

THE FORMATION OF THE NATIONAL INNOVATION SYSTEM AS THE BASIS OF INNOVATIVE-INVESTMENT DEVELOPMENT IN UKRAINE

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Zakharchenko N. V., Kuznietsov E. A. The Formation of the National Innovation System as the Basis of Innovative-Investment Development in Ukraine

The article presents concepts and structure of the national innovation system (NIS), defines its main role in economic growth and the country's transition to the innovation-investment development path. It has been determined that the instrument of the strategic management of innovation process in terms of the State is the innovative mission that sets the overall direction and development priorities for the initiative project teachers and researchers' teams'. The "triple helix" model and the conditions of its implementation in Ukraine are proposed. Three institutions – university, business and government – are committed to cooperation. At the same time, the innovation component does not come from the State, but from the interaction "university – business – government". The "triple helix" model of innovative development inspires its followers to developing new interdisciplinary knowledge, cooperating in the field of science, and creating joint ventures.

Keywords: national innovation system, innovations, investments, economic system, innovation economy.

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Захарченко Н. В., Кузнецов Е. А. Формування національної інноваційної системи як основи інноваційно-інвестиційного розвитку України

У статті представлено поняття і структуру національної інноваційної системи, визначено її ключову роль в економічному зростанні та переході країни на інноваційно-інвестиційний шлях розвитку. Визначено, що інструментом стратегічного управління інноваційним процесом у державі повинна стати інноваційна місія, що задає загальний напрям і пріоритети розвитку ініціативних проектних команд викладачів і наукових співробітників. Запропоновано модель потрійної спіралі та умови її реалізації в Україні, яка включає три інституції – університет, бізнес і влада. При цьому інноваційна складова походить не з ініціативи держави, а саме із взаємодії «університет – бізнес – влада». Модель інноваційного розвитку «потрійна спіраль» надихає своїх послідовників на розробку нових міждисциплінарних знань, співпрацю у сфері науки і створення спільних підприємств.

Ключові слова: національна інноваційна система, інновації, інвестиції, економічна система, інноваційна економіка.

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Захарченко Н. В., Кузнецов Э. А. Формирование национальной инновационной системы как основы инновационно-инвестиционного развития Украины

В статье представлены понятия и структура национальной инновационной системы, определена её ключевая роль в экономическом росте и переходе страны на инновационно-инвестиционный путь развития. Определено, что инструментом стратегического управления инновационным процессом в государстве должна стать инновационная миссия, задающая общее направление и приоритеты развития инициативных проектных команд преподавателей и научных сотрудников. Предложена модель тройной спирали и условия её реализации в Украине. Модель включает в себя три институции – университет, бизнес и власть. При этом инновационная составляющая активизируется не по инициативе государства, а именно благодаря взаимодействию «университет – бизнес – власть». Модель инновационного развития «тройная спираль» вдохновляет своих последователей на разработку новых междисциплинарных знаний, сотрудничество в сфере науки и создание совместных предприятий.

Ключевые слова: национальная инновационная система, инновации, инвестиции, экономическая система, инновационная экономика.

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Although the international community has not yet found a single term defining the post-industrial economy (innovation economy, knowledge economy, new economy, etc.) as a single possible, one cannot but agree that the key determinants of growth are knowledge and innovation. The lack of generally accepted definition reflects the complexity of this phenomenon, and different interpretations reveal a particular side of it.

Despite different challenges faced by researchers, they have a common understanding of national innovation system (NIS) as the process and result of the integration of structures with diverse goals and tasks engaged in the production and commercial realization of scientific knowledge and technologies within the national borders, which is provided by interaction of a complex of legal, financial and social institutions that have strong national roots, traditions, political and cultural features.

In the preparation of this article, there considered works of classics of the modern economic theory as well as other domestic and foreign scientists, namely V. Dubnitskiy [1], V. Zakharchenko [1; 3; 4], I. Bahrova, O. Cherevko [2], G. Itskovich [5; 7; 8], L. Fedulova [6], etc. Back in the middle of the twentieth century, R. Solow identified as a source of economic growth the following factors: growth of the working population, increase of all types of capital, mastery of new technologies. Using as an example agricultural production in the United States, he showed that the advanced nature of the reproduction is ensured by 80% by the intensive way of development, i.e. through the introduction of innovation, and only 20% of the production increase is a consequence of the net increase in capital investment [10].

In the last decade, in developed countries there observed a decrease in the share of traditional factors (workforce, fixed capital investments) and, consequently, increase in the share of innovative component in economic growth measured by the GDP growth.

Developed countries have already realized that for transition to the innovation economy there required a holistic NIS that transforms new knowledge into products and services necessary for the economy and society. In fact, the most important priorities of science and technological growth are more associated not with grandiose, expensive projects of a breakthrough nature but with continuous daily work on the formation of NISs and their links.

The concept of NIS was formulated in the mid 1980ies. Its founders are C. Freeman, B. Lundvall and R. Nelson.

Scientists recognized the importance of NIS and its key role in economic growth in the transition of Ukraine to the innovation and investment way of development. But the mechanism and instruments of strategic management of the innovation process in the state are not defined.

The *aim* of the article is to reveal the mechanism and instruments of strategic management of the innovation process development in the transition of Ukraine to the innovative and investment way of development.

The concept of NIS has received wide usage in diverse studies of innovation processes, moreover, not only in the mainstream economic science. So, today we can hear about innovation systems in the fields of education, politics, culture, etc. Thus, the interpretation of innovation system has gone beyond economy, while retaining its qualitative distinctness – category [1].

Let us define each of the three components of the concept “national innovation system.” The usage of the term “national” is due to the below mentioned reasons. First, the study of the NIS in particular countries allow to conclude that there are a lot of inter-state differences between the innovation systems. The comparison can be made in such parameters as natural resource potential, size of the country, nature of its economic development, etc. Meanwhile, for separate countries, these features can be significant. Second, the analysis of innovation systems at the national level allows us not to lose sight of the state role in the innovation process. No doubt that the state policy is aimed at the formation and functioning of innovation systems, and implemented primarily at the national level.

Some scholars insist that because of globalization, the importance of national factors in the innovation and investment development process is reduced [4]. The author takes into account that globalization in the modern world certainly has a great influence on all aspects of social life. However, no matter how great the influence of this factor is, it does not exclude the existence of both national economies with inherent features and differences in functions, as well as innovation systems.

Although the researchers of the concept “innovation” has not yet come to a consensus about its interpretation, until recently it was associated mainly with a new or improved product or technology [5]. The modern concept “innovation” now covers not only the production, but other sectors of the national economy, as well as human activities, and means improvement of any object as a system by replacing the existing elements or addition of new ones with the aim of increasing their effectiveness.

The innovation process is based on a complex system of relationships between economic subjects that produce knowledge of a different type and transform them into technology, products, services, and entities that serve these activities.

An innovative mission that determines the overall direction and priorities of development of initiative project teams of teachers and researchers should become the instrument of strategic management of the innovation process in the state. Summarizing, we can offer the triple helix model and consider the conditions of its implementation in Ukraine. In the model of triple helix, each helix when interacting with two others forms an “overlay of communication links, networks, and organizations” [6]. The development of the “triple helix” happens exactly by the type of spiral. That is, the synthesis of evolution on the vertical axis of the spiral and rotation in the horizontal axis (*Fig. 1*).

Thus, the systemic nature of the concept of NIS means that innovation development is considered not in the form of a unilaterally directed chain of causal relationships leading from R & D to innovation but as a process of interaction and feedback among various stages of the innovation cycle, innovation actors, and the whole complex of factors determining the creation of innovation.

The formation of the NIS in Ukraine, according to the author’s opinion, should be carried out based on universities. Today the number of scientific institutions remains stable only in the higher education sector (*Fig. 2*). Although the characteristics of innovation and investment development of indicators of stability cannot be considered a positive trend, but in Ukraine such stability suggests, first, that there is a pool of leading universities with the scientific and technical base, and scientific schools, and secondly, in spite of the strict conditions of entrepreneurship development, science represented by the tandem of teachers-scientists and young people survive and thrive [6, p. 182]. The domestic society should treat them with special respect.

The innovation system is an organic and integral part of the economic system. However, unlike the previous stages of the economic history of mankind, the innovative component of the modern economic system is viewed not simply

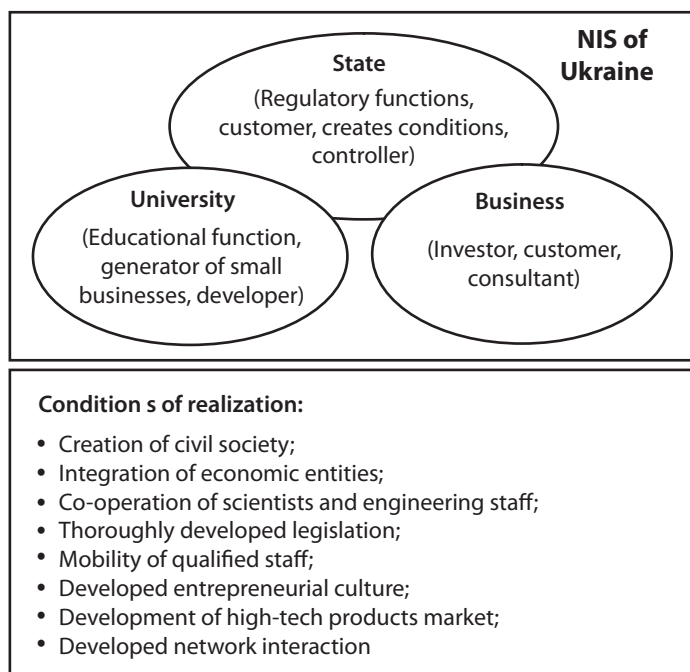


Fig. 1. The triple helix model: conditions of implementation in Ukraine

Source: developed by the author based on [6, p. 190].

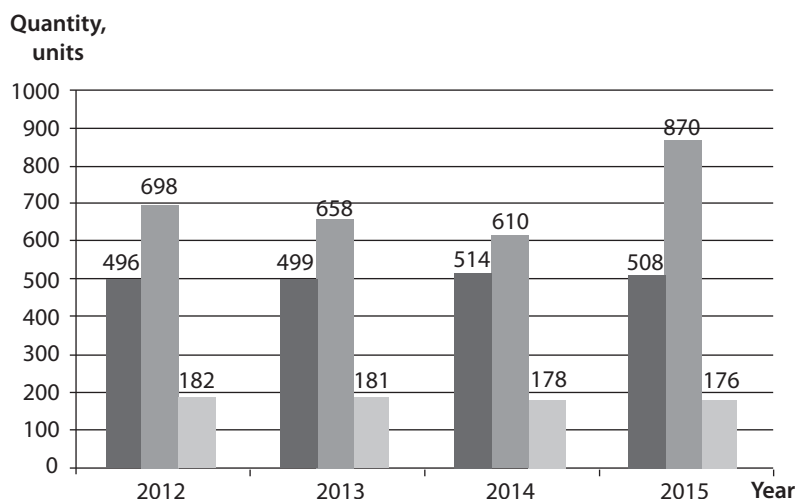


Fig.2. The number of research organizations by sector of activity

Source: developed by the author based on "Scientific and innovation activity in Ukraine": statistical Bulletin/the State Statistics Committee of Ukraine.

as a segment capable of creating innovations, but as a system that increases its significance encompassing all stages of innovation reproduction with its infrastructure, providing not only commercial but also state competitiveness.

Thus, let's define the national innovation system as a part of the national economic system consisting of a set of interrelated economic entities that interact in the process of production, diffusion and usage of innovation and exist along with formal and informal institutions influencing the pace and scale of the development of the innovation and investment process.

NISs of different countries can have different goals. For example, France sees the main task of its NIS in creating additional jobs, and Germany — in developing advanced technologies [2].

Under modern conditions the transition period of the Ukrainian economy from the raw material orientation to the innovation and investment type of development intensifies research in the field of innovation. Without a comprehensive consideration of this problem, it is impossible to identify obstacles and prospects for the formation of an innovation system.

Each NIS is characterized by a certain structure. However, under the impact of socio-economic development of the countries, the NISs are developing, which does not exclude permanent improvement of all their elements. Therefore, there is no universal model of the innovation system that could be applicable to any society. On the contrary, there are a lot of NISs with their advantages and disadvantages.

The most simple and common model describing the interaction of elements of NIS determines the role of the private sector and the role of the state. Individual specifics of certain models of innovation systems are variations of predominance of participation of the state and the private sector in implementation of various functions in the innovation and investment process.

Another common approach to the structuring of the innovation system is to group its components in terms of the leading function in the innovation and investment process.

The set of components included in NIS is not rigidly fixed. However, summarizing the research carried out in recent years, one can name those components (elements) that are given the main attention by the majority of authors:

- ✦ the state (public authorities and management);
- ✦ scientific and technological sphere (scientific organization);
- ✦ innovative business (innovative organizations);
- ✦ education system (educational institutions);
- ✦ innovation infrastructure (service companies).

In general, the key role of the state lies in the integrated management of the innovation system, including its formation and development. There is a sufficient number of examples of successful state innovation strategies in the world experience (USA, Japan, China, India).

L. Fedulova insists that “the so-called small European countries were most involved in the process of transformation of NISs under the influence of globalization” [6, p. 270]. She researched the impact of transnational corporations on innovation policy and the NISs of such countries as Finland, Hungary, Greece, Ireland, Slovenia, and the Netherlands, and showed that, regardless of the economic situation, these countries experience pressure as to their technological position due to the small size of their economies [6, p. 271–278].

L. Fedulova concludes: “... the experience of transformation of the NISs in small European countries suggests that intensive development of the innovation sector under conditions of limited market demand inside the country is possible. The pressure of global technological developments and narrowness of the markets for innovations in these countries caused a safe technological growth. In this context, the experience of transformation of the NISs in these European countries under conditions of limited domestic demand for innovation activity can be indicative and the best for assessing the prospects of growth of the Ukrainian R & D” [6, p. 279].

Scientific organizations are all organizations that are engaged in fundamental and applied research and development as their main activity or have a division whose main activity is implementation of research and development, regardless of their belonging to a particular branch of the economy, organizational and legal form, and forms of ownership.

The results of fundamental and applied researches of scientific organizations are difficult to commercialize, but without them it is impossible to create innovations.

An innovative company is considered a company implementing innovations regardless of the initiator of the idea.

Science can produce knowledge and even stimulate the demand for it, offering new, previously unknown technologies, the mastery of which provides enhancement of enterprise competitiveness, but it is the latter that carry out the practical implementation of innovations, incurring significant costs and risk, their promotion to the consumers and formation of feedback.

The modern statistics and practice convincingly demonstrate high innovation activity and efficiency of small business. Thus, Z. Acs and D. Audretsch found a correlation between the size of companies and the effectiveness of their innovation activities. The findings indicate bigger, compared with large enterprises, innovation activity of small firms. Thus, the expenditures on activities of small risk companies are about 5% of the total R & D. At the same time, they account for more than 5% of all innovations introduced into production [6, p. 414].

In our opinion, combining the efforts of large and small enterprises by creating joint ventures is more effective in reducing the risk level of each participant and useful for the economy. Abroad such integration structures have developed in the form of incubators of new firms at universities, major research centers and corporations.

The education system is an important link in a NIS. Among the types of education, preference is given to the higher education. This is due to the variety of functions performed by universities. Educational institutions conduct training and retraining of specialists for all levels of the NIS. In addition, a significant amount of R & D is carried out in higher educational institutions.

Innovative infrastructure is a complex of organizational and economic institutions that facilitate effective implementation of all stages of the innovation process by business entities.

Components of the innovation infrastructure, depending on the main type of services provided, are represented by the following components: production and technology; staffing; expert-consulting; information, credit and financial; marketing.

CONCLUSIONS

The effectiveness of innovation development of the economy depends not only on how effective are the activities of economic agents in particular, but also on how they interact with each other as elements of the system of creating and using knowledge as well as with public institutions. The lack of such ties ultimately affects the competitiveness of the economy as a whole. Therefore, identification and timely elimination of bottlenecks in the innovation system is an important condition for the effectiveness of innovative processes and one of the key objectives of the state innovation policy. ■

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