
INNOVATIVE DEVELOPMENT OF SCIENCE IN A MODERN UNIVERSITY: PRIORITIES AND WAYS OF IMPLEMENTATION

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Розглянуто питання інноваційного розвитку науки сучасного університету, з врахуванням державних пріоритетних наукових напрямів, і з використанням наявного досвіду, висловленого учасниками міжнародних науково-практичних конференцій.

Ключові слова: *університет, наука, інноваційний розвиток, досвід, перспектива, науково-практична конференція.*

The article hereby considers the issue of innovative development of science in a modern university with account for the state priority research areas and the use of available experience expressed by participants of international scientific conferences.

Keywords: *university, science and innovation development, experience, perspective, scientific conference.*

Research problem. With the modernization of higher education, the role of university research increases, which directly impacts the socio-economic development and transformation processes in the contemporary society. On this occasion, in the address to the members of the International Scientific Conference "Effective technology of education and upbringing in the context of the Bologna Process " (Makijivka , April 18-19, 2013) the Minister of Education and Science of Ukraine Tabachnyk set a task to continue work on implementing measures defined by a program of economic reforms of the President of Ukraine for 2010-2014 entitled "Prosperous society, competitive economy, effective state"- emphasizing that higher education institutions occupy leading positions in solving these problems as they successfully apply new innovative forms of educational, scientific and practical training and social protection of students on practice. Our main goal is to study effectiveness of advanced experience and implement it on the state level [1, p. 3].

Topicality of the research consists in reporting the scientific experience of universities that were the participants of the International Scientific and Practical Conference taking place in such cities as: Kyiv (December 20-21,2012) [2], Donetsk (Makiyivka, April 18-19, 2013) [3], Chernivtsi (May 16-18, 2013) [4], Lutsk (October 4-5, 2013) [5], Odessa (October 24-25, 2013). [6]

Analysis of recent researches and publications. Innovative development needs to address several problems in different areas of scientific activities, including the university ones, aimed at finding ways and justification of intensive growth and significant accelera-

tion of the scientific and technological process. Experience in the use of scientific potential in this area has been explored by I.Agiyenko [2, p.9-12], N.Borysenko [2, p. 22-25], O.Dragunovs'ka [2, p. 103-107], I.Zolotareva [2, p. 155-158], O.Skydan [2, p. 274-278], A.Baranova and O.Shendryk [3, p. 140-144], E.Gorohov and V.Lushchanov [3, p. 153-159], S.Belikov and U.Vnukov [5, p. 22-25], N.Kotsan [5, p. 107-109] and others.

Experience and prospects of scientific cooperation between universities and departments, the possibility of development of international experience and connection to the implementation of international projects, as well as improvement of professional competence have been highlighted in the researches by S.Antoshchuk, O.Galchenkov and S.Khlebnikov [6, p. 8-9], O.Alisova [5, p. 15-17], J.Virna and M.Mushkevych [5, p. 42-44], V.Grabko [4, p. 5-6], S.Fedonyuk [4, p. 7-8], J. Koval [4, p. 43-45], S.Melnychuk [4, p. 68-71], S.Lukanyuk [4, p. 71-75] and others.

The role of university research in the creation and development of innovative institutions with the support of entrepreneurs and business has been explored by U.Bereznytska and O.Dzyuba [5, p. 20-22], L.Gevlevych and N.Piskunov [3, p. 149-153] O.Tymoshenko [6, p. 286-291], etc

New university scientific technologies, being developed of late, include creation of scientific parks extensively studied by O.Alisova [5, p. 15-17], V.Bozhydarnik and I.Vahovych [5, p.27-29], F.Vashchuk, U.Vysochanskiy, J.Golovatch [5, p. 41-42], and other researchers.

Active development of the studied problem, as evidenced by presentations of members of international conferences (for example, only the Lesya Ukrainka Eastern European National University conference was attended by 230 participants, including more than 20 foreign authors), leads to the need of summarizing the experience of university's scientific work and developing recommendations for its improvement.

The purpose of the article is objective analysis of innovative development of science in a modern university and the development of projected prospects of this important direction of scientific activity on the basis of such analysis.

Exposition of the basic material. The most important components of modern higher education include ensuring the organic unity of scientific content of programs in the university through communication of the research and educational processes, development of cooperation of the university's science with the industry, expansion of international relations, preservation and enhancement of developments of modern university research schools.

In the address to the participants of the International Scientific Conference "Scientific parks and innovation infrastructure of the university as a basis for the development of education and science" in Lutsk the First Deputy Minister of Education and Science E.Sulima identified future challenges of this process, noting that the priority tasks of the university development are: strengthening of the development of research activities, ensuring of an adequate level of scientific research (priority innovation projects, new advanced technologies),- instant response of science to new market requirements and their effective satisfaction, ensuring focus of the entire scientific process on obtaining the final result, establishing close and fruitful cooperation of university science and business, i.e. commercialization, and finally, using such an effective tool as park [7, p. 3], thus having defined six major scientific issues that form the structural basis of this study.

1. Update of research. Discussion of this issue at conferences has highlighted a number of problems, solution of which depends largely on the efficiency and effectiveness of research activities at the university, namely:

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- creating conditions (premises, modern laboratory equipment, computer labs, material and human resources, etc.);
 - funding of the scientific research (with the involvement of funds from companies and businesses that are interested in using the university's applied developments);
 - legislative and regulatory support of research activities;
 - formation of a competent person who is capable of carrying out the research activity (including from the student environment) (S.Belikov, U.Vnukov, V. Barabash, M.Il'chenko, V.Dorofeev etc..).

Overall, international experience of leading countries demonstrates the need for the development and implementation of a national scientific innovation system, which is a tool for implementing systematic and consistent government policy aimed at enhancing innovation processes of the social and economic development.

2. Ensuring the appropriate level of scientific research. Most conference participants are unanimous in that compliance of scientific research with urgent needs of the society is ensured by the use of achievements of national and international science and technology. However, this is just a general setting. According to specialists (I.Agiyenko, Y.Atamanova, S.Prylypko, L.Burdolos), the problem of assessing the level and efficiency of scientific research activities has two aspects, because the university can be seen as educational and research center. Hence, there is effectiveness of two types of research: economic – (from the introduction to any sector of the economy) and cognitive (recognized, mate), which is supposedly considered as minor, but that in fact has paramount meaning in training specialists to conduct scientific research activities, and is derived from writing new textbooks and research papers, reading new lectures based on scientific advances, conducting conferences, actively involving students in scientific research activities.

This way, the level of scientific research activity in the university is created by its multifaceted activities. However, a peculiarity of the scientific research in universities is evident not only in that it requires specially trained personnel, specialized scientific equipment, particular item of expenditure, but also in how the final results of the research will be used and which effect they will produce. Therefore, the effectiveness of university's scientific research activities should be reviewed from such perspectives, being based on the primary mission of the high school, i.e. on improving training of highly qualified specialists for the national economy. This is the basic level of evaluation of the university research level the content and main purpose of which is very different from scientific work and scientific research conducted in scientific institutes and other academic research institutions. In addition, a key prerequisite for an adequate level of research is the use of priority innovation projects and new advanced technologies.

3. Instant reaction of science to new market needs and their effective satisfaction. As it is evident from the analysis of the integration of teaching, scientific, and production activities through the system of interaction between university and industry, there is a unique opportunity to use the integrated scientific potential of scientists, graduate students, engineers, and technical personnel to solve topical educational, scientific, technical and economic problems of the university, city or region.

For example, the greatest demand in terms of innovative products of Zaporizhya National Technical University is displayed for the high-tech developments and production of modern aircraft engines, which are presented in Zaporizhya by such enterprises as ZMKB "Ivchenko-Progress" and PJSC "Motor Sich". The university has an innovative type of interaction with these companies, as a result of which there exists

production of the scientific knowledge and innovations, commercialization and use of the scientific knowledge (S. Belikov, U. Vnukovo, [5, p. 22-23]).

V.Lazarian Dnipropetrovsk National Railway Transport University annually registers about fifty applications for scientific inventions and utility models, as well as supports validity of about two hundred patents. The university is involved into up to 20 fundamental scientific, technical and study projects (I. Agiyenko [2, p. 9-10]).

Nowadays, every university in Ukraine can boast of similar examples (to greater or lesser extend). It is also clear that the universities, which can be considered as innovative by nature of most carried out researches, can not use them in the manufacture. In addition, not all scientific developments have customers. A modern university has acquired a traditional problem not of getting innovative solutions and of registering rights on them, but rather on using them. It is an uneasy task for the state university, which is a non-profit public institution is not only the transfer of rights on certain innovative scientific solutions for their implementation in production, but also their evaluation and registration. Although these features are theoretically considered when discussing various models of innovative scientific development, and they exist as software projects, their implementation requires significant resources.

Nevertheless, the entire research cycle and creation of high technology products of domestical and in many cases, international level, their implementation into production and education, commercialization of scientific research, provides an integrated educational and research environment.

4. Provide orientation of the whole scientific process on obtaining the applied final result. Innovations in science and scientific innovation - are innovations, which refer to any goal-oriented activities, research and organizational solutions, system, procedure or method of implementation of research activities, followed by concrete positive results. An example of such research activities can be a scientific work by the Dnipropetrovsk State University "National Mining University". Evaluation of the quality of scientific services (final result) is one of the mechanisms contributing to the Ukraine's integration into the European scientific and educational space with the use of the rating. In line with the rating "Top- 200 Ukraine" (UNESCO-SEPES/Dzerkalo TYZHNYA), which evaluates universities in Ukraine primarily in terms of the impact of scientific potential, over the last 5 years, indicators of NGU have significantly improved, as reflected in changes of ranking positions from the 17th to the 7th place. (G.Pivnyak, O.Beshta, S.Shevchenko [3, p. 180-183]).

As evident from the practical scientific activity of most universities the representatives of which are supposed to hold speeches at international conferences, obtaining the final result largely depends on the legal acts of varying legal force (ranging from the laws to local normative acts) regulating innovation (warranty, legal and binding acts). Among them, there is the Economic Code of Ukraine defines innovation activities in chapter 34(Article 325), determined by its species (Article 327), forms of investment in innovation (Article 326), means and forms of state regulation (Article 328) and the system of state guarantees of innovation activities (Article 329), fundamentals of the state examination of innovation projects (Article 330), the concept and content of the agreement on the creation and transfer of scientific and technical products (Article 331), which is used to perform innovation developments ordered by innovation activity subjects with a view to their subsequent sale.

The Civil Code of Ukraine has Chapter 62 entitled, "Implementation of scientific research or development and technological works" (governing contractual relations in the process of execution, completion and adoption of such works, including innovative projects).

Within 1991-2012 there were adopted more than ten laws of Ukraine as to these issue, several resolutions of the Verkhovna Rada of Ukraine that regulate innovation relations, including, for example, the Law of Ukraine "On the Scientific Park " Kyiv Polytechnic " as of 22.12.2006 regulating law, economic, organic relations associated with the establishment and functioning of the scientific Park "Kyiv Polytechnic", and aimed to integrating the processes of development, production, introduction of high-tech products in the domestic and international markets, increase of proceeds to the state and local governments through a combination of education, science and production with a view to the innovative development of the economy of Ukraine [2, p. 9-12].

In addition, there have been adopted a lot of sub-legal acts on innovation, with a focus on the final result of scientific and technological developments, including: regulations of the President of Ukraine, the Cabinet of Ministers of Ukraine, industry ministries, executive bodies, universities and scientific institutions (for example, documents on innovative research activities of the Donbas National Academy of Civil Engineering and Architecture [5, p. 51-53]) and others.

5. Establishing close and fruitful cooperation of university science and business. International cooperation. Information about multidimensional scientific activities of universities in Ukraine shows that nowadays the efforts of higher education in Ukraine are aimed at solving urgent problems in various fields, one of which is to build and support the development of innovation- oriented economy based on existing scientific potential, launching innovative products in the real economy in order to ensure improved living standards in the country. 2013, is to see the end of the five-year cycle of the implementation of the Ukrainian State Focus Economic Program "Creating innovation infrastructure in Ukraine" for 2009-2013 (Resolution No 447 of the Cabinet of Ministers of Ukraine as of 14.05.2008), which sets out specific tasks of university research to obtain important scientific results that are directed at the innovative development of the economy and business. In this regard, according to conference materials, a number of problems is defined, which can be summarized in the following list:

- ensuring efficient use of public funds for good research results aimed at different sectors of the economy, attracting extra-budget funds for the development of scientific infrastructure and linking it to the business;
- commercialization of research as an integral component of scientific progress in the process of infrastructure reformation;
- creation of territorial- industrial cluster, an important component of which is the university and scientific organizations, as well as innovative orientation provided by the formation of a clear customer -oriented distribution system of technologies and new knowledge;
- creation of a special communication network between participants, which provides a link between the operational requirements, research solution , and business results;
- construction of a closed technological cycle: production needs - generating research ideas - research development - production implementation - business results;
- creation of licensing departments at universities, centers of technology transfer;

- establishing direct links with the industry, government agencies, market infrastructure entities, forming information and commercial space, which is to generate effects of scale and synergies;
- accelerating the transformation of scientific and technological developments in innovation and obtaining commercial effect on the results of scientific research;
- access to commercial sources of research funding and reducing the cost of their implementation and commercialization through deliberate coordination at all stages;
- establishing effective communication between education and the labor market, forming the image of the university as a center of the new knowledge, which has clear practical orientation, the main installation of innovative research.

An important part of university interaction is international cooperation. This issue is actively discussed, particularly at the International Scientific Conference in Chernivtsi entitled "International cooperation of universities as an integral part of the innovative development of higher education." Work experience has been shared by representatives of 30 Ukrainian and 25 foreign universities, which is the evidence of an active process of their international activities - membership in the international organizations, institutions and associations involved in the development and implementation of various projects and programs, including those initiated by the General Director of Education and Science of the European Commission to promote the reform of higher education through the most balanced cooperation with partners from EU countries, holding joint researches together with foreign partners, cooperation with international offices in obtaining grants for the training of students and researchers abroad, participation in international innovative scientific events, etc.

However, based on the analysis of presentations submitted to the Reporting Campaign of Scientific and Technical Activities for 2012 universities of III-IV accreditation levels have proved to lead to a disappointing conclusion of deepening "the abyss of innovation" [4, p. 9] between Ukrainian university research and Ukrainian industrial complexes. International experience that sufficiently operates effective interaction of university (institute) science and industry, points out at two possible options for overcoming this discrepancy:

- significant public funding of local science and local businesses to organize the transfer and commercialization of university technologies;
- support of individual and collective participation of national scientists in international research and demonstration projects for the development and dissemination of innovative technologies.

As the speakers at the conference testify, including representatives from universities of Kyiv, Donetsk, Dnipropetrovsk and other industrial centers of Ukraine, there are already quite successful attempts of universities to implement the first option without additional financial costs from the state by creating innovation infrastructure (by appropriate orders in the university without financial support of technology transfer centers (TT), which have entered the national network of technology transfer (NNTT), etc.).

The second option is also tried in Ukraine under the principle: who needs it, finances it. To this end, 2011 saw establishment of National Contact Points of the 7th Framework Program of the European Union Research and Technological Development, which provides information support for participation of Ukrainian scientists in European projects, yet because of the subjective obstacles, their effectiveness has not been felt so far.

Thus, the key to the organization of open distributed international cooperation is the destruction of corporate and business communication barriers between members of university and other scientific and engineering communities. This communication (Corporation) is possible in modern conditions of civilization development through the use of such an effective tool, as a park. As international experience shows the development of science parks provides science, technology and innovation at universities, effective and efficient use of their existing scientific potential of logistics for the commercialization of research and commercialization.

In June 2009, the Law of Ukraine "On Scientific Parks" was adopted (signed by the President of Ukraine on 25.06.2009; No. 1563) [8]. The law regulates the legal, economic, organizational relationships associated with the establishment and operation of research parks, and aims at intensifying the processes of development, implementation and production of innovative products in the domestic and foreign markets. Thus, the purpose of the law is to create first of all conditions for the development of scientific and technological activities of universities and academic research institutions.

A number of universities in Ukraine have created such scientific parks (for example, scientific park "Uzhhorod National University" that is a basic organization-innovation structure of the region and so on.). However, this is only the initial stage of strategic educational and scientific relations in Ukraine. International experience suggests that such research activities, require systematic attention and support from the state, but most importantly they need creative initiative, perseverance and completeness of the university research.

Conclusions and projected future. The effectiveness of university research in general, as well as its individual components, is determined primarily by economic reasoning of research topics specified by the final result of the work which is done, and the result, which is matched with implementation. Materials from international conferences testify that such experience is already worth being consolidated and extended.

There are significant achievements in terms of the results of the scientific activity, namely university's direction associated with the transformation of such activities in an innovative final result (product). Thus, formation of scientific and modern innovation of universities should be considered in the unity of the innovation culture of the teacher, students and management and be aimed at providing: a sufficient degree of academic and economic freedom, ability to implement the knowledge in specific projects and products, ability to organize and manage innovation processes at all stages. This will grant access to specific measures to implement university policy of innovation development in order to create opportunities for sharing the experience of the advanced units of the university in terms of the best examples of such activities in the country and the world.

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