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THE FORMATION OF A REGIONAL INNOVATION SYSTEM. THE INSTITUTIONAL APPROACH

The historical and empirical approach to creating the national and regional innovation system is analyzed in the article. The use of institutional paradigm in shaping innovation system is investigated. The process of innovation systems' development in conjunction with the transition to an innovative economy is analyzed. The features and advantages of regional innovation systems are considered. The practical aspects for provision of innovative regional development in Ukraine that are a systematic approach to the economic transformation of the region, the need to create mechanisms for coordination of regional innovation policy and consideration of possible social development problems are outlined. Most important functions of the regional innovation system, such as search, economic, analytical, project management, information, mediation, organizational and investment, are identified. The project model of regional innovation system for Kharkiv region is offered.

***Keywords**: innovation system, systems approach, national innovation system, regional innovation system, localized knowledge, regional innovation policy, knowledge based economy, Kharkiv region*

Introduction

By studying the processes of economic development of different countries (Germany, England, USA, Japan), well known scientists, such as F. List, F. Machlup, S. Freeman, have determined in their scientific papers that in today's world new knowledge particularly forms the strategy of success for different states. Knowledge in the field of engineering and technology changes economic platform; however, humanitarian knowledge alters social and governmental institutions. Therefore, to succeed in the competitive environment of the world economy, any national economy must be updated constantly and rapidly by means of using innovation as the main driving force for progress. The same mechanism for obtaining new knowledge and its practical application requires new institutions in those areas that provide regulation of the economy, namely institutions of science, education and manufacture of high-tech products, innovative marketing and management, investment policy, financial system, international economic relations, to be developed. Due to use of this wide range of institutions, a hierarchical structure that has a particular purpose and unites knowledge, organization, information, personnel and other items can be combined. This structure is able to design, develop and support the innovation process in the economy. Similar structures have been already established and are working now in advanced countries under the generalized name of the "national innovation system" (NIS). These systems differ in status, organizational form, methods of work, the nature of interactions and effects, but they share the main mission because they transform knowledge into new products and services and provide a competitive advantage for the economy, in which they are working.

In the U.S., UK, Germany, France, and Italy NISs have already consistently strengthened their positions in the macroeconomic model to ensure efficient regulation of economic development of these countries. The Ukrainian NIS as the system of a new type and an institution for innovative development has not yet formed. This does not mean that the NIS doesn't exist in Ukraine; conversely, its main elements are functioning. Among them are universities, academic and branch related research institutions, regulation bodies in the central state government and the regions. The problem is that these elements are not systematically organized, deprived of modern tools of interaction, and don't demonstrate effectiveness. Therefore, the state innovation policy is clearly signaling to create the NISs of new quality with corresponding structures in the regions. Since this work has already begun, the scientific support of it is relevant and necessary along with large amount of other challenges. The concept of NISs that are attributed with the broken connections between science and industry hasn't been elaborated. The issues of how to select the basic model of future NIS and especially form the regional blocks of the system are required to be further investigated. It makes sense to study the functions and organizational forms available during the creation of regional innovation systems (RIS) since first real approaches to the development of innovative strategies in specific regions of Ukraine have shown some contradictions in understanding the mechanisms of the innovation process.

The significant contribution to development of institutional approach applied in macroeconomic systems

designed for regulation has been made by such famous scientists as D. Norton, G. Hodgson, R. M. Nuriyiv, A. A. Chuhno, M. A. Yohna, and O. L. Yaremenko. Innovation theory and practice has been presented and developed on the scientific works delivered by J. Schumpeter, B. Santo, F. List, F. Machlup, V. I. Kushlin, V. Heyets, and L. I. Fedulova. Specifically, the creation of the NISs and RISs has been investigated by such scholars and experts as C. Freeman, B.-A. Lundvall, N. I. Ivanova, V. P. Solovyov, and P. T. Bubenko. These developments, theoretical offers and recommendations are scientific framework of the problem and serve as the initial positions in its further scientific solving.

Results

Two basic approaches that have slightly different definition of the NIS and its operation objectives at the national level can be distinguished in foreign studies. Foreign experts define these approaches as a historical and empirical, and knowledge based approach pursuing the idea of interactive learning [1, p. 98].

The first approach uses a methodological component of the NIS concept for empirical studies of institutional effects on economic activity of enterprises and industries based on national characteristics. The practice of empirical research is used as a tool for developing industrial and innovation policy. Particular attention is paid to the historical development of national institutions that is understood as regulation activities divided into types related to their historical and social and economic transformation. An example of this approach refers to a study of Japanese economy performed by C. Freeman. The scientist was the first who presented the concept of NIS due to having analyzed the rapid development of Japan in the second half of the XX century and revealed the reasons for this development [2, p. 165].

Further, by making a comparative analysis of the economies of various countries, C. Freeman defines the fundamental differences in the various models of NICs that have been established internationally in the 80-90 years of the XX century. He argued that the dynamic growth of the newly industrialized countries of South East Asia (South Korea, Taiwan, Singapore, Hong Kong), which had been lasting for more than a decade, resulted in the development of these countries, science, education and advanced science-intensive industries. In contrast to the successful development, he pointed to a slowdown in Latin America accompanied with ignoring the high-tech production and not caring about funding for science. Thus, historical and empirical approach emphasizes the priority of some structural characteristics of innovation systems, and the impact of the national policy on economic and social development characteristics. The main objective of the innovation system, according to this approach, is to be the base for the development and empirical analysis of innovation processes in the existing social and economic context.

The second approach, which has been launched by the Olburh School (according to the name of Olburh in Denmark, where there is the university in which famous B.-A. Lundvall and his many supporters worked), is based on the idea of interactive learning. They see the NICs in a more abstract sense than proponents of the first approach focusing mainly on the role of knowledge and studying institutions in the innovation process [3, p. 241]. This approach is based on two basic conditions which were formulated by Lundvall in 1992. The first condition is that knowledge is the most important resource of the modern economy that makes learning to be an important and necessary process. The second condition is that learning is interactive being a social process. In this regard, in order to obtain necessary knowledge, firms need to encourage joint online learning taken together by wide range of actors (developers and users of new technologies, research institutes and other institutions). The basic concept of success in a competitive environment is the "concept of the economy based on knowledge". For the first time, the processes of interactive learning were considered by B.-A. Lundvall and described in his studies of relationships between producers and consumers in Denmark [4, p. 125]. Later the idea of interactive learning has been disseminated to the regional level for the analysis of territorial agglomerations and business environmental of the regional firms. Thus, the concept of "localized knowledge" was introduced. It is argued that the local concentration of the necessary knowledge for geographical clustering of economic activity ensures the long- term economic growth in the region due to internal factors.

It should be noted that the scientific approach to the creation of NISs, despite fairly widespread in recent years, has not yet had generally accepted views. Instead it is characterized by some of the conceptual frameworks, which provide development and deepening of existing knowledge. In the writing papers of the founders of the NISs and their followers, this situation can be traced quite clearly. In the recent work, which includes a series of papers inder the name "New horizons in the economics of innovation", in the book "Innovative System of Asia in Its Transition" [5, p. 143], professor B.-A. Lundvall offers to consider a new aspect – the process of transition. Herewith, the transition is understood as a process of gradual transformation of one set of institutions to another. In his work, the author emphasizes that the last 15 years show a stable and recognized standards of innovation systems and processes of transition from a planned to a market model, but a transition itself is to be understood in a broader sense as a process of changing the object or concept system. As a result, more attention is given to existing institutions and structures, and less to qualitative changes in the structure and the institutional basis of innovation systems. "An empirical analysis is usually an attempt to consider the

innovation system in terms of structures, institutions, organizations, and relationships between organizations, but not in the sense how they are all changing" [5, p.33].

In supporting this view, we consider it appropriate to examine the transition of the economy to an innovative way of development drawing a parallel with the development of the innovative systems their selves that eventually are getting new quality characteristics. The relationship between institutional economics and economics of innovation has long been found in the study of innovation systems. As G. Hodgson points out, innovation activities are initially characterized by a high degree of uncertainty [6]. So, the theory of rational choice is unable to offer clear mechanisms and options for decision making. Therefore, the decision taken by the subject of innovation is largely dependent on existing public institutions that are rules, laws and informal norms, and traditions and so on. Thus, the scientific school by Lundvall defines transition as a process of radical institutional changes taking place both inside and outside the system. The amendments provide two mechanisms simultaneously acting and collectively determining the transformation of innovation systems.

The first mechanism can be attributed to situations where the business environment is transformed in a way that existing institutions are not able to solve new problems. Lundvall defined this mechanism as the occurrence of institutional structures inadequate to external challenges. Another mechanism refers to situations where endogenous economic change within the system leads to the fact that the system reaches the limit of its possibilities. This situation can be considered as the resource depletion. To overcome the inadequacy caused by the external transformation and internal barriers, the essential institutional changes are required. Thus, transformation of rules and systems is also needed.

Among most important transformations that change the innovative system itself the following factors can be distinguished. They are growing importance of knowledge and information in social development, increasing international relationship in the globalization process, shortening innovation cycle. In such circumstances, it is important for successful individuals or organizations to have access to sources of specialized knowledge and the ability to be trained and gain updated knowledge.

Another important trend of social development is the globalization. In recent years, increasing interdependence between different parts of the world has led to doubled increase in the capacity of the education system. However, it should be noted that globalization is the unbalanced and unfinished process while some industries, segments and countries locating in the heart of this process; that are also countries and industries which are barely touched by the process. In this regard, today it would be more correct to use the phrase that "the economy is globalizing" than the term "global economy".

The terms "the economy that is globalizing" and "learning economy" are closely related, support and create opportunities for mutual development. On the one hand, the establishment of an integrated world creates many opportunities and different sources for learning. On the other hand, the active generation of new knowledge and its implementation in new technologies especially in the field of information and telecommunication have created a material and technical basis of globalization.

In the new global environment of economic relations competition is an important element. Competition stimulates the processes of integration and accelerates learning processes for the entities to keep their market positions. This is not the only high-tech, but also traditional industrial sectors that were previously protected by the governments face the impact of global competition, and therefore, all new industries and sectors are included in the structure of national, sectorial and global innovation systems.

Above listed items create new opportunities (threats and challenges) for developing countries and transition economies. As follows from the assessments of countries, today (e.g. Southeast Asia) those countries receive substantial benefits which have integrated their economies and NICs into the international division of labor getting real benefits from the process of globalization in the research and innovation sectors. At the same time, the economies of Latin America and the CIS countries being in the process of opening their national economies are considered stopped in their development for decades.

Activities developed in Ukraine to include the national economy into the world economic processes have brought small and unstable results. Among several reasons for this situation are political uncertainty, changes in international vector orientations, the shadow economy and others. Not least in this series is the problem of unshaped NISs for which we still have some amount of resources and conditions including diversified education and research sector, knowledge base and intellectual potential. The listed resources are required to be combined at a new level of interaction: science and industry, regulatory policy and market, the regions and the center. Real growth and competitive advantages are not in the public center of strategic management, but in the scientific and industrial agglomerations at a regional level. To create a NIS base, regional NISs need to be built since the specifics and work, knowledge makers and mechanisms for its use in practical terms are concentrated there [7, p. 226].

Regional innovation policy is getting to be one of the essential instruments for NIS's shaping. Moreover, real plans to create a strong "knowledge based economy" in the European Union as a prerequisite for success are considered possible through implementing the regional innovation policies. Regionalization of innovation policy relates to the nature of innovation development in a single area of the world economy. The large standardized

production is losing its priority position. There are new leaders who are focused on non-standard and high-tech manufacturing where no the size of production and sales, but the ability to constantly update products through the introduction of product technologies (development and market introduction of innovative products) plays a crucial role in strengthening the competitive advantage in the marketplace. Small business starts to play a dominant role as the most suitable to rapid changes in technology and products with significantly smaller investment. In the new economy, local alliance of scientists, entrepreneurs, local government as well as clustered forms of interaction are very significant factor for competitiveness. These groups are generally created at the regional level, but often get global value that benefits the state as a whole.

It is recognized that regional governments are more suitable for careful creating high-quality supportive environment than large government agencies; regional authorities are also able to develop a non-trading relationships and mobilize intellectual capital.

Scientists emphasize the dominant role of interaction and communication in innovation processes including geographical proximity and availability of contacts as a key advantage of regional economies. However, there is no doubt that the national system has a greater potential knowledge. Supporting the overall (cumulative) learning processes is not enough for innovative development if the proximity is insufficient to maintain relationships. Context subtle knowledge as a key element of the innovation process is best transmitted through constant and direct interaction; it cannot be transferred over time and space regardless the "informed the subject". At the same time, knowledge designed for a specific application can easily be transmitted over a distance, and is of an economic value in different sectors and geographical areas.

One could argue the following benefits of such regional innovation processes over national: joint presence of different manufacturers that offer specialized services in a timely and flexible manner to respond to the demand; learning effects that are caused by the participation of regional producers in transnational networks; availability of local labor markets in which specific skills and learning forms are concentrated; compact and dynamic institutional infrastructure which occurs both outside and inside the regions; the development of regional networks of trust between economic actors; predicted and consistent distribution of resources, tasks, and responsibilities.

The "regionalization" of the innovation policy is related to features of "technological resources". Creation of innovative technologies becomes more cost intensive due to the increased expenses (generally public expenses) for research and training of qualified personnel. At the same time, there is a high risk that new ideas and technologies can be quickly used by countries or companies that do not spend money for the development of these ideas or technologies. As one knows, the outflow of intellectual resources and knowledge is associated with migration of experts between countries. Therefore, an important condition for reducing risk caused by the reason of this negative moment is as fast commercialization of new technological advances that is their combination with business as possible. In turn, it stimulates their implementation throughout national companies and promotes the results to the market.

An important reason for strengthening the role of regional innovation development is that modern innovative economy, particularly its important component, provides processes called learning by doing and learning by interacting. That is the success of innovation policy largely depends on how much new knowledge that are implemented in the activity plans of economic development of the region have been generated depending on the nature of tasks and how closely local elites (primarily scientists and entrepreneurs) interact in order to exchange knowledge, take correct decisions, make mutual efforts, and if necessary correct development processes.

When one creates a RIS, it is need to be taken into account that regions in terms of industrial specialization, availability of resources and expertise for the development of new industries are different. For example, regions with standardized and raw materials intensive production, and high social pressure are less capable of large-scale innovative transformation compared to those regions where such a structure was not developed. International experience shows that the stronger and more stable economic system is before the reform, the greater resistance to the new system's development will be. The creation of an innovative economy should begin in areas with high level of small and medium sized businesses.

By defining high internal diversification of economy that affects the occurrence of many variations of regional innovation policy, every region should be estimated not only for total innovation potential, but also for specific and external (internal) relationships. Regional specificity is just used for selecting priorities for innovation development and the formation of joint projects.

By realizing that the establishment of knowledge becomes more dynamic process and regions can no longer focus only on making their own knowledge, regional innovation institutes should be integrated into the global flows of knowledge as independent production of all necessary knowledge is almost impossible. In addition, regional universities and research institutes can benefit from knowledge production that is valuable to others since it helps become a full partner in the network of knowledge.

To support innovative regional development one must consider the following key aspects. Firstly, balanced regional economic transformation should be based on a system approach that will be used not only the key innovation institutes of the region, but also the regional infrastructure as a whole.

Secondly, for the successful formation of the Institute of Regional Innovation System it is necessary for its participants to be mutually supportive. To do this, in the process of formation of regional innovation policies mechanisms of coordination and vision of perspectives are established. Conversely, the gap between new knowledge and their implementation into production will constantly exist.

Thirdly, the formation of regional institutions that provide innovative development is required to take into account that the process of fundamental transformation generates not only the winners but also those who are lost. Supporting strong industries by means of weak and non-competitive ones may lead to serious social problems. Without social training, which allows avoiding the critical level of social tension, the progress in development may be at risk.

Discussion

The study found that the implementation of innovation policy at the regional level depends on the coordination of national and regional innovation strategies that is prioritizing the research and technological development, combining and coordinating the activities of all participants, creating and maintaining the appropriate institutional and legal conditions. Besides, for the successful implementation of innovation policy it is necessary to ensure the interaction and cooperation of powerful industrial companies with small and medium-sized businesses, create regional innovation infrastructure. Regional innovation systems created in Ukraine are expected to contribute to the new ideology of regional development [9].

The studies show that most important functions of RISs are the following principally separated activities: research, organizational, economic, analytical, design, information, mediation, organizational and investment.

Defined functions characterize the RIS as a multifunctional system, the structure of which should be highly developed on various issues: innovation policy, marketing, analytics, legal protection of intellectual property and others. Therefore, the organizational structure of the PIS proposed for the implementation in Kharkiv region includes analytical branch curators, expert groups, the center of innovation management, laboratory of technology and energy [11, p. 287].

Information base for the RIS is a double unit consisting of a data bank and information technology division. Initial phase of the creation of the RIS implies that the organizational structure and database should be developed since personnel and information are most valuable in this system. Databases of RIS consists of electronic resource innovation block; component for monitoring the educational, scientific and technological activities; bank of innovations, developments, and applications; system for assessments of regional innovation performance.

Analytical component of the RIS can be worked out with the inclusion of indicators to the information provided for general members of the system. For example, evaluations of innovative situation on the region's resources, the possibility of attracting other resources, assessment of barriers for expected changes, trends of the future.

The design model of RIS in Kharkiv region involves the introduction of monitoring systems with subsystems, analytics and forecasting, search marketing, service innovation, corrections and reserves control [12, p. 114]. Moreover, monitoring facilitates reliability of information and enhances the accumulation of data for the development of prudential regulations.

The strategic objective of RIS is the informational support of social and economic development of the region, which is due to resource provision and performance characteristics of the development programs. The experience of technologically developed countries shows that monitoring, performance review and evaluation, and applications must be accessible to the public and protected from possible impact of administrative measures and directives that require the methods for independent expert review of the system and the effectiveness of its work to be developed. Expert assessment can also be used in handling the "conflict of interest" that should be associated with the objectives of improving the institutional innovation process in the region.

An innovative component of social and economic development in developed economies has the leading role and is increasingly taken into account by other countries. Research and statistics prove that the new economy is the economy of knowledge, intelligence and innovation and that it concentrates driving forces of progress. Therefore, in Ukraine, new elements of complex models of innovative development are shaped. Past studies determined that in the real world of today to create the NIS and its supporting units in the regions called RIS, we need to use foreign experience in this area.

It is proved that the NIS is basically formed as a new management institute to facilitate economic development and overall institutional approach is a prerequisite for the transformation of existing elements of the old system to a new qualitative level.

As a way to knowledge-based economy is long and complicated, and the necessary institutional changes meet resistance from the old standards and norms of economic activity, there is an urgent need to organize ongoing training on innovative development problems. The second problem is the formation of modern cluster models of interconnection between science and industry; such work should be launched in the regions.

In Ukraine RISs are formed very slowly, but some experience of such work has already been present,

especially in Kharkiv, Donetsk and Sumy regions. Unlike existing views on the RIS as the stable form of administrative structures, the necessity and ways to create a variety of areas given situational characteristics and peculiarities of each region are provided in the study.

In Kharkiv region there has been developed scientific basis for the creation of the RISs, defined their structural elements and recommended to pay more attention to the information on base of a new system locked on the monitoring subsystem. A pilot project of the system has also been developed.

Further important task for activation of processes regarding innovation development in the regions under RIS conditions is expanding the direct links between the RIS at the interregional level.

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ФОРМУВАННЯ РЕГІОНАЛЬНОЇ ІННОВАЦІЙНОЇ СИСТЕМИ. ІНСТИТУЦІЙНИЙ ПІДХІД

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У статті проаналізовані історико-емпіричний та знанієвий підхід до створення національної та регіональної інноваційної системи. Досліджено використання інституційної парадигми при формуванні інноваційної системи з урахуванням специфіки розірваних зараз зв'язків науки з виробництвом, що потребує подальшого дослідження питання вибору базової моделі національної інноваційної системи та врахування особливостей формування регіональних блоків такої системи. Дослідженні функцій і організаційні форм створення регіональних інноваційних систем, оскільки вже перші реальні підходи до розробки інноваційних стратегій в окремих регіонах України показали деякі протиріччя в розумінні механізмів управління інноваційним процесом. Проаналізовано процес розвитку інноваційних систем одночасно з переходом економіки на інноваційний шлях розвитку. Розглянуті особливості інноваційних систем, а саме зростаючу важливість знання та в цілому інформації у суспільному розвитку, зростаючу міжнародну залежність в рамках процесу глобалізації, скорочення інноваційного циклу. Розглянуті особливості й переваги регіональних інноваційних систем, а саме присутність багатої кількості різних виробників, ефекти навчання, які викликані участю регіональних виробників в транснаціональних мережах, наявність локальних ринків робочої сили, компактна і динамічна інституціональна інфраструктура, розвиток мереж довіри між регіональними економічними учасниками, прогнозований та узгоджений розподіл ресурсів, завдань і відповідальності. Сформовані практичні аспекти забезпечення інноваційного розвитку регіонів в Україні, а саме: системний підхід до економічної трансформації регіону, необхідність створення механізмів координації регіональної інноваційної політики та врахування можливих соціальних проблем розвитку. Визначені найбільш важливі функції регіональної інноваційної системи - пошукова, організаційно-економічна, аналітична, проектна, інформаційна, посередницька, організаційна та інвестиційна. Запропонована проектна модель регіональної інноваційної системи для Харківського регіоні де вже розроблені наукові основи розбудови такої системи, визначені її структурні елементи та рекомендовано більшу увагу приділити інформаційній базі нової системи, замкнувши її на моніторинговій підсистемі.

Ключові слова: *системний підхід, інноваційна система, національна інноваційна система, регіональна інноваційна система, регіональна інноваційна політика, економіка заснована на знаннях, Харківський регіон*