

THE PROBLEMS OF REALIZING THE INNOVATIVE POTENTIAL OF SCIENCE AND MECHANISMS FOR THEIR SOLUTION

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Ianchenko Z. B.

The Problems of Realizing the Innovative Potential of Science and Mechanisms for their Solution

The aim of the article is revealing reasons for the low payoff of science in terms of the effectiveness of the research activity and demand for its results in economic spheres, identifying problems in the innovation activity of research institutions and reasons for their arising, searching for fundamental approaches to the development of a strategy and mechanisms for realization of the innovative potential of science to strengthen its position in the real sector. The study used general scientific methods, including: systems approach — to systematize the problems of the innovation activity of research institutions; methods of theoretical generalization — to study the theoretical principles of the scientific and innovation activity; methods of analysis and synthesis — to search for fundamental approaches to the development of mechanisms for realization of the innovative potential of science. The used concepts of scientific activity and innovations are generalized. The author's definition of the term "innovation" is proposed. The main reasons of the minor impact of science on the economy are systematized, the mechanisms for their elimination are offered. Based on the comprehensive analysis of the reasons for losing by science its impact on the economy, the ways of realizing the innovative potential of science are improved. The results of the research can be used in reforming domestic scientific research institutions.

Keywords: science, innovation, innovative potential.

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Ianchenko Zinayida B. – Doctor of Sciences (Economics), Associate Professor, Head of the Department of Business Administration, International Institute of Business (8a Brest-Litovskiy Highway, Kyiv, 03179, Ukraine)

E-mail: 230859@ukr.net

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Янченко З. Б. Проблеми реалізації інноваційного потенціалу науки та механізми їх вирішення

Мета цієї статті полягає у пошуку причин низької віддачі науки в частині результативності наукової діяльності та її затребуваності в економічних сферах, виокремленні проблем інноваційної діяльності наукових установ і причин їх виникнення, пошуку принципових підходів до формування механізмів і стратегії реалізації інноваційного потенціалу науки для посилення її позиції в реальному секторі економіки. В процесі дослідження використовувались загальнонаукові методи, зокрема: системний підхід – для систематизації проблем інноваційної діяльності наукових установ; методи теоретичного узагальнення – для дослідження теоретичних основ наукової та інноваційної діяльності; методи аналізу та синтезу – для пошуку принципових підходів до формування механізмів реалізації інноваційного потенціалу науки. Узагальнено вживані поняття наукової діяльності та інновацій. Запропоновано власне вдосконалене визначення терміна «інновація». Систематизовано основні причини незначного впливу науки на економіку, запропоновано механізми їх усунення. На основі всебічного аналізу причин втрати впливу науки на економіку країни удосконалено шляхи реалізації інноваційного потенціалу науки. Отримані результати дослідження можуть бути використані під час реформування вітчизняних наукових установ.

Ключові слова: наука, інновація, інноваційний потенціал.

Бібл.: 8.

Янченко Зінаїда Борисівна – доктор економічних наук, доцент, завідувач кафедри бізнес-адміністрування, Міжнародний інститут бізнесу (Брест-Литовське шосе, 8а, Київ, 03179, Україна)

E-mail: 230859@ukr.net

Янченко З. Б. Проблемы реализации инновационного потенциала науки и механизмы их решения

Цель этой статьи заключается в поиске причин низкой отдачи науки в части результативности научной деятельности и ее востребованности в экономических сферах, выделении проблем инновационной деятельности научных учреждений и причин их возникновения, поиске принципиальных подходов к формированию механизмов и стратегии реализации инновационного потенциала науки для усиления ее позиции в реальном секторе экономики. В процессе исследования использовались общенаучные методы, в частности: системный подход – для систематизации проблем инновационной деятельности научных учреждений; методы теоретического обобщения – для исследования теоретических основ научной и инновационной деятельности; методы анализа и синтеза – для поиска принципиальных подходов к формированию механизмов реализации инновационного потенциала науки. Обобщены употребляемые понятия научной деятельности и инноваций. Предложено собственное усовершенствованное определение термина «инновация». Систематизированы основные причины незначительного влияния науки на экономику, предложены механизмы их устранения. На основе всестороннего анализа причин потери влияния науки на экономику страны усовершенствованы пути реализации инновационного потенциала науки. Полученные результаты исследования могут быть использованы при реформировании отечественных научных учреждений.

Ключевые слова: наука, инновация, инновационный потенциал.

Библ.: 8.

Янченко Зинаида Борисовна – доктор экономических наук, доцент, заведующий кафедрой бизнес-администрирования, Международный институт бизнеса (Брест-Литовское шоссе, 8а, Киев, 03179, Украина)

E-mail: 230859@ukr.net

Statement of the problem and its connection with important practical tasks. The Ukrainian scientific and technical potential is in crisis now and characterized by a further loss

of the position of science in the real economy. The considerable lack of financial resources, the depreciation of the material and technical base, the low percentage of commercialization

of scientific research results significantly limit the possibilities for further researches and their conducting at the world level. The continuing process of destruction of the experimental and production base of the national science leads to deepening the gap between the scientific sector and manufacturers of high technology products. The financial, tax and credit incentives for the development of innovations and technology transfer are not working due to the lack of a proper infrastructure. The problem of the low payoff of science in terms of effectiveness of scientific and technical products and demand for them in economic spheres becomes an irreversible trend. The searching for an effective model of scientific development requires an in-depth study of its current condition, analysis of the existing problems and motivation to solve them.

Analysis of recent researches and publications. The problems of intensification of the innovation activity in organizational and legal, and socio-economic aspects were investigated by O. Amosha, V. Antonyuk, A. Zemlyankin [1], N. Chukhrai, L. Lisovska [2]. The problems of innovation development of the economy, its trends and growth potential – by L. Gnylyanska, A. Hryschuk, I. Gurnyak, L. Zahvoyska, O. Makara, V. Petrynka, Z. Yurynets [3].

However, the problems of realizing the innovative potential of science need further systematization and the mechanisms for solving them require improvement.

The aim of the article. The article focuses on revealing reasons for the low payoff of science in terms of the effectiveness of the research activity and demand for its results in economic spheres, identifying problems in the innovation activity of research institutions and reasons for their emergence, searching for fundamental approaches to the formation of a strategy and mechanisms for realizing the innovative potential of science to strengthen its position in the real sector of the economy.

Presentation of basic material of the research. The declared by the state path of the national economic development using an innovative model implies that new scientific knowledge should become the main source of economic growth and mechanisms for its commercial use should serve as a catalyst for development. The international experience confirms that the model of innovation development has no alternative among the modern strategies of leading countries, the innovative economy is dominant and the high-tech industry is a source of their economic growth. Science is considered a basic sphere of an economy that is built on innovative approaches.

The vector of activity of research institutions directed towards innovations necessitates a clear distinction between the concepts of scientific and innovation processes, and innovations. The concepts of scientific activity and research results used in their traditional sense are defined as new knowledge. Innovative components of a scientific process, as the very perception of innovations, cause discussions among domestic scientists. In view of this, we would like to point out a fundamental, in our opinion, difference between these definitions: a research institution functions under the Law of Ukraine «On scientific and technical activity» and other laws and regulations. The result of its work is scientific knowledge, technical and technological decisions that can be implemented in the form of scientific products and should serve as a basis for innovation activity.

Modern western economists (H. Barnett, E. Mansfield, N. Monchev, I. Perlaki, E. Rogers, B. Twiss, V. Hartman, R. Fos-

ter) depending on the object and the subject of the study interpret innovation with consideration for different aspects: as a process, as a system, as a change, as a result. That is the reason why some scientists emphasize the creative component of innovations, while others – its production or consumer component. The Eurostat and the Organization for Economic Cooperation and Development defined innovation as the use of any new or significantly improved product (goods or service) or process, a new marketing method or a new organizational method in business practice, workplace arrangement or external relations [4]. The minimal sign of innovation is the requirement that the product, process, marketing method is new (or significantly improved) in the practice of the enterprise.

According to Art. 1 of the Law of Ukraine «On innovation activity», innovations are newly formed (applied) and (or) improved competitive technologies, products or services as well as organizational and technical solutions of industrial, administrative, commercial or other kind that significantly improve the structure and the quality of production and (or) social sphere [5]. That is, the national legislation, as opposed to the Western economic thought, supports the concept considering the essence of innovations as a certain new result of an innovation activity that can be implemented in the form of technology, products, services or an organizational and technical solution. Representatives of the national innovation school in the overwhelming majority are adherent to the concept that regards innovations as a result of activity of economic entities on implementation of new ideas and application of them in their economic activity [6, 7]. Summarizing the above mentioned scientific approaches, the following definition of the term «innovation» seems to be most optimal: *innovation is a method of providing beneficial effects in all spheres of public activity that implies implementation of results of scientific researches and is associated with risks* [8].

Breaking the chain «new knowledge – novations – innovations» can lead to losing by science its influence on the development of innovation activity and consequently of its position in the real sector of the economy. Attempts of some research institutions to improve the situation do not bring positive results due to insufficiently balanced and uncoordinated actions. The discussion of these issues requires revealing the reasons of the insufficient influence of the scientific environment on innovation processes in Ukraine and formulating possible solutions.

Reasons of legal nature. It is obvious that to improve the practical payoff of science, the results of scientific activity should be commercialized. However, only the institutions for which scientific activity is the basic type of activity and represents over 70 % of the total annual volume of the work performed are defined by the current legislation as research ones. Entrepreneurial activity is as a rule prohibited for scientists. In view of this, introducing changes in the existing legislation is a priority task.

The insufficient state financing of scientific researches. The financial priorities of the state concerning innovation processes in the scientific sphere are mainly defined as the direct funding of the research and development activity by the envisaged directions. The undeniable advantage of the direct state financing of research and development activity is the prospect of a rather fast intensification of the research and innovation processes and high rates of their implementation, manageabil-

ity, mobility, possibility of direct influence on the formation of benefits from scientific researches in different spheres. It is obvious that this way requires a significant amount of financial resources, and in case of their availability, the building of a system of training, selection of priority scientific researches, their promotion and control over the movement of the state funds. At supporting the direction of the state funds to fundamental researches under conditions when the direct state financing of research and development activity is limited and the allocated resources cannot provide an innovative breakthrough either in developing or in promoting the distribution of a science product, the central place in the applied research should be taken by encouraging competition and providing various financial subsidies and benefits not only for scientists but also for participants of innovation processes in general.

Encouraging the attraction of investment resources to innovation development in the world ensures a sufficient effectiveness of innovation activity and in this way enhances the interest of investors and enterprises. As a result, the effectiveness of using budget funds allocated for incentives and reliefs is growing significantly faster compared with that of the direct budget financing. In view of this, stimulating scientific applied researches and introducing innovations will be attractive for market participants, and avoiding possible risks in the procurement of innovations by means of a partial or full state insurance, especially in priority areas, will allow obtaining economic benefits. The proposed approaches should be legalized by introducing changes in the existing legislation for innovation development. At the same time, it is necessary not only to form such legislative framework that will guarantee to researchers and other market participants the envisaged incentives, ensure stability and timely correction of the legislative norms in accordance with social and technological changes but also provide a mechanism ensuring compliance with the legislation; for the purpose of forming the national concept of investment and innovation activity, the state should provide the priority directions of fundamental scientific researches with resources. It should be noted that we understand «resource provision» not only as direct financing from budgetary funds but also as creating conditions for attracting investments; an important reserve can be creating special purpose and venture funds, the filling of which is possible also through the mechanism of selling land (for the agricultural sector) and contributions to innovation funds. This approach seems feasible, since the practice of contributions to innovation funds has already been applied in Ukraine.

More substantive government measures to revitalize the activity in the innovation sphere should include application of reliefs in taxation of profit in accordance with the economic feasibility; provision of immunity from taxation to the scientific research institutions which activity is carried out at the expense of the state budget and preferential taxation to investors in terms of the invested funds. The criterion in providing incentives for innovative projects should be the effectiveness of their implementation during a certain period (for example, the first year of its mass application). This will prevent the thriving of pseudo-innovations, the life of which continues only up to the moment of obtaining a tax relief. The selection criteria for granting any kind of tax reliefs may be the correspondence of innovation projects to the following parameters: impact on the quality of life and its safety, development of human capi-

tal, increase of the economic efficiency of manufacturing and energy saving, achievement of the world level of product competitiveness, development of communication technologies and technology transfer, etc.

Cooperation with partners also presents a significant financial reserve: participation in infrastructure projects within the implementation of the Europe 2020 Strategy, the European Neighborhood Policy as well as in grants from the European Cluster Alliance. The funds allocated for these projects are sufficient for stimulating innovation processes in certain national research institutions.

The non-favorable terms of the public-private partnership. The prime mover of the market for innovation can be the public-private partnership (PPP) between the state, research institutions and other participants in the innovation process in the case if the state finances fundamental researches, and the enterprise ensures a transition to the stage of applied research and practical implementation of the results obtained. On the one hand, the PPP guarantees allocation of the state funds for researches without expenditures on the stage of their practical implementation, on the other hand, the attraction of enterprises to the project automatically expands the circle of participants in the innovation market, which, in the case of a positive result, will increase the number of enterprises ready for implementation of innovations.

An important direction of the PPP in the field of the innovation and investment development of research institutions can present a creation on their basis of regional innovation and advisory centers that may be part of scientific parks. Their activities should be aimed at providing additional benefits in the realization of high technology products by improving their competitiveness and using a comprehensive approach to working with the market as well as forming the necessary material and technical base, including at the expense of accredited business partners — providers of projects and investments. Innovation and advisory centers perform functions of a transfer infrastructure platform and their rational distribution will allow the science park system by using project management to find opportunities for spreading innovations, ensure the transferring of scientific and technical products in the market through the integrated network of the public-private scientific and production infrastructure.

The staffing of innovation processes, which, given the presence of the legal framework, would meet the need to promote innovations, seems most important.

In view of this, we would divide the process it into two equal parts:

The formation of a new cohort of scientists interested (that is, stimulated, including by the state) not only in creating an innovative product but also in introducing it into manufacturing, on the one hand, and providing this opportunity for scientists — on the other). The latter seems not less important because creating conditions for approbation of scientific research results can provide benefits to the national economy. The experience of domestic scientists show that they are not always able (due to their usual practice or the way of thinking) to commercialize the results of their researches. For this reason, even on condition of obtaining sufficiently serious research results, scientific institutions do not always obtain economic benefits.

The training of staff in higher educational institutions. The content of academic programs of educational institutions should contribute to the development of creative potential of innovators and the perceptivity of future scientists and experts to innovations. To train leading cadres, it is advisable to use a network of state institutions of higher education that can provide high-quality training, postgraduate education, popularization of the latest knowledge in scientific, scientific and technological spheres. For the employees engaged in the production process, it is necessary to ensure a comprehensive development of the system of professional education, training and retraining. The financing of staff retraining can be carried out using several sources: the state, enterprises, investors, etc.

The lack of a commercial network for transferring advanced technologies does not contribute to converting scientific knowledge into innovative products. The correction of the existing legislative framework aimed at stimulating the use of research results, forming a database of such developments and contributing to rising producers' awareness will significantly expand the access of a business to innovative products and, finally, ensure an increase in its production efficiency. We see the prospect of co-financing the expenditures aimed at: developing expert models and their introducing into production, financing the access to international bases of research and development materials and forming their unified base, obtaining interest income from the implementation of inventions, and granting immunity from taxation for funds allocated for innovation development. For this purpose, the state should define the legal relationship between the developer of an innovation and its consumers. Positive changes in the science system will be ensured by its participation in the sale of scientific research results, licenses; creation and support of a franchise; attraction of innovative brokers, consulting, advisory services, connection to an automated reference and information system.

The inefficient cooperation of the scientific sector with private business. The defining feature that characterizes the processes of introducing innovations is the separateness of their participants. Business entities that carry out manufacturing activities, educational and scientific institutions that produce results of scientific researches exist independently and practically do not fall within the sphere of interests of each other. Their activities focus only on production. Even if they are able to introduce innovations, the use of the accumulated scientific heritage becomes practically impossible due to the limited real access to scientific research results, the lack of specialists capable of distinguishing them and ensuring their introduction, as well as organizations that would ensure the cooperation of scientific research institutions and producers.

As regards scientific institutions, some of them have serious research results, but they are not able to commercialize them, since they do not know their potential buyer, and establishing ties with each enterprise requires considerable expenditure of money and time. The state authorities are practically deprived of the possibility to exert real influence on the interaction of science and industry or coordinate their cooperation in any way except for mandatory instructions that are peculiar not to the market but to the command and administrative practice of management, and therefore are completely unacceptable.

The poor investment attractiveness of objects of the innovation and investment development caused by the opaque

rules of the game in domestic markets, complexity of the tax legislation, large-scale bankruptcies of enterprises, downward tendencies in the investment ratings of Ukraine.

The state of the current legislation in the sphere of patent licensing requires its alignment with norms of international law, which will not only help protect the rights of innovators but ensure the emergence of international innovation in the national market and, due to equal access of each market participant to the world scientific research results, stimulate the emergence of full-fledged players in the international market in Ukraine. The opportunity to realize a result of scientific researches not only in the national but also in the world market at international market prices will make scientific work prestigious and interesting for developers. On the other hand, the access of research institutions and business structures involved in the innovation process to the international market will make possible the development of a competitive business sector and its ability to concentration and redistribution of funds among priority sectors.

The national system of research institutions also requires certain changes. Though it possesses a sufficiently high level of managerial potential, the current management mechanism still remains its weak link. It needs new functions and methods for managing the network of research institutions, creating and coordinating the work of the innovative entrepreneurial infrastructure, protecting the interests of state institutions in their relationships with business. The reorientation of research institutions towards innovative principles requires creating a mechanism for technology transfer, performing work depending on the needs of the market and business entities. The bulk of scientific institutions have significant production bases, property and labor resources sufficient for conducting research activities. However, the effectiveness of their use remains low. The vector of the future operation of these institutions should be directed at revitalizing their industrial and commercial activities. It is advisable to pay more attention to attracting investments (including financial and technical assistance, venture and credit resources), increasing the amount of extra-budgetary revenues and the profitability of the experimental production base.

The results expected from the implementation of the mentioned conceptual principles can contribute to establishing the innovation and investment model of development of Ukraine, including:

- orientation of the research process to increasing the output of scientific products with high innovative potential;
- formation of a base of scientific research results, provision of the access of scientific and business structures to the international scientific base, creation of a market for innovations and technologies;
- creation of an innovative infrastructure and building a technology transfer system;
- the deepening of the integration processes in the high technology market, provision of participation of research institutions in modern innovative formations able to ensure a highly effective manufacturing and selling of competitive goods not only in the domestic but also in international markets due to using high-tech products and the attracted investments.

The implementation of the mentioned approaches will

help use the scientific potential in promising areas of the innovation development of the country, in particular:

- reformation of the existing research system and the network of research institutions into an innovation-oriented structure, improvement of the level of science competitiveness;
- development of the public-private partnership by commercialization of scientific research results, creation on their basis of business projects for their implementation in the national and international innovation markets, provision of the innovative and investment development of economic priorities with participation of the state, research institutions and private capital;
- creation of a competitive national economy with the developed system for transferring innovative technologies, sufficient investment and integration support;
- creation of a network of infrastructure objects, the main of which are: innovative parks – infrastructure objects to attract investments to innovative projects; science parks – an association of the participants of an innovation process on the basis of a research or higher education institution; technology parks – associations on the basis of a leading innovator company; industrial parks – areas for innovative in industrial production equipped with infrastructure; innovation centers (technology transfer networks) – innovation and information support of technology transfer; incubators (venture funds) – organizations that support innovative startups. The priority technological directions in the implementation of infrastructure projects on adaptation and integration of science in the market environment are: technology platforms – as a tool for communication of the participants of an innovation process, technology clusters – as concentration of enterprises by geographic organization within the framework of technological integration;
- creation of a flexible system of incentives for entities of all forms of ownership to ensure the access to high-technology and financial resources, the use of the tender mechanism for realization of innovative products;
- attraction of foreign technologies and capital on favorable terms for participation in investment development of the innovative infrastructure of the high-tech agricultural market on a corporate and cooperative basis.

Conclusions. Thus, a powerful research complex that is able to effectively produce world-class results, does not perform the role of a source of economic growth properly, the proposed product does not find application in the economy. Ukraine is increasingly turning into an exporter of goods and services with low added value, and business continues using scientific products of other countries. The threat of losing the scientific elite through the reorientation towards the needs of foreign countries with more favorable working conditions is becoming critical. The strategy of state innovation development under such conditions should include a combination of principles of effective innovation policy, science innovative potential, busi-

ness mechanisms of the market innovation infrastructure and the production base of innovation and investment business structures.

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