

THE FORMATION OF THE NATIONAL INNOVATION SYSTEM AS A BASIS FOR STRENGTHENING THE INNOVATION POTENTIAL OF THE COUNTRY

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ABSTRACT

The article considers two ways of support and development of innovative potential - innovative breakthrough and innovation borrowing. The main advantages of the second one are determined. The problems of formation of national innovation system of Ukraine and the ways of its solution are underlined. Authors formed the basic principles and factors for effective functioning of the national innovation system. The main functions of managing and providing functional subsystems overall national innovation system are considered.

KEY WORDS:

national innovation system, innovation potential, innovation strategy

JEL Classification: R1, R11, P49

Introduction

Moving the economy to an innovative way of development is not possible without the formation of a globally competitive national innovation system [NIS] - a system of tools, mechanisms and infrastructure to support innovation in all spheres of economy and social life. In accordance with the best international practices, the creation of an effective national innovation system is largely provided by the system to stimulate innovation and technological development of sectors of the economy, also eliminate the fragmentation of the existed innovation system.

Initial interpretation of the national innovation system involves concentration on science and technology as the main factors that determine the environment in which firms operate. By the end of 1990 the concept of the NIS has found a broader context, arguing that NIS includes all elements of the socio-economic system, and that the level of technology and innovation by national peculiarities of historical development. System aspect of the NIS concept is that it is a set of interrelated institutional structures (small and large firms, universities and public research centers, central and regional administrations, the objects of innovation infrastructure, financial markets, etc.) affects the innovative potential. This means that to create an effective NIS is impossible without a clear understanding of global trends and experiences of other countries.

Methodology

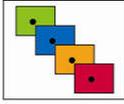
The founders of the NIS formation theory considers Christopher Freeman [1] (Institute for Scientific Policy Research, University of Sussex, UK), Bengt-Åke Lundvall [2] (University of Uppsala, Sweden) and Robert Nelson [3] (Columbia University, USA), to analyze the development of innovation activities in various countries and on this basis, gave the definition of the concept of the NIS. At the same time the basis of the results of research have been put previously obtained Schumpeter (the theory of economic dynamics), Friedrich August von Hayek [4] (the concept of dispersed knowledge), D. North (institutional theory), R. Solow [5] (STP role in economic growth), P. Romer [6] and Robert Lucas [7] (new growth theory).

Results

Modern domestic and foreign experts on innovative development of national economy distinguish two ways of enhancing the innovative capacity and ensuring the technological level of country's development needed for its active participation in the international division of labour and ensuring competitive advantages.

First of all, this is the way of the innovative breakthrough, which provides the development and active use of the basic science and the ability to create radical innovations.

The second way is «effective borrowing» or import of innovations, which is not only more economical, but also due to the lag of the innovation process involves a smaller investment of time, which also enhances the effect factor of effectiveness. Not only the countries with low or insufficiently high level economic development choose this way. It has been chosen by Japan, which proved its feasibility.



Academician Polterovich V. (Polterovich, 2008), outlined the main reasons that cause the benefits of the second way of innovative development ensuring of countries with insufficient innovative potential, such as Singapore, Hong Kong and others, as following:

- New technologies are produced on the basis of already existing, so the lack of previous researches and developments slows down the creation and implementation of innovations.
- The complementarity of technology means that by using brand new technology required changes in many other places, that are not under the power of even large powerful corporations. Not taking into account this reason, firms may find themselves trapped in a «coordination».
- Borrowing is cheaper and less risky in comparison with the creation of «a fundamentally new», which is contrary to the principle of effectiveness.
- In the field of basic science in countries with insufficiently high level of economic development, there is a high level of emigration of scientific personnel. It is due not only to economic factors, but also organizational, which do not provide there required level of working conditions.
- Presence of «bad institutions» in the country, which includes weak protection of contracts, such as intellectual property rights. This leads to a reduction in the planned horizon and high risks of cooperation.
- Excessive monopolism, which prevents the formation of motivational ever sand in centivesto innovation activity.
- Undeveloped institutions of support and innovation that is a lack or weak position of the national innovation system.

Polterovich V. (Polterovich, 2008) selects three strategies for the formation of national innovation systems. First of all, it is the strategy of shock therapy, which is based on absolute structural change of the institutes of development that exist at present in the country. Secondly, it is the strategy of the cultivation of the innovation strategy and third is the strategy of interim institutes. This scholar argues that the third strategy is the most suitable. It simple mentation involves the construction of a particular institutional consistency, the final element of which is the NIS (National Innovation System), which is not equal to the performance of the Western innovation systems.

By constructing national innovation system is recommend to consider absorptive and innovative ability in the country.

Absorptive capacity is the ability to determine the value of a new external information, digest it and use it for commercial aims, that in the complex shows the ability of the country to the borrowing of technologies.

Absorptive capacity provides:

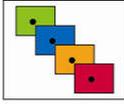
- import of new equipment and technologies, the purchase of licenses and tariff policy; regulation of direct foreign investments in the domestic economy;
- mastering new methods of organizing production as a result of participation in competition on the world market;
- interaction with foreign experts during the course of study or training abroad, joint researches, invitation of foreign scholar sand lecturers for training in the country;
- prevention of highly skilled specialists out flow and there turn of the persons who have received training abroad back to the country;
- politics of direct support borrowing;
- development of research departments in large companies.

The innovative capacity of a country determines its ability as a political and economic body to produce and bring into commercial use the flow of new technologies for a long period of time (Furman et al, 2002).

The main system problem of Ukrainian innovation development defined in the Strategy Project of Ukrainian innovation development for 2010-2020 years (Androshchuk et al, 2002). It provides the fact that the effectiveness, quality, functioning, structure of the creative part of the national innovation system – sector research, development, invention is not fully meet the potential needs of the intensive economy development. On the otherhand, structurally backward technologically low in voice domestic economy, in herited from the USSR, and also system of enterprise that has developed under the influence of an imposed to Ukraine outside neoliberalre forms, remains extremely unfavorable to modern achievements of science and technological innovation. To solve this issue is necessary to determine the original positions of the main components of the national innovation system, the degree of their compliance with the requirements of innovation and investment model of development, to identify weaknesses and obstacles that inhibit this development, as well as the existing benefits and potential opportunities for the implementation of the agreed system changes.

The risk of innovation is the highest comparing with other types of economic activity. This raises the need for the use of such mechanisms:

- in the field of innovation system management:
 - formation of managerial bodies of the innovation system, which activities are aimed at determining the riskiness of innovation projects and the formation of Government guarantees package to investors;
 - creating of managerial bodies, a function of which acts as controlling, that provides conducting a strategic analysis of the innovative potential and real capabilities and innovative prospects. Here the greatest empha-



- sis is advisable to put for the methods of «Foresight» and indicative planning, that will ensure the adequacy and reality of innovative targeted programs;
- activation of the regulatory mechanisms, that promote cluster architecture innovation system, provide the integration processes between the scientific sector, development and production area;
 - create a subsystem of the national marketing, which will promote the image of Ukraine for investors in the sphere of innovation activity. To ensure the creation and coordination of the regional marketing of subsystems, which will make stronger the subsystem of the national marketing.
- in the field of the national innovation system of infrastructure:
 - expand relationships with scientific organizations and innovative companies of Western countries at the level of the national system and its items. For example, intensify cooperation between the universities of Ukraine and their potential foreign partners, between the national leading companies and their Western counterparts;
 - more actively use opportunities of the innovative cross-border cooperation, which are caused by the presence of borders with countries of the European Union and Russia. Specific mechanisms may be cross-border clusters, grant levers for innovation based on the exchange of technical information, creating joint ventures etc.;
 - rebuild the system of higher education on the training of professionals, who are able to not only work with new manufacturing technologies, but also to use modern and innovative management techniques. For example, the ability to take a dequate to the various conditions of managerial decisions, possessing the techniques of strategic analysis; these are features, which should be included in the circle of professional qualities of high school graduates. The innovative system of the country will function successfully upon condition of a continuous training system, which not only provide support to the professional level, but also the diffusion of new knowledge;
 - using the organizational, economic and marketing mechanisms to create attractive conditions for engaging Western companies into economic space of a country, that operate in the field of innovative technologies.
 - Under the formation of the innovation system must be used the principles of the system approach, which ensure the functioning of such functional subsystems, which are drawn in a picture.

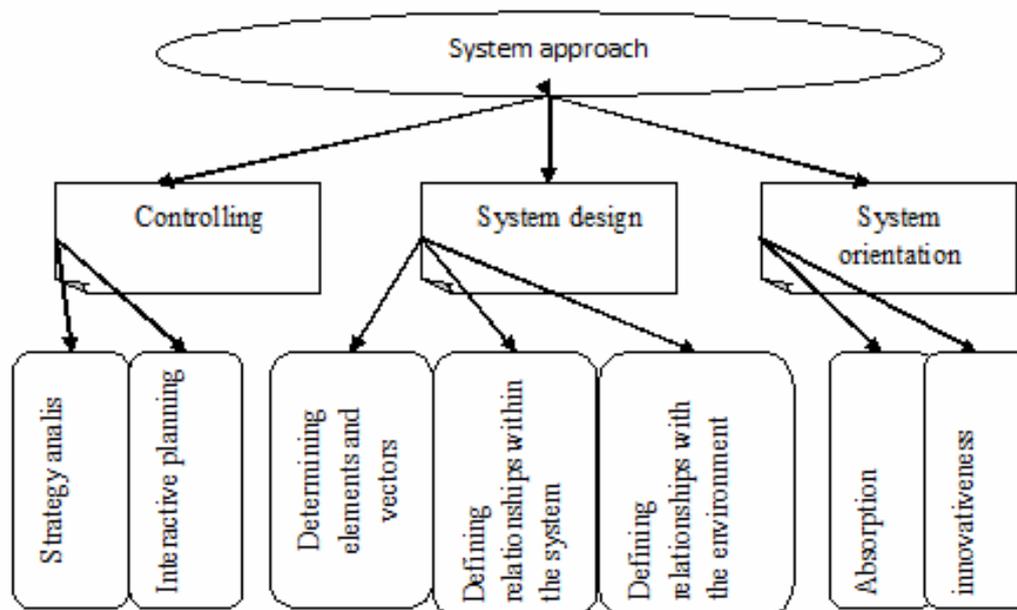
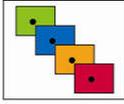


Fig 1. The main components of the system approach under the formation of national innovation system
Source: Compiled by the authors.

The efficiency of the functioning of the national innovation system is associated with compliance of the following principles.

- Development and variety of forms and extensions of integration resources of education and science, production and market infrastructure.



- Strengthening the role and capacity of the national economy in the formation of the national innovation system for strategic areas of national importance.
- Enhancing the level of the innovative orientation of investment resources and investment processes in the country.
- Extension of the activity of regions, local territorial and commercial complexes in the resource supply for the NIS (National Innovation System).
- Structurally innovative system consists of subsystem, the main purpose of which is to control the NIS, and a subsystem that provides the implementation of the objectives of the existence of the NIS.

Basic function of control system is a regulation of activities and the development of the NIS (National Innovative System). Regulation can be carried out on the basis of such mechanisms as political (support of the scientific community, businessmen and regional communities in holding the course of innovation development, which reduces the resistance to organizational changes in reforming existing institutions); legislative (the formation of the legislation, which provides the institutional norms of interaction of entities in the innovation field); financial-economic (benefits and preferences, tariff policy, inflation, credit leverage, etc.), General and administrative (public procurement, warranties, government services); organizational (the formation of the system of knowledge sharing on the basis of national conferences, symposiums, which provide direct communication and the possibility of a direct exchange of information among the various entities of the national innovation system); cultural (formation of innovative culture based on the creation of a network that covers, from the one hand, primary school, and on the other, politicians and businessmen clubs).

The main functions of the subsystem, which is carried out by the production of new knowledge and commercialization, is the production of ideas of innovation, transforming them into innovation, implementation of innovation, the dissemination of innovation. By the implementation of innovation we mean the income from the distribution of an innovative product. By the distribution we mean the transmission of information about the main advantages of the innovative product.

Schematically functions of control subsystem and production innovations subsystem proposed on Fig.2

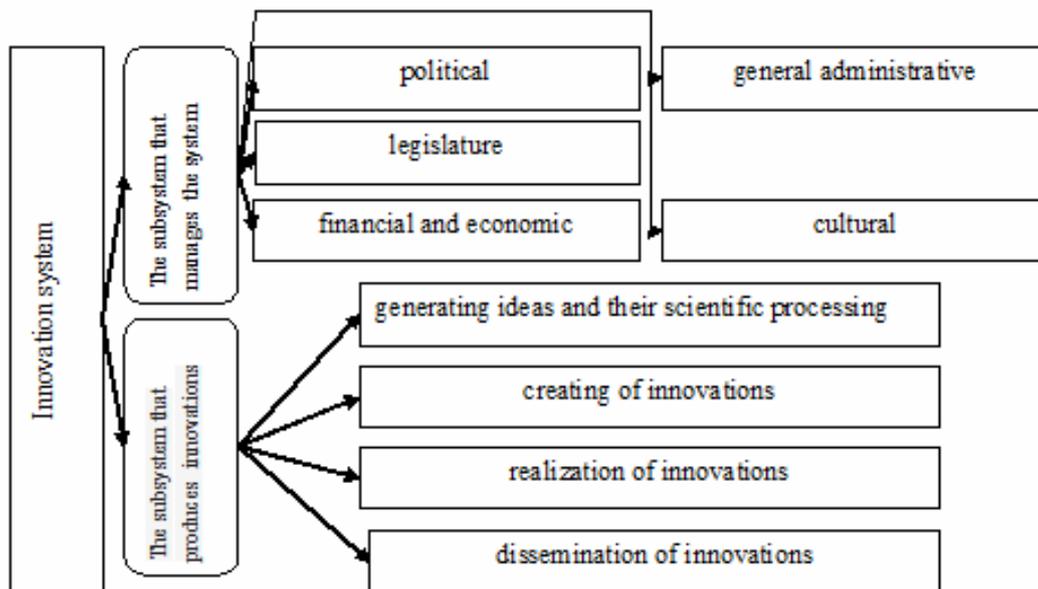
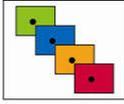


Fig.2. Functions of control subsystem and production innovations subsystem
Source: Compiled by the authors.

Structurally national innovation system defined by the Concept of the national innovation system (<http://zakon4.rada.gov.ua/laws/show/680-2009-%D1%80>) as follows:

- Regulation Subsystem. This subsystem includes legislative, structural and functional institutions that establish rules and regulations for the functioning of the innovation sector to control their compliance.
- Education Subsystem and other institutions and companies that provide training, retraining and skills development.
- Knowledge Creation Subsystem. This subsystem forms institutions, which conduct research and development, carry out development work.



- Innovation Infrastructure Subsystem, which includes industrial and technological power, financial, informational and analytical, expert and consulting components, and a network of parks, innovation centers, business incubators, etc. institutions.
- Manufacturing Subsystem, producing innovative products or innovative services. In addition to this subsystem referred companies that are consumers of technological innovations.

The algorithm of forming NIS and design of models covered by many factors, consideration of which ensures high efficiency and self-development. All factors that influence the formation of NIS are divided into objective and subjective. The objective factors include:

- Placing the country's borders and the presence of highly countries in terms of technology. This placement provides additional features that are implemented through innovative cross-border cooperation. Ukraine can use the benefits of such cooperation, such as with Slovakia - in projects of green energy, Hungary - in modern innovative agricultural technologies. In addition, placing Ukraine in Central Europe provides opportunities for its positioning as a logistics center and enhance innovation activity in logistics;
- Availability of human resources capable fo generating new knowledge and work with the new technologies. It is a complex factor, which depends on factors such as the state of education in the country, health care, cultural foundations of the nation, which are formed for centuries, etc .;
- Technological potential of Ukraine. State of technical equipment of enterprises of the real sector of economy, staffing and staff development departments of institutions, the level of depreciation of fixed assets in the country and the extent of their updates. This factor determines the choice of models NIS predominantly absorptive qualities or models aimed at "innovative breakthrough";
- Communication network and information potential of the country; the accessibility of information, exchange of methods, accuracy and completeness.

Subjective factors that are in a state of formation and depend on the will and intentions of the people who form the policy, including innovation. Subjective factors defined as follows:

- Trends in the legislative activities of the country; existence of laws that adequately regulate and serve as incentives to enhance innovation; presence of respect for intellectual property as part of private property;
- Status and prospects enterprise institute. Supporting entrepreneurship by public bodies active their participation in public-private partnerships, focus on the development of national innovation cluster formations.

When choosing a model of innovative systems taking into account factors that are divided according to their place of origin, national, international and global. National force in the country and, most importantly, can be more or less adjusted. These factors identified in the first place, the national technology policy, its institutional reinforcement. International factors act in international relations and technological knowledge sharing provides or innovative products between countries. International factors are guided by each country that participates in the technical and technological relations, limited in coordination with foreign partners. Global factors arising outside the country and affecting the global processes. This group of factors must be considered as special risk factors with which the country can't manage. An example is the global crisis, whose effects must be considered when forming systems development and innovation in the country.

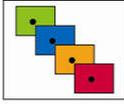
In conducting factor analysis of opportunities and threats formation of NIEs in Ukraine should return to the methodology of the World Economic Forum Global Competitiveness Index definition (GCI) based subindexes, reflecting the effect of the twelve factors. These factors are:

- Extensive group of factors (quality of institutions, infrastructure, macroeconomic stability, health and primary education) determines the type of extensive development of the national economy;
- A group of intensive factors (higher education and training, goods market efficiency and services, labor market efficiency, financial market sophistication, technological level, the size of the domestic market) causes intensive type of development;
- A group of innovative factors (competitive companies, innovative potential) determine the type of innovative development of national economy.

I. Bahrova and O. Cherevko (Bahrova - Cherevko, 2010) calculations of Global Competitiveness Index Ukraine in 2009-2011 to determine that the national economic system is in transition from extensive to intensive type of development. The results of the calculations confirmed the proposal to focus on the formation of Ukraine in the NIS, aiming to import Hong Kong, Singapore and Japan.

L. Gurieva (Gurieva, 2004) offers for basis take a model that describes the interaction of elements NIS private sector and the state.

The role of the private sector is to develop technologies based on their research and market promotion of innovation. Activities of state components of innovation system to support the creation of basic knowledge at universities and complex technologies of strategic character, good infrastructure and institutional pleasant environment for innovation by private companies. Within this basic model can be generated national characteristics NIS model in Ukraine: a certain proportion of



the public and private sectors NIS; defining the role and importance of large or small business involvement in innovation; value and applied research and development; priority allocation of NIS; industrial structure of innovation areas.

Conclusions

As a result we can conclude that we need systemic public policy measures that will intensify scientific and technological potential which has remained a timely manner to carry out the restructuring of the national economy at the forefront of technological basis, dramatically improve its competitiveness in terms of increasing global competition and, most importantly, change public attitudes to innovations. In this case, should works the effect of "innovative multiplier", which will involve a set of the potential of scientific, technological and institutional innovations, through which will form an effective national innovation system.

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REFERENCES

- Freeman, C. (1995). The National System of Innovation in Historical Perspective. *Cambridge Journal of Economics*, 19, 5–24
- Lundvall, B-Å. (1992). *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*. Pinter, London.
- Nelson, R. (1993). *National Innovation Systems. A Comparative Analysis*, Oxford University Press, New York/Oxford.
- August von Hayek, F. (1937). *Monetary Nationalism and International Stability*. London.
- Solow R.M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70 (1). 65-94
- Romer, P. M. (1994). The Origins of Endogenous Growth. *The Journal of Economic Perspectives* 8 (1): 3–22.
- Lucas, R. E. (1988). On the mechanics of Economic Development. *Journal of Monetary Economics* 22.
- Polterovich V. (2008) *Principy formirovania nacionalnoy innovacionnoy sistemy [Principles of formation of the national innovation system]* - Problemi teorii i praktiki upravlenija 11, c. 8-19. [in Russian]
- Furman J., Porter M., Stem S. (2002). The determinants of national innovation capacity. *Restfrch Policy*, 31, 899-933
- Strategy of innovative development of Ukraine for 2010–2020 in terms of global challenges. Authors compilers: Hennadiy Androshchuk, Ihor Zhylyayev, Borys Chyzhevskiy, Mykola Shevchenko. Kyiv: Parliamentary publishing house, 2009. — 632 p [in Ukrainian]
- Concept of the national innovation system. Approved by Cabinet Ministers of Ukraine dated 17 June 2009 g. Number 680-p. from <http://zakon4.rada.gov.ua/laws/show/680-2009-%D1%80>
- Bagrova I.V. , Cherevko O.L. (2010) Nacionalna innovacijna sistema Ukraini [National innovation system of Ukraine] *Visnik DDFA*, 2 (24), 81 – 90. [in Ukrainian]
- Gurieva, L. (2004) Nacionalnaja innovacionnaja sistema Rosii [National Innovation System of Russia], Retrieved December 30, 2016 from <http://www.uran.donetsk.ua/~masters/2004/fem/belomerya/library/6.htm> [in Russian].

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