the analysis of the cooperation between science and business. These concepts have been very rarely taken into account in the issue of management of this cooperation.

The purpose of the article is to show the importance of cooperation between universities and business in stimulation of innovativeness of enterprises and problems and obstacles in this field in Poland. The aim is also to show the potential of new management concepts in enhancing and making more effective the cooperation of academia and business. Nonetheless further research on this issue would be needed.

2. Cooperation between science and business and its influence on innovativeness of economy and regional development–the literature review

In the literature, there are quite a lot of analysis on the cooperation between science and business, and the operation of intermediary institutions as one of its forms. However, there is lack of approach to cooperation of universities and firms from the perspective of stimulators of this cooperation in the form of proper management tools for the promotion of innovation and regional development.

The widespread study on management of cooperation between science and business is publication of UNESCO (2000), which contents case studies of 12 universities in terms of management of relationships with business in some important areas, including: organization, procedures of finance, procedures of personnel management and management of intellectual property (Martin, 2000). In another publication Benneworth and Dawley took the issue of management of cooperation between science and business for the purpose of increasing the innovativeness of firms for regional development (Benneworth, Dawley, 2005). Universities offer innovative companies access to resources, which they are not able to find elsewhere, and thus, if they help companies to be innovative and increase their productivity, they contribute to regional growth. In recent years, universities are encouraged by politicians to achieve cooperation with the business. A pioneer in this regard was the United States, where the Bayh-Dole Act created strong incentives and rewards to researchers who were able to successfully commercialize their knowledge (Bayh-Dole Act, 1980).

Meanwhile, many universities in the world began to support the commercialization of knowledge, especially in the form of technology transfer centers: Silicon Valley, Research Triangle, Rt.128 in the U.S. are known around the world as innovative engines of growth. Universities are the center of a model of development in those clusters and they generate thousands of technology licenses and spin-off companies. In all these cases transfer of technology clearly affects local, regional and national economy. Only in one year (in 2003) Stanford University in Silicon Valley was the source of more than 300 patents, and many companies such as Google, Sun Microsystems, Silicon Graphics, Netscape, Cisco Systems and Yahoo, which are based on the knowledge of the university. For comparison, approximately 150 companies are formed each year in cooperation with the MIT (Massachusetts Institute of Technology) and about 10% of them are directly related to the transfer of technology from universities (Palmintera, 2005).

Analyses carried out by Meyer and Hecht showed also a significant effect of Canadian universities to regional development, and thus turned attention to their role as growth poles. In Canada, almost all universities in some way cooperate with local industry through initiatives such as research and technology parks, as well as consultancy for the industry. There were distinguished five potential channels of impact of the science (universities) on the economic growth: college expenses for salaries, purchases, taxes, stimulation of regional demand for goods, services, labor and capital, as well as through the multiplier process. Relationships of universities with business include knowledge providing, training for students, technology transfer, direct investment (start-ups), academic entrepreneurship, attracting businesses to the region because of the qualifications of the employees, the ability to advise and attractive intellectual environment (Meyer, Hecht, 1996, pp. 7–8). The analyzes showed that the universities in Canada operate as growth poles increasing the economic potential

of the given regions, but the impact of these universities is limited only to nearest location of sites – such as counties (Meyer, Hecht, 1996, pp. 11–13).

Traditionally, the universities have been seen as a source of basic knowledge. Despite some abstraction of research at the universities, these studies could be focused on more practical purposes. Many scientists (particularly in the fields of engineering) are focused on the development of prototypes and research on the technology industry. Opponents of intensive links between science and industry often argue that the academic research is "spoiled" by the application needs of the industry, which is trying to manipulate the research agenda for its own purposes. However, in the United States, it is the science sector, that was often the initiator of links with business (Van Looy, Zimmerman et. al., 2002).

Economic benefits of the research are not only publications of results of research and theories. Schibany et al. (1999) defines the following economic benefits of research, supporting the innovative potential of enterprises:

— a new and useful information,
— new tools and methodologies,
— skilled graduates,
— access to a network of experts and information,
— people able to solve complex technological problems
— spin-off companies (academic entrepreneurship).

Various benefits of research are interrelated and mutually supportive. For example, training of graduates promotes the development of professional networks, as well as facilitates the transfer of new information and methodologies to the industry. Some of these links will be direct – if research lead to the application results, engineering research techniques and instruments. Others are indirect – when educated graduates, published scientific knowledge and professional networks contribute to the improvement of businesses operations.

OECD (OECD, 2000) summarizes the relationship between science and business, as follows:

— formal relations such as joint laboratories of research centers and enterprises, the company founded by researchers (spin-off companies), contracts for research, consulting, commercial transactions regarding intellectual property rights (patents etc.), cooperation in the field of teaching (practice and training), the temporary movement of scientific personnel into the industry;
— informal relationships, such as joint publications of scientists and entrepreneurs, fairs, symposia, conferences, trade literature, contacts in the professional associations, the flow of graduates into the business (including the company founded by students and graduates).

Due to the criterion for funding links between science and business from the point of view of firms the following models are distinguished:

— trade – chargeable on the basis of the contract: buy-sale (purchase of the results of research, patents, technology licenses, consulting services);
— partially chargeable – cooperative (co-financing of R&D and innovation activities), training (training of specialist, postgraduate student training, student internships, the involvement of business in the development of university curricula);
— free – imitative-adaptive, i.e. copying of designs, prototypes, study of trade literature, gaining knowledge through industry intelligence and fairs, exhibitions, conferences, symposia, contacts in the professional associations (Weresa, 2007, pp. 35–36).

Polish studies mainly relate to the issues of cooperation between science and business by the prism of bridging institutions (see Matusiak, Guliński, 2010; Bąkowski, Mażewska, 2012; Santarek, 2008) or the overall analysis, mainly in different regions (Weresa, 2007) or indicators of cooperation (Wojnicka, 2004). However, from the Polish perspective it is important that cooperation between academia and business aimed at stimulation of innovative awareness of companies. It can be made through cooperation in the field of education, i.e. training of entrepreneurs in the postgraduate studies of innovative attitudes and match skills with the needs of innovative enterprises through consultation and new programs of study.

3. The level and forms of cooperation between science and business in Poland

According to data from Community Innovation Survey 2006 on average in the EU27 8,3% of innovative companies and 4,3% of all the enterprises cooperate with universities. For the comparison the results in Poland are following: only 7,6% of innovative companies and 2,1% of all companies has linkages with academia. The highest percentage of all the companies cooperating with universities was in Finland (13%) and Belgium, Austria, Slovenia, Denmark, Germany and Sweden (from 9,1% to 6,5%). In comparison with Poland weaker collaboration in the line science-business was only in Spain, Bulgaria, Romania and Malta. Companies involved in the innovation process in Poland do not differ so much from the average of the EU in terms of the willingness to cooperate with universities. Weak cooperation in the line science-business in Poland is mainly due to the small number of innovative companies. It should be noted that very poor involvement of universities in promoting of innovation and collaboration with companies doesn't positively affect the change in those trends, but rather further deepens them.

It is worth noting, that according to the latest Eurostat data for innovation covering the period 2008–2010, in EU27 there was at least 52,6% innovative companies (innovation at the firm level), while in Poland only 28,1% (worse result: 27,1% was noticed only in Bulgaria). In particular, there is lack of these companies, for which cooperation with universities is important and which are trying to implement inno-

vation based at least partly on R&D, leading to the development of new solutions in the scale of the industry. In Poland in 2010 only 31% of innovative companies made R&D (worse result in the EU concerned only Bulgaria: 14%).

Research carried out in Poland showed that in the opinion of entrepreneurs the main barriers for cooperation with R&D sector are the high cost of such cooperation, lack of funds for its financing, mismatch of offer to the needs of companies and the lack of suitable partners (Wojnicka, 2004). This means that for cooperation with business, the universities should be able to obtain public funding for the development of this kind of collaboration and enhancement of business innovation (which can be co-financed by business), but also activities in the field of lean management in order to reduce the cost of such cooperation.

Universities can become initiators of business clusters, such as Gdansk University of Technology, which has initiated the ICT cluster and University of Information Technology and Management in Rzeszow, which through the project "System of support of clusters" has inspired "Stowarzyszenie Informatyka Podkarpacka", which is the basis of "Klaster Informatyczny Polski Wschodniej" (Górzyński, 2006). For stronger linkages between academia and business important will be all activities oriented toward initiating and managing clusters as network organizations. Studies carried out in Poland in 2003 on a sample of 283 companies from potential clusters showed, however, that cooperation with universities increases the chances of introducing the innovation "new in the scale of industry", and this increases the chance of obtaining the better profitability of companies (Wojnicka, 2004). Moreover, small and medium-sized companies from the high-tech sectors, cooperating with the science were characterized by a higher innovativeness, higher profitability, and also had a significantly higher (8,4% versus 2,9%) share of exports in sales (Wojnicka, Wargacki 2003). Thus, there is a correlation between cooperation with science and export orientation.

In many universities in Poland there are technology transfer centers and they cooperate with science parks. At universities there are also academic business incubators and technology accelerators. These institutions are kind of bridge between the world of science and business, but their purpose is primarily commercialization of knowledge from science to business. They should play also the role of initiators of innovative actions in business sector with greater impact on business innovation by stimulating the internal R&D in companies, which consequently will increase the demand for services of bridging institutions.

In the years 2007–2012 were implemented many training projects aimed at improving the management of R&D and knowledge transfer at Polish universities. Some of these projects included internships of scientists in companies. It is assumed that these projects have increased knowledge about methods and tools of management and stimulating the cooperation between science and business at universities. Nonetheless there is still need for deeper diagnosis and formulating recommenda-

tions on stimulators and models of management of cooperation with business at universities.

4. New management concepts and their application in the management of science-business cooperation

Determinants of functioning of the organization in recent years have changed a lot (90th years of the XX and the beginning of the XXI), which resulted in the growing importance of innovation approach in management (not only with regard to the enterprises) (Koźmiński, 2004; Obłój, 2002; Walentynowicz, 2013). In science and practice there are created a lot of new approaches and concepts of management, which aimed at raising the efficiency of the business in response to changing and challenging conditions of their functioning. The main of them are: restructuring (investments, divestments, mergers and acquisitions and the creation of groups of companies), TQM (Total Quality Management), kaizen, benchmarking, outsourcing, reengineering (business process reengineering), Lean Management, TBM (Time Based Management), Six Sigma, TOC (Theory of Constraints), controlling, knowledge management, organizations: virtual, fractal, network, flexible, intelligent, learning, as well as quality management, according to ISO (International Organization for Standardization).

These concepts have successfully checked in a new and difficult practice of the business environment and often – by analogy – are transferred to practices of other organizations. Attempts are being made to use them in educational activities. The authors believe that they can be (and should be) successfully used in universities to increase the effectiveness of cooperation with business, for the benefit of regional development and innovation of the beneficiaries of this collaboration. However, it's not necessary to implement all of these ideas or their components to improve the efficiency of collaboration: academia-business. The authors propose using in the debated issue the following concepts (discussed below):

Lean Management – aiming at significantly reducing the cost of creating added value for internal and external customers, primarily through the elimination of the wider comprehensive waste (jap. *muda*) while maintaining or improving the quality of the processes of value creation and shortening the time of its supply (abbreviated Q, C, D: quality, cost, delivery). Such effects can be achieved only through a systematic approach and process approach to manage the organization and effectively using the tools (methods and techniques) proposed by this concept (Walentynowicz, 2013). The authors believe that some of these instruments, the objectives and principles of this concept can be successfully used to improve the efficiency of management of the cooperation between universities and business practice. For example, the answer to the question "how to maximize the added value of a successful cooperation between science and business?" – by maximizing processes directly creating this value, reducing the value of the processes forming this value in an indirect way

and the elimination of "collaboration" processes that do not make up the added value – can provide a good foundation for constructing the model of cooperation (in general and in specific cases). Also focusing on the elimination of muda within the organizational structures of individual projects should result in reducing the costs of such projects, and thus, increase their efficiency. For even greater increase in the efficiency of the presented cooperation (for example, by shortening the durations of individual projects), you can use the process approach and knowledge of modern project management.

The process approach, as opposed to functional approach, is one of the newer trends of the organization in the science of management, although the prototype of this approach can already be seen in the U.S. companies in the early XX (Ford), and in time of World War II (Boeing). Later this approach, used in practice in such companies as Xerox, IBM, Form Motor Co., Hallmark, Taco Bell, was spotted by U.S. consultants: Hamer and Campy and widespread in the science and practice of management in 90s under the banner of reengineering. From the point of view of the conditions of the modern environment of higher education and business, the effective functioning of the organization without applying the elements of the process approach is not possible. This approach is not just a simple concept of the integration of process of creating of added value for the customer as part of the logistics or manufacturing processes in the company, but the change of mechanisms of operating and organizational culture throughout the institution (Grajewski 2007, Grajewski, 2012). Hence, the process approach is a good idea to improve the effectiveness of cooperation between academia and practice, where in the framework of this cooperation, this approach can be used to increase the efficiency of the functioning of institutions, the implementation of various projects through virtual companies, or consortia created for these projects and raising awareness about the process approach to business and innovation in business,[3)] to ultimately obtain an increase in the efficiency of the final beneficiaries.

The marketing approach – very popular in Poland since the early 90's, hence, not in all companies and institutions in Poland is applied. In this approach in the centre of interest is a client, whose needs must be identified, and then in an efficient way filled, within the chosen marketing strategy and an adequate level of profitability of the market. The key activity in marketing approach is defining marketing strategy and implementation of the marketing mix (including promotion-mix). The modern marketing management includes also the creation of concept and market research, brand management (corporate brand and product brand), shaping the marketing development of the company (product, technology, marketing and organizational innovation), as well as the potential of human resources (Garbarski, Rutkowski, Wrzosek, 2000). The best companies in the world use the modern tools of marketing management (strategy of relationship) (see Simon, Dietl, 2009). Marketing approach

[3)] In this context also the awareness of Lean Management, as Lean Management is an example of practical usage of process approach.

in the context of the analyzed cooperation should be used on one hand to better diagnose the needs of final beneficiaries by universities, on the other hand, to propagate using marketing their potential and range of opportunities through which individual entrepreneurs will stop thinking about this cooperation in a stereotypical way ("little on this we can use, or not at all").

Project Management is more and more popular concept of management in contemporary organizations, not only in business, but also in public and non-profit organizations. This is due to changes in the conditions of functioning of modern business and related changes in the nature of modern organizations. The purpose of a modern approach to project management is to achieve the intended results of the project in the intended time and on budget (Lewis, 2006; McGary, Wysocki, 2005). In achieving the desired results helps project management methodology (depending on the nature of the project – PCM, PMI, Prince2, SCRUM). Application of project management tools to R&D projects carried out by universities with business should make them more willing to start the cooperation f.ex. due to better seeing of the benefits of it and being trusting f.ex. about the timing of certain phases of the projects.

Theory of Constraints is oriented towards identification and management of constraints that have negative impact on functioning of the organization. Particularly intensive constraints appear at the points of contacts the various organizational systems (subsystems and also cooperation between organizations). Therefore, in the model of management of cooperation between universities and business practice should be used the assumptions of this theory. We recommend the use of the elements of that not very widely known and used in the practice of management theory, especially for the identification and elimination of all kinds of "bottlenecks" that may arise in the context of projects or for example, Critical Chain Project Management –as one of the detailed methods of this concept.

Benchmarking is nowadays one of the most widely used method of modern management in the practice. The purpose of this method is solving the problem with using the comparison with the benchmarking organization (it is usually the entity leading in the market in terms of performance in the area of organization – the leader) (Węgrzyn, 2000). Therefore, this approach can be used for looking for the inspiration (regarding to the discussed problem) in the world's top universities and – on this basis – implementation the best practices in universities in Poland.

Knowledge management is one of the new concepts of the resource approach in managing of organizations. It involves the institutionalization of the process of obtaining, collecting, sharing and development of knowledge in the organization (including the conversion of tacit and unstructured knowledge in explicit and structured knowledge) in order to permanently increase the company's competitive advantage (learning organization), with extensive use of ICT tools in this process (Czerska, Szpitter, 2010). There are many models and recommendations for the process of knowledge management, including Nonaka and Takeuchi's, Burton, Davenport and Prusak's, Bukowitz and Williams models (Figurska, 2012). The concept of knowl-

edge management should improve cooperation with business f.ex. by creating of data bases of partners and research projects or portals of cooperation and co-working of academia and business and other forms of improvement of the learning processes in organisations.

Outsourcing is currently the most popular concept of management, which is used in practice by majority of companies (in today's market conditions the model based on self-sufficiency is almost impossible to use, and most of all – not profitable). Outsourcing involves the distribution of some functions (processes) of the enterprise to business partner for a long time. These functions were so far carried out on its own, and without them the proper functioning of the organization becomes impossible (Nogalski, Walentynowicz, 2004). The main aim of outsourcing in today's organizations is primarily to improve their market competitiveness (Trocki, 2001). Thus, outsourcing is the basis of the use of such forms of organizations as network organizations, virtual organizations, strategic alliances and clusters. Universities' cooperation with business often takes the form of outsourcing of R&D or education services from academia by firms. However it may be also used for enhancing the cooperation f.ex. by creating of associated organisations like companies or foudations of universities specialized in cooperation with business which will be more elastic and responsive to firms' needs than universities itself.

Innovation management is also important for stimulating innovation and regional development by universities. Great importance in this respect have open innovations referring to cooperation with external entities within the innovation process – universities can promote this concept and stress their role as one the key source of innovation. On the one hand, the universities should develop their own ideas for innovation (technology-push model), but on the other they have to take into consideration the voice of the customers (enterprises) and try to fill their requirements (market-pull model). Universities should be used as a "living labs" and help the companies to implement new solutions. In addition, a method called "design thinking" promotes the search for innovation with the participation of organizations representing various sectors, including the universities. Universities can teach such methods, as well as support especially small and medium-sized enterprises in the visualization of different innovations with the usage of modern tools such as CAD/CAM. Universities should also be able to operate as a network and virtual organizations, taking part (and sometimes inspiring) in joint activities with business partners in the form of clusters and consortia. This kind of collaboration is oriented towards research and development of breakthrough innovations. Universities can also educate and help to develop innovative strategies in companies, such as "Blue Ocean Strategy" (Kim, Mauborgne, 2005).

The above concepts of management may practically be used by each department or, in the case of smaller universities, on the level of the whole institution. They should be applied mainly to research and innovation cooperation with business, but some of them, like innovation management, should be taught at various departments,

not only management department to enhance innovation promotion activity of universities. Each department of a bigger university should have an office or specialized unit responsible for cooperation with business, where specialists in management of this cooperation should be present. However the topic of implementation of management concepts to cooperation of universities and business and formulating of a model of such cooperation, with suitable structures (organizational, financial etc.) needs further research.

4. Summary

Universities by taking action aimed at increasing innovation of enterprises would constitute specific *growth poles* – driving forces of modern economies. The theory of growth poles (Perroux 1955) is one of the unbalanced growth theories (polarization theories). Unbalanced growth theories emphasize the imbalance (sectoral, temporal and spatial), and in this imbalance they perceive the driving force for regional development. In accordance with this approach, economic development is uneven in space and is done in the form of cyclical process that is initiated by development factors in limited areas or industries, and its effects are accumulated in the economy, thus contributing to the polarization of the economic forces at different points of space. In this way, space becomes differentiated, dividing into areas of growth and areas of late.

Thanks to cooperation between universities and business, regions (where such cooperation would appear in the appropriate form and intensity) would take advantage of positive development impulses. Proper and effective management of the cooperation between science and business (with using modern management concepts) would have therefore a stimulating effect on the development of the whole region, and the role of growth impulses would play innovations, developed in enterprises, with the support of the universities (growth poles), spread to other territories by diffusion.

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