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THE MECHANISMS OF INNOVATIONS SUPPORT: THE ROLE OF INTERCOLLEGIATE INNOVATION INFRASTRUCTURE

This research offers the mechanism for intercollegiate innovation infrastructure functioning, which enables realizing the interaction potential of entities performing innovation activity and adds new development opportunities to the existing institutions of innovation activity support in Russia. The aim of the research is to define the development trends and possibilities taking into account the world practice of innovation activity support instruments and special character of these processes development in Russia.

Keywords: *innovations; innovation system; mechanisms to support innovation; intercollegiate innovation infrastructure.*

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МЕХАНІЗМИ ПІДТРИМКИ ІННОВАЦІЙ: РОЛЬ МІЖВУЗІВСЬКОЇ ІННОВАЦІЙНОЇ ІНФРАСТРУКТУРИ

У статті запропоновано механізм функціонування міжвузівської інноваційної інфраструктури, що дозволяє реалізувати потенціал взаємодії суб'єктів інноваційної діяльності, доповнюючи та розвиваючи наявні інститути підтримки інноваційної діяльності. Визначено перспективи та можливості розвитку з урахуванням результатів досліджень світової практики формування механізмів підтримки інноваційної діяльності та специфіки розвитку даних процесів у РФ.

Ключові слова: *інновації; інноваційна система; механізм підтримки інновацій; міжвузівська інноваційна інфраструктура.*

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МЕХАНИЗМЫ ПОДДЕРЖКИ ИННОВАЦИЙ: РОЛЬ МЕЖВУЗОВСКОЙ ИННОВАЦИОННОЙ ИНФРАСТРУКТУРЫ

В статье предложен механизм функционирования межвузовской инновационной инфраструктуры, позволяющий реализовывать потенциал взаимодействия субъектов инновационной деятельности, дополняя и развивая существующие институты поддержки инновационной деятельности. Определены перспективы и возможности развития с учетом результатов исследования мировой практики формирования механизмов поддержки инновационной деятельности и специфики развития данных процессов в РФ.

Ключевые слова: *инновации; инновационная система; механизмы поддержки инноваций; межвузовская инновационная инфраструктура.*

Introduction. Current trends of economy's development change the role and the mission of universities. Nowadays universities become the development generators of new innovation economy all over the world. Not only the functional part of universities activity is changing but also the interaction of their main entities at the market is changing too. The positions of leadership in forming economic indices are constantly changing together with the changes concerning the role of universities in the process of elaboration and taking new products to market.

However, the rate of innovations introduction in Russian business sector is unjustifiably low because of the insufficient level of business susceptibility to innovations

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elaborated in colleges and universities. The reason for such situation is that contemporary business needs complex innovation project realization based on technological innovations introduction elaborated by technical colleges and non-technological innovations which can serve the technological ones and which are usually elaborated in classical universities. This leads to the necessity for enhancing the integration between the subjects of two levels: at first between business entities and universities in order to raise the efficiency of university innovations implementation into production stage and taking innovative products to market; at the second – between colleges of different specialization in order to perform united innovation research to elaborate technological and non-technological innovations for entrepreneurial sector.

Latest research and publications analysis. Innovation management and national innovation systems were investigated by H. Lofsten (2014), H.-C. Wang et al. (2013), R. Bysted (2013), N. Gaponenko (2013) and others. However, these studies analyzed the problem from the viewpoint of business activities or the activity of state support institutions. But the rising role of universities shouldn't be underestimated. This stipulated the objective need for a conceptual approach to innovation management as the integration process between business entities and universities in order to raise the efficiency of university innovations implementation into production stage and introducing innovative products to markets.

The research object is organizational and economic relationship emerging during innovation management process.

The goal of the article is to define the development trends for the mechanisms of innovation activity support and analyze the specific character of these processes' development in Russia.

The research methods are system analysis, expert judgment, economic and mathematical modelling.

Key research findings. The global practice shows that for the recent 10–20 years there are some changes concerning the forms and the ways of market entities participation in forming new products. For example, the research of D.C. Mowery and B.N. Sampat (2014) shows that the greatest part of new products, produced by huge American corporations was initially created either by small private enterprises, or by universities. And this model is continuously being accepted even by such traditionally conservative industries as aircraft industry or heavy engineering. We can't say that this model is used only by American producers, it is quite often used in Europe too but with some difference. European version of this model is characterized by additional intermediate mechanisms aimed at rising the efficiency of interaction between the developer of an innovative product with a major manufacturer. The role of these mediators such as technological platforms, technopolis or various cooperation programs was studied by H.A. Al-Mubaraki and M. Busler (2012).

The most interesting in this case is the experience of Korea. The main drivers of science and innovation activity development in this country are industrial corporations which actively interact with small local business, colleges, scientific and research institutes and such strategy helps to form industrial clusters. E. Ricote (2007) studied the state active support for such a cluster policy by developing scientific research works at universities. Applications for financing of scientific or innovative development are submitted from a cluster, they are studied by the special committee

and only after that the decision on financial support is made. In this case the innovative initiative can come from a university or an enterprise but as the application is made from the entire cluster it should have the high rate of substantiation, independently from the initial source of origin. Thus, special innovative environment is formed where all participants work for a common goal and are equally interested in its results (we can say that they form the united chain of project advance from an idea to experimental pattern and up to industrial manufacturing).

Besides, if there is no large corporation as the central segment of such a cluster, then mini-clusters uniting initiative participants ready to lead the initiative up to the financing stage can be created. Projects which are assured to come at the market with the ready-for-sale-product in 3–5 years are financed through Korean corporation of industrial complexes (KICOX), more long-term projects are usually financed by industrial ministries.

System analysis of the global trends in implementing, developing and support of innovations shows that the key trend which caused many changes in global innovation systems was the manufacturers' renunciation of the driver function in the sphere of direct innovation design with simultaneous retention of the planning function, the function of prior innovations choice and their taking to the market. The reason for this lies in profit distribution by key stages of innovation design, production and sale. Nowadays manufacturing companies get profit at the production stage and the highest profitability at the sales stage as proved by R. Bysted (2013). So the design stage has the lowest profitability and that is why manufacturing companies are continuously renouncing participation in this process. Thus, fabless companies appear being able and ready to come into this free niche of designing new products. Surely the situation is not the same in various companies and different industries concerning the degree of participation in the process of product design but the general trend is the decrease of large manufacturers' participation in the process of design and advancement of new ideas and products. The indicated factors greatly influence the changes in the structure of R&D market because the need for new partners with new qualities appear and this stipulates the changing role of universities. Today university is no more the supplier of qualified staff but the central generator of new knowledge environment around it, the generator of innovative processes. This is happening because of the reduction of R&D activity inside large manufacturing companies. The period when most of big companies formed the knowledge centers or R&D centers inside them is coming to its end. According to A. Padilla-Melendex and A. Garrido-Moreno (2012) from Massachusetts Technology Institute (MIT) the share of own development measured by the number of articles in leading engineering American journals done by IBM and other leaders reduced 3 times and in some sectors – up to 10 times.

Thus appears the objective need in changing the forms of cooperation between enterprises and universities. A contemporary enterprise is ready to pass the function of R&D planning for outsourcing and university if it has the needed potential is able to fully accept this function. But there is some peculiarity in the process and it is about the fact that big enterprise doesn't need separate research. It needs the implementation of the whole set of works concerning the substantiation and implementation of product design. In fact, to implement this function university needs to have research laboratories, engineering centers and other research departments with large scale of

competences. The global practice shows that the most demanded are those developers who can independently formulate the scientific and innovative problem solving in the frame of the wide task and offer definite instruments for its elaboration and the methods to achieve the set aims. So, developers should perform the function of setting the task, generating new ideas, starting up new business and developing new technologies. Besides the developer's ability to lead the idea up to the definite product pattern or technology being ready for industrial manufacturing is also very important.

It also should be mentioned that this trend has appeared because of some factors influence, the most important of which are speeding-up the environment changeability, new technologies appearance etc. Also many global companies ("Intel", for example) have clearly defined development strategy for 15–20 years which allows developers integrate with the development trends defined by the company offering the corresponding product. But the value of strategy charters for companies acting in dynamic industries such as IT or medicine starts reducing because quite often decisions suggested by the market excel the planned ones.

Development of contemporary information environment and existence of research competence allows developers define development vectors for technology zones with the same research quality of a big manufacturing company.

In other words, earlier only a company could be the customer of scientific and innovative researches and university was the executor and only to some extent could compete for the development of a new product limited by the frames of research topics done by the company for the long-term period. But now the universities quite often accept the direct function of designing the technology development charters. For example, MIT has its own big R&D department aimed at modelling and analysis of technology trends in all spheres where MIT has corresponding competences.

The global experience of such tasks decision is connected with changes in universities functions as it happens in American model where major universities have the function of technology charters design and initiate new technologies and new products creation at definite markets. European model creates the pool of centers of various specialization and universities with various competences which take part in creation of new technology development charters. Korean model of forming cluster initiatives of industrial sectors development is also based on the synergy effect of a university and a corporation cooperation while designing a new product.

Russian national innovation infrastructure slightly differs from the world one. It includes, first, base producers of innovative and scientific knowledge such as academy institutions, universities, industrial branch science institutions, research centers; second, financial infrastructure of scientific researches support, the main elements of which are Russian fund of fundamental research, Russian humanities scientific fund, Russian venture company, some private funds; third, the infrastructure of technology transference and commercialization including techno-parks, incubators, technology transfer centers, informational and analytical centers, special economic zones etc.

But the research shows that the trends of commercializing scientific researches and innovation development designed in Russian scientific organizations and universities significantly lag behind the global ones. N. Gaponenko (2012) indicates the following reasons restraining commercialization in Russia (Figure 1).

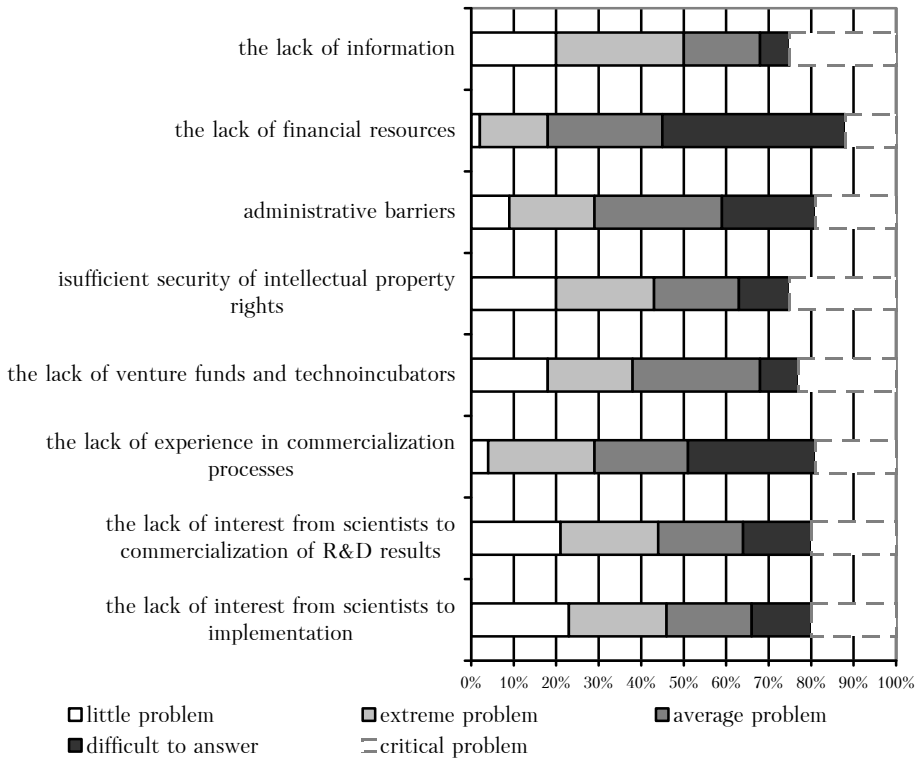

Figure 1. **The problems preventing R&D results transfer and commercialization in Russia** (Gaponenko, 2012)

The lack of financing was indicated as the basic reason. Also the lack of commercialization experience and administrative problems seemed to be of importance. The interviewees mentioned the underdevelopment of infrastructure that should support commercialization processes; the gap between the institutions of knowledge and technology transfer and the sources of knowledge production such as universities or research institutes.

In fact, in Russia the situation is characterized by the lack of coordination between the interests of scientific knowledge producers and their consumers. Such situation is also becoming worse because of inefficiency of the mechanism of knowledge transfer support between producers and consumers of such a specific product.

But it should be mentioned that the authors' analysis of Russian national innovation system showed the greater role of colleges and universities in its structure. From one side, universities are the main source of fundamental and applied research works for entrepreneurial sector, from the other – they supply the learning of qualified personnel contributing to innovative development of the country (Figure 2).

It also should be mentioned that lately Russian universities have influenced greatly the intensification of commercialization process and it has been possible also thanks to state measures concerning the development of innovative infrastructure taken during the recent years.

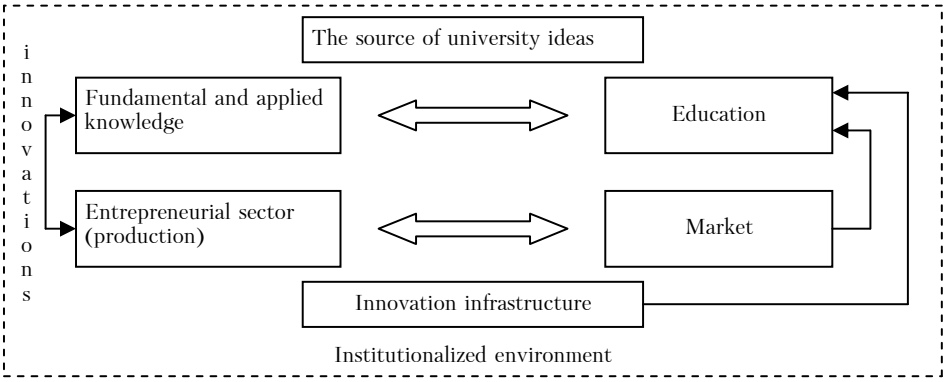

Figure 2. **The place of universities in Russian national innovation system,** *authors' development*

The specialization of a university influences greatly the development trend of its research work in Russia:

- technical colleges have fundamental or applied research works in the area of technology which can be the basis for technological innovations such as information technologies, production technologies, hi-tech goods for business;
- economic colleges have research in the field of economy or management which can be the basis for organizational or administrative innovations.

But the most problematic aspect here is the insufficient level of business susceptibility to the innovations elaborated in colleges and universities. The reason for such a situation is that contemporary business needs complex innovation project realization based on technological innovations introduction elaborated by technical colleges and non-technological innovations which can serve the technological ones and which are usually elaborated in classical universities. This leads to the necessity of enhancing integration between the subjects at two levels: first, between business entities and universities in order to raise the efficiency of innovations introduction into production and taking innovative products to the market; second, between colleges of different specialization in order to perform joint research to elaborate technological and non-technological innovations for entrepreneurial sector.

It can be concluded that the design of effective innovation system is possible only in case of integration development between universities and business environment plus integration with other universities in order to develop the common innovation activity with the help of corresponding infrastructure support. Here the innovation university infrastructure is becoming especially important. That is why Russian government approved the decree #219 (April 9th, 2010) titled "On the state support of innovation infrastructure development in the universities of federal level". According to this decree, the state can support innovation infrastructure development including small innovative entrepreneurship at universities by tendering. After the tender was performed, 78 universities got financial support for the development of their innovation infrastructure in 2010–2011. The important fact is that 90% of these universities-winners were technical colleges and classical universities. As for the colleges of social or economic specialization there were only two of them: National Research University "Higher School of Economics" and the Pacific Ocean State Economic

University. This proves the state priority of technological innovations and support for colleges involved in technological innovations and it could be estimated as the right thing because innovative activity of technical colleges and classical universities demands complex infrastructural support. On the other hand, this approach reduces the innovation development opportunities for social science colleges and consequently the speed of non-technological innovations implementation into the production sector.

The authors' opinion is that today's business demands not only technological environment convergence but also new economic and management techniques. In fact, the market starts demanding projects not only with technological grounds but also with thorough economic and managerial description. Thus, a contemporary university should have the center of special competence in management techniques in engineering sphere, project management etc. But it is difficult to forecast whether it would be efficient to create such a center at each university, probably the development of innovation activity coordination of technological and non-technological innovations elaboration at different universities might be more efficient. Raising the efficiency of such collaboration demands intercollegiate infrastructure aimed at joint innovation activity support. The aim of such intercollegiate infrastructure is to create helpful conditions for manufacturing, innovation expertise, innovative staff learning, information and marketing support of universities' joint innovative activity.

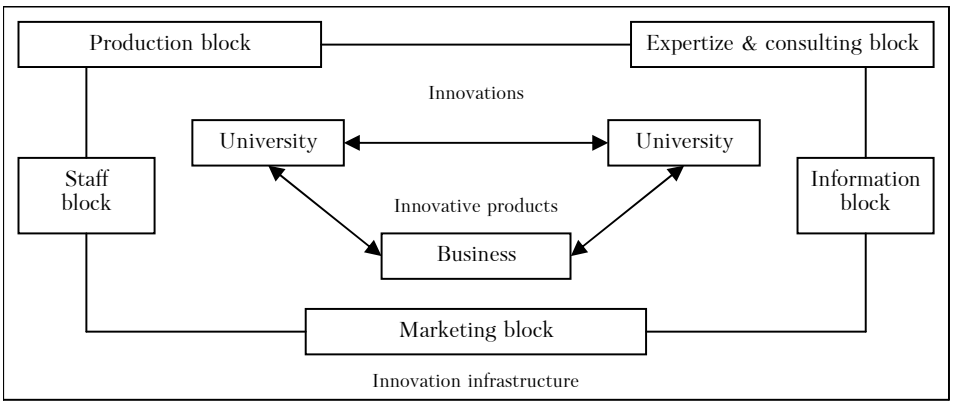

Figure 3. **The scheme of the intercollegiate innovation infrastructure,** *authors' development*

The authors research resulted in the following structure of the intercollegiate innovation infrastructure, it can be represented through several interconnected blocks:

- production block – creates conditions for technological and non-technological innovations design by universities and for joint innovation projects' realization;
- expertise and consulting block – implements preliminary work on the commercialization of universities' innovation activity results;
- staff block – implements effective training for innovation activities;
- information block – implements information support for innovation activity of universities with different specialization;

- marketing block – supplies the advancement of technological and non-technological innovations elaborated by universities in the manufacturing sector.

Thus, the intercollegiate innovation infrastructure is to serve for the integration of entities in the chain "university – university – business" (Figure 3).

Conclusions. The design of intercollegiate innovation infrastructure can serve as an effective mechanism of innovation support because it can be the basis for forming conditions that will help raise the intensity of innovations elaboration by universities because they will become free of some servicing functions; to raise business susceptibility to complex innovation projects of the universities being the result of joint activity of technological and non-technological innovations elaboration.

One of the main tasks of a contemporary university is to keep the balance between its development as an innovative educational ground able to satisfy the needs of the state, employers and students in educational services and the development of its entrepreneurial functions aimed at meeting the market demand in scientific and innovation products. These processes are usually accompanied by the change of cooperation mechanisms with teaching staff and professors in order to keep the balance between lecturing hours, possibilities to carry out research and developing entrepreneur competences and new management techniques knowledge in them.

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