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PRIORITY SELECTION WITHIN NATIONAL INNOVATION STRATEGY IN GLOBAL CONTEXT

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Abstract. The article deals with global experience in analysing the priorities based on their importance for country development and on national and international criteria using algorithm for the selection process. The main aspects of the process of development and implementation of international technology strategies were considered. The authors prove that through the analysis of innovation systems at macro level decision about the priorities in optimization with the aim to improve regulations in science, technology and innovation is provided. The main techniques and decisions were considered based on foresight-studies. Authors propose to create informative and analytical system for the foresight aims.

Keywords: *Strategy, international cooperation, innovations, priorities, globalization.*

INTRODUCTION

Today the competitiveness of state in global space is provided by innovation technological imperative, which demands modernization of production system according to the requirements of scientific and technological progress and post-industrial development. Thus, it is necessary to highlight the priority sectors that are material basis for the functioning of most important areas of human life and ensure the development and implementation of advanced technologies.

In some cases such strategic initiatives have even further importance. World experience shows that the greater the lag in the development of a country, the greater is the role of government in infrastructure development, resource mobilization, identifying priorities, reaching proportions and relationships in national economy and national innovation system. Given the fact that the economy is a selection of best possible, there is a need for effective prioritization of socio-economic, scientific-technical and innovation development.

In several countries despite the existence of national regulatory selection process of priorities, resources for its implementation do not meet the real needs. Also unlike the technologies of choice of priorities in other countries, international criterion of development is not considered, which requires an appropriate organizational and economic security.

Today the main policy issue of countries is integration into the global innovation system by using its potential and achieving long-term economic growth

through innovations. Also the development of education, research and favourable conditions for foreign investment through the public-private partnerships is in priority areas. Already in the report of World Economic Forum "Global Competitiveness 2000" embeddedness in world economic relations system is one of the three main factors that determine the competitiveness of the economy.

The article is based on the idea, that innovation system development requires an interrelated definition of performance indicators and priorities, strengthening of inter-sectoral coordination, changing of operation principles of development institutions, formation of domestic demand for innovation.

The purpose of this article is to analyse the global experience and to develop a framework for the selection processes of innovation priorities, based on their importance for the country according to national and international criteria.

1. METHODS AND PROCEDURES

To achieve the aim of the research it was necessary to consider the existing experience of foreign states in innovation development policy, especially identifying the opportunities in international cooperation and international economic activities, based on the selection of innovation priorities and the development of appropriate system support mechanisms.

All these problems have to be solved within the framework of interaction of national and global innovation systems and as a science and industry compound, which is oriented on providing faster and more efficient management in "science – production" cycle in the priority sectors of scientific and technical progress, acceleration of new idea development and its most effective application in practice (transfer).

The development of each priority is based on system approach of social and economic conditions as a result of integration and cooperation of different agents of innovation system (enterprises, research institutions, industry, society) (Omelyanenko, 2016a, Omelyanenko, 2016b). In this context the effectiveness of coordination at cross-sectoral level and innovation interaction are proposed to be determined based on competitiveness of production and economic development based on innovations at meso- and micro level (Omelyanenko, 2015; Prokopenko, Eremenko & Omelyanenko, 2014; Prokopenko & Omelyanenko, 2014).

The main factors (determinants) of innovation, which are considered in the analysis of national innovation priorities, are as follows (Omelyanenko, 2015; Prokopenko, Eremenko, Omelyanenko, 2014; Prokopenko, Omelyanenko, 2014):

- market and resource factors, including consumer preferences;
- relationship between consumers and producers which is often intense within the national system;
- research system that generates scientific and technological innovations;
- technological interdependence in the country which is most significant in the early stages of innovation processes;
- communication and public policy in different areas (for example, scientific and technological policy and defence researches), as well as

the conditions for technological and economic activity (as defined within the framework of the policy) such as legislation and regulation;
- education and training system, developing skills, abilities and competencies required for innovation;
- national institutions, that support innovations, such as industry and engineering associations.

Also priority-setting is concerned with the resources allocation (Stenberg & Nagano, 2009). We propose to consider the development resources, which creates the possibility to achieve the selected national goals.

EU smart specialisation strategies (Sörvik & Kleibrink, 2015) also deal with the resources allocation and propose to develop portfolios of priorities to overcome potential problems of fragmentation, imitation and lack of critical mass.

For the specialisation strategies we need to develop criteria and indicators for new programs, to monitor program results and evaluate strategic questions, including impact evaluation (Buckles, 2013).

For specialisation strategies we need to use multi-criteria analysis (MCA) as one way of approaching decision-making for complex problems (Lesslie, 2012). When for priorities evaluation MCA generally involves evaluation of options or alternatives, that have both qualitative and quantitative dimensions, its focus is on eliciting values, understanding relationships and exploring potential outcomes.

Also based on innovation system interdisciplinary analysis we note that system openness (accessibility ecosystem) provides the ability to take the system for its appearance and is usually associated with the presence of unoccupied sectors. Generaly any system openness is one of key characteristics of nonlinear self-organizing systems, denoting the property in which the system has the capability of continuous exchange of resources with environment. Ideally such an exchange may be anywhere in system, not just through the fixed channels.

2. GLOBALIZATION OF NATIONAL INNOVATION SYSTEMS: GENERAL ISSUES

Global competition leads to a significant reduction in product life cycle, while increasing technological integration promotes appreciation of innovation and improvement of their riskiness. Companies tend to move high-end features (for example, development, R&D) to international level. At the same time innovation in companies is becoming more open to cooperation with foreign partners (suppliers, customers, universities, etc.). This has an impact on the formation of innovation policy on a global scale, taking into account the important role of corporate innovation in the rate of economic growth. The authors note that globalization process led to the discovery of the innovation process, and thus, the active strategic use of the outside world to strengthen the innovation capacity (Gumerova, Shaimieva & Kazimov, 2009).

But globalization of innovations does not have merely the commercial side. Paragraph 197 of final report from Rio+20 underlines the role of global innovation system for sustainable development and states: “We recognize that traditional knowledge, innovations and practices of indigenous peoples and local communities

make an important contribution to the conservation and sustainable use of biodiversity, and their wider application can support social well-being and sustainable livelihoods" (Ely, 2012).

According to Atkinson, Ezell and Stewart (2012) "effective innovation policy relies on more than just science policy and promotion of high-tech product development. It also must focus on improving productivity across the board in all economic sectors". Accordingly, the countries, which have most effective innovation strategies, strive to coordinate innovation policy by combining scientific research, skills, information and communications technologies (ICTs), trade, tax, intellectual property protection, government procurement and standards, regulations etc. in integrated mode, which is aimed to support economic growth.

According to OECD analytics (OECD, 2005), public policy should develop innovative system towards its openness for foreign knowledge sources, which should not replace the existing domestic sources, but complement them. OECD experts underline, that the degree of innovation system openness depends on its reachability and accessibility, which is an object of policy making.

According to Wyckoff and Colecchia (1999) openness can lead to some kind of transformation to some state in the economy: better (transparency or competition increasing) or worse (invasion in regional business with its further destruction).

Similarly, governments leading firms clearly recognize that their products or services create added value and negotiate over its division with partners. Any successful firm understands, that value creation through innovation is not a zero-sum game, and effects are necessary along all supply chain to support innovations by all participants of value chain from another firms and different countries.

The case of iPod is an interesting example, which explains how the product design and internationalization of implementation can reflect the different government policies. For the fifth iPod generation the most valued components are contributed by the firms that are headquartered in Japan (Toshiba, supplying the hard drive), Korea (Samsung Electronics, supplying the flash memory), and the United States (Broadcom Corporation, supplying the multimedia processor). All these components have been in turn manufactured in other countries: China (hard drive), Singapore or Taiwan (media processor), Korea (memory) (Linden, Kraemer & Dedrick, 2007). This fact illustrates competitive advantages of R&D, as well as of production costs.

The level of integration of the national innovation system into global can be estimated by analysing the flow of innovation factors and the degree of increase of innovation potential of international cooperation. We also need to assess the changes in national innovation system (for example, harmonization of standards and IP rights protection) and the relative changes in the country's export and specialization in the direction of its intellectualization.

One of approaches is presented in the report of Global Innovation Policy Index, which assesses analysed states according to their strength in 7 key innovation policy areas (Atkinson, Ezell and Stewart, 2012):

- openness and non-discriminatory market access principles of FDI policy;
- R&D policies that support innovations;
- openness in the area of domestic competition and new firm development;

- effective IPR protection policy;
- digital policy that enables the broad ICT platform deployment;
- open and transparent state procurement policy;
- policy of openness to high-skill immigration.

In addition, analysis of international processes should be carried out on the basis of criteria of technology transfer as a major form of promotion of innovation. Thus, it is necessary to take into account the priority of high technology – NBIC technologies, that will form the future economy.

That is why many countries now are actively using the opportunities and potential of global system. For example, Norway has managed to simultaneously create its own national innovation system and make it a part of the global. Norway has built its relationships with multinational corporations such as TNCs to localize their technologies or transfer them to Norwegian research organizations and universities. As a result, Norway has increased its own shipbuilding companies, and developed strong sector IT-related technology for oil and gas production. The result was the integration of the traditional industries and high technology.

According to the above mentioned, a country should develop national innovation-driven policy and international technology transfer strategies.

Given the importance of international factors the necessity to develop an international technology strategy is actual, which includes the development and implementation of complex strategic decisions in national and international policy development process and technological dynamics of national economy. The process of development and implementation of international technology strategies should take into account the following aspects:

- Necessity of cooperation with international organizations, particularly in implementation of programs of intergovernmental regional scale based on experience, international exposure guidelines and UNIDO. Legislative support for international scientific cooperation and selection of its most effective priorities and forms is also very important;
- Institutional problems of internal improvements and financing of scientific and technological sectors in the context of global trends.

In order to optimize these aspects, it is appropriate to provide the following options for combining state driven and market driven dimensions of technology policies:

- Application of principle of comparative advantage which means that a country cannot simultaneously maintain competitiveness in many directions. As for the technology policy, in our opinion comparative advantages should be considered from two positions – current and future, as there is the necessity to implement the policy, which allows to create benefits in the selected areas;
- Elimination of depressed sectors or their replacement with imported products, allowing to get additional resources for the development of the selected promising sectors. There are two variants of industrial policy: substitution of imports (import substitution) and focus on exports (export-led). The experience of foreign countries shows that import substitution

and export orientation options may vary according to current economic situation;
- Selection of strategic market: internal or external. Market is not only a motivation for industrial policy, but is important for innovation priorities selection.

When providing benefits, sectoral priorities and market policy should be implemented by taking into account future. The evolutionary development in modern conditions of technologies provides for gradual increase in their number, and when we rapidly reach a certain level of development through the revolutionary development, which later turns again in evolutionary development in a qualitatively new level.

The necessity of a combination of state and market technological policy is caused by the fact that the market is not able to provide adequate resources investments in science, especially in basic (fundamental) science, through the so-called "market failure". The argument, that the market basically has not guaranteed optimal or acceptable social research expenses in the last 40 years is a leading substantiation for state regulation of research and development management.

So we can conclude, that at the macro level through such types of innovation system analysis provides the solutions to optimization and improvement of the regulations in science, technology and innovation

These processes should include:

- clarification of R&D, supported by the state, and subsequent improving of the incentive mechanism of innovation;
- coordination and cooperation in the pre-competitive stage of applied research and development;
- improving of technical regulations;
- determining of future requirements for quality characteristics of products (services) purchased for state needs;
- clarification of innovative development programs of large companies with state participation;
- clarification of directions and principles of support for state institutions of science, technology and innovation;
- improving of educational standards;
- identification of areas of international scientific and technological cooperation.

3. GLOBALIZATION OF NATIONAL INNOVATION SYSTEMS AND SELECTING OF PRIORITIES: THEORY AND WORLD EXPERIENCE

Activation of innovative activity in the chosen areas of technology development requires the development of national innovative system, which is able to transfer knowledge into new technologies, goods and service and is integrated into global innovative system.

In this case it is necessary (i) to differentiate groups of critical technologies that are interdisciplinary in nature, (ii) to pose significant prerequisites for the development of many technological areas or areas of research and development and (iii) to provide it in aggregate principal amount for the solution of key problems of science and technology priority areas.

As a result of the necessity of the development of strategic and tactic prognostication in high technologies a lot of prognoses have been developed. The road map of nanotechnology development, investigated by RAND Corporation (Research and Development, USA) and the road map (Nano Road Map Medical and Health) created by the European Committee in preparation and realization of WP 7 related to the scientific and technological development in the EU, are paid a lot of attention to in analytical materials developed by various expert groups. These documents analyse the state of deals in some spheres nowadays, and also suggest forecasting of the development of different sectors in further perspective (2015–2020). In this research the main attention is paid to those branches, which will be applied in industry and become commercially available.

The authors observe two factors – integration and independence, and analyse two cases of international relations development, while determining the priorities. The analysis shows that the increased integration means wider regulating diapason. At the same time the course to independence leads to the decrease of regulated diapason and has the tendency to average development of technological directions.

While choosing priorities in the UK, themes are sorted by indexes in decreasing order which present the indexes of the target function. The aim of this program in the UK was wealth creation and improvement of life quality. The results are reflected in a two-dimensional column on both target functions as variables for each of the observed areas.

Another type of choosing priorities is used by CSIRO (Australia) and UN University within Millenium Project. In this case two parameters (feasibility and attractiveness) are used. Parameters are defined for every technology in initial list. Technologies, which have good results in both parameters are potential candidates for the final list of ultimate technologies. Both parameters have complicated character – they appear from separate criteria, which have been defined by experts of some technologies from the initial list.

It is necessary to point out that there is a mechanism of choosing social and economic criteria of technologies based on regional priorities. For example, investigations of World Fish Centre in 9 Asiatic countries determined the following criteria in technological development: efficiency of production, food safety, work positions, impact on environment.

Technological priorities are chosen based on the following criteria:

- Scientific and technical: it is necessary that the selected priorities are suitable for the perspective directions in modern technological structure and creation potential in-time;
- Economic: state support of the high-priority directions has 1) to have great external effect to improve economic environment and business activity development conditions; 2) to initiate the growth of business activity in many branches, connected with high-priority plants. In other words, it has

to make an impulse for growing demand and business activity;
- Production: state support has to cause the growth of competitiveness of proper strategic production, which is independently resumed in the global market, playing the role of "growth driver" for the whole economy;
- Social: realization of high-priority directions in the structural reconstruction of economy has to be followed by the extension of engagement, increase of real salary and qualification of working population.

Also we can underline the necessity of identification of some special priorities. One of them deals with the strategic innovation priorities for sustainable manufacturing, i.e. improving of resource efficiency, developing of new business models and adopting of new technology (King, 2013). For example, for the sustainable development purposes it is necessary:

- to use sustainability criteria for all technologies and technological systems and transition to the state, when all technologies are environmentally friendly;
- to ensure that sustainability criteria cover a full flow of the life cycle of material, energy and water in production and consumption systems;
- to cover full list from basic technologies (complementing production system) to fully integrated technologies, in which environmental technologies are production technologies for themselves;
- to consider technological development in ecological and social context.

The main techniques and decisions in this area are based on foresight-studies (Gretchenko, 2010; Havas, Schartinger & Weber, 2010), that in turn are based on the following principles:

- commitment of different social forces (business, science, state authorities and society) to set long-term prognostications and development strategies;
- communication of participants as the way to coordinate expectations;
- concentration on sustainability;
- coordination and estimation of development due to economic and social changes;
- consensus: necessity to coordinate the activities of various social forces, which have to agree on basis of investigated scenarios of society development, developed by specialists;
- complex, based on experts' structured estimations.

The potential variety of prognostication tools is located in "foresight rhombus", which is based on factors providing its success (creativeness, expertise, interconnection and provability). Proper combination of methods is selected depending on the importance and effectiveness of the concrete research.

Foresight rhombus should be focused both on opportunities and content of research and related thematic priorities and on challenges, shortcomings and bottlenecks in national innovation system (Ohler *et al.*, 2012).

In the innovative development context foresight-technologies have to be implied not only at macro-level, but also at the level of separate sectors in economy, clusters and enterprises.

From the viewpoint of the foresight social and technological systems in the technologies international transfer sphere, we observe through SKW-matrix (Smart Key Word), which is the structure of knowledge flow (Ginzburg & Kibalnikov, 2011). In the original of SKW-matrixes provide ability to code activity products and to give it to others, which evaluate them. To our mind, strategic technological policy projecting, owing to the given instrument, allows more effectively to realize existing competitive advantages and to form new ones, in the context of international aspects in innovative development.

We propose the following algorithm for using SKW-matrix for technological foresight:

1. To research the external environment of the country and to identify global trends and problems;
2. To draft the problems of the country and to define the key problem at national level (focusing), for example on innovative development gap;
3. To leave the internal environment and to study external environment with the purpose of finding analogues and prototypes (problem spreading). Analogues are similar decisions, which have disadvantages; prototype is an analogue, when our expectations coincide on most features;
4. To focus on internal environment and to find the decision, which eliminates defects. If the decision is made, niche will be defined for technology development. Otherwise one makes the decision to use a foreign analogue.

4. INFORMATION AND ANALYTICAL SUPPORT TO THE PRIORITY SELECTION FOR GLOBALIZATION OF NATIONAL INNOVATION SYSTEM

Informational and analytical support to science, technology and innovation is an infrastructure element of science, technology and innovation activity, providing access to its constituent databases and data banks on different terms (including commercial) for all interested companies and organizations irrespective of their property form and location.

The necessity for informational and analytical support is caused by the fact, that priority is implemented as cross-sectoral projects for the creation, development and dissemination of technologies contributing to fundamental changes in technological base according to innovation strategy. So it is necessary to monitor the whole process.

In this case technological audit is a high-priority and allows to identify new technologies that have commercial potential, new opportunities to implement the results of research activities (skills, knowledge, experience, equipment) and the most likely ways to implement each of the features or a full range of possibilities. As a result of technology audit we get much more added value through analysis (identifying the need for innovation, comparing costs of competing firms, forecast demand), technological intelligence (gathering internal and external information to assess the main strengths of the company in relation to its key products and technologies) and market approach.

We propose to create the following informational and analytical system for the foresight aims:

1. Monitoring of the state of innovative sphere: identification of target factors, characterizing the state of national innovative system (national statistics);
2. Monitoring of international state of innovative sphere based on wider analysis: estimation from the viewpoint of provision of competitiveness on international scale, image audit and marketing policy formation, determination of the perspective spheres and clusters, including inter-sectoral, for integration;
3. Development of evaluation module of unclear expertise concerning regularities of the scientific and technical sphere and interconnection of separate strategic indexes;
4. Development of strategic analysis module of possible threats, caused by the external environment, and considering the strengths and weaknesses;
5. Development of module for integral estimation of innovative development;
6. Development of scenario analysis module to search for the decision with proper incoming values;
7. Development of module of uncertainties to estimate occasional changes of coefficients and admissions in order to study their steadiness and sensibility;
8. Development of global optimization module to search for the decisions, which can be chosen by way of initial ones (optimal at the concrete time) for management tasks;
9. Development of the module of consequent improvement and close optimal management synthesis to realize an iterative improvement of close decisions depending on system state.

For example, nanotechnologies are chosen as a strategic direction in the country. At first, the state of the given sphere is investigated (analysis of the institutes and organization structure, effectiveness, based on patent statistics analysis, cooperation at national and international levels). Then the international aspect of the given sphere is analyzed (level of competition, tendencies of development, etc.). After the analysis the decision concerning the given sphere development is made at national level. Due to the results of the foresight state proper policy has to be implemented, especially in the sphere of innovative activity management in main directions, e.g. in the sphere of normative and legal regulation.

The given strategic directions were analysed according to the following criteria:

- International competitiveness of the direction;
- Potential of international innovative and technological cooperation within the direction;
- Patent information concerning the current state of R&D in the sector;
- Demand of home market for the production of the direction.

Priority estimation method is based on using added (statistic and expert) transformations, which allow to obtain standardized 10-grade scales in measuring

of the analysed indexes in such a way that zero and ten-grade values are the worst and the best potential consequently.

By consistent value we can build and analyse regression (to study statistical significance of coefficients, to define and to interpret determination coefficient), to grade countries (regions) in decreasing order of values and to calculate the size of the correlation rank coefficient, which allows to foresee the tendencies.

Under the conditions of innovative changes, new economic model on economy factors of evolutionary systems has to be built with such key ingredients as ideas, talent and capital. The laws of supply and demand do not work in the economy of evolutionary systems and there emerges a need for new institutes – non-market ones. The most important institute is trust and objective conditions are created to develop informal institutes and relations. The traditional economy resources – land, capital and labour, are limited, but intellect and informational resource are not limited and allow to organize innovative activity in a network-based way, when integration occurs at the level of individual scientists and communities (Krapyvny, Omelyanenko & Vernydub, 2015).

In this case it is possible to identify cluster and network-based structures, which let innovative activity overcome geographical boundaries. It demonstrates the necessity to develop economy of complex evolutionary systems. Therefore, in order to stimulate innovative development at different levels, one needs to form such elements as "human innovation", innovation corporation, innovation territories, national institutes and national environment.

CONCLUSION

Based on the research results, it is necessary to carry out the audit of the existing technological directions and forms of their support, included in the state programs on innovative development, and to change them or to divide into two groups: for nation-wide studies and for international-wide studies. Hereafter top directions in science and technology development have to be included in the list of crucial technologies, which usually are inter-branch ones and influence other branches.

Due to the above mentioned, we analysed strategic high-priority directions of innovative activity for 2011–2021, defined by the Act of Ukraine "On innovative activity high-priority directions in Ukraine", from the viewpoint of the development of the mentioned directions, in particular, development at national level, international cooperation, foreign technologies transfer.

According to the analysis, Ukraine in the whole cycle has the ability to develop only the rocket and space technologies and directions that are connected with energy efficiency. In order to develop other directions, it is necessary to have active state and private partnership, import of foreign technologies or international cooperation.

On the basis of the optimization mechanism of the structure of directions, suggested by authors, we propose the algorithm to determine the option for complex scientific and production development, based on high-priority directions defined in science and technologies:

1. Analysis of the current state of the direction at international level;

2. Determination of probability to relate the direction to the high-priority group, keeping the existing financing tendencies, in the near 20 years;
3. Determination of the final term from the current state with constant financing level to ability implement new technologies;
4. Comparison of the option of using national applied technologies with the option to borrow foreign technologies;
5. Defining of technology significance in relation to national security (defence) and social policy;
6. Analysis of the autonomy of technological direction;
7. Analysis of the existing scientific and production base in this area, of the necessity to extend the development of technological directions and of opportunities of its redesigning;
8. Choosing of the final option:
   - referring to the strategic priorities and investigation of the organizational and economic provision system;
   - slowing down of development rates due to further decrease of financing level or redesigning of the existing investigations and using of borrowed analogical technologies.

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REFERENCES

Atkinson, R. D., Ezell, S. J., & Stewart, L. A. (2012). *The Global Innovation Policy Index*, Washington, DC: Information Technology and Innovation Foundation and the Kauffman Foundation.

Buckles, D. (2013). *Innovations with Evaluation Methods: Lessons from a Community of Practice in International Development*. Publié par Canada World Youth, Montreal, Canada.

Ely, A. (2012). Harnessing diversity across the global innovation system: a key challenge post Rio+20, STEPS Centre.

Ginzburg, V. E., & Kibalnikov, S. V. (2011). Overview of technological problems of a sustainable development of the human civilization from a position of perveance e-optics. *Sustainable innovation development: design and management, 4*(13), 38–52. Retrieved from http://www.rypravlenie.ru/wp-content/uploads/2011/12/3-Kibalnikov.pdf (in Russian)

Gretchenko, A. A. (2010). Foresight as an innovative instrument forecasting and implementation of scientific and technological priorities. *Bulletin of the Siberian State Aerospace University. M.F. Reshetnev, 1*, 154–159.

Gumerova, G., Shaimieva, E. & Kazimov, A. (2009). Open innovation and open technology platforms. *Investments into Russia, 3*, 42–48.

Havas, A., Schartinger, D., & Weber, M. (2010). The impact of foresight on innovation policy-making: recent experiences and future perspectives. *Research Evaluation, 19*(2), 91–104. https://doi.org/10.3152/095820210X510133

King, K. S. (2013). Strategic innovation priorities for sustainable manufacturing in Australia. *Proceedings of the 11th Global Conference on Sustainable Manufacturing - Innovative*

Solutions, Universitätsverlag der TU Berlin.
Krapyvny, I. V., Omelyanenko, V. A., & Vernydub, N. O. (2015). International innovation networks as new stage of innovation development, *Economic Processes Management: International Scientific E-Journal, 1*. Retrieved from http://epm.fem.sumdu.edu.ua/download/2015_1/2015_1_17.pdf
Lesslie, R. (2012). Mapping our priorities – innovation in spatial decision support. In P. Figgis, J. Fitzsimon & J. Irving (Eds). *Innovation for 21st Century Conservation* (pp. 156–163). Australian Committee for IUCN Inc.
Linden, G., Kraemer, K., & Dedrick, J. (2007). *Who Captures Value in a Global Innovation System? The Case of Apple's iPod*, Personal Computing Industry Center, University of California, Irvine.
OECD. (2005). *Public Sector Modernisation: Open Government Policy Brief*.
Ohler, F., Radauer, A., Vermeulen, N., Ionita, M., Rotaru, F., Țoncu, A. C., Pislaru, D., & Horvat, M. (2012). *Mid-Term Evaluation of the National Strategy and of the National RD&I Plan 2007-13*. Retrieved from http://www.research.gov.ro/uploads/organizare/mid_term-evaluation/mte_national_strategy_plan_final_report_2012_01_23.pdf
Omelyanenko, V. A. (2015). Space technologies transfer as an economic growth driver. *Economic Processes Management: International Scientific E-Journal, 2*. Retrieved from http://epm.fem.sumdu.edu.ua/download/2015_2/2015_2_20.pdf
Omelyanenko, V. A. (2016a). General context of economic and legal reforms international comparative studies (example of innovation development). *Economic Processes Management: International Scientific E-Journal, 3*. Retrieved from http://epm.fem.sumdu.edu.ua/download/2016_3/epm2016_3_8.pdf
Omelyanenko, V. A. (2016b). Innovation priorities optimization in the context of national technological security ensuring. *Marketing and Management of Innovations, 4*, 226–234.
Prokopenko, O., Eremenko, Y., & Omelyanenko, V. (2014). Role of international factor in innovation ecosystem formation. *Economic Annals–XXI, 3–4* (2), 4–7.
Prokopenko, O., & Omelyanenko, V. (2014). Analysis of characteristics of technology marketing in high-tech industry (case of space industry). *The contemporary problems of management – value-based marketing, social responsibility and other factors in process of development – micro, meso and macro aspect*. Bielsko-Biala: University of Bielsko-Biala.
Sörvik. J., & Kleibrink, A. (2015). *Mapping Innovation Priorities and Specialisation Patterns in Europe*. S3 Working Paper Series No 08/2015, European Commission, Joint Research Centre.
Stenberg, L., & Nagano, H. (2009). *Priority-Setting in Japanese Research and Innovation Policy*. VINNOVA Analysis.
Wyckoff, A., & Colecchia, A. (1999). *The Economic and Social Impact of Electronic Commerce*. OECD.

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