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Modeling of the Integrated Interaction of the Innovation Process Subjects and Estimate of Efficiency of its Results

Oksana V. Vaganova, Marina V. Vladyka,
Svetlana A. Kucheryanenko and Nadezhda F. Sivtsova
Belgorod State National Research University, Belgorod Oblast, Russia

Abstract: The study deals with the problems of modeling of the integrated interaction of the innovation process subjects and estimate of efficiency of its results. It should be noted that the central moment of the integrated process is innovation. Inefficiency of the processes of integration leads to spreading of innovations. The researchers suggest extending opportunities of the results of integration of innovation process subjects via formalizing their interaction and the choice of their estimation criteria. It has been suggested by the researchers formalizing the model of interaction of innovation process subjects in the frameworks of their integration, the approach to the estimate of efficiency of the integrated interaction of the innovation process subjects. The results of the conducted empirical studies confirmed the opportunity of practical use of the offered indicators of efficiency estimate of the integrated interaction of the innovation process subjects at the level of region.

Key words: Integration of the innovation process subjects, model of interaction of the innovation process subjects, indicators of estimate of efficiency of the integrated interaction of the innovation process subjects, empirical studies, estimation criteria

INTRODUCTION

Under present-day conditions of trade market fluctuations raising intensity of an innovation activity is possible on the basis of analysis of the processes of integration running in it. The innovation and integrated processes by virtue of possible perspective of receipt of considerable competitive advantages are interfaced with a significant risk.

Therefore, revelation of tendencies and formalization of integrated models providing maximum efficiency of future innovation play here a special role (Vaganova, 2012).

Note that the conceptions of modeling the processes of integration of innovation activity have already become the object of study in a number of works but the issues of efficiency of innovations are given insufficient consideration in them. In the main, the methods of formation of initial information for problem solving of optimal planning of using innovations and also economic and mathematical methods and methodological approaches to their describing are considered (Vaganova, 2013).

Proceeding from the above-stated, the investigation, proposed in this study, dealt with the problems of modeling of the integrated interaction of the innovation processes subjects and estimate of efficiency of its results is very prospective line of research study.

MATERIALS AND METHODS

Main part

The integrated interaction of the innovation process subjects and its formalization: Integration can be considered as a totality of forms and methods by means of which it occurs the creation of dedicated structures in the system of branch-wise and territorial production complexes and postforming of specific ties with the view of enhancement of efficiency of functioning and developing the competitive strength of the considered systems on the whole.

The integrated development of competitiveness can be regarded as a process of creating dedicated structures in the system of branch-wise and territorial production complexes and postforming of specific ties with the view of enhancement of efficiency of functioning and developing the competitive strength of the considered systems on the whole (Sivtsova, 2014). Besides in the context of integration of the innovation activity it should be distinguished network models. The ties between the

Corresponding Author: Oksana V. Vaganova, Belgorod State National Research University, Belgorod Oblast, Russia

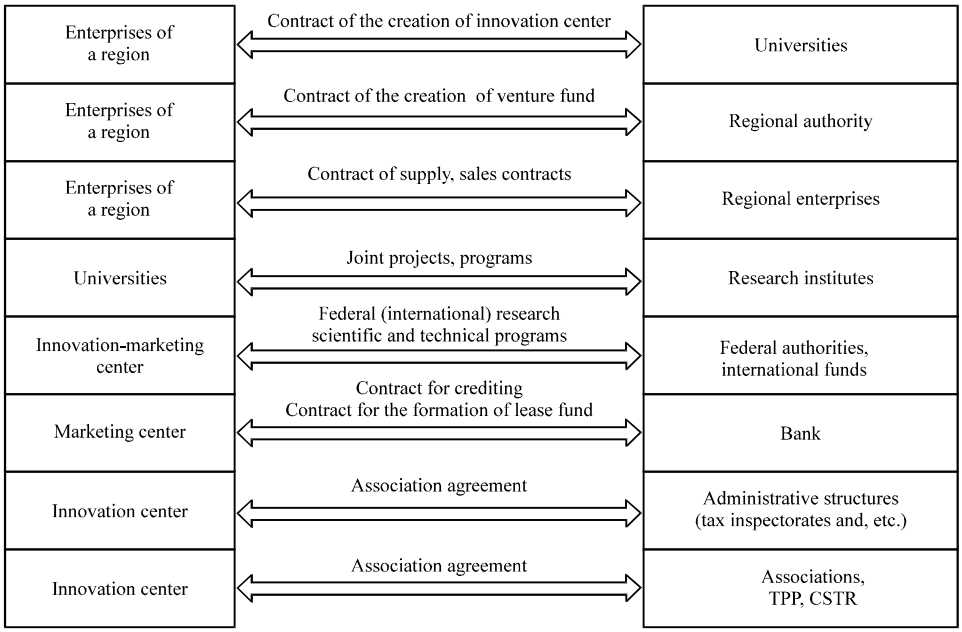

Fig. 1: The forms of interaction of the regional subjects

subjects in the innovation networks can be determined by agreements, contracts and also informal relationship developed within the framework of participation in different forms of business organization (associations, alliances, working groups and, etc.). In Fig. 1, the possible forms of interaction between the partners in organization of joint activity.

On the basis of the presented forms of interaction of the regional subjects one can consider the problems of the integrated interaction of small, medium and large-scale enterprises (Glagolev, 2013). Consistency of branches, sectors and socioeconomic development acquires a great importance in its regulation. Integration of large, medium and small-sized enterprises gives an opportunity to use advantages of not only social division of labour but also combination of forms of management for security for stable production growth, satisfaction of needs of the common market and also export enhancement and competitive recovery (Fig. 2).

Intensive integration of the subjects on the creation of innovation processes in the form of network model allows to gain economic effect due to functioning of the factors: concentration of resources on the priority lines of economics; great possibilities on realization of its interests; staff development and advanced educational system. Effectiveness of functioning of this model depends directly on the degree of intellectualization of all basic elements.

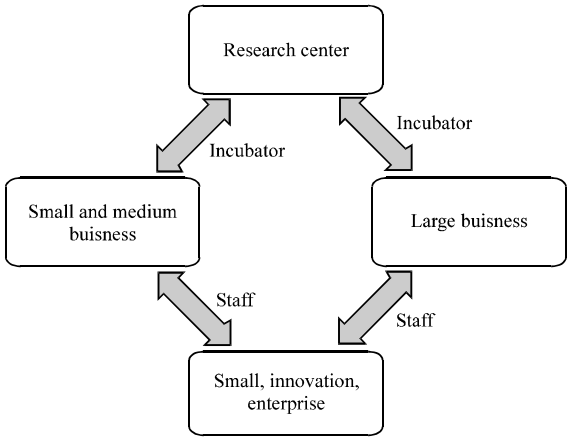

Fig. 2: The model of integrated interaction of research establishment of small, medium and large enterprises

RESULTS AND DISCUSSION

Estimate of efficiency of the integrated interaction of the innovation process subjects: Efficiency of the integrated processes of the subjects of innovations depends to a large extent on environmental quality of the very meso-system which is analyzed and evaluated by means of factor values of different nature: economic, social, cultural, ecological, institutional and others (Glagolev, 2013). Among the concrete factors one may single out.

Table 1: The main types of effects of innovation activity

Type of effects	The content of effect and forms of its manifestation
Economic effect of the innovation activity	Effect in the production sphere results from application of scientific and technical developments, oriented to creation of engineering processes, rise of level of automation and mechanization of production Effect in the sphere of consumption depends on production and use of novel items of production with enhanced performance characteristics
Scientific and technical effect of the innovation activity	Information gain, acquaintance of new knowledge appear mediately through the efficiency of up-to-date goods, equipments, machinery, technology, created on the basis of this knowledge
Social effect of the innovation activity	Level and quality of life: rise in the standard of living of population, improvement of their everyday habitat, raising the level of education, occurring of new intangible values-cultural, ethic, aesthetic
Ecological effect of the innovation activity	Improvement of the performance of ecological environment: noise level, indices of electromagnetic field, pollution, illumination, vibration and forth

Procurement of own financial resources that may have an impact on reproduction of innovation output on the whole.

Insufficiency of government financial support (may have strong negative effects for innovation activity of enterprises oriented to the productions of non-civilian goods and also to some types of economic activity, for example, railway):

- High cost of innovations identifying high risks for investors
- High economic risk (it may be connected, for example, with demand)
- Low innovation potential of organization is defined by the inheritance of system of management, specificity of activity and orientation to market trends, therefore, expansion of innovation activity may involve a certain loss for organization
- Disadvantages connected with staff's skills and information of new technologies have unimportant influence and are conditioned, first of all by the difficulties in internal long-term policy of organization management (for example, staff training at the expense of organization and interaction with information centers, participation in them)

Note that the significance of the distinguishing feature of the effect from integration of the innovation process subjects is determined on the basis of the results and expenditures. At that the following types of effects are differentiated (Table 1).

In the broad sense, efficiency of innovation is a complex notion that is in systemic understanding, an integrated system characteristic from the point of view of effectiveness, development of the innovation activity, protection of intellectual property, quality, reliability and timeliness of goal achievement in the course of implementation of the innovation programs, projects, designs, their commercialization and at the expense of this development of regional system in the planned direction in complying with certain criterion indices and restrictions, oriented to resource optimization (minimization as possible) (Vladika *et al*., 2014).

Table 2: Common innovation efficiency estimate

Indexs	Calculation expression	Characteristic
Share of benefit per costs	B/C	Characterizes result per unit of costs
Share of costs per benefit	C/B	Means specific value of costs per unit of the reached result
Absolute deviation of exceeding	(B-C)	Characterizes absolute value of benefits from costs results over costsRelative index of cost-based efficiency
	(B-C)/C	Presents optimum quantity of effect
Relative index of resultant efficiency	(B-C)/B	Reflects specific quantity of effect per unit of the reached result

In the narrower sense, traditional understanding, efficiency of integration of the innovation process subjects is characterized by the ratio of the results and expenditures (compared by different means) of functioning the subjects of microeconomic level in the territory of this territory and their contribution into Gross Regional Product (GRP).

From methodological point of view, it should be considered two conceptions of estimate of efficiency: cost-based and resource.

Therefore, it is necessary to differentiate the notions "costs" and "resources". Resources are people engaged in the process of fulfilling certain activities (human resources), capital, basic assets, circulating assets, technologies and information resources (Vladyka *et al*., 2014).

Costs are value, transferred to output in the form of outlays on raw material and the material of depreciation charges and labour input in the form of wages and outlays on acquaintance of the essential information and knowledge.

Differentiation between Costs (C) and Benefits (B) may be performed by different means in each comparison the obtained indices have determinate sense emphasizing either aspect of the category "efficiency" (Table 2).

Table 3: Efficiency rating of the innovation activity of the region of Belgorod in the essential categories of activity in 2013

Essential catagories	B/C (times)	C/B (times)	(B-C) thousand rub.	(B-C)/C (times)	(B-C)/B (times)
Total	15.1	0.07	20246944,2	14.1	0.93
Metal ore mining	6.1	0.16	1994217,3	5.1	0.84
Subsection DA Food production including beverages and tobacco	50.3	0.02	1624211,8	49.3	0.98
Subsection DB textile and clothing manufacture	11.5	0.09	44581	10.5	0.91
Subsection CB Mining operations. besides fuel and energy	6.1	0.16	1994217,3	5.1	0.84
Clothes production; furs tanning and dyeing	11.5	0.09	44581	10.5	0.91
Food production including beverages	50.3	0.02	1624211,8	49.3	0.98
Section D manufacturing	31.3	0.03	17168280,2	30.3	0.97
Section C Mining operations	6.1	0.16	1994217,3	5.1	0.84

According to the data represented in Table 2 carry out appraisal of efficiency of the innovation activity of the region of Belgorod in some categories of economic activity in 2013.

Basing on the estimate of efficiency of the integrated processes of the regional innovation processes of major activity categories (Table 3), one may see that maximum effect is marked in food production including beverages and tobacco and manufacturing activities. In the rest categories of activity the effect has positive character but less significant (Vladyka *et al*., 2014).

Thus, the integrated system of the region of Belgorod is characterized by fragmentariness that prevents, its efficiency from increasing. In the traditional understanding, the region refers to moderate innovative.

All in all, the innovation potential of the region of Belgorod as integral characteristic of the level of basic elements of the regional innovation system considerably exceeds the average level of the Central Federal District (CFO).

CONCLUSION

Summing up that there exist sufficient number of methodological approaches to the estimate of efficiency of the integration of innovation sphere. But as of today, a single method of complex estimate of efficiency of the regional innovation development.

The problem of forming complex methods of efficiency of integration into innovation activity is connected with some difficulties, the basic of them, in our opinion are:

- Absence of estimated standard guidelines
- Indeterminateness in the structure of efficiency of the innovation activity
- Restrictedness of information on which an external economic evaluation for detached investor is based

The system of estimated criteria for the innovation activity state is to include all the aspects and to create possibility for estimating the state of innovation activity in the hierarchy from the processes of realization of definite innovation projects and technologies to objective reliable estimate of the innovation activity of some industrial enterprises and the state of innovation sphere of the region on the whole.

In present-day economy, the solution of this problem is practically impossible without modeling integration of the innovation activity of the economic subjects.

These models will allow to determine the necessity of innovation activity and practicability of the integrated interactions with other economic subjects for its implementation.

Thus, the conducted investigation confirms that the content of notion “efficiency” becomes more informative.

At that the process of its further essential enrichment will first of all be connected with the modeling of integration of innovation activity of the economic subjects.

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