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## TOPICAL ISSUES OF THE NATIONAL AND REGIONAL INNOVATION SYSTEM DEVELOPMENT



*Features of innovation system formation at the national level have been described; role of the regional aspect in innovation processes has been defined. Historical experience of innovation system formation in the developed countries has been considered. The situation in the sphere of innovation system formation in Ukraine has been described. The national innovation system model has been offered to be based on the development of regional innovation systems using a holistic approach to their formation and support. The practical recommendations on the implementation of priority measures to promote the development of national and regional innovation systems in Ukraine have been given. The conditions for successful development of innovation systems have been formulated.*

*Keywords: innovation system, globalization, regionalization, local competitive advantages, innovation process, and strategy of innovation development.*

In 2007–2009, after the gravest economic crisis in recent history, the governments of leading countries have been trying to accelerate economic recovery and to raise their competitiveness in the international market of goods and services by increasing number of initiatives on the promotion of innovative development.

This has been confirmed by both reindustrialization policy of U.S. President Obama and new industrial and innovation policy of the European Union. The efforts of the governments of these countries are aimed at creating legal, technological, and other institutional conditions for the development of innovative economy throughout at the national level and at establishing the areas of innovation activities based on leading regions. Natural resources have not been playing the key role in the formation of national and regional innovation systems any longer giving way to innovative human capital, infrastructure, and efficient institutions.

The problems of formation and operation of innovation systems and their specific development have been studied in many researches. The founders of national innovation system (NIS) concept are *Christopher Freeman* [1], *Bengt-Åke Lundvall* [2], and *Richard Nelson* [3]. For the first time, the concept of «*national innovation system*» was introduced by Christopher Freeman in research «*Technology Policy and Economic Efficiency: Lessons from Japan*» (1987) where he described the most important elements of Japanese innovation system, which ensured rapid technological and economic development of the country in the post-war period [1].

At the beginning and in the middle of 1990s, the researchers started to focus their interest on regional innovation processes, as a result of a sharp increase in competition in the global markets. Among those who received the most significant scientific results in this area there are world leading theorists *Philip Cook* [4, 5] (one of the firsts who developed the concept of regional innovation systems), *Gerd Schienstock* [6], *Martin Andersson*

and Charlie Karlsson [7], David Doloreux and Parto Saeed [8], Bjorn Asheim and Arne Isaksen [9].

Incidentally, the fundamental principles of the formation of regional innovation systems are largely derived from the concept of national innovation systems, which is more completely elaborated from the theoretical standpoint.

Some issues of innovative development of Ukraine at the macro- and the meso- levels and the formation of innovation system have been highlighted in researches of Ukrainian economists O. Amosha [10], Yu. Bazhal [11], P. Bubenko [12], S. Varnalii [13], V. Heiets [14], Ya. Zhali-lo [15], S. Katsur [16], V. Seminozhenko [14], V. Soloviev [17], and L. Fedulova [11, 18].

Usually, innovative systems are studied by identifying their basic elements, assessing relations between certain parameters of the national innovation system and economic dynamics of the countries and regions. The majority of approaches to the development of innovative systems is characterized by the following features [19, 29]:

1) abandonment of traditional linear model of innovation based on the formula «basic research – applied research – technology transfer – application» and transition to non-linear model of innovation process implying interdependence of all elements of the innovation and their focus on demand;

2) the evolutionary factors are taken into account: the innovative processes and systems are evolving under the influence of national characteristics of historical, economic, social, and political development; therefore, there are numerous innovative systems having both advantages and weaknesses instead of one optimal NIS. In addition, dynamic national innovation systems constantly adapt to changes and transform in line with new opportunities);

3) institutions play a significant role in terms of establishment of rules (regulations and laws) and organization (players);

4) more emphasis is put on the *forms* and *intensity* of interaction between the main elements (actors) of NIS;

5) the concept of NIS is considered to be an *analytical tool* that can be used in policy development and planning; however, it should be noted that none NIS model can be a ready template for the organization of national innovation process.

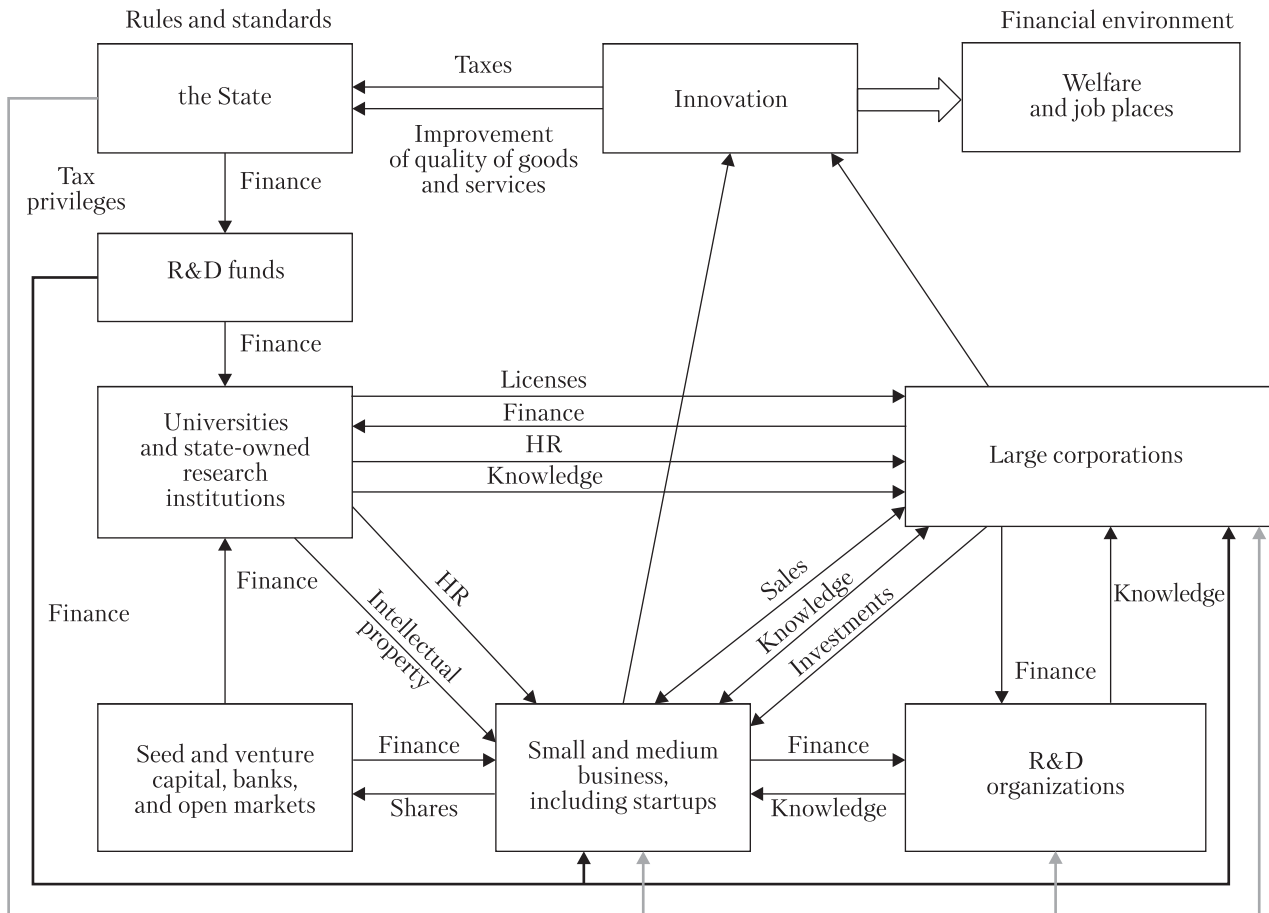
However, the complex problem of formulation and development of national and regional innovation systems requires further research taking into account today's rapidly changing economic conditions, challenges related to the deepening of globalization processes and liberalization of international trade, and strengthening role of regions in promoting the innovative economic development.

Despite the fact that currently researchers pay much attention to the formation of innovative systems, many conceptual, methodological, and practical aspects of the problem have remained unsolved so far. The underdeveloped problems mentioned above, on the one hand, and their research and practical significance, on the other hand, have defined the objectives of this research:

- ✦ To highlight the features of innovation system formation at the national level;
- ✦ To study the historical experience of their development and to elaborate proposals on accelerating the formation of national and regional innovation systems in Ukraine with international experience and local conditions taken into account; and
- ✦ To identify the conditions for successful development of innovative systems.

#### **INNOVATION SYSTEM: ESSENCE AND HISTORICAL EXPERIENCE OF FORMATION**

The innovative system can be considered in narrow and in broad aspects. In the first case, it includes the corporations and their relations with each other and with universities and research institutes. In a broad sense, the innovation system covers the education system, the sources and channels of financing, measures of government intervention, including the regulatory environment and social guarantees [20, 3]. The main objective



Model of national innovation system

of the innovation system is not only to produce innovations, but also to make them effectively operating in the economy. This is achieved through an *interactive innovative process* that involves a complex system of mutual relations and communications between the participants<sup>1</sup> with different functions and capabilities, which are constantly providing expertise, sharing and using it to produce new or to significantly improve existing products and processes, etc. (see Figure [21, 11]).

Thus, according to *Gerd Schienstock*, a leading expert on the development of innovative systems (University of Tampere, Finland), the economic success of various innovation systems cannot be

explained by merely by mentioning their members and supporting institutions. It is necessary to take into consideration the relations between them. If the participants of innovation system interact with each other in a proper way, it can be a powerful driving force for economic growth. In contrast, the failure to interact significantly impedes the innovation [6].

The successful operation of any innovation system depends on many factors. In particular, *Bengt-Åke Lundvall* stresses the importance of labor market and education for innovation processes [20, 3]. President and CEO of the New York Academy of Sciences *Ellis Rubinstein* believes that talented professionals are a cornerstone of the innovation system. One can spend a substantial fortune on innovation without any positive

<sup>1</sup> The relations can be realized as joint research, exchange of personnel, equipment, etc.

result unless persistent and intelligent people are involved in the innovation process [22, 23]. The innovation system on economic growth is largely influenced by regulative framework (property rights, patent regulation), research system, culture (national development in the spirit of entrepreneurship), and the availability of venture capital for funding innovative businesses.

The worldwide experience shows that the innovation systems are an effective tool for the regional development. The most obvious limitation of space for innovation system is the ratio of the city and the state (Athens and Rome in the ancient times, Florence and Venice during the Renaissance, Singapore and Hong Kong, to some extent, nowadays are examples of innovative zones).

However, according to all researchers who deal with innovation systems, when establishing the innovation systems it is necessary to take into account a large number of objective factors specific for each country: size, availability of natural resources, geographical location and climate, development of industry and legal, financial, social institutions, and cultural heritage.

At the same time, some scholars note [23, 8] that there are no ideal territory where innovations are generated continuously. It is necessary to seek after the presence of four certain features of the city, which are able to maintain the innovation dynamics [23, 8–9]:

*Firstly*, a geographical area with institutional environment favorable for frequent, intensive, and high-quality interactions;

*Secondly*, a city with a certain degree of product and trade specialization, where individuals and corporates are professionals in the manufacture of certain things and have a high level of competence;

*Thirdly*, the developed infrastructure of knowledge in the city; and

*Fourthly*, a city that eventually acquires specific features of demand, which, to a certain extent, meet its specialization and allow the city to build interaction between the producers and the consumers of goods.

The historical experience of the innovation systems shows that *they cannot be built themselves, without regard to the public interest* that is determined by the corresponding development strategies. Vice versa, *the innovation systems always correlate with interests of the state*. Among the indicative examples are Asian countries (Japan, South Korea, Singapore, Hong Kong, and Taiwan) and Finland, which use complex innovation strategies. At the beginning, they bought patents, imported technologies, developed them in the domestic market, established corporations, and ousted imports. Later, they shifted to exports gradually complicating the products and developing high technologies.

Forexample, Japan quickly recovered after World War II, reached a high level of economic development and joined the leading countries. However, the political, economic, and social systems formed in the postwar period proved themselves to be obsolete and unable to meet the challenges of today's global changes. Therefore, at the end of 20<sup>th</sup> century, the government of Japan formed a commission (*Prime Minister's Commission on Japan's Goals in the 21<sup>st</sup> Century*) with representatives of business, science, education, culture, and other institutions engaged in order to determine the country's objectives for the 21<sup>st</sup> century. The quintessence of ten-year debates and discussions was the document titled *Inner Frontier: Personal Development and Better Governance in the 21<sup>st</sup> Century* [24]. This document defines the main trends that will dominate in the 21<sup>st</sup> century: globalization, general awareness, IT revolution, scientific progress, a fall in birthrate and global aging of population [24].

To avoid these trends, Japan has planned to implement four groups of reforms:

*The first group* is «*the development of the spirit of innovation*» and includes two subgroups: 1) education reform; 2) raising of literacy;

*The second group* is «*transformation of diversity into power*»; it involves: 1) provision of individuals with opportunities to manage their own lives; 2) expansion of regional autonomy and self-sufficiency; 3) development of the nonprofit sector; 4) development of immigration policy;

The third group is «strengthening of framework for effective management»; it focuses on the following changes: 1) diversity and transparency of political decisions; 2) lowering of the voting age to 18; 3) strict limitation of the role of government; 4) development of rule-based management;

The fourth group is «Pursuing the national interests»; it includes three subgroups: 1) global civil power; 2) comprehensive multi-level security; and 3) good neighborly relations.

Later, in 2007, Japan adopted *Innovation 25* comprehensive strategy for the development of innovative economy for the period till 2025 [25], which defined five key innovation-based directions of the national development:

- 1) long and healthy life;
- 2) safe and secure society;
- 3) diversification of activities and employment in the community;
- 4) solution of global environmental problems; and
- 5) openness of society.

Thus, Japan has clearly stated the goals of its development and long-term technological future of the country according to which, currently, it builds the innovation system.

The majority of developed countries is investing big money in forecasting and developing the national innovation strategies. Thus, among seven priority areas of the EU strategy «Europe 2020. Strategy for Smart, Sustainable and Inclusive Growth» [26, 10–11], there is the one called «*Innovation Union*» that provides for significantly improved conditions and funding of research and innovations to guarantee the R&D commercialization. The financial mechanism for implementing this targeted initiative starting with January 2014 is the *Horizon 2020* Framework Program for Research and Innovation [27] whose budget for 2014–2020 amounts to about EUR 70 billion.

The governments of EU member states on their own are searching for the most effective methods and forms of fostering the innovation, which is reflected in the relevant policy documents, for example, the Strategy for High Technologies of 2020, in Germany; the National Strategy for

Investment in Science and Innovation for the period of 2004–2014, in UK; the National Policy of Research, Development, and Innovation for 2009–2015, in the Czech Republic [28–31].

In 2007, the government of Canada adopted a strategy for science and technology development (*Science and Technology to Canada's Advantage* [32]) in order to strengthen Canada's scientific and technological impact on the world stage; to create a favorable environment for increasing private sector investments in R&D; to attract and to support talented, experienced, and creative people as one of the essential conditions for the development of innovative economy.

The experience of advanced economies leads to the important conclusion: before starting the development of innovation system it is necessary to determine the strategic goals of the country and then to understand which kind of innovation system can ensure the achievement of these goals. However, the main task for the developing countries is to avoid the replication of successful experience of advanced economies or competition with them. The national innovation strategy of developing countries should have a diversified multi-vector nature to take into account the local competitive advantages and to support the promising cluster formations.

#### THE SITUATION IN THE FIELD OF STRATEGIC BENCHMARKS FOR THE DEVELOPMENT OF UKRAINE

Draft Strategy for Innovation Development of Ukraine has not been adopted by the Verkhovna Rada of Ukraine as an official legal document, despite the fact that it was widely discussed, including at the special parliamentary hearings [33]. There are no innovative strategies at the regional level, therefore, the innovation development programs designed by local authorities to intensify regional innovation processes<sup>2</sup> usually do not yield expected results. Moreover, in many regions, the

<sup>2</sup> For example, the program for scientific and technological development of the Donetsk Oblast till 2020; the regional program for innovative development till 2020 (Dnipropetrovsk Oblast); and the program for science, technology, and innovation development of Ivano-Frankivsk Oblast till 2015.

programs related to innovation development are not of holistic nature, insofar as they do not include key aspects of interaction between the innovation system elements, which inhibits their organizational and economic integration. Major barrier that hinders initiatives of local authorities is a system based on a centralized rigid vertical of power and a poor coordination of interdepartmental interactions, which does not provide local governments with enough power and is designed to manage public funds from the capital city.

The lack of approved long-term goals and coordinated efforts of the Ukrainian government to shift the national economy to innovative development has led to a difficult situation in the formation of the national innovation system. In fact, it is a chaotic accumulation of various institutions established by replication of Western institutions. Instead of implementing innovative approaches to create unique national institutions, in recent years, the government has been replicating successful foreign projects. However, due to national geographical, historical, and socio-cultural features it is impossible to successfully replicate the Western model of innovation.

Therefore, today, it is of particular importance to develop our own model of national and regional innovation systems.

#### **PROPOSALS ON THE INNOVATION SYSTEM DEVELOPMENT IN UKRAINE**

Given the global experience and local conditions, for successful implementation of innovations in the economy of Ukraine, the model of the national innovation system is based on the development of regional innovation systems using a holistic approach to their formation and support. This approach is caused by the fact that *the innovation system is an open system* whose operational efficiency depends on many factors, including the labor market, the industrial relations, educational, legislative, judicial, financial, banking, and cultural systems. All together, these factors influence the innovation system: they either promote or, conversely, slow down its development.

In Ukraine, the factors influencing the innovation processes are partially available; moreover, they are not interlinked with each other by a comprehensive national policy. Therefore, the rate of formation and the prospects for the development of national innovation system directly depend on the ability of the government to organize a strong system of staff training adequate to the needs and challenges, to adapt researches to the market demands and customer needs, to create an effective system of incentives, and to ensure the effective operation of business environment, etc.

Hence, in order to accelerate the formation of national and regional innovation systems and to increase innovation susceptibility of the economy the following priority measures should be taken:

1. Since Ukraine already has a clear development strategy set out in the Association Agreement with the European Union, a mere revision of the existing draft Strategy for Innovation Development Ukraine, which has become obsolete, cannot be an effective solution. It is necessary to create immediately (within a month) a special commission under the government, which consists of the representatives of government, industry, science, education, culture and the general public for the development of the National Innovation Strategy of Ukraine as a single comprehensive document accumulating the political initiatives, the proposals of scientific community, businesses, educators, and all other stakeholders with the goals, principles, and the list of system reforms set forth in the Association Agreement, as well as the global challenges taken into consideration. The result of commission's work should be the national innovation strategy of Ukraine approved by the government and submitted as a draft law to Verkhovna Rada of Ukraine.

In the same way, the issues related to the elaboration of realistic strategies for innovative development of the regions and the long-term programs for their implementation should be extensively discussed at the regional level, among the representatives of local authorities, research institutions, and business environments.

In terms of progressing globalization, the regional strategies should address the positioning of regions in the global markets instead of containing a set of measures without any regard to the system of worldwide economic relations. This requires a comprehensive analysis of industrial, scientific, technical, intellectual, financial, and organizational potential of the region to identify the areas where each region can consistently play a leading role and strengthen its position through the development of local competitive advantages.

The approved innovation development strategy should be the basis for the formation of national and regional innovation systems aimed at realizing the long-term objectives outlined in this strategy.

2. The Cabinet of Ministers of Ukraine should ensure the development and implementation of the National Target Comprehensive Program for facilitating the establishment and development of national and regional innovation systems that would identify a set of organizational and legal models and tools to support their formation and development.

The tasks to be addressed during the implementation of the Program are as follows:

- ✦ To create a system of economic (tax, credit, customs, etc.) incentives for corporations engaged in innovative activities, including the use of intellectual property rights;
- ✦ To identify «traps» between the links of the innovation process, to build a robust and well-balanced innovation infrastructure for their removal;
- ✦ To improve the mechanisms of interaction and communication between the participants in the innovation process, to support and to facilitate new organizational forms of cooperation;
- ✦ To provide the R&D institutions, industrial enterprises, and small innovative businesses with human resources, including young gifted professionals, to develop a system of training and improvement of qualifications for the innovation sphere;
- ✦ To implement effective measures for the protection of intellectual property rights;

- ✦ To enhance the innovation potential of small innovation enterprises and to ensure their integration into the system of scientific and industrial cooperation;
- ✦ To develop the legislative framework for innovative activities in the regions.

The central government and local authorities should be initiators and coordinators of the formation and development of innovative systems. They should create favorable conditions for a competitive market environment as major driving force of innovation and other frameworks for boosting innovation activities of economic entities.

This success of innovation systems depends on compliance with the following basic conditions:

1) Coordinated actions of all participants of innovation processes; coordination and harmonization of long-term strategies of the science and the industry (otherwise, there is a risk that the areas of research and the needs of industry do not correspond to each other, that can lead to negative consequences for both parties and the economy as a whole);

2) The comprehensive character of management decisions (the abandonment of the practice of implementing fragmented programs with a poor mutual coordination, the application of an entire set of instruments of government policy in a certain sequence, and the involvement of all stakeholders and participants of the innovation process (corporations, research and educational institutions, financial and credit institutions, authorities, and NGOs) into a single system of administrative decisions);

3) The suitability of innovations for the general public expectations, because if the innovation does not comply with traditions, code of behavior, and values of the society, it is unlikely to be effectively implemented therein. So, it is necessary either to study existing traditions and, on this basis, to develop innovative programs (projects), or to force innovations into application artificially incorporating them into «rules of the game» that exist in the society.

When deciding on facilitating the establishment of innovative systems the government

should take into account that the innovations generate not only new opportunities for the national development, but also risks for the society. Firstly, the innovative systems are very resource-intensive and costly in terms of implementation. Secondly, the innovative systems always support the promising areas and activities in the economy at the expense of the weak and uncompetitive ones, which can lead to serious social problems. Therefore, starting with the very beginning of innovation processes it is necessary to spread the positive impact of «areas of growth» throughout the economy to prevent the aggravation of inter-regional disparities in socio-economic development.

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#### АКТУАЛЬНІ ПИТАННЯ РОЗВИТКУ НАЦІОНАЛЬНИХ І РЕГІОНАЛЬНИХ ІННОВАЦІЙНИХ СИСТЕМ

Висвітлено особливості формування інноваційних систем на державному рівні, визначено роль регіонального аспекту в інноваційних процесах. Розглянуто історичний досвід становлення інноваційних систем у розвинених країнах. Окреслено ситуацію, що склалася у сфері функціонування інноваційної системи України. Запропоновано покласти в основу моделі національної інноваційної системи розвиток регіональних інноваційних систем з використанням цілісного підходу до їх становлення та підтримки. Надано пропозиції прикладного характеру, які стосуються запровадження першочергових заходів щодо сприяння розвитку в Україні національної та регіональних інноваційних систем. Визначено умови, дотримання яких дозволить досягти успіху у розвитку інноваційних систем.

*Ключові слова:* інноваційна система, глобалізація, регіоналізація, локальні конкурентні переваги, інноваційний процес, стратегія інноваційного розвитку.

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#### АКТУАЛЬНЫЕ ВОПРОСЫ РАЗВИТИЯ НАЦИОНАЛЬНЫХ И РЕГИОНАЛЬНЫХ ИННОВАЦИОННЫХ СИСТЕМ

Освещены особенности формирования инновационных систем на государственном уровне, определена роль регионального аспекта в инновационных процессах. Рассмотрен исторический опыт становления инновационных систем в развитых странах. Обозначена ситуация, сложившаяся в сфере становления инновационной системы Украины. Предложено положить в основу модели национальной инновационной системы развитие региональных инновационных систем с использованием целостного подхода к их становлению и поддержке. Даны предложения прикладного характера, касающиеся внедрения первоочередных мер по содействию развитию в Украине национальной и региональных инновационных систем. Определены условия, соблюдение которых позволит добиться успеха в развитии инновационных систем.

*Ключевые слова:* инновационная система, глобализация, регионализация, локальные конкурентные преимущества, инновационный процесс, стратегия инновационного развития.

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