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Conceptual Approaches of Evaluating the Effectiveness of Innovation Processes

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Abstract: The research concentrated on reviewing previous studies on effectiveness of innovative performance analysis and recognized and categorized the reported measures and evaluation methods of evaluating the innovative performance. The main purpose of the research is to increase and structure the understanding of the influence of the factors and dimensions of innovative performance analysis on the applicable measures or evaluation methods of effectiveness of innovative performance. The measures and evaluation methods of effectiveness of innovation process can be categorized in several ways. In the present study the main groups are made on the basis of the purposes of R and D performance measurements, suggested or reported measurement levels, types of R and D as measurement subject, the perspectives of measurement and the phase of the R and D process where the measure or evaluation method is suggested to be most applicable. Additionally, it is reported that a distinction is made between measures utilized in real-world applications and those suggested in the academic literature. The analysis of reported measures offers comments and suggestions on the applicability of the measure or evaluation method to certain situations and purposes of measurement.

Key words: Innovation process · Performance · Effectiveness

INTRODUCTION

A great number of measures or evaluation methods indicating effectiveness of innovation process have been reported in the literature during the last decades. In this research we aim to clarify the complexity of different types of innovative performance metrics by categorizing them with the help of measurement dimensions that should be notified in all organizations. The final set of utilized measures specific for the type of organization and depends on a number of factors. This means that common, universal sets of the effectiveness of innovation process measures do not exist. However, with the help of the recognition of different types of reported measures and measurement dimensions, organizations can become more aware of different possibilities and can use the earlier reported measure proposals as checklists for certain measurement purposes.

Earlier, innovative activities at the firm level were often considered as a “black box” and an isolated function, which was nearly impossible to be systematically managed and controlled. A defined amount of money was given to innovation development and in the long run the managers expected something useful to turn up. The characteristics associated with innovative activities and innovative personnel also increase the difficulty of performance analysis. New, different organizational structures and control models have forced many managers to rethink the mechanisms related to innovation process and its control. One of the most critical motives for measuring effectiveness of innovation process is the validation of the chosen investment level on R and D, i.e. the R and D function has to prove its productivity and significance for the whole company as well as the whole country.

Innovative activity is one of the most important ways to increase the efficiency of production. It is also a powerful tool for the country out of crisis and provides a dynamic sustainable economic development. Studies of domestic and foreign scientists clearly show that an innovation economy is the strategic direction of development of various countries. This fully applies to our country.

The main objectives of the national innovation policy in the Republic of Kazakhstan are:

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- Promoting innovation activities, ensuring the growth of competitiveness of domestic products based on the development of science and technology and upgrade production;
- Focus on the full support of basic and improving innovations that forms the basis of modern technological system, a combination of government regulation of innovation with the effective functioning of a competitive market mechanism innovation, protection of intellectual property;
- Promoting innovation in the regions of Kazakhstan, interregional and international technology transfer, international investment cooperation, protection of interests of innovative entrepreneurship.

Obviously, the goal set by the Government of the Republic of Kazakhstan can be achieved only on the basis of deep diversification the economy by stimulating innovation, implementation and development of competitive industries that are integrated into the regional and world markets.

One of the first documents related to the issue, is the Law of the Republic of Kazakhstan dated June 19, 1997 No 131-I «State support of small business», which uses the concept of innovation. This law of innovation is regarded as a small business aimed at the use of scientific knowledge and new technologies to produce new or improved quality and lower costs of manufactured product, manufacturing processes, indicates that the local representative and executive bodies, together with the Commission on development of small businesses should develop measures to create a network of technology parks, leasing centers, small centers of innovation activity, venture capital firms and other infrastructure created to support small businesses. This was followed by the adoption of the Law of the Republic of Kazakhstan dated July 9, 2001 No 225-II «About Science» in which we talk about the state support of innovation in science and technology.

A landmark event was the adoption of the Law of the Republic of Kazakhstan dated July 3, 2002 No 333-II «On innovation activity», which reflects the need for regulation in the field of innovation, identify underlying principles, directions and forms of public innovation policy. Scale up innovation in Kazakhstan aimed substantive provisions "Innovative Development Program of the Republic of Kazakhstan."

Further developed the following strategies that have been proposed and secured the first steps to address the problem of raw material orientation of the economy of Kazakhstan:

- Strategy of Industrial and Innovation Development of Kazakhstan for 2003-2015;
- The State program of development of the Kazakh sector of the Caspian Sea, 2003-2015;
- The program of forced industrial-innovative development of the country in 2010-2014.

Considering the problem of innovation development should note the importance of the problem to assess impact of innovation. Investments in innovative projects to be effective and can improve the efficiency of the economic system at different levels of economic management: at the regional, provincial, city and business levels. The effectiveness of innovation will depend not only on innovations in different areas of the investments, but also on the methods used in selecting effective solutions. A bad choice and application of these methods can lead to erroneous conclusions about the effectiveness of innovation and in some cases to a significant loss of economic, social and other content. From the above, it can be said that at present the problem of assessing the effectiveness of innovation activities in different economic systems is relevant. The analysis of this problem shows that at this stage there is a need for further development of the theory and practice of choosing effective and innovative solutions.

Literature Review: A considerable literature has accumulated on the subject of innovation, which is widely seen as the basis of a competitive economy [1]. This literature includes evidence that competitive success is dependent upon an organization's management of the innovation process and proposes factors that relate to successful management of the innovation process [2-10]. Innovation management is an increasingly covered topic in scientific and management literature over the past 40 years. The reason for this interest is likely to be the realization that innovation is of key importance for survival of a company. Whether it concerns firms that need to compete for market share or income [11,12].

But at the same time, innovation is not easy. Innovation efforts over time gave us a multitude of failed innovation cases. Even huge enterprises that once were the forerunners and creators of whole markets have failed to stay competitive when (mayor technological) changes occurred [13]. An organization is so involved with-and purely used to-what they are good in (core competencies), they become trapped in it. When the surroundings changes (e.g. changing consumer needs, changing regulation) enterprises are not able to adapt [14, 15].

As can be seen, innovation comes in a variety of types; product or services. Second, there seems to be a debate whether innovation needs to be successful in order to call it innovation. Compare on this point for example Hartley [16]. A third variation is that authors differ in including [17] or excluding [18] the post-launch-or commercialization phase of the innovation process. Nevertheless, innovation is not only an idea; it is also the implementation of it.

Independent of how you actually define innovation, it is good to know that the occurrence of innovation is not new [19]. Already in pre-historic times, mankind could turn ideas into realization.

Quantifying, evaluating and benchmarking innovation competence and practice is a significant and complex issue for many contemporary organizations [20]. An important challenge is to measure the complex processes that influence the organization's innovation capability, in order that they can be optimally managed. Within the literature on the management of innovation, measures of aspects of innovation management are frequently proposed, responding to the needs of both ?rms and academics to understand the effectiveness of innovation actions [21, 22]. The construct research and development (R and D) intensity has frequently been used as a global measure of input. Characteristically, it is expressed as a ratio between expenditure [23] or numbers employed in R and D roles [24] and some expression of output. The relationship between R and D intensity and firm or innovation performance has been empirically demonstrated in several studies [25, 26]. More than a few quantitative approaches have been developed for the measurement of imported tangible knowledge. The most frequently used approach counts numbers or value of patents brought in. Nevertheless, this restricts its application to contexts in which patents are significant and overlooks those industries where they do not feature. For a while, patent data was widely accepted as a proxy measure for innovation. More recently, however, the validity of patent statistics has been questioned: patents vary in their utility for organizations and so their input value to the innovation cannot adequately be judged in terms of a cash price [27, 28]. No more than a few studies have attempted to devise measures for other contexts. For instance, [29, 30] constructed a question designed to capture the informal hours of R and D work that are hypothesized to be hidden within other activities or to take place outside formal working hours.

Methodology: Analysis of domestic and foreign papers devoted to innovation, has shown that a significant need in the theory and practice of assessing the effectiveness of innovative systems for various applications based on the latest achievements of science and technology in accordance with the task of creating an innovative economy.

In today's world there are a significant number of the practice of various indicators, approaches and methodologies that assess the level of development of the innovation system at the macro level. For example, a number of researchers evaluated the effectiveness of innovation, based on the classical definition of efficiency: a quantitative changes in the ratio of resources spent and the innovation process, that is, the intensity of the development. Clearly, the most appropriate indicators to objectively assess the ratios are changing costs and benefits. Along with this, the intensive development of macro is just one of the possible options and , in addition, can be described as the efficiency and quality indicators, including the status of the legal environment, the level of infrastructure development, etc.

Findings: Indicators that assess the effectiveness of the innovative sphere are primarily a reflection of the environment in which it is formed and develops. Analysis of international experience and scientific literature on the formation of effective innovation system in the framework of the national economic system can provide features (characteristics) of the system. Thus, an effective innovation sphere:

- to ensure the sustainable development and operation of the subjects of macro-system;
- prioritizes innovative type of development in order to realize the socio-economic development strategy of macro;
- identify priorities of innovative development of the country, as well as the responsibility for their implementation;
- requires the implementation in practice of effective and concrete measures of innovation policy;
- allows the education sector to ensure the need for specialists qualified in the field of innovation, which in turn requires an interaction between the education sector and the business environment;
- reflects the ability of the financial system to provide the necessary resources innovation;
- contributes to the perception of innovation and innovative world-class national industrial sector.

Various international organizations have developed their own system of indicators that reflect the level of development of the national economy's innovation system. The most commonly used in the world, including in the country comparison, we present the following approach to assessing the effectiveness of innovation areas:

- Index of scientific and technological capacity («technology index», World Economic Forum), as an integral component of the indicators around the country's competitiveness in the global economy;
- System performance evaluation of innovation activities of the Commission of the European Communities (CEC), used for comparative assessment of innovation in the EU;
- Assessment of technological competitiveness, developed by the U.S. National Science Foundation (NCF) (since, 1991);
- Methodology of the World Bank under the "Knowledge for Development» (Knowledge for Development-K4D), which assesses the willingness and ability of a country to transition to an innovative model of development;
- Formal approaches to evaluating the effectiveness of NIS developed by individual researchers, based on the author's understanding of the nature and impact of the innovation system.

In the annual survey by the World Economic Forum (WEF) «Global Competitiveness Report» presented data on the competitiveness of countries. Competitiveness of the country is estimated in two complementary indicators. The first, characterizes the "macroeconomic" level of competitiveness, the so-called "Global Competitiveness Index» (Global Competitiveness Index) (calculated for 131 countries in 2007) and the second "micro-economic" level- "index of business competitiveness» (Business Competitiveness Index) (calculated for 131 countries in 2007), based on the theory of competitiveness Porter.

According to the WEF methodology, the ability to achieve economies of sustainable economic growth in the medium and long term depends equally on the three categories of variables: the macroeconomic environment, public institutions and technology (innovation). All countries are divided into two groups: the "innovative" and "no innovation. Such as USA, Japan, Korea, Singapore, etc., are characterized by the fact that their economies are growing mainly because of their ability to innovate. In the second group, which includes Russia, technological improvements are achieved in part through innovation and partly by copying or use of technologies, which were developed in the first group [31-34].

Innovation capacity index is calculated on the basis of such data as the number of patents per 1 million population, the country's position in terms of technological development, the contribution of foreign investment in the innovation of local firms, the cost of R and D companies, the quality of scientific research institutions, etc.

Thus, the experts of the World Bank indicate that Kazakhstan index KEI is a 73-site, next to countries such as Mexico, Peru and Jordan. The index of the knowledge economy in Kazakhstan is-5.04; Knowledge Index-5.40, the index of economic and institutional regime-3.96; innovation index-3.97; education index-6.91, the index of information and communication technologies-5, 32. Based on these data, we can conclude that in our country, especially the weakest links are the economic and institutional environment and low capacity developing national innovation system and its components to perceive and adapt global knowledge to local needs and create new knowledge based on its new technology.

In general, the specified method to evaluate the effectiveness of the innovation sphere in both quantitative and qualitative indicators, linked to the socio-economic performance of the country.

Currently, the national statistics used four groups of indicators that describe some aspects of innovation: the development of statistics in research and development (cost of research and development, the number of research personnel, etc.), patent statistics, bibliometric data on scientific publications and citations, technology balance of payments, which characterizes the international transfer of technology. Limitations of this approach, performance evaluation innovation sector is obvious, because in general they do not train on the extent of innovation in the microsystem, or the quality of its results. Some authors in the process of developing methods of assessing and predicting the innovation processes in the macrosystem use different sets of indicators. For example, the innovation performance can be evaluated from the standpoint of efficient use of budget funds, or through correlation of R and D needs of the company engaged in them, etc. It appears that such studies generally do not allow to comprehensively assessing the effectiveness of the innovation process at the macro level. They only reflect some of its quantitative characteristics and can be used for analysis of individual components, irrespective of their mutual influence on each other and on the

economic growth of the country. The performance on innovation is assessed by analysis of the competitiveness of products, the successful implementation of its market, both internal and external. As a consequence of the implementation of innovations are born completely new ideas, products and services, processes, forms of organization and management in various sectors of the economy and its structures.

Up activity to innovation are formed as an innovative product that can have some real form or be in the form of universe. The purpose of facing the R and D can be called the creation of new products and services, which later will be the production base of the company in the future. Therefore, when planning activities for innovation firms need to calculate and analyze the effectiveness of the prospects of the innovation project. But we should not forget the fact that any part of the plan does not require to be carried out consistently, on the contrary, it should be corrected in the performance goals. The effectiveness of innovation should be assessed within the whole of the work, based on the analysis of the influence of the previously unaccounted factors. Implementation of innovation measurement calculates efficiency is necessary to consider the costs. In analyzing the issue of cost-effectiveness estimates exclude the results of operations. Result from the use of innovation depends on the account of the results and costs. Allocate economic, scientific, technical, financial, resource, social and economic effects.

Due to the time factor calculation results and costs are divided into indicators:

- Effect for the billing period;
- Annual effect.

Efficiency is defined as the ratio of the result (effect) and expenses. Generalizing all of the above, we can say that the main objective of the feasibility of design within the ROC is to ensure the effectiveness of established products and, therefore, its competitiveness in the market. In this context, great importance is the construction of the integral index of quality and integrated economic indicator of the product. In the management efficiency of the innovation process, but to provide its technical and economic indicators, the main position is the reduction in the time to research and choose the release date of a new product to market. The entry of new technologies indicates the effectiveness of innovation. Investigation of the efficiency due to the fact that it is the lead and reliable criterion for the evaluation and selection of the most promising innovative projects for implementation. It is important to note that one should distinguish between innovation efficiency and effectiveness of investments in innovation. Measuring the effectiveness of innovation and investment in innovation is the calculation of indicators. The effectiveness of innovation is characterized by private and general indicators over time, i.e. using the criterion of expressions-increase, decrease, increase, acceleration, deceleration (profit growth, the relative savings of production costs, etc.). Effectiveness of investments in innovation defined performance indicators, taking into account who is an investor and what purpose it has., Effectiveness of investments in innovation means an economic category that reflects the results of innovative activities and the cost of its implementation of the goals and interests of its members, including in the cost of its implementation of the goals and interests of its members, including, where appropriate, the state and the people. Accordingly, efficiency involves getting more with less or equal cost. To date, the economic literature is allocated eight sets of criteria (priorities) to evaluate the effectiveness of innovation gives an indication of its attractiveness and advantages: strategic, scientific, technical, financial, market and operational criteria, the criteria for the subject of investment, regional characteristics and a group of external, environmental and social criteria. At the same time, we believe this approach is more appropriate to construct a system of criteria, which take into account the economic substance of the innovation process and allows moving from one stage to another, increasing the degree of validity of selected options.

DISCUSSIONS

In solving the problems of assessing the effectiveness of innovation activities in different economic systems there is a need for a classification of goals and indicators to assess the effects of innovation by different stakeholders. In this paper, the principles of evaluation of the effectiveness of investment decisions are developed in relation to the assessment of the effectiveness of innovative projects that are determined by features of the basic principles and the results of their tests with the innovators. To solve the problems associated with the assessment of the effectiveness of the innovative development of economic systems, carried out a comparison of approaches to the evaluation of investment and innovative projects, will provide a comprehensive approach based on the use of financial criteria and criteria of novelty. Regulatory mechanism of innovation areas should be based on the interaction of

actors, to innovate and the federal and regional structures, which manage financial resources in innovative and rich investment. At each level of innovation sphere must have a certain degree of freedom, with a high degree of responsibility. The effectiveness of this mechanism is highly dependent on the economic feasibility of the selection criteria and evaluation of innovative programs in the innovation process. For the construction of the mechanism of innovation sphere should identify shared goals, priorities, leverage and accountability throughout the chain of reproduction-from organizations at the federal level through the regional structure to companies and organizations directly involved in innovation. Effective direction of the state of innovation and investment policy is to support the development of innovative area in which the object of the application of the control action is the regional innovation program. One way to implement public policies in support of innovation is to participate in the funding of regional programs that involve the efforts of innovation activities at various levels and in various industrial branches. With each of the participants in the program pursues its goal. To implement regional innovation program is a socio-economic development of the region. Therefore, the effect of the program will be achieved only if the balance in all areas of innovation and investment, which will ensure the structural balance of socio-economic development. The logical conclusion of such an approach to the organization of innovative activity is the measurement of the results of innovation sphere on the basis of socio-economic indicators. This principle of evaluating the effectiveness of innovation support will allow comparing the intensity of innovation with the final results of the economy of the region. Socio-economic indicators of the region in this approach can be considered as indicators of the effectiveness of innovation. Forecasting and analyzes of these indicators will be the basis of decision-making to further support innovative economic development of the region, or change of direction and priorities of forming innovative investment policy. The process of formation of the regional program should be to identify the compatibility of innovative projects submitted by the subjects of innovation, with the goals, the achievement of which will contribute to sustainable socio-economic development of the region. The projects may be included in the regional innovation program only if the implementation of the project in addition to effectiveness, is not a bad developers, representing the interests of business, will give effect to the rest of the economy of the region. A necessary condition is the interaction with other actors innovation areas: scientific and educational institutions, industrial enterprises. On the extent to which will involve research and education, industry and labor potential in the implementation of innovative programs vary the intensity and balanced regional development.

Effectiveness of the implementation of innovative programs at the regional and national levels will be measured from the correspondence of the results to the aims pursued. Thus, the macroeconomic performance will be determined not so much the performance of completed projects that have yielded some success at the micro level as effective interaction among innovation in the implementation of the regional program and the intensity of involvement in innovation largest number of participants. System of criteria for selecting programs and projects should be geared to meet the expected results of your goals. Evaluation of the results should be in terms of socio-economic development, social progress, the development of scientific, educational and industrial potentials is to changes in the area of innovation. Based on this, we can formulate the basic postulate of the proposed method: the macroeconomic efficiency of regional innovation programs put into the economic feasibility of innovative activities through an assessment of expected macro effectiveness initiated by the interaction of innovation activities at the micro level.

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