

Integration principle in developing regional innovation clusters

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The article considers specific features of regions developments within the framework of joint realization of both sustainable development concept and an innovation strategy which provides a synergistic result of achieving optimal economic parameters while minimizing negative anthropogenic impact on the environment. Violation of the optimal equilibrium in the simultaneous implementation of both strategies increases the probability of manifestation of environmental and economic risks and economic risks, due to increasing share of waste at different stages of life cycle of industrial products with a predominant innovation component. Disproportions in the implementation of modern approaches to innovations associated with regional specifics of sustainable development increase adverse effects on the ecosystem. Forming a background of delayed technologic and environmental risk, they increase the likelihood of economic risk, reducing the effectiveness of already implemented innovations. An effective strategy for minimization of delayed risks to different species is the formation of regional cluster structures which include industrial, managerial, research and training components based on integration of intellectual, material and technological resources.

Keywords: Region, innovative development, cluster structures, integration

Introduction

Our paper aims to examine specific features of implementation of the national innovation development strategy in the region in interaction with sustainable development concept.

System analysis method used in the study allows identifying the relationship of material, technological, regulatory and managerial aspects of the regional industrial complex functioning. The objects of research were industrial enterprises and infrastructure of innovation activity support of Grodno region.

Innovation strategy and sustainable development

The leading economies which define trends in the global society are based on the system of two basic principles which are the basis of the innovative development strategy. First of all, the primary economic development objective states increasing output of goods with improved parameters of consumer characteristics, thus increasing the profit of economic entities of different structures and affiliation (Gyachas, Yakubavichus, Melnikas, et al., 2013; Gavrilenko, Myasnikovich, and Nikitenko, 2005; Myasnikovich, 2004; Gavrilenko, 2006; Avdeychik V. et al., 2007; Montik, 2010). Another principle is ensuring the sustainable development concept which embraces a complex system of values, norms, legal institutions, policies, technologies, and instruments, aimed at minimizing the negative anthropogenic impact in any manifestation on the elements of the environment (GEO,

2010; Balashenko, 1999; Kyoto Protocol, 1997; Vienna Convention, 1963; 1985; Nikitenko, 2000; National strategy, 1997; Demchuk and Yurkevich, 2003).

Sustainable development concept, differently being implemented in industrialized countries and inter-governmental associations, is theoretically based on the noospheric approach proposed by Vernadsky (Nikitenko, 2000; National strategy, 1997; Demchuk and Yurkevich, 2003), intending formation and operation of effective engineering and manufacturing complex while minimizing the negative anthropogenic impact on the environment. However, the noospheric approach institutionalized by a number of regulations at national and international levels (National strategy, 1997; Demchuk and Yurkevich, 2003), is characterized in the last decade by strongly pronounced mercantile features which in some cases are represented as an inevitable consequence of effective functioning of economic entities.

The main objective of innovation strategy implementation is “...with the help of development of backgrounds for the formation, dissemination and implementation of innovations to provide a highly competitive business and other subjects, and their products on international markets, high level of public sector, rapid growth of social and economic development and welfare of the population, conformance to the life quality codes and standards” (Gyachas et al., 2013, p.63).

Practical implementation of the national innovation policy assumes a significant increase in the volume of a variety of industrial products to satisfy consumer demands. This aspect conditions occurrence of various bifurcations in established processes of relative equilibrium between industrial production and consumption on the one side and the environment on the other side.

On the one side we have innovation development strategy with its progressive strategic purpose of gaining maximum economic dividends within the framework of a coarsely understood concept of satisfaction of uncertain needs of individuals with different social statuses, intellectual capacities and education levels. On the side, it is said on the strategy of sustainable development with its declared necessity to minimize the negative technogenic impact on the environment in order to preserve it in a stable condition with predictable trends of short- and long-term changes.

The combined impact on the societies of two interrelated and formally opposed strategies increases the likelihood of manifestation of negative local and global trends in the development of socially-oriented national and supranational entities. Violation of the optimal equilibrium in the simultaneous implementation of both strategies increases the probability of manifestation of environmental and economic risks and economic risks, due to increasing share of waste at different stages of life cycle of industrial products with a predominant innovation component.

Innovations strategies and managing development risks

Analysis of the literature dedicated to problems of functioning and development of societies in modern conditions (Gyachas et al., 2013; Gavrilenko et al., 2005; Myasnikovich, 2004; Gavrilenko, 2006; Avdeychik V. et al., 2007; Montik, 2010; Nikitenko, 2000; National strategy, 1997; Demchuk and Yurkevich, 2003; Avdeychik, Pestis, and Struk, 2009) demonstrates transformation of conceptual approaches in strategy development which takes into account innovation and ecological aspects. Unequivocal is the statement that “... in a crisis and post-crisis economy innovations can improve the sustainability of development of both individual enterprises (organizations) and the national economy as a whole. “Use the innovation or disappear” - that is the criterion that guided the leading companies of the world” (Gyachas et al., 2013, p.490).

The concept of creating “knowledge society” and the “knowledge economy” is actively developing; it is now considered as “... the main priority of modern society, its social and economic development and progress” (Gyachas et al., 2013, p.7). Reassessment of the knowledge role takes place in operation of various entities having different social and

political organisation. Modernization of economics is considered “... as a task-oriented process of progressive changes in the economy focused on improving of its efficiency and implementation of the goals and interests of subjects which tend to economic efficiency improvement” (Gyachas et al., 2013, p.17).

However, accomplishing the innovation strategy in the development of economic entities irrespective to their structure, social status, affiliation and capitalization will lead only to increasing of a risk influenced by various factors: economic, social and political, regulatory, material and technological, managerial, etc.

One can agree that that in any chosen innovation strategy, whether it is offensive, defensive or imitative, “... enterprises objectives are achieved by the innovations facing with a significant influence of potential risk factors” (Gyachas et al., 2013, p. 43). Gyachas et al. (2013, p.144) notes on four main approaches in economic entity's activity to minimize negative risk impact on implementation of the innovation strategies: “avoiding, handling over, mitigating or accepting risks.”

According to Gyachas et al. (2013, p.144) the risk is a factor which is concomitant to all innovation processes, because an innovative activity is directed precisely to the future, counts on probable rewards and covers costs using for example alternative or real capital.

The risk manifestations in innovation development strategy of economic entity and societies at different levels are influenced by factors related to globalization and internationalization trends in the social, economic, political, and technology domains (Gyachas et al., 2013). Therefore, in order to confront threats and seize new opportunities, the ongoing transformations should be investigated and new approaches to systemic changes should be developed (Gyachas et al., 2013, p.490).

Violation of the optimal equilibrium in the simultaneous implementation of both strategies increases the probability of manifestation of environmental and economic risks and economic risks, due to increasing share of waste at different stages of life cycle of industrial products with a predominant innovation component.

Integrated approach to innovation strategy on regional level

Finding optimal approach to innovation strategy has particular importance for regional societies which generally have inharmonic structure of industrial, educational, scientific and personnel components, influenced by historical, political and natural factors (Avdeychik V. et al., 2007; Avdeychik, Pestis, and Struk, 2009).

Disproportions in the implementation of modern approaches to innovations associated with regional specifics of sustainable development increase adverse effects on the ecosystem. Forming a background of delayed technologic and environmental risk, they increase the likelihood of economic risk, reducing the effectiveness of already implemented innovations.

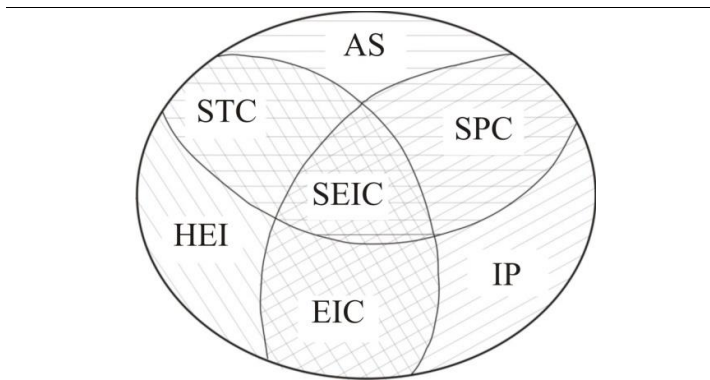
Therefore, the implementation of the national innovation strategy at regional level is a multifaceted problem that can be solved with the achievement of “... synergistic effects which allow to bring new quality into all spheres” (Gyachas et al., 2013, pp.48-49) only when rational utilization of all kinds of resources: intellectual, technological, financial and managerial (Avdeychik, Pestis, and Struk, 2009, p.192). An effective strategy for minimization of delayed risks to different species is the formation of regional cluster structures which include industrial, managerial, research and training components based on integration of intellectual, material and technological resources.

Regions which differ in economic structure, scientific, personnel and organizational environment, have a special role in the implementation of the national innovation development strategy. In our view, the most promising areas in the study of modern sources of regional development and regional innovation strategy include cluster approach (Avdeychik, Pestis, and Struk, 2009; Bogdan, 2000), noospheric principle (Nikitenko, 2000; Demchuk and Yurkevich, 2003), concept of sustainable and mobile support

(Gyachas et al., 2013, pp.525-527), concept of “oases” (Gyachas et al., 2013, p.63, pp.65-66). According to Gyachas, new conceptual approaches transforming management system should, at first, provide the creation of business climate favourable for innovation development, and, at second, ensure the use of “opportunities windows” for technological breakthroughs (Gyachas et al., 2013, p.490).

Studies including our research (Avdeychik V. et al., 2007; Avdeychik, Pestis, and Struk, 2009) show on combined impact of the three sectors influencing on the processes of creation and diffusion of innovation: public, private and social (Gyachas et al., 2013, pp.228-229). Obviously, coordination of joint influence of these sectors determining the structure and effectiveness of the development of societies and individual economic entities, becomes possible by virtue of integration of intellectual, material and technological, managerial, social and political resources in the industrial, scientific and educational institutions, and infrastructure management (Avdeychik et al., 2007; Avdeychik, Pestis, and Struk, 2009).

FIGURE 1. INTEGRATION MODEL OF INTELLECTUAL MAINTENANCE FOR INDUSTRIAL PRODUCTION'S INNOVATIVE ACTIVITY (SEIC - scientific, educational and industrial cluster; STC - scientific and training complex; EIC - educational and industrial complex; SPC - scientific and production complex; IP - industrial productions; HEI - Higher education institutions; AS – Academy of sciences)



Incorporation of all kinds of resources through the integrated approach provides a synergistic effect in the implementation of a national innovation strategy. This is particularly easy at the regional level due to possibility of formation of scientific, educational and industrial clusters (SEIC) which activities focus on development tasks taking into account all specific characteristics of a region (see Figure 1). Effectiveness of the functioning of such structures is significantly higher comparing to traditional scientific and training (STC), scientific and production (SPC) and educational and industrial complexes (EIC).

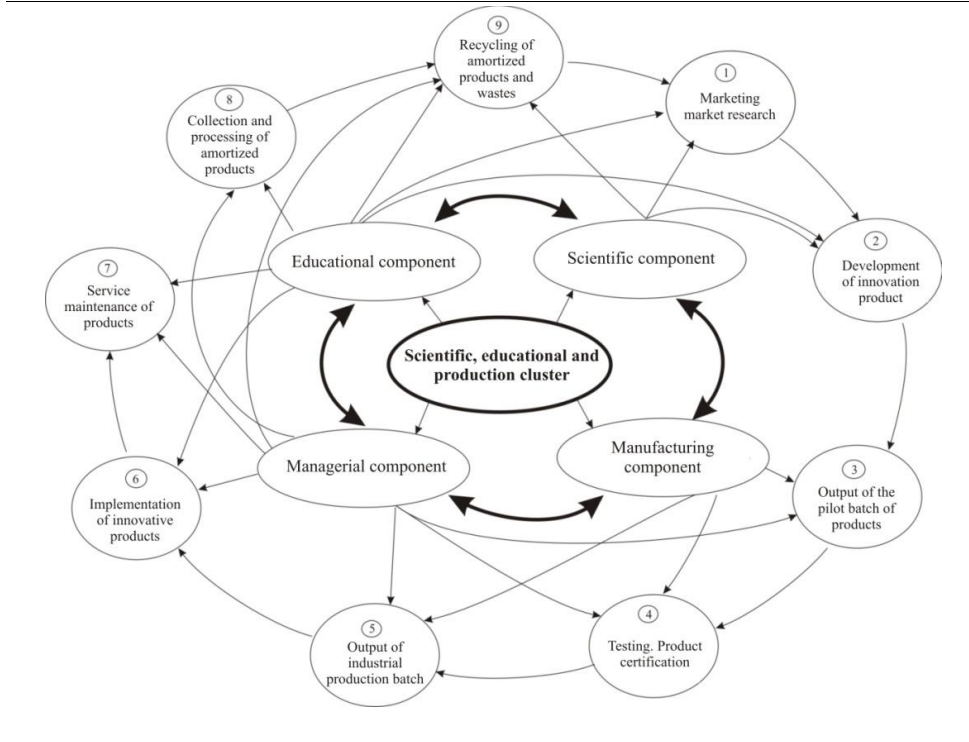
Due to the integrated approach it is possible to modify formalized model of sustainable state development which is based on theoretical balance of the main components of societies and suggested in Gyachas et al. (2013, pp.525-526) to cluster structure shaped by components of innovation process available in each region.

Integrated approach to cluster regional structures formation allows providing not formal transformation of linear models of innovation processes suggested, for example, in Gyachas et al. (2013, pp.561, 527). The most important practical component of the integrated approach is the opportunity to develop clusters containing scientific, education,

production and management components linked to existing system of industrial production at company, corporate, sectoral and regional levels.

Scientific, educational and industrial clusters of different types provide reducing probability of occurrence or negative effects of adverse economic factors on the joint innovation project effectiveness due to scientific support in all stages of innovation project's life cycle (see Figure 2). This happens due to consolidated managing of delayed risk in different stages of production cycle – marketing studies, product development, manufacturing, certification, service maintenance, etc.

FIGURE 2. THE CLUSTER APPROACH IN THE FUNCTIONING OF INNOVATIVE PRODUCTS' LIFE CYCLE



Forms of implementation of the cluster approach to reducing economic risks are determined by industrial entity's performance features in the infrastructure of scientific, educational and managerial components established in the enterprise, sector or region. Special effectiveness of the cluster approach at the regional level provides unification (integration) of intellectual resources of scientific, educational and industrial organizations interacting within the framework of scientific and technological and innovation programs at state and regional levels. Typical example of the cluster approach implementation in the functioning of innovative products' life cycle is the establishment of training and methodological centre (TMC) "Promagromash" in the JSC "Belcard"; this center is providing the scientific, technological, legal and intellectual support for the ongoing industrial production and for the development of innovative products in the automotive components of increased resource market (Avdeychik, Pestis, and Struk, 2009).

Practical experience of TMC "Promagromash" demonstrates significant role of the cluster approach in activation of innovation activity of Grodno region leading industrial enterprises: JSC "Belcard", JSC "BelTAPAZ", JSC "Belvtorpolimer", JSC "Grodno

Mechanical Plant”, MUPE “Tsvetlit.” During 10 years the staff members of Yanka Kupala State University of Grodno, Grodno Agrarian University and Grodno State Medical University and specialists of regional industrial enterprises have carried out more than 20 projects of regional and national research programs in the field of materials science, energy and resource savings and import substitution. Accomplished developments are protected by more than 50 patents in Belarus, Russia and Ukraine. According to the results of joint research, 5 PhD and 20 master's theses were defended, 15 monographs were published, a wide range of training materials were designed for students preparation in the field of engineering profile.

Material and technical, experimental and technological base of the leading industrial enterprises is used by higher educational institutions for engineering students practice and for applied research of graduate students and candidates.

Due to implementation of complex research projects on the issues of development and improvement of nomenclature of goods, energy and resource savings and import substitution, the share of innovative products and services has increased in gross output; nowadays it ranges from 15 to 30% which far exceeds the overall average for the region.

The development of TMC “Promagromash” in JSC “Belcard” supposes improvement of the production component by creating a network of innovation divisions for the production of nanocomposite materials for tribotechnical and structural purposes, automotive parts with import substitution coverings, wear-resistant tools and equipment for metalworking and die casting of materials.

Conclusion

The article examines specific features of intellectual support of regional industrial enterprises' innovation activity. It demonstrates increase of probability of risks occurrence of economic and technogenic character as a result of combined effects of technological, managerial, material and technical, and other factors on different stages of innovative products life cycle. The concept of delayed risk was proposed, the concept suggests occurrence of adverse event after ending of some period in operations of production cycle.

The article discusses specific features of cluster approach to intellectual support of regional innovation activity. The integrated approach provides analytical and policy framework for implementation of innovative development strategy of a region through integration potential of industrial enterprises, scientific and educational institutions, and administrative agencies.

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