

KNOWLEDGE DIFFERENTIATION*

DIFERENCIJACIJA ZNANJA

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Abstract: *The purpose of the present research is ordering of institutes of manufacture of knowledge on a minimum level of managing and development of strategy of their generation, allowing to make changes to technological processes. As a result of the spent researches by authors the differentiation of new knowledge on depth of brought changes in technological processes that allows to consider processes of generation of new knowledge from the various parties of economic activities is carried out. Authors had been revealed structure of external and internal risks of generation of new knowledge. The graphic model of structure of manufacture of the new knowledge is constructed, giving the chance on the basis of their differentiation optimum to divide processes of scientific and design activity. On the basis of the methodological device the institutional economic theory classification of economic institutes of manufacture of new knowledge with reference to a managing minimum level is carried out. Authors reveal effects of decrease in costs of generation of new knowledge as a result of realization of collective activity. The received results allow the enterprises to carry out an estimation, forecasting and planning of generation of new knowledge.*

Key Words: *Knowledge, Knowledge Differentiation.*

Abstrakt: *Cilj ovog istraživanja je uređivanje instituta proizvodnje znanja na minimalnom nivou upravljanja, kao i razvoj strategije njihovog generisanja, u skladu s promjenama tehnoloških procesa. Kao rezultat prethodnih istraživanja autora, sprovedena je diferencijacija novog znanja izazvana korijenitim promjenama tehnoloških procesa, što omogućuje razmatranje procesa generisanja novih saznanja različitih učesnika u ekonomskim aktivnostima. Autori otkrivaju strukturu eksternih i internih rizika u generisanju novih saznanja. Konstruisan je grafički model strukture proizvodnje novog znanja, koji omogućuje podjelu procesa naučnih i dizajnerskih aktivnosti na bazi optimuma diferencijacije. Na bazi metodološkog principa institucionalne ekonomske teorije izvršena je klasifikacija ekonomskih instituta proizvodnje znanja u odnosu na minimalan nivo upravljanja. Autori otkrivaju efekte porasta troškova generisanja novog znanja kao rezultat realizacije kolektivne aktivnosti. Dobijeni rezultati omogućuju preduzećima da sprovedu procjenu, predviđanje i planiranje generisanja novog znanja.*

Ključne riječi: *znanje, diferencijacija znanja.*

JEL Classification: D 83; O 32;

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1. Introduction

Prompt development of market relations, formation of positive tendencies of economic growth and safe quality of a life of the population is based on all-round application of achievements of the economy constructed on knowledge.

The considerable quantity of works suffices it is devoted the decision of problems of the economy constructed on knowledge. The problems of knowledge economics

was investigated by many authors, such as F.Hayek [1945], J. Schumpeter[1952], F.Machlup [1962], However, the conducted researches, as a rule, are limited to discussion of economy of knowledge from outside the tool approach and possibilities of economic-mathematical modeling of innovative development. Questions of an estimation of costs and situations of uncertainty of generation of new knowledge remain unresolved problems. Processes of manufacture of new knowledge, are characterized by considerable risks, it and predetermines application of methods institutional the economic theory.

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The purpose of the present research is ordering of institutes of manufacture of knowledge on a minimum level of managing and development of strategy of their generation, allowing to make changes to technological processes.

2. Differentiation of New Knowledge

According to research of the Institute of technology of Georgia which here is engaged 20 years in an estimation of technological indicators in Russia, today for research and development by managing subjects it is allocated no more than 10 % of all volume of investments, at necessary level at 30-50 %. Discrepancy of actual and desirable volumes of output of new knowledge speaks absence in the scientific literature of the developed techniques on differentiation of changes brought by them in productions.

J. Schumpeter has allocated following typical changes of productions: use of the new techniques, new technological processes; introduction of production with new properties; changes in the organization of manufacture and material support (Schumpeter, 1952).

In F.Valenta's monograph has carried out classification of depth of brought changes in technological process: the elementary qualitative change characterized by small material inputs, absence of risk of realization of changes and accordingly profit minor alteration, thus initial signs of system do not vary; more the radical change of processes characterized by more considerable material investments, presence of risks of realization that allows to raise level of profitability of industrial activity, thus vary all or the majority of properties of system, but the base structural concept remains; the higher change in functional properties systems or its part which changes its functional principle, characterized by considerable financial expenses, high risks of realization (Valenta, 1985).

New knowledge type	Influence on the changes of technological processes	Share of given knowledge type in the total volume of knowledge	Influence on profit
Qualitative knowledge.	Weak. Operating reaction for the changes of external conditions. Do not influence the operating processes.	The share falls with raising of the new knowledge production.	$dP=0$
Structural knowledge.	Medium. Changes in the structure of economical subject. Small influence to the changes of operating processes.	The share falls with raising of the new knowledge production.	$dP=\text{const} < TC$
Functional knowledge.	Strong Changes of technological processes.	The share raise with raising of the new knowledge production.	$dP > TC$

Introduction of new knowledge in activity of the enterprises changes productions that cause necessity of classification of new knowledge on depth of brought changes. Authors offer the following differentiation of new knowledge on depth of brought changes in technological processes (Table. 1)

Table 1 Differentiation of new knowledge on influence on changes in technological processes (dP – profit changes owing to new knowledge; TC – costs of generation of new knowledge).

In 2006-2008 employees authors had been conducted empirical research of the Russian enterprises for a problematic of economy of knowledge. During research employees more than 250 enterprises of Russia have been interrogated. Interviewing was carried out among proprietors and heads of the enterprises. Sample represented a set of random variables and is representative in relation to the Russian enterprises. On a branch accessory, the sizes and time of existence of the firms, the specified sample corresponds to economic characteristics of economic system of Russia.

Authors, on representative sample of the Russian enterprises, had been conducted empirical research of dependence of a share of manufacture of new knowledge from degree of changing influence on productions of managing subjects (fig. 1).

From the analysis figure. 1 it is possible to draw following conclusions.

First of all, financing of generation of new knowledge less than 8 % from profit is characterized by development of qualitative knowledge that does not allow firms to optimize technological activity and to get significant profit as a result of their use.

Secondly, essential changes of technological processes and profit on introduction of new knowledge arise at volumes of financing more than 8 % of a share of profit.

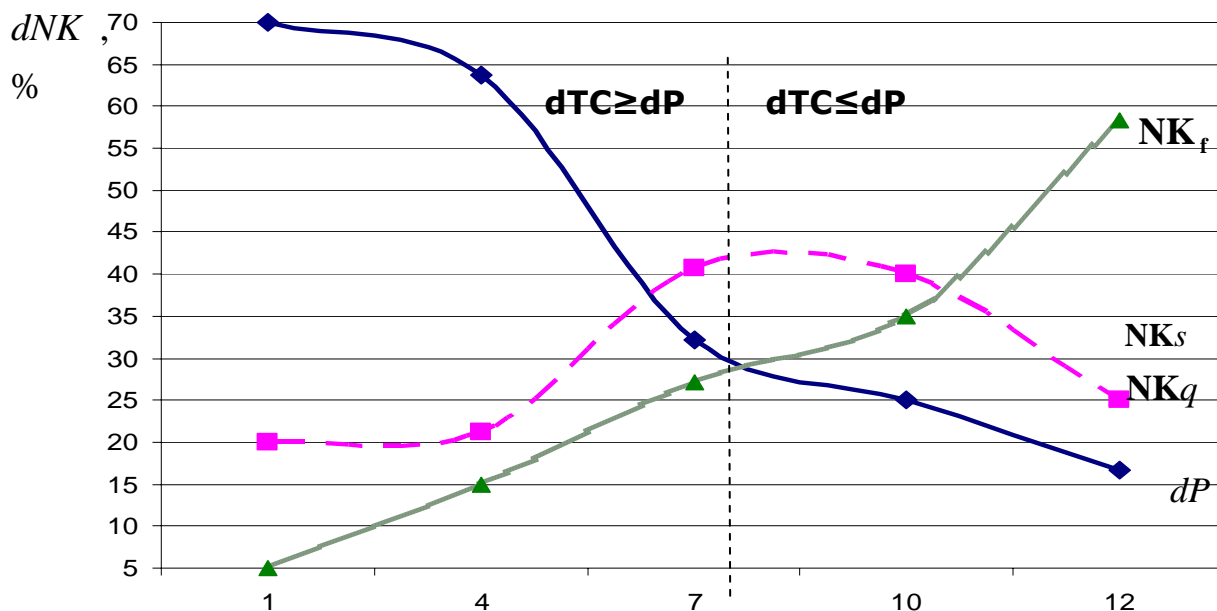


Fig. 1. Profit changes (dP) as a function of the volumes of different type new knowledge production (%) (NK_q – Qualitative knowledge; NK_s – Structural knowledge; NK_f – Functional knowledge).

Now more than half of Russian enterprises carry out, basically, financing of new knowledge of qualitative character that does not provide change of technological processes and reception of competitive advantages, and

соответственно and profit increases. The strategy optimizing manufacture of new knowledge, and, accordingly, allowing increases profit as a result of their introduction can to be described the following system of inequalities:

$$\left\{ \begin{array}{l} dNK_q \leq 0.28 \\ dNK_s \leq 0.43 \\ dNK_f \geq 0.29 \\ dNK_q + dNK_s + dNK_f = 1 \end{array} \right. \quad (1)$$

where:

- dNK_q - the share of qualitative knowledges;
- dNK_s - the share of structural knowledges;
- dNK_f - the share of functional knowledges.

3. External and Internal Risks of the New Knowledge Production

Let's notice that risks of generation of new knowledge are a part of integrated risks of economic activities of economic subjects. According to R.M.Kachalov, the economic risk characterises discrepancy of the received result of realisation of the decision with the planned result, caused by existing and essentially ineradicable uncertainty, i.e. approach of a situation of undesirable succession of events.

Processes of manufacture of new knowledge, in most cases, are connected with considerable time pieces between decision-making on generation of knowledge and introduction of new knowledge in economic activities. Presence of considerable time expenses predetermines occurrence of uncertainty of the future conditions of

introduction of new knowledge that leads to occurrence of various risks of their generation. The risk of manufacture of new knowledge is an estimation of discrepancy of look-ahead and real results of activity on manufacture of new knowledge.

Considering that fact that manufacture of new knowledge is one of directions of activity of the enterprises, risks of such activity are necessary for subdividing under their relation to the managing subject, depending on sphere of their occurrence on external and internal. External risks of manufacture of new knowledge concern such which source of occurrence is in an environment, in relation to considered object. Internal risks of manufacture of new knowledge are the risks which occurrence is caused or are generated by direct activity of the managing subject.

As a result of the conducted research by authors the structure of external and internal risks of generation of new knowledge has been revealed, the estimation of the

importance of risk factors is carried out, the expert way had been defined estimations of weight factors on each risk factor.

Table 2. The structure of internal risks of new knowledge production

Risk factors	Share of each factor in total risk (%)
Low staff qualification.	18
Staff instability.	11
Negative result.	16
Lack of result in set time-frames.	18
Discrepancy between planned and actual results.	21
Impossibility of practical use.	16
Total	100

Table 3. The structure of external risks

Risk factors	Share of each factor in total risk (%)
Market rejection.	27
Uncompetitiveness of the new knowledge.	29
Intellectual property violation.	27
Analogues in world-wide practice.	17
Total	100

Let's notice that the importance of internal risks much above, than the importance of external risks of generation of new knowledge. By results of author's researches, a share of internal risks – 64 % and accordingly external – 36 %.

4. Classification of Institutions of New Knowledge Production

Till now institutional the analysis for an estimation of evolution and forecasting of development of elements of economy of knowledge was used in a weak measure. Thus the estimation of institutes of economy of knowledge with reference to a managing minimum level while is out of achievements of scientists-economists (Popov, 2007).

As institutional environment is a set of the rules structuring activity of managing subjects and their interaction among themselves in frameworks institutional the approach activity of managing subjects are described transformational and transactional by approaches. The first approach focuses attention on influence of internal factors on activity of managing subjects. In turn, transactional the approach considers influence of external factors. Thus, according to O. Williamson's approach, classification of institutes, first of all, should be carried out in relation to the managing subject, i.e. to allocate internal and external institutes. Considering that manufacture of knowledge is one of directions of activity of the enterprises, an initial sign of classification of institutes of manufacture of new knowledge is their relation to the managing subject. The first direction analyzes the enterprises and firms "from within", i.e. through system of norms, agreements and the contracts expressed in various administrative approaches to manufacture of new knowledge. The second direction investigates the economic organisations "from the outside", i.e. rules of interaction of managing subjects (Williamson, 1985).

Allocation of institutes probably on the basis of consideration of a category of market potential of the enterprise. At construction institutional structures can be allocated following functions for endogenous institutes: management, use of resources, interaction with foreign subjects; for external institutes – relations with counterparts, influence of a market situation (Popov, 2004).

In the block of institutes of management mission is formed, strategy is developed, the purposes of manufacture of new knowledge are defined. The given block is represented in the form of set of the components forming a control system: planning, the organisation, stimulation and the control (Oldcorn, 1999).

In the economic literature representation about external uncontrollable factors of macroenvironment of firm which include technological, economic, social, political factors has settled. Authors of the given research consider necessary to add also the analysis of ecological factors. Set of these factors forms the block of institutes of influence of an external situation (Kotler, 1990).

As the basic characteristics of institutes are the endogenous type or exogenous type of their formations or use, and also distribution of the given institutes on activity of separate workers or all enterprise as a whole these characteristics *микроэкономических* institutes of manufacture of new knowledge are necessary for using as the basic signs of classification. Author's classification of institutes of manufacture of new knowledge, on the basis of the criteria set forth above is presented on fig. 3.

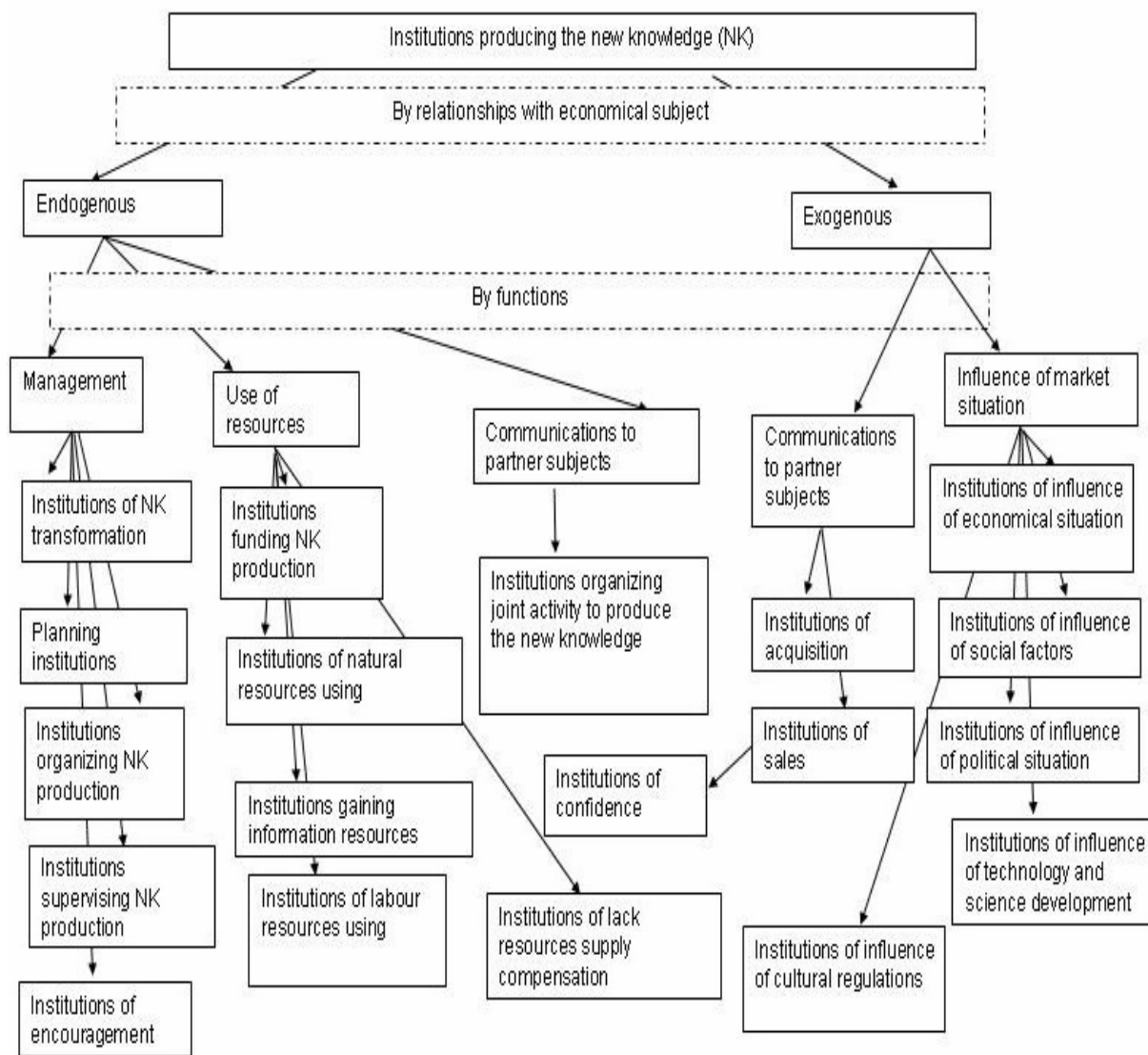
Thus the analysis of obtained data makes it possible to separate out the following basic summaries.

At the first, carried out on the basis of the methodological device of the institutional economic theory classification of minieconomic institutes of manufacture of new knowledge with reference to a managing minimum level allows to reach decrease indeterminateness at the analysis and the organisation of manufacture of new knowledge, an estimation and forecasting of development of elements of the given economy.

In the second, development of institutes of manufacture of new knowledge as norms and rules of the organisation of their manufacture provides effect of considerable decrease in costs and the risks which high

values complicate manufacture at demanded level, and, accordingly, to satisfy requirements of managing subjects for new knowledge.

Institutes of management of knowledge are caused by the developed system of decision-making in the concrete managing subject. By consideration of questions of manufacture of new knowledge the settled norms of management of knowledge at the enterprise – institutes of management of knowledge - define directions of activity, necessity and possibility of financing of manufacture of new knowledge at the enterprise.



5. COLLECTIVE ACTIVITY

Theoretical researches of J. Buchanan according to risks and costs of managing subjects depending on quantity of participants of the collective have shown that the share of risks and costs having decreases for one participant in direct ratio to quantity of participants of collective activity (Buchanan, 1988).

The high importance of the organization of the collective activity directed on the decision of economic problems of managing subjects, the Nobel winners in economy for 2007 L.Hurwicz, R.Myerson, E.Maskin have noted in the works (Izmalkov, 2008).

As a result of the conducted empirical research, the author has received the corrected dependence of decrease in internal risks of costs of one participant depending on quantity of participants of collective activity fig. 4.

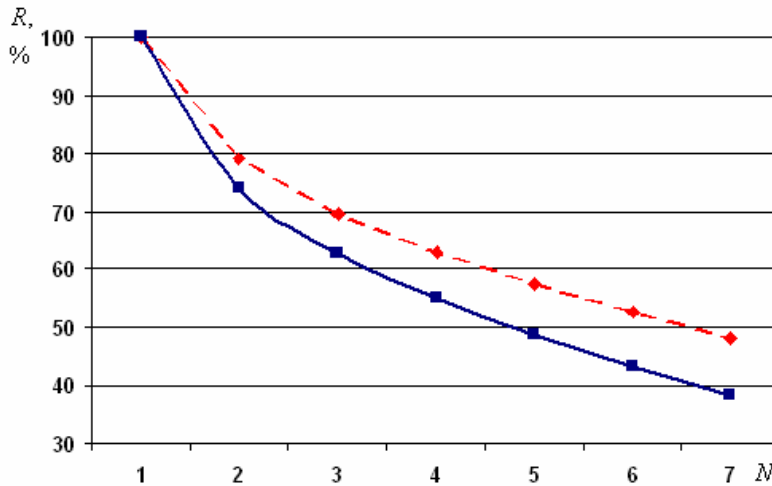


Fig. 4. Dependence of internal and external risks during the new knowledge production depending on the number of participants: solid line is external risks; dotted line is internal risks.

Let's notice that dependences of decrease in external and internal risks of generation of new knowledge on quantity of participants of collective activity have an identical appearance. However external risks decrease much faster, than internal risks of generation of new knowledge. According to authors, it speaks following factors:

first, a share of internal risks much more above, than a share of external risks, and, hence, for decrease in internal risks it is necessary realization much more efforts, than for external risks of generation of new knowledge;

Secondly, a main objective of the organization of the collective activity formulated in works in J. Buchanan, decrease in negative influence of external factors on activity of managing subjects is (Buchanan, 1988).

The organization of the collective activity directed on reception of new knowledge, allows managing subjects to reduce risks of manufacture of new knowledge. The internal risks having on one participant decrease proportionally to quantity of participants, according to the following dependence:

$$R_{in} = 0.35/N - 0.037*N + 0.69 \tag{2}$$

where: R_{in} – internal risk of the new knowledge production occupying by one of project participant.
 N – number of participants.

Thus the external risks having on one participant decrease proportionally to quantity of participants, according to the following dependence:

$$R_{ext} = 0.44/N - 0.04*N + 0.6 \tag{3}$$

where: R_{ext} – external risk of the new knowledge production occupying by one of project participant.
 N – number of participants.

The organization of the collective activity directed on manufacture of new knowledge, allows managing subjects to reduce production costs of new knowledge.

On the basis of the given author's researches more than 90 % of the enterprises consider that collective activity allows carrying out manufacture of new knowledge by the most effective image satisfying requirements for new knowledge of all participants, at simultaneous decrease in financial expenses of manufacture of new knowledge.

According to the empirical researches, spent by authors, decrease in the costs having on one participant of collective activity on manufacture of new knowledge looks as follows fig. 5.

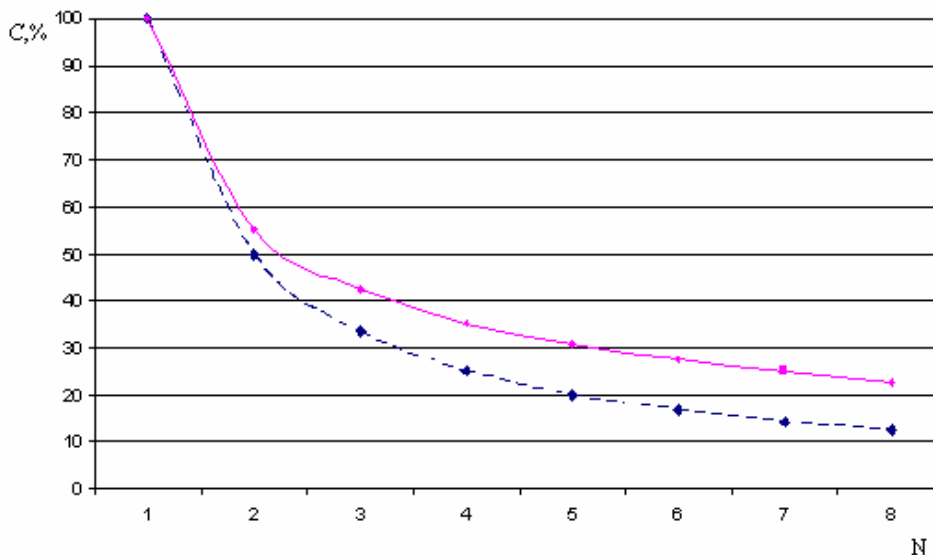


Fig. 5. Decreasing of total expenditures depending on the number of joint activity participants: solid line - according to empirical research data; dotted line - according to theoretical research data.

From the analysis fig. 5 follows that the organization of collective activity directed on reception of new knowledge allows managing subjects to reduce production costs of new knowledge. However, the costs of realization having on one participant decrease proportionally to quantity of participants, according to the following specified dependence:

$$MC = 0.67/N - 0.017*N + 0.33 \tag{5}$$

where: *MC* – share of expenditures occupying one of project participant.

N – number of participants.

Proceeding from the empirical and theoretical data it is possible to draw a conclusion that the most significant decrease in costs, as a result of the organization of collective activity, is reached already with the assistance of 2 – 4 participants, in this range attraction of each following participant leads to decrease in costs on 30 %. The further increase in quantity of participants does not lead to considerable decrease in costs as attraction of the fifth participant of collective activity results to decrease in costs no more, than on 3,5 %. Thus, attraction of four participants provides the most effective organization of collective activity on manufacture of new knowledge.

5. Conclusions

As a result of the spent researches by authors following results are received. First, the differentiation of new knowledge on depth of brought changes in technological processes that allows to consider processes of generation of new knowledge from the various parties of economic activities is carried out. The graphic model of structure of manufacture of the new knowledge is constructed, giving the chance on the basis of their differentiation optimum to divide processes of scientific and design activity. On the basis of an estimation of numerical criteria of structure of generated knowledge recom-

mendations about development of strategy of manufacture of various types of knowledge are developed.

Secondly, authors had been revealed structure of external and internal risks of generation of new knowledge, the estimation of the importance of risk factors is carried out, the expert way had been defined estimations of shares of each factor in total risk. As a result of the spent researches ordering of risks of manufacture of new knowledge is carried out. For an estimation of possibilities of forecasting of occurrence of risks of generation of new knowledge and development of directions of their decrease it is offered to use the device of the institutional economic theory.

Thirdly, on the basis of the methodological device of the institutional economic theory classification of economic institutes of manufacture of new knowledge with reference to a managing minimum level is carried out. Fourthly, have been revealed external effects of introduction of new knowledge of technological appointment in economic on others by fields of activity of the enterprises. So, external effects of manufacture of new knowledge of technological sphere give the chance to satisfy essentially requirements for ecological and social fields of knowledge.

Fifthly, authors reveal effects of decrease in costs of generation of new knowledge as a result of realization of collective activity. Mathematical dependence of decrease in costs on quantity of participants of collective activity on generation of new knowledge is received. Collective activity on manufacture of new knowledge predetermines considerable external and internal risks of manufacture of new knowledge and, accordingly, increase in their introduction in activity of the enterprises.

The received results allow the enterprises to carry out estimation, forecasting and planning of generation of new knowledge.

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