

Improvement of system of criteria and indicators of assessment of construction and transport enterprises' innovative capacity

Oksana Papelniuk¹

¹Moscow State University of Civil Engineering, 26, Yaroslavskoye shosse, Moscow, 129337, Russia

E-mail: oksana-17@mail.ru

Abstract. The author studies innovative activity of enterprises and carries out classification and systematization of criteria and indicators of construction enterprises' innovative group assessment taking into account features of innovative activity of construction enterprises. The offered approach will allow construction enterprises to estimate the level of their innovative capacity and to define the directions of this development for achievement of a resource-saving in construction sector.

1. Introduction

At present time the problem of resource-saving is particularly acute enough in all branches of economy, including construction branch. All major factors of intensive growth of economy, the most important of which, certainly, are acceleration of scientific and technical progress and improvement of an economic mechanism, exert impact on resource-saving.

Now low efficiency of use of resources is one of the main factors interfering increase in production in most branches of national economy. Increase in this efficiency is possible only during the using and development of their innovative potential by the construction enterprises. At the same time active introduction and use of innovative products and technologies in construction is achievable only due to implementation of the strategy of development of innovative activity of the enterprise.

The main condition of ensuring efficiency of innovative activity of the construction enterprises, and also total element of the mechanism of management of their innovative activity is determination of criteria for evaluation of efficiency of innovative activity or identification of an economic indicator (group of indicators) which value will give an opportunity to draw the correct conclusion on the level of development the enterprise in this aspect.

Allocate two approaches to an assessment of efficiency of innovative activity of the enterprises. According to one of them construction and the analysis of system of indicators of statistics of results of innovations is carried out, the second approach provides calculation of integrated indicators of innovative development.

2. Materials and Methods

The system of indicators which gives an assessment to effectiveness of performance of innovative activity in official data of Rosstat consists of consideration of the following items (figure 1):



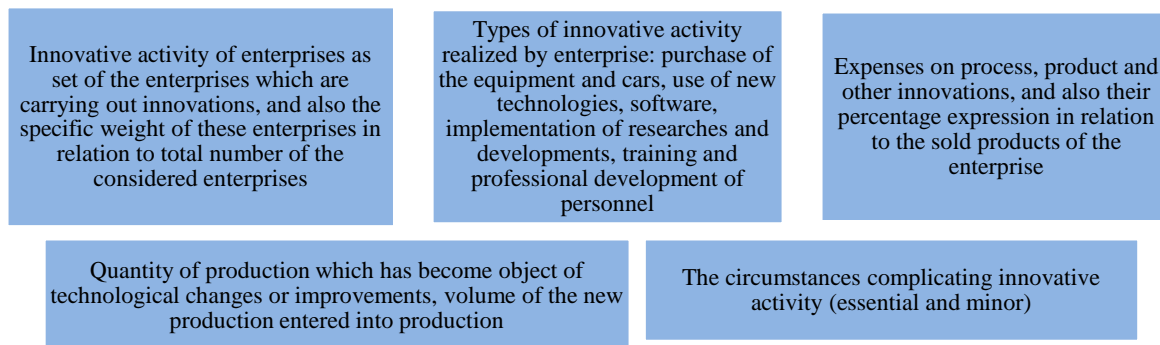


Figure 1. Indicators of an assessment of effectiveness of performance of innovative activity

At this stage process of formation of statistics of innovations is made on the basis of creation and introduction of the program of the fourth European inspection (CIS-IV) according to which the program of statistical control of innovative activity has been transformed (form No. 4 the innovation of "Data on innovative activity of the organizations", is approved by the resolution of Rosstat from 7/27/2006 No. 42) [1]. Today in the Russian Federation the sphere of this inspection includes the organizations connected with power generation, production of water and gas and their distribution, the organizations of the extracting and processing productions, the organizations of a services sector including along with branch of the communication and activity applying computer facilities and information technologies, and the organizations of wholesale trade.

The system of statistics constructed on the basis of the grouped results of the analysis of the Russian and foreign experience of research of innovations is a methodological basis of a research and improvement of statistics of innovations [2,3].

3. Results

For implementation of an assessment of efficiency of innovative activity of the enterprise it is necessary to define economic indicators and feasibility of their use in reality. These indicators have to give an impartial assessment of the valid condition of innovative activity of the studied construction enterprises. Moreover, they have to consider distinctive features of a production system and feature of innovative processes in construction branch, and also to reflect features and to characterize the strong and the weak sides of small and medium-sized enterprises.

Except the accounting of features of the enterprise it is also necessary to estimate the developed level of innovative activity that is especially important in the analysis of results of innovative activity after implementation of the innovative project. And also it is necessary to estimate the prospects of expansion of innovative activity for what it is necessary to estimate innovative potential. Though, it should be noted that the innovative capacity of the enterprise is made also by the elements characterized by indicators of technological, organizational and economic level.

Considering the aforesaid, it makes sense for an efficiency assessment of innovative activity to apply calculation of especially significant relative standardized indicators which really reflect innovative activity of the construction enterprises. It is important for this purpose on separately taken indicator to create criteria value which would give the chance to estimate a condition of an indicator and to carry out certain decisions in process of management of innovative activity at the enterprise, that is it is necessary to process parameters of measurement (to reconstruct, reorganize, transfer) to parameters of management.

Criteria value is a basis of comparison and assessment of efficiency of innovative activity of enterprises therefore its definition is carried out at the first stage. Use of the reasoned, calculated criteria values will allow to construct multilateral model of realization and development of innovative activity of the construction enterprises. For comparison it is possible to use predictive values, values of indicators (average or threshold) in construction area for the different periods of time, value of the same indicators

at various construction enterprises. Profitable work of the construction enterprises during the considerable period of time, and also high effectiveness, is criterion of scientific legitimacy of these values at the level of the construction enterprises, and they can be ranked as number of reference [4].

It is also recommended to use the economic indicators determined by data of the reporting of the enterprises that allows to estimate not only the dynamics but also to carry out the factorial analysis of results of innovative activity of the enterprises of small and medium business in construction branch.

For achievement of this purpose blocks of estimated indicators of level of innovative activity and innovative capacity of the construction enterprise (figure 2) have been chosen and grouped on clusters.

The offered indicators of an assessment of innovative activity of the construction enterprises of small and medium business are grouped according to features of innovative activity of the construction enterprises, each of which includes a number of subsystems of indicators.

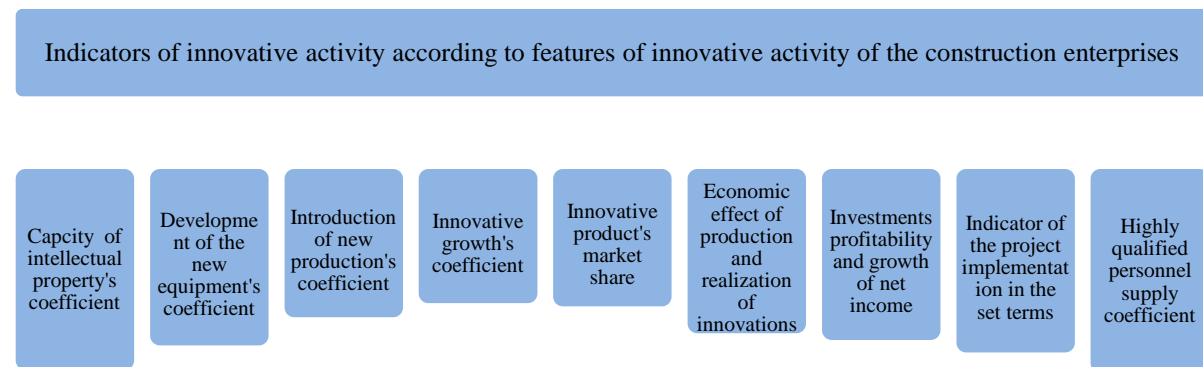


Figure 2. Indicators of an assessment of innovative activity of the small construction enterprise

The research of the innovative activity made by the construction organizations is offered to be conducted proceeding from definition and calculation of especially essential indicators of innovative activity and innovative potential. Thereof, the subgroup of statistics has to be considered as the first component of the studied group of indicators of innovative activity. As a part of system of indicators of innovative activity characteristics of the innovative enterprises, resources of scientific research and innovative activity, their results (directly, created actually in the sphere of science and innovations and mediated, received from application of scientific and technical achievements and innovative production in economy and society and reflecting effect of functioning of system), the internal and external relations reflecting target orientation of innovative activity, and many other aspects of activity are selected. Set of indicators of innovative activity it is possible to systematize as follows (figure 3).

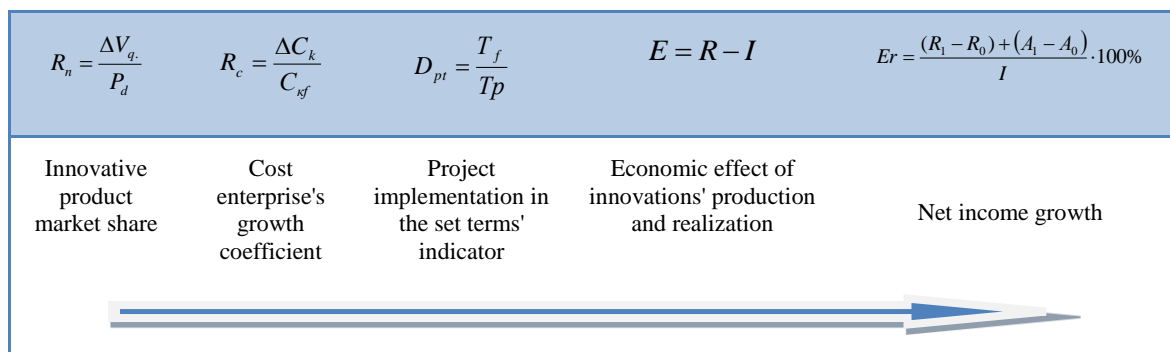


Figure 3. Indicators of innovative activity of construction enterprise

V - change of sales volume of enterprises as a result of introduction of new or improved production, in monetary units; Pp - total amount of the market of an innovative product, in monetary units; ΔC_k - change of the capitalized cost of enterprises at implementation of innovative activity, in monetary units;

C_{kf} - the cost of enterprises before realization of innovations, in monetary units; $T_f (T_p)$ - time which is actually (planned) spent for implementation of the innovative project, month; R - the sum of money received from production and realization of an innovation, in monetary units; K - investments in production realization of an innovation, in monetary units; R_1, R_0 - annual profit, in monetary units; A_1, A_0 - annual depreciation of fixed assets and intangible assets, respectively, before investments into new technology or new construction production for the analyzed period, in monetary units; I - sum of innovative investments, in monetary units;

It should be noted that a controversial issue among the main characteristics of innovative development of economy, is the number of the enterprises using technological innovations on the basis of which the indicator of level of innovative activity is calculated [5]. In this regard it becomes important to identify those signs on basis of which the enterprise can be referred to category of innovative. Calculation of indicators of level of innovative activity is caused by what of types of innovations (or several types at once) is realized by the construction enterprises: administrative, technological, organizational and marketing. The integrated level of innovative activity of which calculation definition of the relation of number of the enterprises realizing at least one of types of innovations, to total number of all enterprises of construction branch which have undergone a research for the considered period is the cornerstone is summarizing. In addition, the level of innovative activity by each type of innovations pays off individually. For this purpose the specific weight of those enterprises which realize administrative, organizational, technological or marketing innovations, in total number of all enterprises is defined. Indicators of influence on results of financial and economic activity, from a position of their innovative component, forms the second component of indicators of innovative activity. These indicators give the chance to carry out the analysis of a condition of internal resources of the enterprises, and also to establish a possibility of productive realization in the existing infrastructure conditions of the made innovative activity [6,7]. According to many authors, the economic assessment of innovative activity of the construction enterprises is carried out similar to an assessment of investment activity which is in detail given in literature and regulations. There is a number of the techniques developed by the international organizations and the largest consulting companies by means of which efficiency and appeal of the carried-out innovative activity is estimated.

4. Discussion

Except the results of innovative activity directly characterized by indicators of the block of innovative activity it is necessary to estimate prospects of the enterprise from the point of view of introduction of innovations. It characterizes the block of indicators of innovative potential. A number of authors [8, 9] as an assessment of innovative potential understand readiness for innovations of all system of the enterprise, and suggest to estimate prospects of all functional subsystems.

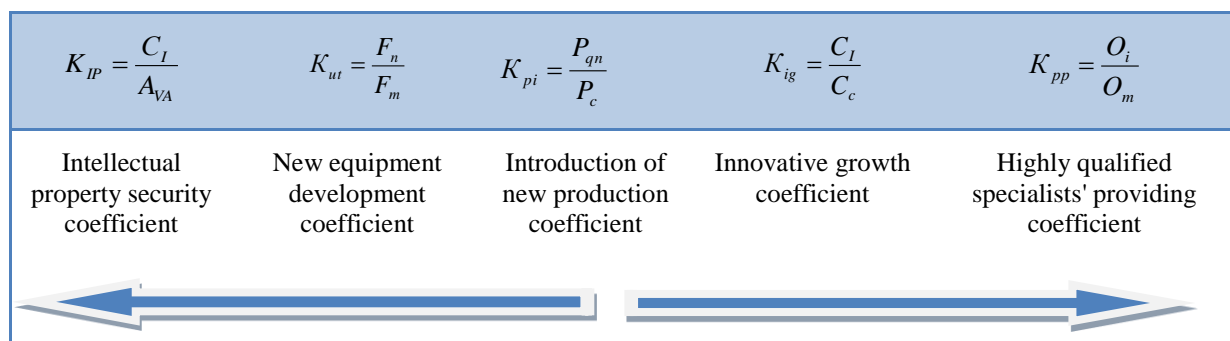


Figure 4. Indicators of innovative capacity of construction enterprise

In our case it is offered to carry coefficients of security of the enterprise with qualified personnel, intellectual property, and also speed of introduction of innovations to indicators of innovative potential (figure 4).

where,

C_I – intellectual property; A_{VA} – other non-current assets; F_n – cost of new entered fixed assets, in monetary units; F_m – average annual cost of the fixed produce assets, in monetary units; P_{qn} – the profit got as a result of sale of the improved or new production, in monetary units; P_c – total profit, in monetary units; C_I – cost of research and educational and methodical investment projects, in monetary units; C_c – total cost of other investment expenses, in monetary units; O_i – number of the research works and developmental works, the people occupied in the sphere. persons; O_m – average number of employees of the enterprises, persons

5. Conclusions

Thus, the offered classification of indicators of innovative group allows to capture most fully all studied parties which are carried out by the construction enterprises of innovative activity on the basis of application of the integrated systematized approach with use of the multilateral and multidimensional analysis of their activity.

References

- [1] Jevric, M., Romanovich, M.: *Procedia Engineering*, **165**, 1478 – 1482, doi: 10.1016/j.proeng.2016.11.882 (2016)
- [2] Nezhnikova E 2016 *Procedia Engineering* **165** 1300-1304
- [3] Chechevichkin V N and Vatin N I 2014 *Magazine of Civil Engineering* **50(6)** 67-74
- [4] Grabovyi P G, Avilova I P and Sharapova A V 2014 *Life Science Journal* **11(2)** 820-838
- [5] Larionov A and Nezhnikova E 2016 *ARPJ Journal of Engineering and Applied Sciences* **11(3)** 2023-2029
- [6] Kankhva V, Uvarova S and Belyaeva S 2016 *Procedia Engineering* **165** 1046-1051
- [7] Borboni A, Mor M and Faglia R 2016 Gloreha-Hand Robotic Rehabilitation: Design Mechanical Model and Experiments *Journal of Dynamic Systems, Measurement and Control, Transactions of the ASME* **138(11)** 111003
- [8] Gumba K, Belyantseva O and Kochetova L 2016 *Procedia Engineering* **165** 1323-1327
- [9] Romanovich R and Vilinskaya A 2016 *MATEC Web of Conferences* **53** 01052