Problems of Measuring Effectiveness of Innovation Performance

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Abstract—The innovation performance of nations has been repeatedly measured in the literature. We argue that while the literature offers many suggestions, their theoretical foundation is often weak and the underlying assumptions are rarely discussed. In this paper, we systematize various mechanisms by which spatial units influence nation and firms' innovation activities. On the basis of this, common innovation performance measures and analyses are discussed and evaluated. It is concluded that there is no general best way of measuring the innovation performance of spatial units. In fact, the most interesting insights can be obtained using a multitude of different approaches at the same time.

Keywords—Innovation performance, firms effectiveness of innovation, national innovativeness, innovation effectiveness, national innovation activity's measurement

I. INTRODUCTION

AT present stage innovations are not only the basis for economic growth, competitiveness and economic security of any country, but also have become source of multi-billion dollar revenues. Modern countries and corporations can prove their economic viability, rearranging their activities for effective use of intellectual potential by transforming it into an innovation. Thus, a country's or corporation's ability to generate and implement innovations has become an important factor in determining their international competitiveness.

The phenomenon of implementation of innovations in any sphere of human activity lies in the fact that besides creating a completely new product, technology or service, it also generally significantly reduces material and labor costs. Thereby, it provides extra surplus for market leader, which happen to be in the avant-garde of innovation. In this regard, it has become an axiom that every innovation has to be effective, since it increases labor productivity and decreases costs.

Meanwhile, the process of producing innovations is reasonably multifaceted and complicated, linked with a variety of factors and costs, which are sometimes economically immeasurable and the results are not always predictable. Difficulties surface especially during generation of new ideas by scientist-innovators and require assessment in terms of market relevance and value potential. There is no clear

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explanation of the process of generation of new ideas, which led to occurrence of such phenomenon of last centuries as "competition for the minds" between developed countries.

II. REFERENCE

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] or public companies that need develop their services [13], does not matter. The need for innovation is imperative [14].

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 [15][16]. 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 [17][18].

As can be seen, innovation come 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 [19]. A third variation is that authors differ in including [20] or excluding [14] 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 [21]. 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 [22]. 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 firms and academics to understand the effectiveness of innovation actions [23][24].

The construct research and development (R&D) intensity has frequently been used as a global measure of input. Characteristically, it is expressed as a ratio between expenditure [25] or numbers employed in R&D roles [26] and some expression of output. The relationship between R&D intensity and firm or innovation performance has been empirically demonstrated in several studies [27][28].

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 [29][30]. No more than a few studies have attempted to devise measures for other contexts. For instance, [31] constructed a question designed to capture the informal hours of R&D work that are hypothesized to be hidden within other activities or to take place outside formal working hours.

III. METHODOLOGICAL APPROACH

The object of research is a study's methodology or generalizability, which might still incorporate measures of innovation management that could contribute to the construction of a measurement framework, and so differrent methods of measuring innovative effectiveness is included in this paper.

The goals were to create a compendium of the logic and methods in measuring and monetizing innovation, to identify sources of innovation data as well as gaps in the data, and to outline critical areas for future research.

IV. FINDINGS

Modern countries, in which Kazakhstan considers itself, are seeking to economic prosperity and independence, where the important role play the transition to innovation and knowledge economy.

In general, macroeconomic trends in the development of innovation in Kazakhstan show that there are positive changes in improving all elements of national innovation system, mobilizing and exploiting scientific potential, developing new legislative approaches to the sources and mechanisms financing of innovation performance in accordance with best international practices. However, according to the findings of experts at the World Bank, at this stage there is no observable significant economic impact from innovative projects

implemented in the country. With regard to macroeconomic indicators, Kazakhstan is considered to be a middle-income country, whereas by Knowledge Economy Index (KEI) the country is in the same league with such countries as Kenya and Mongolia, where incomes are much lower.

The Knowledge Economy Index - a composite index that measure the level of economic development based on knowledge in the country. It was developed in 2004 by the World Bank team through a special program Knowledge for Development — (K4D) for assessing the ability of countries to create and distribute knowledge. It is produced annually. It is assumed that index should be used by countries for analysis of trouble points in their policies and measure readiness of a country to move to a model of development, based on knowledge.

The basis for calculating the Index was proposed by the World Bank The Knowledge Assessment Methodology (KAM), which includes range of 109 structural and qualitative indicators divided into four main groups:

1.   The Economic Incentive and Institutional Regime reflects the conditions in which economies, and society as a whole, economic and legal environment, quality of control, development of business and private initiative, the ability of society and its institutions to make effective use of existing and creation of new knowledge are developed.

2.   Education and Human Resources show the level of education of the population and the presence of skilled labor, willingness to create, disseminate and use knowledge. This group also includes measurement of level of adult literacy, the ratio of registered pupils (students and schoolchildren) to the number of individuals of corresponding ages as well as a number of other indicators.

3.   The Innovation System reflects the level of development of national innovation system, including companies, research centers, universities, professional associations and other organizations, which perceive and adapt global knowledge as well as creating new knowledge, based on the new technology. They are the number of researchers, engaged in research and development; the number of registered patents, the number and circulation of scientific journals and so on.

4.   Information and Communication Technology (ICT) shows the level of development information and communication infrastructure, which contributes effective dissemination and processing information.

For each group of indicators countries are rated on a scale of 1 to 10. The higher the score, the better the country satisfies a given criterion. When calculating general economic and social indicators also are take into account, including the annual rates of growth of gross domestic product (GDP) and the values of the Human Development Index (HDI) countries.

Knowledge Assessment Methodology also offers two combined index - the Knowledge Economy Index (KEI) and The Knowledge Index (KI). If the Knowledge Economy Index is a composite index, evaluating the effectiveness of knowledge of the country with a view to its economic and

social development, then the Knowledge Index is a comprehensive economic indicator, reflecting the country's ability to create, receive and spread knowledge. Actually the Knowledge Index characterizes the potential of any country or region with respect to the knowledge economy.

In general, the Knowledge Economy Index represents the average value of the four constituents of indices, they are - the Economic Incentive and Institutional Regime, Education and Human Resources, the Innovation System, Information and Communication Technology. The Knowledge Index is the average value of three of them - Education and Human Resources, the Innovation System and Information and Communication Technology. All these indices calculated for each country, the group of countries and the entire world. The methodology allows comparing separate indicators of different countries, as well as the averages indicators characterizing the group of countries. A comparison can be performed on separate indicators as well as the consolidated indicators.

Thus, by using methodology, World Bank experts, determine that Kazakhstan's ranking is 73rd, next to Mexico, Peru and Jordan. The Knowledge Economy Index in Kazakhstan amounts to 5,04; the Knowledge Index - 5,40; The Economic Incentive and Institutional Regime - 3,96; the Innovation System - 3,97; Education and Human Resources - 6,91; Information and Communication Technology - 5,32.

The system of indicators for assessing the innovation activities of the Commission of European Union (CEC) which is used for comparative analysis of development level of innovation activities in the countries of EU is slightly different, as well as their comparisons with the indicators of the U.S. and Japan.

The system of innovation indicators proposed by CEC Entrepreneurship Directorate includes 19 indicators, divided into four groups: human resources; generation of new knowledge, transmission and application of knowledge; financing innovation and the outputs of innovation activities.

 Human resources for innovation, comprising 5 main indicators:

1. S&E graduates (% of 20 - 29 years age class)

2. Population with tertiary education (% of 25 - 64 years age class)

3. Participation in life-long learning (% of 25 - 64 years age class)

4. Employment in medium-high and high-tech manufacturing (% of total workforce)

5. Employment in high-tech services (% of total workforce)

The generation of new knowledge, comprising 4 main indicators of which two are divided into EPO and USPTO patents:

1. Public R&D expenditures (% GDP)

2. Business expenditures on R&D (BERD) (% GDP)

3.1. EPO high-tech patent applications (per million population)

3.2. USPTO high-tech patent applications (per million population)

1.1. EPO patent applications (per million population)

1.2. USPTO patents granted (per million population)

The transmission and application of knowledge, comprising 3 main indicators which are divided between manufacturing and services:

1. SMEs innovating in-house (% of manufacturing SMEs and % of services SMEs)

2. SMEs involved in innovation co-operation (% of manufacturing SMEs and % of services SMEs)

3. Innovation expenditures (% of all turnover in manufacturing/services)

financing innovation and the outputs of innovation activities, comprising 7 main indicators of which three are divided between manufacturing and services:

1. Share of high-tech venture capital investment

2. Share of early stage venture capital in GDP

3.1. Sales of 'new to market' products (% of turnover in manufacturing and % of turnover in services)

3.2. Sales of 'new to the firm but not new to the market' products (% of turnover in manufacturing and % of turnover in services)

4. Internet access/use

5. ICT expenditures (% of GDP)

6. Share of manufacturing value-added in high-tech sectors

7. Volatility rates of SMEs (% of manufacturing SMEs and % of services SMEs)

The given system of indicators also provides an opportunity to use the methodology of cluster analysis to evaluate the concentration of knowledge in certain sectors, regions, groups of countries, which, in turn, allows to elaborate the alignment issues of technological development in separate territories of the country, and also helps to determine the areas, which require additional efforts from private organizations and the government.

It should be mentioned that the most of the indicators of the evaluation system of innovation activities coincides with the well known indicators of the European innovation scoreboard, combined into three groups. The first group of indicators, which reflect required resources, are combined together. In the other groups are indicators that characterize the result of innovation.

ENABLERS captures the main drivers of innovation that are external to the firm as:

1. Human resources – measures the availability of high-skilled and educated people.

1.1. S&E and SSH graduates per 1000 population aged 20-29 (first stage of tertiary education)

1.2. S&E and SSH doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education)

1.3. Population with tertiary education per 100 population aged 25-64

1.4. Participation in life-long learning per 100 population aged 25-64

1.5. Youth education attainment level

2. Finance and support- measures the availability of finance for innovation projects and the support of governments for innovation activities

2.1. Public R&D expenditures (% of GDP)

2.2. Venture capital (% of GDP)

2.3. Private credit (relative to GDP)

2.4. Broadband access by firms (% of firms)

FIRM ACTIVITIES captures innovation efforts that firms undertake recognising the fundamental importance of firms' activities in the innovation process:

1. Firm investments – covers a range of different investments firms make in order to generate innovations.

1.1. Business R&D expenditures (% of GDP)

1.2. IT expenditures (% of GDP)

1.3. Non-R&D innovation expenditures (% of turnover)

2. Linkages & entrepreneurship – captures entrepreneurial eff orts and collaboration eff orts among innovating firms and also with the public sector.

2.1. SMEs innovating in-house (% of SMEs)

2.2. Innovative SMEs collaborating with others (% of SMEs)

2.3. Firm renewal (SME entries plus exits) (% of SMEs)

2.4. Public-private co-publications per million population

3. Throughputs – captures the Intellectual Property Rights (IPR) generated as a throughput in the innovation process and Technology Balance of Payments flows.

3.1. EPO patents per million population

3.2. Community trademarks per million population

3.3. Community designs per million population

3.4. Technology Balance of Payments flows (% of GDP)

OUTPUTS - captures the outputs of firm activities as:

1. **Innovators** – measures the number of firms that have introduced innovations onto the market or within their organizations, covering technological and non-technological innovations

1.1. SMEs introducing product or process innovations (% of SMEs)

1.2. SMEs introducing marketing or organizational innovations (% of SMEs)

1.3. Resource efficiency innovators, calculated as the average of:

1.3.1. Share of innovators where innovation has significantly reduced the use of materials and energy (% of firms)

1.3.2. Share of innovators where innovation has significantly reduced labor costs (% of firms)

2. **Economic effects**– captures the economic success of innovation in employment, exports and sales due to innovation activities.

2.1. Employment in medium-high & high-tech manufacturing (% of workforce)

2.2. Employment in knowledge-intensive services (% of workforce)

2.3. Medium and high-tech manufacturing exports (% of total exports)

2.4. Knowledge-intensive services exports (% of total services exports)

2.5. New-to-market sales (% of turnover)

2.6. New-to-firm sales (% of turnover)

One of the most significant indicators is innovation activity of enterprises, region, sector and country. The innovative activity is the intensity of action on technology development and implementation of new or improved products, technology or services in the economy. Experts have identified several approaches to measuring innovative activity. The first

TABLE I
RECOMMENDED PARAMETERS FOR MEASURING INNOVATIVE ACTIVITY

	Estimated Parameters of Innovation Activity	Content of the Parameters
1	Quality of innovation strategy and innovation goals	Compliance with the innovation strategy's mission, goals, opportunities, innovation potential, threats to the environment and the relationship with other strategies
2	The level of innovation capacity	The ability of management to mobilize and use effectively required capacity, such as resources, information, personnel, R & D results, etc.
3	Amount of investment involved	Determining appropriate level of sources of investment and management's ability to attract them in the required amount
4	Methods and guidelines used to carry out innovative changes	Activity in the implementation of innovative transformations and overcoming potential and real resistance to changes to the use of the concepts and methods aimed at obtaining real competitive advantages
5	Relevance of the firm's reaction to the competitive nature of strategic situation	Using the appropriate strategic situation, type of behavior (reaction) considering state of the object (innovation) and condition the environment: reactive, active and planned forecast.
6	The speed of the development and implementation innovative strategies	The intensity of the action to conduct research and promote innovation, implementation of innovative changes
7	The validity of the level of implementing innovation activity	Relevance and adequacy of the activity's level of external environment and the organization by itself.

approach is the assessment development of innovation infrastructure and definition of the ability of companies to commercialize innovations. Such approach is used basically in the formation of accounting and statistical data on the status and prospects of development of innovation activities on countrywide and regional level. The second approach is the evaluation of innovation activity as the initial stage of the process' development of innovative strategies of enterprises. At the same time main objective consists of analyzing the economic development of specific economic entity and associating with structural elements. It is assumed that subsequent innovation, investment, strategic and marketing policy will be formed according to the conditions of enterprise's innovative scope. For diagnostic approach, it is appropriate to use expert assessments, which allow to take into account number of parameters of innovation activity.

V. DISCUSSIONS

The essence of the measuring of innovative activity is not only to assess the extent development, implementation and diffusion of innovations, but also to implement the selection innovative development and the formation of appropriate innovation policy. In Table I, there are recommended parameters for measuring innovative activity.

An important basis to measure innovative activity may be

the elements of the innovation potential, determining the current status of industrial and technological enterprises, their investment opportunities to develop and implement innovative solutions. Following relevant elements must be considered: availability of innovation-oriented departments, staff, financial resources, material and technical equipment, intellectual property, organizational and managerial performance.

Techniques used worldwide to determine level and results of innovation development of an enterprise relate to region or industry, and the country as a whole. At the same time criteria for evaluating the results of innovation performance in different countries have their own specifics and serve not only to improve management decisions, but also allow differentiating innovation processes in terms of economic efficiency.

The technique developed in Kazakhstan in 2010 was called "Methodology of assessment of the public authorities for the implementation innovation policy in the Republic of Kazakhstan", which contains the complex factor model of evaluation of innovative activity public authorities, national governing holdings, national holdings, national companies, large companies and public-private partnerships. Currently, the country is working on the construction of an integrated system of evaluation of innovative activity based on a unified methodological approach, using modern technological decisions has been launched. However, in our opinion, the results of innovative activity in Kazakhstan should be measured based on the following national characteristics:

• construction of a national innovation system is realized "top-down" on the initiative of public authorities in the absence of actual "drivers of innovation" - enterprises, which are motivated by market competition on implementation of innovations;

• absence of large high-tech corporations, wealthy enough to develop their own innovations;

• absence of clear lines of responsibility and the hierarchical subordination of public authorities and other national institutions in the field of innovation process;

• absence of systemic legal framework to determine the authority and relationships of all subjects of innovation process and envisage protection of intellectual property;

• absence of tax and other preferences for entities engaing in innovation process;

• absence of qualitative examination of innovative projects.

Despite our country's government's numerous attempts to shift from declarative programs to the real case, in the field of innovation qualitative breakthrough has not yet been observed. Inability to measure the effectiveness introduced and implemented innovations leads to enormous losses of financial, human and intellectual resources. In our opinion nowadays Kazakhstan needs its own National methodology evaluating the effectiveness of innovation performance which allows to monitor the level of innovation development in the country, regions and industries, promptly undertake adequate steps in the implementation of innovative projects and allows to organize a system of management of innovation processes,

oriented on the expected results. Primarily, these are connected, with features of national innovation potential. Moreover, the system of benchmarks and indicators of innovative activity performance may vary depending on the socio-economic challenges at this stage of development of the country.

It is well known that the effectiveness of any innovation can be measured by indicator, which is obtained by comparing the results of innovation's contribution with its costs. The concept of innovation efficiency is defined as their specific ability to save an appropriate amount of labor time, resources and money per unit of all the necessary and expected beneficial effects of the product, technical systems, and structures. It is important to note that the effectiveness of some of the innovations appears through a sufficiently long periods of time when the immediate economic return from investments should not wait.

Taking into account that systemic failure in the implementation of innovative programs in the country is at the intersection of macro-and micro-economic hierarchy, as well as at the junction of branch and territorial governments, we believe that the efficiency of innovative activity in Kazakhstan should be measured using a scorecard, which provides coverage of the most vulnerable aspects of the innovation process.

This method sets the general rules of benchmarks and indicators, information sources, ways of organizing assessment and analysis on macro- and micro-level development innovation index. Implementation of the method includes forming the base input data in accordance with the structure of the describes indicators. The proposed system of indicators is comprehensive, which ensures the objectivity of the estimated results of innovation.

The proposed system for assessing the effectiveness of innovation differs from other methodologies that aim to improve effectiveness of innovations' implementation, taking into account the specifics of the national innovation system formed in Kazakhstan.

The System of innovation activity performance indicators in Kazakhstan.

A. Indicators of innovative activity performance at the macro level include the followings:

1. Assessment of innovation potential of the whole country and its regions. There are nine indicators, which are commonly used to measure the innovation potential:

· number of personnel engaged in R & D per 1 million people employed in the economy;

· the proportion of employed people with higher, incomplete higher and secondary vocational education of total employment in the economy;

· fixed assets in research and development per employee in research and development;

· domestic expenditure on research and development in 1000 tenge per GDP;

· share of personnel engaged in research and development in

the general population, in%;
· number of students per 1 million population
· the number of PhDs per 1 million population;
· the number of Professors per 1 million population;
· intensity of innovation expenditures (share of expenditure on technological innovation in the volume of products shipped innovatively active organizations).

2. Methods of calculating indicators which measure economic growth provide evaluation of innovative development and increase the level of economic development. The main indicators include the followings:
· literacy of adult population aged 15 years or older;
· GDP per capita;
· the average percentage increase of GDP;
· index of human development capital;
· index of unemployment;
· the level of unemployment.

3. The index of competitiveness of the country, region, group of factors includes:
· the Global Competitive Index;
· the current competitive index;
· index of infrastructure and communication networks' development
· index of external activity.

4. Indicators of infrastructure development include the following: number of innovative organizations, including business incubators, technology parks, technology transfer centers, exchanges of intellectual property databases, innovation funds, venture funds, exhibition centers.

5. The index of innovativeness includes such indicators as
· number of organizations that perform research and development, per 1 million population;
· domestic expenditure on research and development per capita in tenge;
· costs of technological innovation per capita, tenge;
· volume of new products and products subjected to significant changes, per capita, tenge;
· volume of improved products which are subjected per capita in tenge;
· average number of advanced manufacturing technologies created per year;
· average number of advanced technologies used per year;
· level of innovation activity of enterprises (the proportion of the number surveyed).

6. Index of scientific activity:
· indicator of inventive activity;
· the proportion of intangible assets in total assets of the institutions of research and development sector, %;
· the proportion of research funding which is carried out on a competitive basis,%;
· the number of publications per researcher;
· citation index by field of science, in accordance with international standards.

7. The index of innovation:
· the volume of innovative products to one organization, million tenge;

· the proportion of entirely new products in the total volume of innovative products,%;
· expenditure on research, development and technological innovations,% of totals hipped products;
· the volume of innovative products per capita, million tenge;
· the share of innovative products that came abroad,%
· increasing number of employees in small innovative enterprises,%.

8. Indicators of effectiveness of innovation management:
· the proportion of funds allocated to the implementation of innovations, including: public order; grants, (in %)
· outcomes of targeted programs and programs of the Government of the Republic of Kazakhstan;
· promotion of diversification and modernization of production (the production of innovative products);
· the budgetary income of penalties for release and realization of production made with derogation from requirements of technical regulations, in one million tenge.

B. Indicators of Innovative Activity Performance at the Micro level

1. Indicators of scientific and technological potential of the company include the following:
· scientific, technical and engineering staff;
· the material-technical base of scientific and technological activities, ie set of labor in the field of research, including research equipment and facilities and equipment in colleges, laboratories, computer centers, etc.;
· providing information- reports, publications, databases, regulatory, technical, design and technological documentation, samples of new products;
· the system of organization of research and development activities and management of the enterprise.

2. Production and financial performance evaluation of innovation include the following:
· The volume of high-tech products, million tenge
· The volume of innovative products and services, including:
- Newly implemented (including brand new), or exposed to significant technological change over the past three years,
-Exposed to the improvement in the last three years;
· the share of innovative products in the total amount of goods shipped, work orders and services, (in %)
· exports of innovative products and services, their share in total exports, in million tenge;
· the cost of acquisition of scientific output in the budget (target programs + articles + budget subventions for science cities), million tenge
· Number of advanced manufacturing technologies, in units;
· The number of advanced manufacturing technologies used, in units;
· The cost of technological innovation by type of innovation, million tenge;
· The cost of technological innovation on sources of funding, million tenge.

3. Indicators to measure innovation, industrial organizations:
· The number of acquired patents and licenses on the balance

sheet, in units;
· the value of intangible assets, million tenge
· The proportion of intangible assets in fixed assets, in%;
· The proportion of the active part of fixed assets, in%;
· the percentage of the active part of renovation of fixed assets during the year, in%;
· production of innovative products, including:
- New (previously unreleased);
- Advanced (with improved performance)
- Production of pilot production;
· the share of innovative production in total production, in%;
· growth of innovative products, in%;
· the percentage of primary production technologies which satisfy the international quality standards ISO series, in%;
· the share of Manufacturing Technology (share in total fixed assets)that have been replaced over the past3 years, in%;
· the share of manufacturing technology of its own design, in%;
· the average annual growth rate of labor productivity for the three years after the technology change, in%;
· the number of contracts with organizations that perform innovation, in units;
· the proportion of reduction of material over the past three years, including reporting, in%;
· reduction of energy consumption over the past three years, including reporting, in%;
· the volume of investments in fixed capital, in million tenge;
· the proportion of high-tech investments(the ratio of expenditure on research and development, the acquisition of intangible assets to investments in fixed capital), in%.
4. By the use of indicators of innovation are
· The number of items of new products over the years;
· The proportion of new products in the total amount of over the years;
· Competitiveness in domestic and international markets;
· the degree of progressivity of technology;
· The amount of work on technical improvement of production, their absolute and relative change from year to year;
· economic results: an increase in profits resulting from the introduction of innovation, reduce the resource intensity of production, etc., which are calculated on an annual basis, determined by their absolute and relative change.

This method sets the general rules for measuring benchmarks and indicators, information sources, ways of organizing assessment and analysis at the macro- and micro-level development innovation index. Implementation of the method includes forming the base input data in accordance with the structure of the described indicators. The proposed system of indicators is comprehensive, which ensures the objectivity of the estimated results of innovation.

The real technique establishes the general rules, structure of criteria and indicators, information sources, ways of the organization of an assessment and the development analysis at the macro - and micro level of an innovative index. Realization of a technique is included formation of base of basic data according to the structure of described indicators. The offered system of indicators has complex character that provides objectivity of the received assessment of innovative activity.

The offered system for assessing the effectiveness of innovation differs from other techniques that are directed on increase of productivity of introduced innovations taking into account specifics of formed national innovative system in Kazakhstan.

Besides, according to the offered structure of private indicators on separate blocks of primary information determination of efficiency of innovative activity as at level of the country, the region, and at level of the enterprise it is considerably facilitated. Procedure of an assessment of scientific and technological development of the country, the region or the enterprise assumes consecutive performance of the certain steps allowing in a quantitative form to generalize all indicators, characterizing resources, scales and results of use of their scientific and technological potential. Calculation of efficiency of innovative activity of the country, the region and the enterprise for system of indicators allow to carry out ranging on level of scientific and technological development, for the purpose of identification of existence of an inefficiency of innovative policy and further impact on changes of the direction of innovative policy at a certain stage of its realization.

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