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The innovations' monitoring in the developed economies: the systems of indicators and their application in Russia

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ABSTRACT

Relevance. Further to the postindustrial transition and the Forth Industrial revolution challenges operating nowadays in the world the Russian federation leaders task the nation to provide intensive innovation development of the economy and society with the effective administration of the process. The fulfillment requires toapply to such a praxis in the developed economies with the advanced manufacturing.

Research object. The paper provides the analysis of the innovative activity indicators systems of the three developed economies leading in the world for a long time in manufacturing as well as in the novelties production and commercialization spheres, i.e. USA, Japan and Germany. Herewith the main principles of the systems' formulation, bases to select their particular indicators has been determined, the element composition analyzed and their structures compared.

Methods. To solve the task various research instruments have been applied: the system analysis, the content analysis, the comparative one and others. The institutional and evolutional theories and the modern political-economic approaches constituted the methodological basis of the research.

Results. The operation of the research facilitated the determination of the perspective approaches to form the systems of innovation activity indicators there to be applied and\or adapted in Russia and the recommendation to make use of these. The comparative analysis realized manifested different variants of the system' structures with such bases and facilitated the elaboration their typology further to the modes of the indicators' grouping, their factors of influence and the presence\absence of the synthesizing indicator. The conclusions served for the recommendations to use some principles and methods of the foreign systems of innovation activity indicators' constitution.

Prospects. The immediate perspective of the research realized if the practical application of the deductions made, the theoretical conceptualization of the results obtained and the determination of the opportunities the systems to refine further on.

KEYWORDS:

indicators system, innovation activity, manufacturing, competitiveness, state program, innovative activity monitoring.

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1. INTRODUCTION

In the world economy there is a significant increase in innovation activity. In order to be among the leaders of this process, Russia mobilizes not only to own achievements, but also seek to take into account foreign experience (Decree 2018 a, b; Order, 2011). For effective monitoring of production and innovation at the national level, the best practices of countries that have not only succeeded but also have an economic structure desirable for our country (Innovation activity, 2017; National report, 2017). In this structure of particular importance is the situation of manufacturing industry, development of which is associated with breakthrough of Russian economy in comparison with its current state. When choosing national systems of indicators used in monitoring innovative development in developed (according to UN classification) states, their successes in this sector were taken into account (InternationalYearbook, 2018; The 2016 Global Manufacturing Competitiveness Index, 2016; Industrial Development Report, 2017). Therefore, the object of research was indicator systems adopted in Japan, the USA and Germany. Such similarity of the structures of their economies, however, did not lead to the identity of the indicator systems used to control their innovative development. Taking into account methods of grouping and number of indicators influencing values of factors, as well as existence or absence of a generalized indicator, we have identified different types of indicator systems.

2. SINGLE-LEVEL SYSTEM WITH LIMITED NUMBER OF INDICATORS (JAPAN)

The National Institute of Science and Technology Policy of Japan has compiled a system of indicators based on monitoring data. System is designed primarily to identify new demand and determine the impact of innovations on labor productivity as the basis of sustainable economic growth. System focuses on commercial firms that carry out 70% of all R&D and are the main subject of innovation (Measuring and Analyzing Innovation, [s.a.]). R&D is given maximum attention in the private sector, especially in industry. Transfer of knowledge from different organizations (including academic, state), as well as

the role of the Institute of intellectual property in this has been established. Special indicator system "Scientific and Technological Indicators of Japan" is based on data from official statistical sources and other databases. R & D expenditures and their components (first of all, personnel employed in this sphere), infrastructure support of R & D (higher education system), products and results of R & D; actual scientific activity, production and implementation of technologies and innovations at home and abroad are allocated in separate sections (Japanese Science, 2018).

Innovative activity of business seems appropriate to take into account in Russia. As of today, it is insignificant and for a long time does not respond to incentives from the state. In the development of the domestic system, it would be appropriate to form an appropriate set of indicators to analyze the relations of Russian business with other participants in the innovation process, the impact of the latter on entrepreneurs and the innovations resulting from this interaction. We believe that monitoring of production/acquisition and mastering of knowledge would be representative, the results of which would be described by indicators of the ratio of R&D and innovation among different groups of industrialists, including distributed not only by industry criteria, but also by size, knowledge intensity of their production, export activity and other parameters.

Japanese system is characterized by the equivalence of the above spheres and the absence of a generalized indicator in relation to them, which gives the reason to define the system as a one-level one. Japanese system has a limited number of indicators (about 60) and a relatively simple structure. This approach does not seem to be able to see the full diversity of linkages and factors influencing innovation, including in the commercial sector as well as in other socio – economic actors (Moreva, 2017).

Under the current Japanese system, a partial solution to this limitation is to resort to numerous comparisons between the values of relevant national indicators and those of foreign countries. Comparison with foreign analogues is carried out in almost all sections and subsections of the system: objects of comparison are indicators at the input and in the process of innovation activity, the effects of the latter: influence on the trade balance, transfer of knowledge, share of new products in foreign economic operations, etc. Japanese system pays special attention to national manufacturing industry. Relevant indicators allow to carry out both an overall analysis of the sector as a whole and its individual segments, including those with different knowledge intensity.

By making comparisons, Japanese researchers are not limited to comparison with data of any single country or permanent group of countries, they attract data from different countries, leading in different countries innovative areas that are significant for Japanese business and science, as well as other national stakeholders.

This approach also seems appropriate for consideration in Russia. National data can be compared with the best foreign indicators. It would also be worthwhile to analyze the measures that are being taken in other States to maintain their leadership, to develop their own measures to reduce the existing gap with the leaders.

3. MULTI-FACTOR SINGLE-LEVEL SYSTEM (USA)

Science and Engineering Indicators (SEI) system discussed below stands out among a number of other innovation indicator systems for its completeness and regularity of updating (Foster, Grim, Haltiwanger et al., 2017; Andrew, DeRocco, Taylor, 2009; Telling Our Story, 2018; An Innovation Challenge, 2019). Many academic, statistical and other research centers have participated in its development and improvement, and the results of the development and improvement are widely used by public authorities, public organizations and other interested persons. This interest is explained by the very successful efforts of the authors to accurately reflect in SEI the true state and dynamics of American innovations against the background of modern world processes (Science and Engineering Indicators 2018). Unlike Japanese model, American model does not imply the direct use of its content for economic and political purposes. This allowed the authors to freely vary its structure in search of a more accurate reflection of the current situation and preservation of the continuity of its data with the information of previous years (Science, 2018).

Attempt to reflect changes in innovation activity in the USA amid global growth of knowledge-intensive industries, increased international cooperation and competition is undertaken in system indicators of 2018. Unlike Japanese system, American indicators were not only related to research and development

and higher education, they reflected the importance of different functional areas, from primary and secondary education (in the field of mathematics and natural sciences) and to the attitude of society to science and development – for the innovation process.

For the first time, innovation indicators were allocated in a separate, final, section of the system. Accordingly, production and implementation of innovations were considered as a complex result of development of economy and society. As the most important aspects are allocated investments in intellectual resources, venture investments (in the context of industries and stages of innovative product creation), state programs on elimination of obstacles to innovation activity, the innovation activity of enterprises itself and its results (changes in labor productivity and aggregate productivity of factors, dynamics of number and the economic activities of young firms). The last indicator was introduced by the authors for the first time. In their view, in order to justify the pattern of this indicator in the system, all previous sections of the system that did not properly reflect the origin of this phenomenon.

Perhaps a similar analysis of young firms and the allocation of their special indicator would be useful in Russia. Since our country has experienced several periods of rapid recovery and recession, it may be appropriate to conduct a similar analysis of young firms and to identify their special indicator in Russia. Analysis of the conditions of formation of new firms, their innovative potential and mechanisms of its implementation would allow to clarify their importance for domestic innovations, as well as optimize the efforts of the state and society within the framework of the strategic course of activating the latter.

In Russia it would be worthwhile to use such a promising indicator of American monitoring system as statistics of digital transformation in academic and business organizations. So far, only the use of digital communication channels by business and academic organizations can act in this capacity. Similar studies are still awaiting completion in both the US and Russia (Restoring the Foundation, 2014).

American system of indicators has much in common with Japanese: references from different sections of the system to manufacturing and its separate segments; international comparisons not limited to the same country or group of them, and use as a basic principle of building the logic of the innovation process, based on the production of knowledge and culminating in the implementation of innovation.

At the same time, the need to constantly complement and change such a system raises the question of its holistic assessment, allowing, inter alia, to trace the overall dynamics of innovation in the country. The solution of this problem contains a system of indicators used in Germany.

4. MULTI-FACTOR MULTI-LEVEL SYSTEM (GERMANY)

German system of innovation indicators, like American one, is the object of special efforts of a number of state and academic organizations (in different periods their number and composition have changed). It is designed to monitor the state of innovation in the country, is taken into account when making political decisions and has its own information sources statistical data, the results of special surveys and selected analysis.

Like American system, German system is flexible and focused on accounting and analysis of promising areas of innovation. For example, in 2017, digitalization and network processes were included in the system for the first time (The Innovation Indicator, 2017).

In German system a lot of attention is paid to the manufacturing industry, including its indicators of high and medium technological production, as well as operations with their products. In addition, Germany makes extensive use of comparisons with those of other leading countries in innovation. Evaluation of German innovations is formed in the form of appropriate ratings, allowing to determine the position of the country relative to competitors.

In the German system, an attempt is made to summarize the numerous and varied data in the form of a composite indicator, the German innovation index, which began to be compiled since the beginning of this millennium. It is calculated by comparing innovation indicators with similar data for 35 countries. This allows the government and society not only to assess their own dynamics, but to see it against the background of the results of other countries.

The system is compact: instead of 200 indicators at first, only 40 are now used. The main mechanisms of interaction between the main stakeholders of innovations are revealed. The Pie Chart shows the

share of innovation in industry, economics, education, and science (The Innovation Indicator, 2017).

In the German system, along with the national system, there is a regional system of indicators of innovation (European Innovation Scoreboard, EIS), which is due to the integration of the country into the EU and its innovative processes. EIS is designed to monitor innovations in all EU countries, assess their performance and identify priority areas of innovation policy in the region (European Innovation, 2017). It contains more general information concerning all EU members and also includes comparisons of the region and its countries with some other countries, international leaders of innovation.

Like the national German system, EIS is regularly improved. However, in all versions of the EIS, the basis is not the interaction between the main socio-economic stakeholders, but, as in the systems of Japan and the United States, the sequence of the innovation process.

Despite this similarity, the implementation of this principle in the European system is markedly different from the versions of its implementation in other regions. In the latest versions of EIS (for 2017 and 2018), the structure of indicators shows a more weighted approach to highlighting the general conditions of innovation activity, including an enabling external environment (broadband Internet and entrepreneurship; the forms in which resources (including non-R&D innovation costs) are used and their main actors; how these latter implement innovation activities and the results thereof, including the impact on employment (European Innovation, 2019).

Data of regional system are complementary to the national German system, which allows to synthesize both to obtain a multidimensional picture of innovative activity in the country, its places in the region and the world as a whole.

The use of such a technique is very useful for Russia and its partners in the post-Soviet space. After all, despite the adopted programs and strategies of innovative development at the national and, especially, regional levels, many participants of this space have existing systems and complexes of indicators of innovative activity that do not allow to effectively control its development beyond the framework of individual projects; identify opportunities and bottlenecks at the level of national systems; eliminate them, using not only their own, but also regional potential (Decision, 2011; Decision, 2009; Innovative activity, 2017).

5. CONCLUSIONS

The analysis of the systems of indicators of innovation, used by the countries – leaders in the sphere of innovation, allows to draw a number of conclusions on the use in Russia some approaches from these practices.

1. When constructing a system of indicators of innovative activity, it is advisable to take into account its civilizational nature, which involves the formation of its resource bases in the context of generations. This aspect was reflected in American system of indicators, but not disclosed in terms of its accounting in the operational management of the course of national innovative development. Both of these aspects should be taken into account in the formation and/or improvement of such a system in Russia. In addition, in order to be effective in the system, it would be advisable to envisage the possibility of highlighting certain areas in the system, particularly in the areas of formation and development$ economic culture, the analysis and monitoring of which are of strategic importance to our country.

2. As shown by the analysis of systems used in developed countries, manufacturing industry is among the strategically important areas of innovation development in all of them. It is advisable to pay attention to it, including in the aspect of the formation in this sector of resource bases for innovation and subsequent effects, for example on the chains of interaction, supply, cost, etc., in the development of indicators of different subsystems of the entire system.

3. Forming a system of indicators of innovation in modern conditions of intensive processes of globalization and regionalization, it is advisable to actively use comparisons with indicators of other countries, not being limited to one group constantly, it is worth focusing on the leaders of different directions and functional areas of innovation activity.

4. In order to make effective operational use of the system of innovation indicators, especially the complex architecture, it seems effective to compile aggregate indicators in the form of an appropriate $ index (and possibly its subindices), as is done in Germany in particular and in Europe in general.

5. In order to optimize efforts to develop and use a system of innovation indicators, the opportunities offered by regional processes should be taken into account. German experience of combining systems

of different levels with different structures shows the possibility and validity of such an approach for complex analysis of innovations and effective solution of management problems them.

6. Integration of efforts of different national entities in the formation of a two-level system of indicators allows to pay special attention to the identification and development of new promising areas of innovation, which occur in them in different forms and at different speeds. In this regard, the introduction of German national system of indicators of digitalization and the development of related networks into the list of indicators is of interest.

Taking into account the above principles and techniques for building innovation indicator systems in developed countries that have succeeded in developing their manufacturing industry and are leading in the field of innovations, as possible for use in Russia, which do not contradict its national characteristics and correspond to the imperatives of an effective response to modern challenges of digitalization and regionalization, suggests that their application in our country will prove appropriate and effective in the development of an appropriate system of indicators.

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