Montenegrin Journal of Economics

Vol. 14, No. 1 (2018), 121-131

Assessment of Intellectual Development of the Human Capital of Hi-Tech Productions

EVGENY POPOV[1], and MAXIM VLASOV[2]

[1] Head of the Centre of Economic Theory Institute of Economics, Ural Branch of the Russian Academy of Sciences, Professor, Ural Federal University named after the first President of Russia B.N.Yeltsin, Ekaterinburg, Russia; e-mail: *epopov@mail.ru*

[2] Senior Fellow at the Centre of Economic Theory Institute of Economics, Ural Branch of the Russian Academy of Sciences, Assistant Professor, Ural Federal University named after the first President of Russia B.N.Yeltsin, Ekaterinburg, Russia, Ekaterinburg, e-mail: mvlassov@mail.ru

ARTICLE INFO

Received December 12, 2017
Revised from December 24, 2017
Accepted February 23 2018
Available online March 15, 2018

JEL classification:

031, 022.

DOI: 10.14254/1800-5845/2018.14-1.9

Keywords:

intellectual development,
human capital,
Hi-Tech Productions.

ABSTRACT

The subject of research are the directions of development of the intellectual capital at the hi-tech enterprises. Objective of this research is development of almost applicable technique of quantitative assessment of the generation of knowledge for the hi-tech enterprises allowing to make evidence-based administrative decisions. Research hypothesis. Authors consider that at the hi-tech enterprises the chelovesky capital is a basis of development of the intellectual capital. The author proposes the following definition: the human capital of high-tech enterprises consists in a set of abilities and skills obtained because of training, as well as the scientific activities of workers necessary for the effective operation of the enterprise. Within the framework of this study, the hu-man capital of the firm will be considered only from the point of view of intellectual activity. In connection with the basis for increasing the competitiveness of products in high-tech enterprises being to increase the efficiency of intellectual activity, which is primarily ensured by the continuous improvement of the qualifications of scientific workers. Authors have received the indicator "an intellectual share in development of the human capital" which is quantitative assessment of generation of knowledge of the hi-tech enterprises. An indicator "the intellectual share in development of the human capital" represents the relation of a gain of the intellectual capital to a gain of the human capital. On each of stages life cycle of a product, it is necessary to count separately an indicator "an intellectual share in development of the human capital" because on each of stages intellectual and human the capital of the hi-tech enterprise have different components. The theoretical importance consists in receiving an indicator "an intellectual share in development of the human capital" developing the methodical device of economy of knowledge which can become further a basis for quantitative assessment of processes of generation in various fields of managing.

INTRODUCTION

In an era of innovation, high-tech enterprises carry out highly complex tasks in the competitive development and production of science-intensive products. In this context, questions of the effectiveness of knowledge generation activities, which include the processes of creation, accumulation and diffusion of knowledge at the level of the firm, as well as the processes of consumption, transmission and knowledge exchange both within the organisation and in interaction with the external environment, come to the fore. It is therefore important to assess the resource requirements for changing knowledge generation processes (Popov, Vlasov and Hanusch, 2017). Here, due to the constant reduction in creation timescales and the growing quality demands placed on technologically innovative products, the question naturally arises as to how the effectiveness of this type of activity may best be assessed and improved.

The purpose of this study is to develop a method for assessing the intellectual development of human capital in high-tech enterprises. In order to develop a method applicable to high-tech enterprises in the instrument-making industry, it is necessary to consider existing methods used in industrial organisations and assess their applicability in high-tech enterprises.

1. THE INFLUENCE OF INTELLECTUAL CAPITAL ON INNOVATION

After several decades of research, the complex question of the connection between intellectual capital and radical innovation remains unresolved. Problems associated with the accumulation of intellectual capital in connection with radical innovations have been investigated. It has been demonstrated that the connection between radical technological innovations and intellectual capital loses its intensity once a certain level of technological capital has been achieved. However, the relationship between human capital and radical innovation increases exponentially, growing more intensively once a certain level of human capital has been reached. On the other hand, the relationship between human capital and radical innovation is linear and positive (Delgado-Verde, Martin-de Castro and Amores-Salvado, 2016).

In their article based on a large-scale empirical analysis, Galeitzke, Steinhofel, Orth and Kohl argue that under contemporary economic conditions intellectual capital becomes the basis not only for the development of innovations created by a particular firm, but also for business success in general (Galeitzke, Steinhofel and Orth and Kohl, 2017).

An analysis of the causal structure of the development of intellectual capital using the DEMATEL method is the subject of an article by Sekhar, Patwardhan and Vyas. The DEMATEL method for analysing multifactorial problems allows expert evaluation of the degree of influence (correlation) of the i-th risk factor on the j-th factor of the development of intellectual capital, $1 \leq i, j \leq n (n=14)$. The attitude and behaviour of employees, which is important for the management of the enterprise, is initiated in different ways by various factors of intellectual capital. This helps the firm's management to analyse the various dynamic circumstances that lead to different outcomes. The experimental study made it possible to evaluate these combined actions as well as the causal structure of the development of intellectual capital (Sekhar, Patwardhan and Vyas, 2017).

Business Model Innovation (BMI) has become a key approach for creating new value.BMI is important for newly established as well as existing companies, especially those in the high-tech industrial sector. The study by Elia, Lerro, Passiante and Schiuma was devoted to questions of how high-tech enterprises update their BMI to develop the size of their intellectual capital (Elia, Lerro, Passiante and Schiuma, 2017).

In Soo, Tian, Teo and Cordery's article, a study of the role of intellectual capital in the development of human resources (HR) in relation to the innovative replenishment of the firm is presented. The results confirm that various HR-based methods used for increasing intellectual capital affect the innovative replenishment of the firm (Soo, Tian, Teo and Cordery, 2017).The study ex-

plores the theme of the relationship between intellectual capital and innovation by analysing the role played by the effective development of human and structural capital as the determinants for achieving technologically innovative products (Manzaneque, Ramirez and Dieguez-Soto, 2017).

The effective management of intellectual capital resources increases the capacity of the organisation to create new value. Intensive interactions between various tangible and intangible assets transform organisations into complex systems of interconnected resources; therefore, the use of a system approach alongside the causal scheme of the innovation cycle provides a feedback structure for the interaction of resources. The developed resource interaction model is demonstrated by means of a practical algorithm indicating the different dimensions of resource use, including the potential value of resources, the use of resources in key business processes and the mechanisms for sustained growth of strategic resources (Zakery and Afrazeh, 2017).

Increasing competition and improvements in the quality of products has led to the need for organisations to solve complex management tasks. Corporate entrepreneurship is one of the most important factors affecting the success and growth of organisations. Intellectual capital can be considered as one of the key elements of corporate entrepreneurship. In the study carried out by Bahrami, Nosratabadi and Illes, a response to the question of how the components of intellectual capital affect corporate entrepreneurship was formulated. In other words, the influence of intellectual capital components (employee competencies, innovation capital, internal structure, social capital and external structure) on corporate entrepreneurship was investigated. The results show that the components of intellectual capital have a significant positive effect on corporate entrepreneurship (Bahrami, Nosratabadi and Illes, 2016).

In the study conducted by Krstic and Bonic, the importance of intellectual capital – knowledge not recorded as assets on enterprise balance sheets – is stressed. Due to the high salience of this form of capital, managers need access to reliable information about it in order to expedite effective processes by which it can be managed. The problem of measuring intellectual capital has been attracting growing interest over the past two decades, both in the academic community and in management practice. The authors propose a new methodological framework for overcoming the problem of measuring intellectual capital in high-tech enterprises. Efficiency of Intellectual Capital (EIC) comprises a methodological framework that offers practical solutions for measuring the effectiveness of such capital in high-tech enterprises. By means of the EIC structure, financial accounting estimates are linked to market valuation (Krstic and Bonic, 2016).

The increasing research interest in intellectual capital, however, relies on a variety of definitions and the development of a variety of measuring tools. However, research focusing on the relationship between innovative management and intellectual capital in the context of small and medium-sized enterprises has been conspicuous by its absence. The role of the technological innovation strategy as regards the development of intellectual capital in general – and concerning innovative productivity in the production of small and medium-sized enterprises in particular – was investigated. The results demonstrate that the strategy of technological innovation affects all components of intellectual capital. Internal structural capital supports creative and human capital, with the latter affecting the company's technologically innovative productivity (Verbano and Crema, 2016; Strazdas and Cerneviciute, 2016).

2. METHODS FOR EVALUATING INTELLECTUAL ACTIVITY

The method proposed by M.A. Bocharova and A. A. Kuzmina assumes a systemic intangible assessment of the state of the system for managing the creation of new knowledge before and after the implementation of the changes. This method of evaluation comprises several stages: determining the intellectual capital of the enterprise, determining the impact on the effectiveness of the enterprise of changing the amount of intellectual capital and determining the means of monitoring intangible assets (Bocharov and Kuzmina, 2010; Okoń-Horodyńska et a., 2015).

First stage. Determination of the total amount of intellectual capital owned by the organisation (Tobin coefficient) (Zagorodnova and Novikov, 2014). This coefficient is calculated as the ratio of the market valuation of the firm to the replacement price of its real assets (buildings, structures, equipment and supplies) (Lipatnikov and Galdikaite, 2013). Subsequently, a comparison of the results obtained before and after the organisation of knowledge management is carried out. In this case, it is possible to make a qualitative assessment of how knowledge management influenced the market valuation of the organisation (positively or negatively); this is referred to as the coefficient of change. The main drawbacks of this method include:

- the action of the temporal factor (the effect of the organisation of knowledge management tends to be manifested in the long term);
- since a decrease in the coefficient in the long term may be due to a significant increase in real assets, an additional factor analysis of the causes of the decrease is necessary;
- since a real estimate of the value of an organisation manifests itself at the time of its purchase / sale on the stock market, itis hard to evaluate it in abstract terms;
- the lack of effective markets for information and intellectual resources that can determine their real price; imperfection of the accounting policy of the organisation, which limits the number of types of expenses that can be formally attributed to the formation of intangible assets.

Second stage. If it is determined that the coefficient of change calculated after the organisation of knowledge management has a value higher than the corresponding coefficient before implementation (and this is not related to the partial liquidation of tangible assets), it is possible to determine the effect of the change in the amount of intellectual capital on the performance of the enterprise using the formula:

$$K\ chg = \Delta\ IC / \Delta\ Profit \quad (1)$$

where:

- K chg is the coefficient reflecting the effect of the change in the amount of intellectual capital on the performance of the organisation;
- Δ IC is the difference between the amount (value) of intellectual capital before and after the organisation of knowledge management;
- Δ Profit is the difference between the profit received before and after the organisation of knowledge management (or the average profit obtained with the previous value of intellectual capital and the new value of intellectual capital).

Third stage. Monitoring of intangible assets. This method is most attractive out of the set of non-stochastic knowledge assessment methods in terms of the breadth of its coverage and capability of evaluating all the components of the organisation's knowledge management system. The monitoring of intangible assets comprises a system of various indicators that reflect the state of the intellectual assets of the organisation. The methodology for determining the effectiveness of the organisation of knowledge management is not so much the calculation of specific numerical values, but rather the comparison of the two states of the object: before and after the implementation of the knowledge management system.

The presented method is applicable in commercial high-tech organisations, where the significant indicators are: customer satisfaction, sales level, proportion of major consumers, frequency of repeat orders and the commitment index of the brand manufacturer. However, these criteria cannot be evaluated at high-tech enterprises that fulfil state orders. In this regard, the considered approach is difficult to apply to high-tech industrial manufacturers that are financed from the state budget, since having limited sales markets and a low level of competition.

P. A. Kalachikhin proposes to use the economic-mathematical model of the innovation potential of the results of intellectual activity to determine the effectiveness of the knowledge generation

system, taking into account the peculiarities of high-tech enterprises of the instrument-making industry (Kalachikhin, 2014). The evaluation of innovative capacity components is assumed to refer to, namely: competitiveness (relevance, accomplished work, salience, practical significance, authorial preparedness, connections with other areas, abstractness, breadth of topic, timing of implementation, copyrights), resource availability (cost of allocated resources, requested resource costs), efficiency (resource potential, expected profit), feasibility (risk of achieving a negative scientific result, risk of financial losses in the implementation, risk of failure to commercialise the project results). However, calculations require the use of complex mathematical formulas, making analysis difficult.

S. N. Yashin and S. D. Karlina (2014) propose the use of an integral index of innovative development in industrial enterprises, including calculations for the following parameters:

- the number of employees engaged in the implementation of research and development work;
- the level of development of new technology;
- the level of production of new products;
- the equipping level of material R&D resources;
- the level of the enterprise's intellectual property;
- the proportion of investment in innovative projects.

Based on the method of weighting coefficients, it is proposed to calculate the integral index by the formula:

$$II = \sum WiKi \qquad (2)$$

where

- II is the integral indicator of innovation development of the analysed enterprise;
- Wi is the weight of a single indicator in the total amount;
- Ki is the calculated average value of the corresponding indicator for a certain period of time.

It is proposed that the integrated indicator be calculated for each individual period of time, constructing a graph of sliding curves necessary for calculating the change in the index of innovation development. The advantage of this method is its adaptation to the activities of industrial enterprises; however, its main drawback consists in the inadequate study of the characteristics of high-tech enterprises and the absence of any rigorous analysis of the results of intellectual activity.

Table 1. Methods for assessing the effectiveness of knowledge generation

Method	*Short description*	*Advantages and disadvantages*
1. Calculation of the influence of the change in the amount of intellectual capital on the performance of the organisation	Assumes a comprehensive intangible assessment of the state of the system for managing the creation of new knowledge before and after the implementation of the changes. This method of evaluation comprises three stages: determining the intellectual capital of the enterprise, determining the impact on the effectiveness of the enterprise of changing the amount of intellectual capital and determining the means of monitoring intangible assets.	Advantages: the possibility of assessing two conditions of the object, i.e. before and after the implementation of the knowledge management system; ideal for commercial high-tech organisations. Disadvantages: the proposed criteria cannot be estimated at high-tech enterprises that fulfil state contracts.
2. Evaluation of effectiveness of increment	This is based on an estimation of intellectual capital of the self-learning or-	Advantages: the knowledge increment efficiency indicator reflects both the

of knowledge	ganisation of a manufacturing company. This method assumes the calculation of the effectiveness of knowledge increment index, representing the ratio of the index of the average coefficient of knowledge increment considering the organisation as a whole relative to the index of costs associated with increasing workers' knowledge:	effect of the activity on ge-neration of knowledge, and its eco-nomy, i.e., in terms of achieving the goal with minimal costs. Disadvantages: the time factor, which is a key factor for high-tech enterprises, is not considered.
3. Evaluation knowledge generation activities	This is based on two types of valuation: monetary and non-monetary. The cost indicators include the initial, replacement and residual value.	Advantages: it has a value expression. Disadvantages: it does not contain an assessment of organisational knowledge, does not take into account many indicators of intellectual capital and is not applicable to high-tech enterprises in the instrument-making industry.
4. Evaluating the innovation potential of the results of intellectual activity.	Includes an assessment of the diverse components of the innovation potential of a high-tech enterprise: competitiveness, resource availability, efficiency, feasibility, etc.	Advantages: the assessment involves multiple components. Disadvantages: the complexity inherent in the calculations, the inability to apply calculations at large high-tech enterprises of the instrument-making industry
5. Evaluation of the level of innovation activity based on an analysis of indicators of statistical and financial reporting	Includes the calculation of the integral index of innovative deve-lopment of industrial enterprises, as well as the construction of a graph of sliding curves necessary to calculate the change in the index of innovation development.	Advantages: adaptability to the activities of industrial enterprises. Disadvantages: insufficient study of the characteristics of high-tech enterprises, including the lack of evaluation of the results of intellectual activity.

3. ORIGINAL METHOD FOR ASSESSING KNOWLEDGE GENERATION

After analysing the literature, the authors came to the conclusion that there is no practically applicable method for quantifying the generation of knowledge for high-tech enterprises to support the taking of scientifically-based management decisions. For a solution to the stated problem in terms of a scientific hypothesis, the existence of a direct relationship between the growth of intellectual capital and the growth of human capital, i.e., the increment in the costs of ensuring the intellectual activity of workers, can be asserted:

$$\Delta IC \rightarrow \Delta HC \quad (3)$$

Human capital in a broad sense is an intensive productive factor in economic development as well as in the development of society and the family, including the educated part of the labour resource, knowledge, tools of intellectual and managerial work, the living environment and labour, ensuring the efficient and rational functioning of human capital as a productive factor of development (Korchagin, 2005). Human capital is characterised by a system of indicators that reflects the reproduction processes of the population, their possibilities (capabilities) in meeting their needs under the prevailing circumstances of life, taking into account the prevailing state of health, security and environmental conditions. There are three main types of human capital (Smirnov, Soshnikov, Romachin and Skoblyakova, 2005): individual human capital, the firm's human capital and national human capital. The human capital of the firm consists of factors such as professionalism, knowledge, information services, health and optimism, the law-conformity of employees, their creativity and efficiency, etc.

We propose the following definition: the human capital of high-tech enterprises consists in a set of abilities and skills obtained as a result of training, as well as the professional and scientific activities of workers necessary for the effective operation of the enterprise. Within the framework of this study, the human capital of the firm will be considered only from the point of view of intellectual activity. In connection with the basis for increasing the competitiveness of products in high-tech enterprises being to increase the efficiency of intellectual activity, which is primarily ensured by the continuous improvement of the qualifications of scientific workers, we propose to calculate of the increment of human capital using the following formula:

$$\Delta IC = \frac{CT_2}{CT_1} \quad (4)$$

where:

- ΔIC – increase in human capital
- CTn – the cost of training for the n-th period.

On the other hand, human capital forms a part of the intellectual capital. Intellectual capital consists in the knowledge, skills and experience of specific people and intangible assets, including patents, databases, software, trademarks, etc,., which are used to maximise profits as well as contribute to other economic and technical results(Sergeev, 2012). According to the studies conducted by Belkin V. N., Belkina N. A., Antonova O. A., Luzin N. A., the fact that intellectual capital is based only on new knowledge that is expressed in the cost of patents, licenses, know-how, new software – in short, in the cost of the results of the organisation's intellectual activity. A formula for calculating the growth of intellectual capital is proposed:

$$\Delta IC_n = \sum_{n-1}^{i} K_i P_i \quad (5)$$

where:

- ΔIC_n – the increase in intellectual capital in the n-th period of time.
- $K_i P_i$ – the cost of the results of the intellectual activity of the organisation.

In connection with the fact that the main activity of high-tech enterprises in the instrument-making industry is associated with obtaining patents and licenses, registering know-how, etc., the calculation of intellectual capital does not take into account the wages of employees, as these are not included in the main type of activity.

On the basis of the foregoing, and in the development of the proposed hypothesis, the increment in the costs of providing intellectual activity for workers, reflecting the interrelation between the intellectual and human capital of a firm, can be expressed as follows:

$$\Delta I = \frac{\Delta IC}{\Delta HC} \quad (6)$$

where:

- ΔI – coefficient of the intellectual proportion of the development of human capital;
- ΔIC – increase in intellectual capital;
- ΔHS – increase in human capital.

Moreover, a short time period is chosen for the calculation, one in which the firm cannot change other production factors, but only the indicators of intellectual and human capital change. Thus, an original approach is developed for the estimation of the increment of the intellectual capital of the enterprise in the course of innovative activity: the coefficient of the proportion of intellectual capital in the development of human capital, which is equal to the ratio of the change in the growth of intellectual capital to the change in the growth of human capital of a high-tech enterprise involved in innovative activity. The difference between the authors' original approach and existing approaches is that the increment of knowledge is assessed in the structural breakdown of high-tech enterprises of the instrument-making industry: the educational level of workers; the availability of R&D, technology, intangible assets; the availability of developed software products; the existence of implemented and applied information technologies.

4. EMPIRICAL STUDY

In order to confirm the developed approach, an empirical study into the applicability of the coefficient of intellectual proportion in the development of human capital, as the most appropriate assessment of the generation of knowledge in high-tech enterprises, was carried out. The analysis was conducted at an enterprise that is engaged in fulfilling a permanent state order, having a stable growth in profits. In the period between 2012 and 2016, data were gathered on the results of innovation and the creation of inventions, as well as on the costs of training scientific personnel. In order to determine the values of intellectual capital, an analysis was performed on the number of publications on the subject of the enterprise, as well as obtained patents for inventions, developed industrial designs, utility models and software (additional results of intellectual activity). The indicator of the balance sheet of intangible assets for 2012 was used for the comparison base. The value of each result of intellectual activity was established using the expert method.

Having further synthesised the obtained results using Formula 8, as well as carrying out a normalisation of the indicators for the growth of intellectual capital for each considered year, respectively, to the base year (2012), an array of data was obtained in the form of a relative increase in intellectual capital. In order to determine the values of human capital, the costs of training personnel working in the generation of knowledge on the subject of the enterprise were estimated. A standardisation of the indicators for the increase in the cost of staff training for the base year (2012) was carried out, and, using Formula 6, an array of data obtained in the form of a relative increase in human capital.

5. RESULTS AND DISCUSSION

On the basis of the final indicators, the coefficient of the intellectual proportion of the development of human capital,reflecting the effect of a change in the value of human capital on the intellectual capital of the organisation without making changes in the system of knowledge generation, was calculated using Formula 8. The coefficient ΔI was calculated for the period from 2012 to 2016. The data obtained are presented in Table 2.

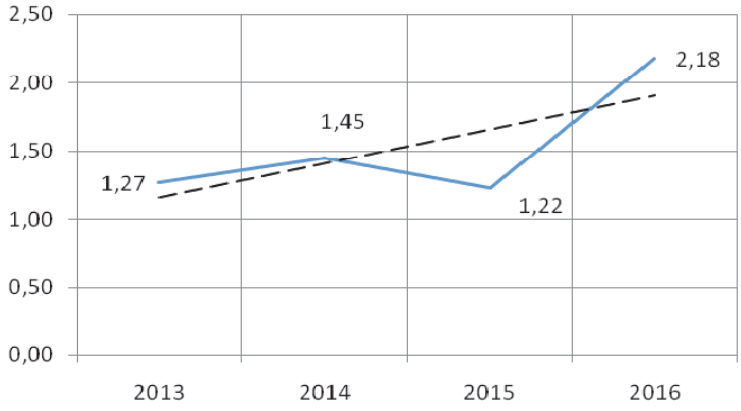
Table 2. Coefficient of the intellectual proportion of the development of human capital 2012-2016

Indicator	*Years*				
	2012	*2013*	*2014*	*2015*	*2016**
Δ IC, increment to the base year (2012), %	100	113	140	210	135
Δ HC, increment to the base year (2012), %	100	143	203	258	294
Δ I	1	1.27	1.45	1.22	2.18

*The refinancing rate of the Central Bank of Russia 2012-2015 applies to 2016 prices.

A graph was constructed to represent the dependence of the growth of intellectual capital on the change in human capital on the basis of calculated indicators for the visibility of the results of the empirical study (Fig. 1).It can be seen that the trend line has a positive slope angle.

Figure 1. Change in the coefficient of the intellectual proportion of the development of human capital; ΔI for 2012-2016



– – –– Trend line

Figure 2. Variants of the slope of the trend line Δ I

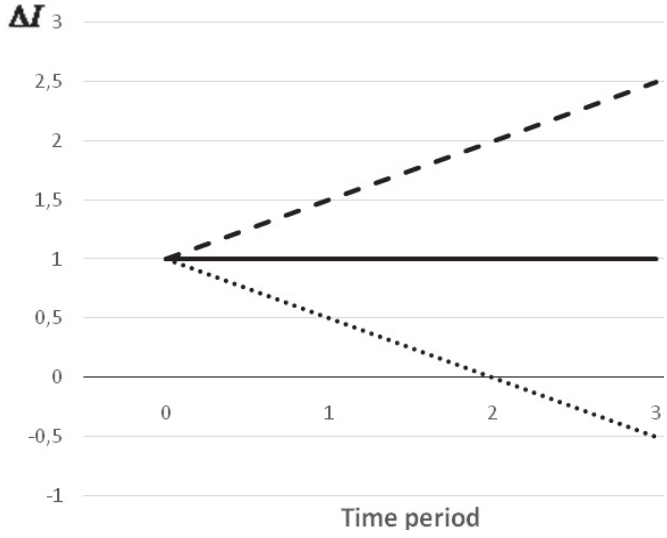


Figure 2 shows possible variations in the slope of the trend line of the intellectual proportion of the development of human capital.

It is possible to construct the following interpretation of the angle of inclination of the trend line of the coefficient of the intellectual proportion of the development of human capital.

The trend line ΔI has a positive angle of inclination in the event that the growth of intellectual capital is caused by the growth of human capital. In this situation, the growth rate of intellectual

capital exceeds the growth rate of investments in human capital, indicating the effectiveness of investment in education.

The trend line Δ I has an inclination angle of zero when investments in human capital account for a constant present level of intellectual capital. Here it is possible to talk about the lack of a "safety margin", since the probability of external factors influencing the growth / decrease of the intellectual capital of the enterprise is high.

The trend line Δ I has a negative angle of inclination when changes in intellectual capital do not cause a growth in human capital.In this case, the intellectual capital of the enterprise tends to decline.

It can be seen from Figure 1 that the trend line of the coefficient of the intellectual proportion of the development of human capital has a positive angle of inclination. It is evident that, in the large state-owned enterprise studied, the growth rate of expenditures on human capital does not exceed the growth rate of intellectual capital. In other words, the cost of personnel contributes to a growth in the effectiveness of scientific activity.

CONCLUSION

As a result of the conducted researches, the authors developed a methodical approach to the evaluation of the results of knowledge generation depending on changes in human potential. Based on the nature of problems raised relative to the knowledge generation system, the specific indicators of the proposed method can be changed.

The theoretical significance of the obtained results is to expand the methodological apparatus of the theory of the knowledge economy, serving as a basis for further research on the quantification of knowledge generation processes.

The practical significance of the study is that the application of the proposed approach to assessment of the intellectual proportion of the development of human capital developed in the thesis allows operational management decisions to be taken in response to external factors.

ACKNOWLEDGMENT

Article is prepared according to the plan of research works of Institute of Economy UB RAS.

REFERENCES

Bahrami, P., Nosratabadi, S., Illes, C. B. (2016), "Role of Intellectual Capital in Corporate Entrepreneurship", *Quality-access to success*, Vol. 17, Issue 155, pp. 111-115.

Bocharov, M. A., Kuzmina, A. A. (2010), "Approaches to the estimation of the effectiveness of control system of the knowledge of contemporary organizations", *Transport Business of Russia*, No. 9. pp. 162-165 (in Russian).

Delgado-Verde, M., Martin-de Castro, G., Amores-Salvado, J. (2016), "Intellectual capital and radical innovation: Exploring the quadratic effects in technology-based manufacturing firms", *Technovation*, Vol. 54, pp. 35-47.

Elia, G., Lerro, A., Passiante, G., Schiuma G. (2017), "An Intellectual Capital perspective for Business Model Innovation in technology-intensive industries: empirical evidences from Italian spin-offs", *Knowledge management research & practice*, Vol. 15, Issue 2, pp. 155-168.

Galeitzke, M., Steinhofel, E., Orth, R., Kohl, H. (2017), "Intellectual Capital-Driven Technology and Innovation Management", *International journal of innovation and technology management*", Vol. 14, Issue 5.

Kalachikhin, P. A. (2014), "Methodology for Evaluating the Innovative Potential of the Results Intellectual Activity in the Defence-Industrial Complex", *Statistics and Economics*, No. 5, pp. 165-169.

Korchagin, Yu. A. (2005), *Russian Human Capital: a Factor of Development or Degradation?*, CIRE, Voronezh (in Russian).

Krstic, B., Bonic, L. (2016), "EIC: A New Tool for Intellectual Capital Performance Measurement", *Prague economic papers*, Vol. 25, Issue 6, pp. 723-741.

Lipatnikov, V. S., Galdikaite, K. V. (2013), "Calculation of the Tobin Coefficient for the Estimation of Intellectual Capital", *Economics and Management: Collection of Scientific Papers,* Part 1, pp. 103-108.

Manzaneque M., Ramirez Y., Dieguez-Soto J. (2017), "Intellectual capital efficiency, technological innovation and family management", *Innovation-management policy & practice,* Vol. 19, Issue. 2, pp. 167-188.

Okoń-Horodyńska, E., Zachorowska-Mazurkiewicz, A., Wisła, R., Sierotowicz, T. (2015), "Gender in the Creation of Intellectual Property of the Selected European Union Countries", *Economics and Sociology*, Vol. 8, No 2, pp. 115-125.

Popov, E. V., Vlasov, M. V., Hanusch, H. (2017), "Traditional Economy Influences on Intellectual Capital Development", *Montenegrin Journal of Economics,* Vol. 13, No. 1, pp. 87-95.

Sekhar, C., Patwardhan, M., Vyas, V. (2017), "Study of Intellectual Capital Dimensions in IT Industry Using DEMATEL Method", *Journal of information & knowledge management,* Vol. 16, Issue 3.

Sergeev, A. (2012), *Intellectual Capital of Management.Theory and Trends in Russia*. LAP LAMBERT Academic Publishing GmbH & Co. KG., Saarbrücken.

Smirnov, V. T., Soshnikov, I. V., Romachin, V. I., Skoblyakova, I. V. (2005), *Human Capital: Content and Types, Evaluation and Stimulation*, Orel State Technical University, Orel (in Russian).

Soo, C., Tian, A. W., Teo, S. T. T., Cordery, J. (2017), "Intellectual Capital-Enhancing HR, Absorptive Capacity, and Innovation", *Human resource management*, Vol. 56, Issue 3. pp. 431-454.

Strazdas, R., & Cerneviciute, J. (2016). "Continuous improvement model for creative industries enterprises development". *Transformation in Business & Economics*, *15*(2), 46-60.

Verbano, C., Crema, M. (2016), "Linking technology innovation strategy, intellectual capital and technology innovation performance in manufacturing SMEs", *Technology analysis & strategic management*, Vol. 28, Issue. 5, pp. 524-540.

Yashin, S. N., Karlina, S. D. (2014), "Method of Sliding Curves in the Estimation of Innovative Development of Industrial Enterprises*", Financial Analytics: Problems and Solutions*, No. 45 (231), pp. 24-34.

Zagorodnova, L. V., Novikov, N. I. (2014), "The Q-tobina Coefficient – an Indicator of the Investment Potential of Ferrous Metallurgy Enterprises", *Bulletin of the Kemerovo State University*, Vol. 2, No. 2, pp. 236-240 (in Russian).

Zakery, A., Afrazeh, A. (2017), "Analysing intellectual capital management and growth based on dynamic modelling", *Knowledge management research & practice*, Vol. 15, Issue 1, pp. 101-113.