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HOME   Revista ESPACIOS ▾   ÍNDICES / Index ▾   A LOS AUTORES / To the AUTHORS ▾

Intellectual Resource as a Key Resource of Entrepreneurial Activity in the Structure of Assessment of the National (Russia) Economy's Intellectual Activity: Theory and Methodology of Research

El recurso intelectual como recurso clave de la actividad emprendedora en la estructura de evaluación de la actividad económica nacional rusa: Teoría y metodología de la investigación

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Content

ABSTRACT:

The purpose of the research is to develop a methodology for assessment of national economy's intellectual activity index based on the assessment of intellectual resources. For this purpose, the authors offer a methodology of evaluation. The main components of the national economy intellectual activity index are distinguished: intellectual resources, institutional environment, research and development, innovation activity. The qualitative and quantitative parameters are set to characterize the level of development of intellectual resources as a key resource of innovative development of national economy.
Keywords: intellectual resources, index of intellectual

RESUMEN:

El objetivo de la investigación es desarrollar una metodología para la evaluación del índice de actividad intelectual de la economía nacional basada en la evaluación de los recursos intelectuales. Para este propósito, los autores ofrecen una metodología de evaluación. Se distinguen los principales componentes del índice de actividad intelectual de la economía nacional: recursos intelectuales, entorno institucional, investigación y desarrollo, actividad de innovación. Los parámetros cualitativos y cuantitativos se establecen para caracterizar el nivel de desarrollo de los recursos intelectuales como un recurso clave del desarrollo innovador de la economía nacional.
Palabras clave: recursos intelectuales, índice de

| activity in national economy, institutional environment, scientific research, innovation activities. | actividad intelectual en economía nacional, entorno institucional, investigación científica, actividades de innovación. |

1. Problem setting

In the current conditions of development of the Republic of Belarus, the issues of effectiveness of assessment of institutions forming intellectual resources are of paramount importance, which is determined by reduction of a number of economic indicators characterizing the innovativeness of national economy and the role of intellectual resources, which are the main entrepreneurial resource in the development of innovation economy. Unfortunately, the problem of assessment of the role and place of intellectual resources as a key resource of entrepreneurial activity for the development of innovative character of national economy still remains open. This is mainly due to the lack of a unified approach towards the category in scientific community, as well as complexity of assessment of its qualitative and quantitative characteristics. Due to this circumstance, existing models, methods, and approaches that do not take into account a comprehensive assessment of intellectual resources are distinguished by significant inaccuracy of measurements. Significance of development of an index of intellectual activity in national economy (hereinafter – national economy intellectual activity index) is based on the assessment of its intellectual resources through introduction of the author's notion of economic content of the concept of "intellectual resources", specifics of its qualitative components, and the need to create effective economic institutions for the formation of intellectual resources as a key resource of entrepreneurial activity in the innovative development of national economy of the Republic of Belarus.

2. Recent research and publications analysis

 When developing the foundations of the theory and methodology for the formation of intellectual resources as a key resource for entrepreneurial activity in the innovative development of national economy, we used works of domestic and foreign researchers in the field of human and intellectual capital assessment such as: Stukach V.F., Lalova E.Y. (2012), Tsapenko I.V. (2005), Richardson K. (2004), Teslenko I.B. et al. (2014), Schiuma G., Lerro A. (2010), Edvinsson L., Yeh-Yun Lin C. (2011), Andriessen D. (2001), Weziak D. (2007), Wodecki A. (2006), Bontis N. (2004), "Wissensbilanzen für regionale Cluster und Netzwerkinitiativen", Kudryavtseva S.S. (2010), Makarova P.Y. (2013); intellectual resources assessment such as: Melnikov O.N. (2005), Kudryavtseva S.S. (2010), Ankudinov I.G. (2009), Oganyan K.M. (2013); and also international test and rating databases "The Global Innovation Index 2016: Winning with Global Innovation" (2016), "The Global Competitiveness Report, 2015–2016", World Economic Forum (2016), "The Global Information Technology Report 2014", "Knowledge Economy Index" (2012), "European Innovation Scoreboard" (2016), "Innovation in science, technology and industry" (2016).

Unresolved part of the problem: firstly, evaluation of intellectual resource as a component (sub index) in the assessment of national economy intellectual activity; secondly, increase of effectiveness of economic institutions that form an intellectual resource, a key resource of entrepreneurial activity and the main factor of imparting innovative character to the national economy.

Aim of the research. To develop a methodology for assessment of national economy intellectual activity index (Iia) based on assessment of intellectual resources.

3. Main results

Based on the essence and significance of intellectual resources, we consider it necessary to introduce such indicator as "national economy intellectual activity" defined in the form of an index into the system of assessments of the level of development of national economy. From the point of view of issue statement **theory and methodology** presupposes definition of the purpose, problems, structure, estimation indicators, methods (indicator method, method

of grades, and method of expert estimations). After that, the status of the object of evaluation is monitored, recommendations are developed.

In our case, the purpose of determination of the national economy's intellectual activity index is to develop recommendations for the development of intellectual resources as a key resource for entrepreneurial activity and the main factor in the development of innovative character of national economy. The task can be defined as identifying problem areas that impede innovative development of the national economy.

In the structure of intellectual activity index we include the following set of basic components: institutional environment (*IE*), intellectual resource (*IR*), results of research and development (*R&D*), results of innovation activity (*IA*). Into the institutional environment, we have included political stability of a country, regulators (government efficiency, regulatory efficiency, the rule of law) and business environment (compensation of reductions, procedures for starting a business, ease of bankruptcy, ease of tax payments), the data which is reflected in the database of international Global Innovation Index Research. The next component - intellectual resource - reflects both qualitative indicators (physical resource, mental resource, emotional resource, social resource, spiritual resource, deep resource), based on test data and world rank indices, and quantitative indicators reflecting the number of researchers and their level of education, which can be determined from the data of statistical sources. The spiritual resource indicator is very hard to define and measure. It is possible to use the research of S. Gusakivskaya conducted according to the method of S. Schwartz in the field of cultural value orientations (Gusakivskaya, 2014) for its determination. There also exists the problem of deep resource estimation. We propose to determine this indicator by the method of N.M. Lebedeva and A.N. Tatarko (Lebedeva & Tatarko, 2009). The next two components: results of research and development, and results of innovation activities include data on: research and development costs, high-tech exports, etc., which are also reflected in the data-bases of rating agencies and countries' statistical reports (Table 1).

Table 1
The structure of national economy intellectual activity index

Element	Indicator	Source
IE1	Political stability and absence of violence (terrorism)	Global Innovation Index
IE2	Government effectiveness	
	Effectiveness of regulatory bodies	
	Law supremacy	
IE3	Compensation of reductions	
	Procedures for opening a business	
	Ease of bankruptcy	
	Ease of tax payments	
IR1	Physical resource	Welfare index of countries: sub-index 'health'
	Mental resource	IQ indicator of the population (Lynn and Vanhanen)
		Welfare index of countries: sub-

		index 'education'
	Emotional resource	Emotional quoefficient (EQ)
	Social resource	Welfare index of countries: sub-index 'social capital'
	Spiritual resource	System of cultural value orientations (SVS57) – 'attainment', 'stimulation', 'power', 'safety'
	Deep resource	Index of individual innovativeness
IR2	Researchers, full employment per million population, *people*	Statistical data (Belarusian national statistical committee), Global Innovation Index, Organization for Economic Cooperation and Development.
	Graduation of post-graduate students and doctoral students (ISCED 6) per 1 000 people aged 25-34	
	Number of researchers with a scientific degree (PhD, Doctor of sciences) per million population, *people*	
R&D1	Domestic expenditure on research and development, *% of GDP*	
	Number of scientific and technical articles in journals calculated per billion GDP PPP $	
	H-index of publications	
	Number of resident patents applications filed in a national or regional patent office calculated per billion of GDP PPP $	
	Number of utility models applications filed by residents in a national patent office (per billion GDP PPP *$*)	
IA1	Share of SMEs implementing product or process innovations in the total number of SMEs, *percent*	
	Share of SMEs implementing marketing or organizational innovations in the total number of SMEs, *percent*	
IA2	High-tech net exports, *% of trade volume*	
	The number of approved trademarks applications of the population in a given national or regional fice calculated per 1 billion of GDP PPP *$*	
	Number of design projects contained in applications for industrial design, filed in a given national or regional office calculated per 1 billion of GDP PPP *$*	

	Export of cultural and creative services, *% of trade volume*		

We define a set of indicators based on the structure of intellectual activity index of a country, which causes differences in measurement units used: percent, unit, etc. For further calculations using the linear scaling method within the limits [0; 1], the indicators must be converted to reach a comparable form.

$$I_{ia} = \frac{X_i - X_{min}}{X_{max} - X_{min}} \text{ (or } I_{ia} = \frac{X_{max} - X_i}{X_{max} - X_{min}} \text{ for negative impacts),} \tag{1}$$

where: *Iia* - index of an element of intellectual activity; *Xi* - actual value of an indicator describing the i-th element of the index; *Xmin* and *Xmax* - minimum and maximum values of the indicator describing the i-th element; *i* is the number of indicators.

Proceeding from the purpose of the methodology, we accept the following limiting values of the index: 0 is the worst value of the indicator if it is possible to correlate with the indicators of other regions, countries, or years. If direct comparison is not possible, you can take a zero value of the indicator (the worst). If direct comparison is possible, 1 corresponds to the best value. Other values reflect development zones, i.e. act as target values in the short and long term. The evaluation of the indicators that make up the intellectual activity index (Iia) can be represented as follows (Table 2) (Makarova, 2013).

Table 2
Evaluation of the indicators making up the index of intellectual activity (Iia)

Element	Indicators	Amount			Index
		year	min	max	
Element					

Source: compiled by the authors on the basis of (Makarova, 2013)

After evaluating the components of intellectual activity index, one should evaluate the significance of the parameters. Here expert method or balance method can be used. Use of the balance method involves filling in the matrix of cause-effect relationships (vertically and horizontally located components of the index (Iia)) using the scale of influence of elements in the matrix: 0 - no effect; 1-moderate influence; 2 - significant impact (Table 3).

Further, based on the Pareto principle, it is necessary to remove insignificant influences, normalizing the values relative to the total amount. The construction of the influence matrix assumes 3 matrix variants: initial, normalized, purified.

Using the results obtained, index of the level of influence of each element in the structure of national economy intellectual activity (I*ia*) is calculated (Table 3).

Table 3
The index of the level of influence of each element in the structure of national economy intellectual activity (I*ia*)

Element	Total by lines	Total by columns	Independence line 2/ line 3	Share in the total amount by lines	Level of influence line 4 x line5
IE, IR, R&D, IA					
Total					

Source: compiled by the authors on the basis of (Makarova, 2013)

Based on the obtained data, it is possible to determine the national economy intellectual activity or its dynamics as an average of the state of elements, weighted by the level of their significance, by the method of integral estimates.

$$I_{ia} = \frac{\sum I_{iai} \times PI_{iai}}{\sum PI_{iai}} \qquad (2)$$

Where: *Iia* - integral estimate of intellectual activity of a country (region); *Iiai* - evaluation of the state of the i-th element of national economy intellectual activity; *PIiai* - evaluation of the level of influence of the i-th element of intellectual activity.

Taking into account the previously chosen rating scale: from 0 to 1, the level of national economy intellectual activity and just as important - the position of its constituent elements - are determined.

Then follows the analysis of evaluations of national economy intellectual activity, which can be carried out using a matrix (map) that compares the evaluations of elements of intellectual activity and assesses the level of their mutual influence. The distribution of data in the coordinate system will make it possible to identify the most influential elements (basic), elements with an average level of influence (which both make influence and experience influence), elements with the least influence (resulting).

The matrix (map) of intellectual activity of a country presupposes four-directions (zones) analysis: a low value of the state of elements and a weak effect of elements; high value of the state of elements with low impact estimate; high level of influence and low estimate of the state of elements; high indicators of influence and state. The deviations in the state of elements of intellectual activity from the integral estimate should be reflected in a tabular form (Table 4).

Table 4
Deviations of the state of elements of intellectual
activity from the integral estimate

Element	Condition, grade	Deviation from the integral estimate	Impact, grade	Relative level of impact
IE, IR, R&D, IA				
Integral estimate				
Total				

Source: compiled by the authors on the basis of (Makarova, 2013)

Analysis of the deviations in the state of elements of intellectual activity from the integral estimate is carried out in order to formulate subsequent recommendations on the development of constituent elements of intellectual activity of the national economy.

The next step of the methodology is to determine the directions of the national economy intellectual activity development, which can be focused on balancing the essential deviations of the constituent elements, on the formation of key features of the components of intellectual activity associated with the priority areas of the country's development, as well as on the even development of all components of intellectual activity, which presupposes the increase in synergetic effect.

4. Conclusions

The proposed methodology of assessment of national economy intellectual activity is characterized by a new vision of the author, because: firstly, national economy intellectual

activity index is brought out in scientific research of the domestic and international community for the first time; secondly, it is for the first time that six qualitative components of intellectual resources are built into the structure of assessment of the level of national economy intellectual activity (index): physical resource, mental resource, social resource, emotional resource, spiritual resource and deep resource that together determine the intellectual activity of the national economy innovative development in conditions of the institutional environment that was created in it at macro, meso, and micro levels to form an intellectual resource as a key resource of entrepreneurial activity and the factor of its innovative development.

The proposed methodology includes the following stages: aim-setting; formulation of the problem; identification of the structure of the index; selection of valuation indicators; transformation of indicators into a comparable form by the method of linear scaling; evaluation of the components of the intellectual activity index; assessment of the significance of parameters using the balance method based on the influence matrix, which includes three stages: initial, normalized, purified; determination of the level of influence of each element in the structure of intellectual activity; identification of country's national economy intellectual activity using the method of integrated estimates; analysis of national economy intellectual activity assessments using a matrix; analysis of the deviation in the state of elements of intellectual activity from the integral estimate (relative level of influence).

The study and assessment of the level of national economy intellectual activity will make it possible to identify problems of its innovative development at all levels more quickly and develop their main directions.

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