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PROBLEMS OF RESEARCH AND DEVELOPMENT COMMERCIALIZATION IN UKRAINE

Abstract. Commercialization of innovative scientific developments, innovative products using and actively promoting to the market should become one of the main conditions for competitiveness of Ukrainian enterprises improving in the processes of European integration.

The purpose of the article is to break out the gist of the term «commercialization of scientific developments», to define the main elements of the process of commercialization, which in their combination aim at increasing the activity on commercialization of scientific development, and activate on this basis objectivities of practical recommendations for financial and legal support of R&D by the government.

Result. The process of commercialization of scientific development will be effective only under the following basic conditions combination: firstly, the choice of the definitive method of commercialization, secondly, the availability of the sufficient financial resources, thirdly, the availability of the innovation infrastructure and, fourthly, the competent staff.

Conclusion. The effective implementation of the scientific development commercialization in the economy of Ukraine requires, first of all, the governmental support in financing the innovative business activity; as well as the special emphasis on the development of innovation infrastructure, including the formation of cooperation mechanisms between higher education institutions and enterprises to commercialize scientific developments. Commercialization of scientific developments is impossible without a clear legal regulation of relations in innovation activity from the stage of the idea emergence to creating, developing and further implementing of the innovative product to the market. The special emphasis should be on training professionals who can manage and implement innovative technologies in manufacturing, where the main role should belong to higher education institutions.

Keywords: R&D; commercialization; innovative activities; innovative risk; innovative infrastructure; venture capital.

JEL Classification: G23, G24, G32, G38

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ПРОБЛЕМИ КОМЕРЦІАЛІЗАЦІЇ НАУКОВИХ РОЗРОБОК В УКРАЇНІ

Анотація. У статті проаналізовано основні підходи та способи комерціалізації наукових розробок. Визначено ризики, що виникають в інноваційному підприємстві. Виявлено проблеми впровадження інновацій у виробництво в Україні у контексті іноземного досвіду. Запропоновано практичні рекомендації щодо використання альтернативних джерел фінансування, а саме венчурного капіталу, і розвитку інноваційної інфраструктури, основною ланкою якої мають стати вищі навчальні заклади.

Ключові слова: наукові розробки, комерціалізація, інноваційна діяльність, інноваційний ризик, інноваційна інфраструктура, венчурний капітал.

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ПРОБЛЕМЫ КОММЕРЦИАЛИЗАЦИИ НАУЧНЫХ РАЗРАБОТОК В УКРАИНЕ

Аннотация. В статье проанализированы основные способы коммерциализации научных разработок. Определены риски, возникающие в инновационном предпринимательстве. Выявлены проблемы внедрения инноваций в производство в Украине в контексте иностранного опыта. Предложены практические рекомендации относительно использования альтернативных источников финансирования, а именно венчурного капитала, и развития инновационной инфраструктуры, основной составляющей которой должны стать высшие учебные заведения.

Ключевые слова: научные разработки, коммерциализация, инновационная деятельность, инновационный риск, инновационная инфраструктура, венчурный капитал.

Introduction. It has been known that a necessary condition to improve economic efficiency of production is progress in science and technology thanks to which the new more productive means of production appear and technological capability improves. The way to increase production capacity of the soci-

ety is called intensive. This is how the humanity overcomes the limits in resources and increases the output of products. Due to the fact that the postindustrial society is aimed its efforts at developing knowledge-intensive industries, the mandatory condition of their effective functioning is the education and intensive

development of intellectual property. Thus, the development of economy requires constant increase in production efficiency as well as in its capability to meet the increasing demands of the society. Therefore, the research and development commercialization may become one of the main conditions of economy development due to innovative entrepreneurship activeness increasing.

It is necessary to create a marketing system of research and development commercialization to solve the problem of the innovative products promotion at the market.

The purpose is to define the term «research and development commercialization» and the main components of the commercialization process that jointly allow promoting research and development commercialization activity that, in its turn, is supposed to promote competitiveness of national entrepreneurship.

Brief Literature Review. Recently much attention in economic and legal literature is paid to the problem of research and development commercialization. Among Ukrainian scientists the works of V. Bazylevych, A. Chukhno, D. Chervaniov, O. Zhylyanska, Y. Atamanova, V. Virchenko, O. Morozov, A. Moki, V. Osetskyi and others, among Russian scientists – G. Bromberg (2002), B. Leontyev (2002), V. Mukhopad (2012) and others, among foreign scientists – E. Mansfield (1962), M. Porter (2005), J. Schumpeter (1949) and others should be mentioned.

There are a number of approaches to define commercialization in academic literature. In particular, commercialization of innovative activity results is understood as using business entity's intellectual capital that provides mutually beneficial actions for all interested persons related to identification of scientific and technical results (innovations) in order to receive profit or another market benefit from their development or disposal [1, p. 562].

In addition, other authors specify that commercialization of technologies is the most important component of innovation process as it represents the process of turning results of scientific and technical activity into goods and their further effective disposal in commercial scale [2, p. 192].

Also, commercialization of intellectual property is defined as mutually beneficial (commercial) actions for all participants of turning results of intellectual work into product [3].

In the literature, it is possible to find a definition where commercialization is defined as adaptation of fundamental science into business, or as a process of technology transformation into cost-effective product etc. [4].

It should be noted that the commercialization concept is inseparably associated with the «intellectual property» and «intellectual activity» categories.

In addition, intellectual property in its broad sense is defined as rights stipulated by the law on results of intellectual, creative activity in industrial, scientific, literary, artistic fields [5, p. 63].

Intellectual activity is regarded as one of the forms of human livelihood, the essential part of the intellectual product creation process and intellectual capital reproduction, the most powerful force of human civilization development process. It is based on a complex of achievements in science, culture, traditions and spiritual values gained by humankind during thousands of years [6, p. 416].

Thus, intellectual activity embodied and expressed in certain results – intellectual products, namely, various inventions, industrial patterns, commercial secrets etc. It should be noted that intellectual property includes not the intellectual product as result of intellectual activity of the person, but the right on this product. Consequently, due to their legal form intellectual products are included into the process of economic cycle and turn into economic benefits (resources, sources of income, capital).

Based on the above stated, it is necessary to mention that despite different approaches related to the object of commercialization definition, the essence of the process is to turn the object of commercialization into product. Thus, the objects of commercialization, innovations, research and development, or technologies are the results of intellectual activity, intellectual products, i.e. they are the objects of intellectual property.

Results. The commercialization is an important component of the innovation process and is used to implement the results of research and development. In addition, it should be noted

that every innovative product is exceptional and unique that is why the ways of its introducing require individual strategies. This is precisely why it is necessary to pay much attention while choosing the way of commercialization in order to provide effective research and development commercialization. The main ways of commercialization of objects of intellectual property rights include [7]:

- using objects of intellectual property rights in one's own production;
- introducing rights on intellectual property rights into charter capital of the enterprise;
- transferring (disposal) rights on objects of intellectual property rights.

Besides above-mentioned ways of commercialization, some authors also refer to leasing, engineering, and franchising [8, p. 60].

Commercialization objects of intellectual property in one's own production is considered to be the most beneficial due to the fact that the income obtained from innovation product remains at the enterprise. It is necessary to remember that introducing innovation technologies is always accompanied with risk and requires much financial assets. However, in case of successful introduction of innovations, the enterprise becomes more competitive among others and earns more profit because it appears to be the one owner of the invention.

Another way of commercialization may be performed through introducing rights on objects of intellectual property to charter capital of the enterprise. The advantage of this way is that establishing the charter capital occurs without funds diversion.

One more way to perform commercialization includes transferring (disposal) of rights on objects of intellectual property rights that is determined as license trade or technology transfer [9, p. 35]. It should be mentioned, that at present environment transfer of technologies is also important in order to achieve commercial success as well as the capital transfers.

It is also necessary to remember that innovative activity includes more risk compared to other types of business activities. High level of risk in innovative activity is explained by the fact that introducing innovations requires many expenses, although not all innovations are expected to be beneficial. Thus, it is necessary to take into account such peculiarities of implementing innovations such as extended period for their implementation and huge number of participants and financials involved in this process.

The innovative technologies commercialization process is impossible without sufficient amount of financial resources, innovative infrastructure and competent staff.

Financial resources may come from the own funds, as well as from borrowed ones. Only huge and resourceful enterprises are able to afford exploration and implementation of innovations at their own expense. Nowadays there are only a few of such enterprises in Ukraine. Bank loans are issued under high interest and the enterprises are not able to repay them. As for the new projects (startups) financing, the banks operating in Ukrainian market consider them unwillingly because as it was stated above they are too risky. As a rule, private investors are interested in short-term projects and fast income. The projects on exploration and implementation of innovations last for a long period, for about 5 years.

Taking into account the abovementioned, it is necessary to pay attention on venture capital introduction to finance innovative activity in Ukraine. The venture business is regarded as the heart of innovative infrastructure that includes complex of integrated structures that maintain and provide implementation of innovative activity, oriented at practical using of technical and technological innovations, scientific researches that are not tried and tested [10, p. 4].

It is known that in Europe and the USA the venture capital is one of the most important instruments of research and development works and high technologies development, support of small and medium business. For example, Apple, Google, HP, Intel, Microsoft, Yahoo are the companies that reached much success because of venture investments.

Unfortunately, the role of the venture capital in Ukraine is still low. The first steps to implement venture business principles in Ukraine were made not in the field of innovation project financing as it occurred in economically developed countries but with the aim to recover from crisis and to increase operating efficiency of privatized industry [11, p. 54].

In developed countries, the venture capital as a rule is invested into the projects that cannot rely on obtaining financing from credit institutions. Venture business is a mediator between the potential investor and the enterprise that requires start-up budget or investments to implement the new project. The government plays an important role in this process because it creates the respective environment for promotion of venture investments into scientific and technical field, as well as takes part in respective funds financing.

The main components of innovative infrastructure are technological parks, science parks and business incubators. They support innovative companies at the beginning of technology adoption, during their operation as well as in order to maintain at market. Business incubators support innovative management, access to financial resources, establishing contacts with partners.

Reviewing the global experience of research and development commercialization, one of the most outstanding examples is «Technopolis» project thanks to which Japan took the leading positions at the global market among other developed countries. Technopolis is modern form of science and production integration that create conditions for science and technical and technological developments of the countries. The program «Technopolis» involves emphasis on establishing infrastructure with such components as qualified staff, new technologies, data support, capital to conduct modern researches in field of science and technology that had not been researched, telecommunication network [12, p. 57].

Another, one of the most well-known examples of the innovative infrastructure development, is the Silicon Valley in the USA that became the biggest science park. The Stanford Park located at University's lands that are in long-term lease of «high-technology» companies, co-operate closely with the University. This science park joined many research centers, enterprises, consulting and service firms, venture companies and became an example of new model of innovative unit. The development of such park allowed forcing the development of science-consuming production in the region, to put an end to unemployment.

Recently, all countries take the path of innovative development of their economy; in particular, the experience of development of Russian innovative infrastructure may be an interesting one. For example, Innovative Center «Skolkovo» has been developing since 2010. Innovative center «Skolkovo» is modern science and technology facility on new technologies development and commercialization that are under construction. The facility will provide special economic terms for companies that operate in priority sectors of Russian economy: telecommunication and space, biomedical technologies, energy efficiency, information technologies, as well as nuclear technologies [13].

In modern conditions, the development of higher school education should be directly connected with the commercialization of the university scientific activity results. It comes from the necessity of the economic independence. For this purposes sources of funding should be found.

Commercialization of research and development results allows attracting additional funds and shows the effective work of teaching and academic staff of the higher education institution. Today commercialization of results of higher education institution science activity is not only the necessity, but also one of the conditions of educational institutions successful development [14, p. 51].

The situation in Ukraine is such that there is no scientific mobility of talented youth and integration of basic science to the world one at state level, which causes restraining of national research and development implementation into practice, and thus the decrease of the competitiveness of both production technologies and new products [15, p. 6].

Herewith it should be noted that the leading higher educational institutions in Ukraine are implementing cooperation with international scientific organizations as well as manufacturing plants into their practice. In particular, one of the priorities of the activity of the Board of International Science and Technology Cooperation and Innovative Technologies is a scientific and educational advisory division, referring to the research department of the Taras Shevchenko National University of Kyiv, is the establishment of international scientific relations and cooperation programs for innovation and technology transfer.

Thus, higher educational institutions have to become one of the key sections in commercialization of research and development. In order to make this possible, they need, first of all, to develop innovative infrastructure that would ensure activities in the field of innovative products creating and would be able to make the innovative cycle from idea introduction, designs development to implementation into production.

The global experience in university's research and development implementation shows that in most cases researchers and academics without being entrepreneurs become men of ideas who are able to bring income.

Now it is widely accepted that the unique, scarce resources of Chinese universities are not material or financial ones, but HR (human resource), such as university faculty, R&D (for example, Zhou and Zhu, 2007; Fu et al., 2010). Because of the different ability to access to HR among different universities, UTT activities vary considerable, and heterogeneity of UTT activities can be expressed by different patent technology transfer performances [16, p. 261].

For example, the typical innovation cluster in the USA is University surrounded by laboratories, technological parks, business schools, clubs of business-angels, banks, funds of private and venture capital investment. This is a completely open system aimed at cooperation and obtaining positive result, which is a basic principle of such system construction and operation. If the University's laboratory is working on a certain product, it looks for contacts with other laboratories involved in similar developments around the world. After work completion the company is established that is owned both by developers and laboratory and the University with its academic staff, i.e. the company is owned not by one person, but it is the collective property of all those involved in the project [17].

Today, the Ukrainian innovative infrastructure development is in its formative stage, there are no coordinated innovative structure and management system for innovative processes, there is no public support for the inventors' scientists' activities, the venture capital funds and technology transfer centres are established, but almost do not work. Nowadays innovative infrastructure in Ukraine is only at the beginning of its establishment. So, we need to create conditions for innovative start-ups and small science-based ventures development, to introduce financial and fiscal mechanisms to promote innovative activity and to provide the proper level of protection of intellectual property. Of course, the active position of the state in these processes is necessary. It is well known that the model of building innovative business is fundamentally different from the classical business models. The possibility to obtain excess profits from the commercialization of advanced technology, design or invention requires significant investments [18].

Conclusion. The effective implementation of the commercialization of scientific developments in Ukraine requires, first of all, the government support in the innovative business activity financing, namely the development of the venture capital as the state-established part of the suitable environment to encourage venture capital investment to the science and technology field.

Secondly, the special emphasis should be focused on the development of innovation infrastructure, the main elements of which are technology parks, science parks and business incubators, as they in particular provide support to innovative companies at an early stage of the technologies implementation, helping them to work and stay on the market; formation of cooperation mechanisms between higher education institutions and enterprises just to commercialize scientific developments.

Thirdly, commercialization of scientific developments is impossible without clear legal regulation of relations in innovation activity from the stage of the idea emergence to creating, developing and further implementing the innovative product to the market.

Fourthly, the special emphasis should be focused on training professionals, who can manage and implement innovative technologies in manufacturing, where the main role should belong to higher education institutions.

Under the current conditions, the development of higher education should be directly related to the commercialization of the results of the higher education institution research activities.

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