

## **METHOD AND MODELS OF BLOCK-RANK ANALYSIS OF THE VALUE FACTORS AS INDICATORS OF ECONOMIC SECURITY AND EFFICIENCY OF THE MANAGEMENT OF THE INTANGIBLE COMPONENT OF THE VALUE OF THE SCIENCE-BASED PROJECT-ORIENTED ENTERPRISES**

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**Summary.** The new approach to the determination of the economic security of the science-based project - oriented enterprises is considered. It is based on determination of management efficiency of the intangible component of their value. The rates of height of factors of value are used as indicators of the management efficiency estimation. They reflect the state, positive and negative influence, and purposeful betterment of objects of intellectual property and resulting index.

**Key words.** Project oriented enterprises, economic security, value, intangible component, management efficiency.

### **INTRODUCTION**

In modern terms of the global economic system evolution the different paradigms of passing to new strategies of development are examined. One of them has the name informatively-innovative [Buz'ko, Efremov 2010]. The other one's named as knowledge paradigm that underlining a difference between knowledge and information [Rach, Rossoshanska, Medvedeva 2011; Stepanova 2012].

But for today it's already became acknowledged axiomatic statement that an intellectual creative capital of the person is a main economic source. "The time has come when development of this source became not only an absolute necessity but the requirement of life-support of existence of human and the whole civilization" [Ghorelov, Krablova 2012].

To convert the knowledge into the material product of wide consumption (commodity) the new forms of activity organization of enterprises are

needed. Statistics shows that such form is the science-based project-oriented enterprise [Beresovsky 2011].

The projects as instruments of putting the innovations into business are the basis of their activity. Thus, as a criterion of "science-based" is not the character of activity organization but the laws of nature. The application of those laws determines descriptions of the receiving products in technological processes (technological modes) [Rossoshanska 2012]. For them "ability of human capital with high-frequency to generate rational ideas and provide the maximal rate of their implementation becomes the source of competitive advantage, steady development, and providing of economic security" [Atoyan, Lopuhin 2010].

Thus, the point of the choice of indicators that would characterize a presence of competitive advantage and economic security at the enterprise performed as informative sources of the enterprise management and approve the administrative decisions remains arguing and open.

### **ANALYSIS OF THE PUBLICATIONS**

The one may distinguish two groups of indicators that describe fundamentally different approaches from the point of the time measuring. The first one accents attention on a short-term prospect that is related to the competition for a consumer market that provides economic viability of enterprises. It corresponds to the "accounting

standard" of thinking when indicators of average profit, return on a capital are used. In other words, such indicators are analytical derivatives from the financial reporting [Teplova 2004]. The other one examines the health of enterprise from the point of the strategic planning. The main indicator of that is a gradual increase of the total value of the business. It corresponds to the "financial standard" of thinking when the modified indicators are also used from the financial reporting, but with the significant corrections. Except that, not the absolute indicators but their rates of height are examined for the reflection of dynamics of process of value creation [Shyshkin 2009; Shyshkin 2011]. Recently the approach oriented to the value of enterprise was considered most perspective [Shyshkin 2009; Eleneva 2011].

However neither accounting nor financial indexes that were used at the marked approaches are unable to represent reasons of creation of additional value. Therefore the "value based standard" that binds the health of the enterprise with the investing capital in development of human potential and R&D projects and programs comes on to replace financial standard of thinking. Its basic postulate is proclaimed in the paper [Karlsson, Wangerud, Axelsson, Sveiby, Anell, Vikstrom 1991]: "People and not capital that generate profit".

Theoretical bases of the management of the enterprise value has been become the object of research for many authors: [Drucker 1974], [Drury 2001], [Modigliani, Miller 1958], [Stewart, Bennet 1999], [Gryasnova, Fedotova 2003], [Oleyko 2002], [Shyshkin 2009], [Shnayder 2012].

But the decision in economic safe value based management of science-based project-oriented enterprises with an application of the value approach has not been found till now.

## THE GOAL AND TASKS OF RESEARCH

Management is feasible only when corresponding indicators and methods of working of these indicators will be found. Therefore a research aim is to search of the approach to the construction of model and its components, that would give an opportunity, first of all, to estimate the state of economic security of the science-based project-oriented enterprises (SBPOE) and to accept rational decisions in the value management of their intangible component that is more significant for them than tangible one.

## THE MAIN RESULTS AND THEIR ANALYSIS

Any enterprise as well as a human exists when it moves, i.e. perform an activity as an active integrity. Therefore the possibility of providing the continuous activity becomes a criterion of economic security of the enterprise [Rossoshanska, Rach 2012].

For the SBPOE the performance of such activity will be a permanent growth of the intangible component of the value. In this context under the economic security of the SBPOE one should understand employees' sufficiency of own methods and means in order to provide the continuous process of the motion at direction of creation and implementation of new knowledge: the objects of intellectual property, especially those which would provide the growth of the value of the SBPOE.

The creators of the intellectual property objects are employees of the SBPOE, competent persons. It is competent person who is able to make it in terms that constantly changing and practically never repeating [Rossoshanska 2011]. And it is impossible to attain, if they will not be able to "join in the permanent self-training for all their life" [Ramazanov, Kalinenko, Rakova 2011]. A competence is an ability of the employee as a person within the frames of business processes for that he is responsible on the basis of present knowledge and the one that generated by him to design and realize the continuous activity of other employees in the direction of improvement and development the business processes in the conditions of spatio-temporal availability of methods and facilities [Rossoshanska 2012].

The effective growth of the value of the SBPOE will take place with the condition if the growth rates of the most "essential objects" will pass ahead the growth rates of other objects of intellectual property. Exactly this condition can be considered as the aim of value-based management of the intangible component of the SBPOE. From this point the objects of intellectual property on the criterion of importance is suggested to classify as following [Lyashenko 2010]: objects for competitive advantages (CA); objects for innovative activity (IA); objects for service activities (SA); non-traditional for the field of enterprise activity objects (NT). Any of the intellectual property objects are the potential sources of appreciation of market value of the enterprise. But the offered scale gives an opportunity to define the most essential objects and give them a rank.

As an author of the paper [Shyshkin 2009] marked the "economic process of the value creation does not exist out of the time". Therefore only the "dynamic criterion of the decision making model allows to form a structure that provides the optimal trajectory of development of economic process of the value creation". Such criterion mustn't set the concrete values of parameters that should be attained. It determines correlations of indicators. It is the providing of relations that gives the desirable growth of the market value of SBPOE and testifies to its economic security. And understanding of the "desirable growth" i.e. economic security is set subjectively, for example, by the committee of directors of the SBPOE, and is examined as the ideal state in relation to which the transient states of enterprise are measured. It's fully responds to the statement that "we are the source of any and every dangers ourselves, and the idea about the prescribed outside dangers is the essence of the converted form of psychological origin" [Rats, Sleptsov, Kopulov 1995].

The conducted researches of the essence of objects of intellectual property proved that regardless of the belonging to any of the marked group (CA, IA, SA or NT), it is possible to distinguish four blocks of indicators, essence of which represents: the condition of objects (C); the purposeful actions under their betterment (B); their positive (A<sup>+</sup>) and negative (A<sup>-</sup>) reverse actions on the value of the SBPOE.

Except that, to four objects it should be added another one, the additional element that is represents economic essence of value added from the use of objects in total, and that is why can be named as a "resulting" element. For the SBPOE such resulting element can be VIC - Value of Intangible Component that described in [Lyashenko 2012]. It is also possible to distinguish for him marked four blocks of indicators.

The pointed groups of objects, the blocks of indicators, and additional resulting element give an opportunity to build the matrix of correlation of indicators. It is built by the same rules that matrix with the use of EVA has been built [Shyshkin 2009] but taking into account its block configuration (fig. 1).

In this matrix a condition is executed that for the groups of objects VIC > CA > IA > SA > NT. In addition, within the limits of every group a condition is also executed: A<sup>+</sup> > B > C > A<sup>-</sup>. If a comparison of indicator in a line with an indicator in a column will perform that the growth rate of the first one passes ahead the growth rate of the second one then the crossing point must be filled in "1". In opposite case is "-1".

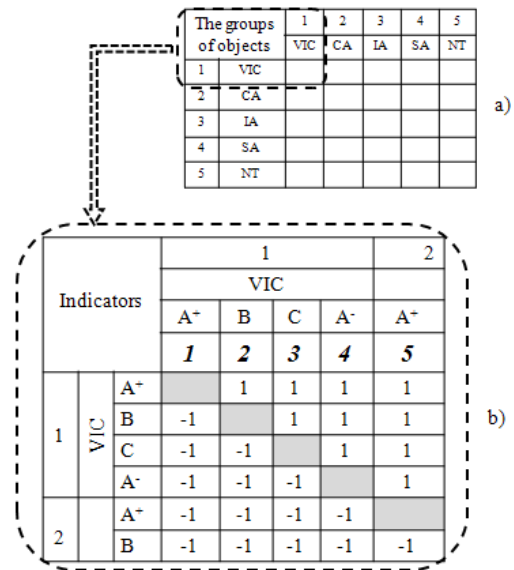


Fig. 1. The matrix of the correlation of indicators  
a – the block structure;  
b – example of the VIC group structure.

The base matrix that represents requirements, for example, from the committee of directors of the SBPOE in the top part from a diagonal must have only "1", and in lower, as a result of its symmetry, only "-1". The sequence of indicators in a matrix determines their ranks (a fat italic on the fig. 1 b). And a rank is used as an indicator for comparison in future. In the actual matrix of indicators "1" and "-1" are filled in depending on actual correlation of indicators that was compared.

The basis of further calculation is made by the matrix of deviations. It has the same dimension as the matrices of correlations of indicators. In it every cell filled in with "0" if the actual grade of indicator on a line did not change in relation to an indicator on a column, and "1", if it actually is. In every line a sum of "1" calculates. Then all sums are summarized to the sum of distinguished from base model correlations of indicators in comparing to actually attained model. On the basis of this sum and amount of indicators the Kendall's tau coefficient is calculated in the matrix. It performs as the integrated indicator of the state of the economic security and characterizes it as the phenomenon that is perceived from outside. In addition, it's examined as an indicator of the estimation of value-based management efficiency of the SBPOE's intangible component. Its comparing to the tabular value gives an opportunity to draw conclusion whether the hypothesis of independences of two selections that are presented in base and actual matrices is cast aside or not [Lopach, Chubenko, Babych 2002].

In this case it gives an opportunity to set the following: data of the matrices closely related between each other or not. With the presence of such relation it is possible to assert that regarding the deviation of actual correlations between the growth rates of indicators from base ones due to intangible component of the value the market value and present state of economic security of SBPOE increases. So, it is possible to consider satisfactory state of the enterprise in total.

The absence of the relations, first of all, testifies that employees showed not enough competence in creating the objects of intellectual property, and/or the created objects are not used in SBPOE to the extent that was planned from the beginning, and/or the received effect does not corresponds to that one planned. Thus, the economic security of SBPOE changes its motion from the state of the safety in direction of the danger [Rossoshanska, Rach 2012]. And the management of the value of the intangible component can be characterized as unsatisfactory.

The offered structure of the matrix contains 20 indicators. It's expediently to present every block of indicators not by one, but by two indicators. That gives an opportunity to enter another additional essence classification of indicators in the future. In that case, the amount of indicators increases to 40. And it considerably complicates the search of ways of change the direction of motion of economic security from dangerous to safe.

For the decision of this point the new approach to the analysis of the matrix of deviations is offered. It's based on principles of system-integral approach [Rach, Rossoshanska, Medvedeva 2010].

From the matrix of rejections as primary integrity (further on – i-matrix) separate blocks are distinguished after the amount of the objects' groups (fig. 2).

Indicators		VIC				Indicators		CA			
		A <sup>+</sup>	B	C	A <sup>-</sup>			A <sup>+</sup>	B	C	A <sup>-</sup>
VIC	A <sup>+</sup>		0	1	0	CA	A <sup>+</sup>		1	0	0
	B	0		1	1		B	1		1	1
	C	1	1		0		C	0	1		0
	A <sup>-</sup>	0	1	0			A <sup>-</sup>	0	1	0	

Indicators		IA				Indicators		SA				Indicators		NT			
		A <sup>+</sup>	B	C	A <sup>-</sup>			A <sup>+</sup>	B	C	A <sup>-</sup>			A <sup>+</sup>	B	C	A <sup>-</sup>
IA	A <sup>+</sup>		0	0	0	SA	A <sup>+</sup>		0	1	0	NT	A <sup>+</sup>		0	1	0
	B	0		1	1		B	0		0	1		B	0		1	1
	C	0	1		0		C	1	0		0		C	1	1		1
	A <sup>-</sup>	0	1	0			A <sup>-</sup>	0	1	0			A <sup>-</sup>	0	1	1	

Fig. 2. The matrices of the deviations for the groups of the objects

Kendall's tau coefficient is calculating for each of them. Then the most dangerous groups are found out on the basis of analysis of those calculations. Exactly in these groups in actual matrices there will be considerable divergences of correlations in comparing to the base matrix.

Then from the i-matrix are examined in pairs the groups of objects, and for them the matrices of deviation (fig. 3) are distinguished. For each of such matrix the Kendall's tau coefficients are also calculating.

Indicators		VIC				CA			
		A <sup>+</sup>	B	C	A <sup>-</sup>	A <sup>+</sup>	B	C	A <sup>-</sup>
VIC	A <sup>+</sup>		0	1	0	1	1	0	0
	B	0		1	1	1	0	1	1
	C	1	1		0	0	1	0	0
	A <sup>-</sup>	0	1	0		0	1	0	1
CA	A <sup>+</sup>	1	1	0	0		0	1	0
	B	1	0	1	1	0		1	0
	C	0	1	0	0	1	1		1
	A <sup>-</sup>	0	1	0	1	0	0	1	

Fig. 3. Example of the matrix of the deviations for two groups: VIC and CA

In the same way the combinations of three and four groups of objects are examined. Depending on values for every separate group of Kendall's tau coefficient, it is necessary to pick up the combinations that will give a maximum of information for the search of the most effective ways of motion in direction of economic safe state.

There is the matrix with different combinations of groups of objects and value for their Kendall's tau coefficient on the fig. 4. The calculation of coefficients for combinations of "CA-IA", "IA-SA" does not give new information because for every separate group of the block tau equaled a zero. There is also not much additional information in other combinations where the involved groups were with a zero value for the tau ("VIC-CA", "VIC-IA", "VIC-SA", "VIC-CA-IA", "VIC-CA-IA-SA").

		.07	.07	.07	.28	.37	.00	.00	.07	.29	.07	.03	.02	.20
VIC														
CA														
IA														
SA														
NT														

Fig. 4. The value of the Kendall's tau coefficient for the different combination for the groups of the objects

From the point of getting an additional information it's useful to calculate the coefficients for the different combinations of indexes for different groups that belong to one block (condition of the objects (C); the purposeful actions on their betterment (B); their positive (A<sup>+</sup>) and negative (A<sup>-</sup>) reverse action. There is an example of matrix of the deviations that was made for the indexes of betterment on the fig. 5.

**BETTERMENT**

<b>K=</b>		0,3333		VIC		CA		IA		SA		NT		The sum of the lines
				B		B		B		B		B		
				1	2	3	4	5	6	7	8	9	10	
				B <sub>1</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	
VIC	B	1	B <sub>1</sub>	0	1	1	1	1	1	1	1	0	0	6
		2	B <sub>2</sub>	0		1	1	1	1	1	1	1	1	8
CA	B	3	B <sub>1</sub>	1	1		1	1	1	1	1	0	0	7
		4	B <sub>2</sub>	1	1	1		1	1	1	1	0	0	7
IA	B	5	B <sub>1</sub>	1	1	1	1		1	1	1	0	0	7
		6	B <sub>2</sub>	1	1	1	1	1		1	1	0	0	7
SA	B	7	B <sub>1</sub>	1	1	1	1	1	1		1	0	0	7
		8	B <sub>2</sub>	1	1	1	1	1	1	1		0	0	7
NT	B	9	B <sub>1</sub>	0	1	0	0	0	0	0	0		1	2
		10	B <sub>2</sub>	0	1	0	0	0	0	0	0	1		2
The sum of the columns		6	8	7	7	7	7	7	7	7	7	2	2	60

Fig. 5. The Kendall's tau coefficient calculation for the indicators of betterment for all groups of the objects

By means of such combinations in a test example it was found out that the indicators of the condition and betterment had greater values (0,38 and 0,33) in relation to the indicators of positive action (0,13). From the position of motion in direction of economic safe state first of all it points on a necessity of activations of development of objects of intellectual property for the competitive advantages, and their putting into operation.

**CONCLUSIONS**

The analysis of the existent approaches to the management has proved that the "accounting" and "financial" standards of thinking were not effective in an era of the knowledge economy. They didn't take into account the main feature of such economy, when people but not capital that generate profit. Therefore, it's proven that the "valued standard" of thinking is needed for the science-based project-oriented enterprises. It's effective in the era of knowledge economy. Thus, the determination to the definition "economic security of the science-based project-oriented enterprises" had been given from this point of view. It was described as an ability of enterprise to increase its market value due to its intangible component.

The classification of the indicators for intellectual property objects was worked out on the base of the earlier classification of intellectual property objects on the criterion of importance that has been offered by one of the authors of this article. Essence of the last one has represented the condition of the objects; the purposeful actions on their betterment; their positive and negative reverse activity on the science-based project-oriented enterprises. Combination of the classifiers gave an opportunity to work out the model of construction of the indicators' correlation matrix that represents the terms of effective value based management of the science-based project-oriented enterprises.

The new method of block-rank analysis of activity results of the science-based project-oriented enterprises were worked out from the point of their economic security that had been based on the analysis of the Kendall's tau coefficient for the groups of objects of intellectual property and indexes of their height rates that characterized their use in the process of activity of enterprise calculated for different combinations of the groups.

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**МЕТОД И МОДЕЛИ БЛОЧНО-РАНГОВОГО  
АНАЛИЗА ФАКТОРОВ СТОИМОСТИ КАК  
ИНДИКАТОРОВ ЭКОНОМИЧЕСКОЙ  
БЕЗОПАСНОСТИ И ЭФФЕКТИВНОСТИ  
УПРАВЛЕНИЯ НЕМАТЕРИАЛЬНЫМ  
КОМПОНЕНТОМ СТОИМОСТИ НАУКОЕМКИХ  
ПРОЕКТНО-ОРИЕНТИРОВАННЫХ  
ПРЕДПРИЯТИЙ**

*Ольга Россошанская, Наталья Ляшенко*

Аннотация. Рассмотрен новый подход к определению экономической безопасности наукоемких проектно-ориентированных предприятий, основанный на определении эффективности управления нематериальным компонентом их стоимости. В качестве индикаторов оценки эффективности управления использованы темпы роста факторов стоимости, которые отражают состояние, позитивное и негативное влияние, а также целенаправленные действия по улучшению объектов интеллектуальной собственности и результирующего показателя.

Ключевые слова. Проектно-ориентированные предприятия, экономическая безопасность, стоимость, нематериальный компонент, эффективность управления.