

# ***Methodical Aspects of Economic Evaluation of Functioning Efficiency for Vertically-integrated Associations of Enterprises***

Baibakova T.V., Suvorova L.A.

Department of Economics  
Vyatka State University  
Kirov, Russia

bai\_t\_vic@mail.ru, larsuvorova@mail.ru

Epinina V.S., Azmina Y.M.

Department of Management  
Volgograd State University  
Volgograd, Russia

econmanag@volsu.ru, manag@volsu.ru

**Abstract** — The article considers different approaches to evaluating the efficiency of a vertically-integrated association of enterprises. Unlike the existing approaches, methodologies and groups of efficiency evaluating indicators that characterize the performance of certain aspects of the vertically-integrated association of enterprises activities, the authors of the article propose the methodology based on calculating and comparing individual and general efficiency indicators of current (operating), financial and investing activities of the vertically-integrated association of enterprises as a whole. These indicators are presented in the form of the coefficients. For the sustainable development of the vertically-integrated association of enterprises, it is necessary to monitor the performance indicators of current (operating), financial and investing activities constantly. This monitoring should be carried out at the level of organizations (enterprises), sectors and the integrated association of enterprises as a whole. Conducting the economic evaluation of the vertically-integrated association of enterprises' functioning helps to identify those organizations that have enhanced their potential and have a negative impact on the integrated association of enterprises performance.

**Keywords** – *vertically-integrated association of enterprises, economic evaluation, functioning efficiency*

## I. INTRODUCTION

One of the economic development directions is the integration processes in the field of industries. Integration processes proceed in different directions. However, from the authors' point of view, the vertically-directed integration is of great interest. It is the vertical integration that helps to balance the interests of the companies, which are members of the association, without canceling the reformation results. A "vertically-integrated association of enterprises" is considered by the authors as the integration of industrial enterprises and organizations on the technological basis in order to improve the quality parameters of the finished product, to optimize the costs of its production and sales, to develop mutually beneficial economic relations, to consolidate certain functional structures. The aim of integrating organizations and enterprises into an integrated association of enterprises is to strengthen its competitive potential and sustainable development.

"Sustainable development" is viewed as the simultaneous fulfillment of two conditions: the growth of production volumes on the basis of applying innovative technologies and the increase in the competitiveness of the manufactured products. Each process in the activities of the organization should be aimed at obtaining an effect (economic and (or) social), which results in increasing labour productivity, efficiency, return from used resources, profitability.

## II. DEFINING THE TASK OF THE RESEARCH

During the integration and after its completion, it is possible to expect various effects. These effects can include the changes in the market scale, the weakening of the natural monopolies positions, the growth of competitive pressure and the increase in the functioning efficiency of all market participants.

The important task of researching the functioning of a vertically-integrated association of enterprises is the economic evaluation of its activities efficiency.

Since each process in the activities of organizations and enterprises should be aimed at obtaining the effect (economic and / or social), it results in increasing labour productivity, efficiency, return from used resources, profitability.

Evaluation of the performance indicators of an integrated association of enterprises should allow comparing the performance of merging organizations and enterprises in specific conditions and should combine the indicators that are acceptable both for individual economic entities and for evaluating their joint activities [1].

## III. DEVELOPING THE APPROACHES TO EVALUATING THE FUNCTIONING EFFICIENCY OF VERTICALLY-INTEGRATED ASSOCIATIONS OF ENTERPRISES

The deep substance of entrepreneurship as a complicated and multiform socioeconomic phenomenon, oriented at gaining entrepreneurial profit and meeting the demands of as many consumers as possible, is a special economic risk

organization form, which in corresponding historical and socio-economic conditions provides the social reproduction with the necessary dynamics [2].

Producing a certain product or service is the main function of an entrepreneurial (economic) system. So, an entrepreneurial system's basics is production, in the framework of which various production resources and factors are developed. Thus, one can say that the process of managing entrepreneurial systems is production resources and factors 'rational development. When managing the production, entrepreneur's rational management decisions or influences are targeted at implementing the changes in the course of concrete resources and factors effective development [2].

Nowadays, there is a great number of publications concerning the problems of economic evaluation of the functioning efficiency [3-19].

Shmidt Yu.D., Romanova I.M. and Mikhina I.S. [5] offer to evaluate the functioning of the integrated association of enterprises in complex, that is, to evaluate simultaneously the financial, production, commercial and investing aspects of the activity in interaction and interconnection with each other. For each aspect, they offer the closed list of economic benefits.

To evaluate the functioning efficiency of vertically-integrated associations of enterprises, one can use different groups of indicators nowadays (Table 1).

TABLE I. GROUPS OF INDICATORS FOR EVALUATING THE FUNCTIONING EFFICIENCY OF A VERTICALLY-INTEGRATED ASSOCIATION OF ENTERPRISES

Group of Indicators	Indicators	Authors
The main indicators of functioning	The increase in volume of output. The increase in profit growth. Improving parameters of product quality. The increase in labour productivity. The increase in productivity from the use of labor and capital investments. The decrease in costs in the production process.	Gordeev A. V. [3]
Indicators summarizing the results of economic activity	Indicative industry profits. Indicative profitability. Indicative expenditures for a unit of output.	Kosholkina L., Borhunov N., Rodionova O. [4]
Indicators of the financial aspect of activities	The increase in the value of the enterprise. The decrease in transaction costs. Savings on tax payments. The decrease in overheads.	Shmidt U. D., Romanova I. M., Mihina I. S. [5]
Indicators of the production aspect of activities	Reduced costs of productive work. Improved product quality. The expansion of product range. The growth of returns from the use of means and objects of labour.	
Indicators of the investment aspect of activities	The increased investments in long-range assets. The increased investments in	

	the development of new technologies in the production of traditional and new products. The increased investments in production equipment.	
Indicators of evaluating the integrated organization potential	Evaluating the peculiarity of funds. Evaluating the market concentration. Evaluating the growth potential of the market power. Evaluating the effect of logistics decisions in the field of supplies.	Sitnikova T. V. [6]
Indicators for selecting potential organizations in order to build the integrated organization and their evaluation	Evaluating the potential of strength and sustainability of the cooperative. Evaluating the market potential Evaluating the effect of logistics decisions. Evaluating the merger of other organizations into the integrated structure.	
Indicators for monitoring the integrated company	Excluding the organizations that have exhausted resource efficiency from the structure The formation of new integration connections among the entered organizations or the inclusion of new companies	
Individual indicators	As for federal and state organizations, they are proceeds from selling the products of the companies that are members of the holding. As for regional and municipal organizations, they are the number of employees.	Shubin S. A. [7]
Indicators of the efficiency of using raw materials	The level of food consumption by population. The size of the gross product. The yield of marketable products. Gross income. Net profit.	
Indicators revealing the degree of integration	The availability of raw materials for the production. Capability. The distance of transporting raw materials.	
Determining the opportunities for increasing milk production in organizations, which are members of the integrated association	Stochastic simulation and optimization models.	Serduk A. N. [8]
Determining the best combination of industries in the reviewed agricultural organizations, taking into account the change in the production system structure.	Block-diagonal and optimization models.	
Investigating the possibility of including new agricultural organizations into the integrated association	Ranging the organizations by means of analytical hierarchical process, which is based on comparing alternatives in the field of management.	

Having analyzed the scientific literature on the subject of the research, one can divide the proposals of all authors into two groups.

The first group includes those authors who propose to evaluate the functioning efficiency of the integrated association of enterprises with the help of the quantitative approach, i.e. the cost approach, to be exact. This method of evaluation allows making one-sided analysis of functioning of the integrated association of enterprises. This analysis affects only their resource potential and excludes qualitative characteristics of the organizations development.

The second group consists of the authors who propose to evaluate the functioning efficiency of the integrated association of enterprises with the help of such qualitative indicators as the range, qualification of personnel, technology and so on.

Thus, the indicators of the integrated association of enterprises condition in the agroindustrial complex do not fully evaluate the efficiency of its activities. In order to reveal the level of the functioning efficiency of the integrated association of enterprises in the agroindustrial complex sufficiently, it is necessary to form a certain system of indicators that have a number of characteristics. The indicators used in the economic evaluation of the functioning efficiency of the integrated association of enterprises in the agroindustrial complex are related quantitatively. This relationship is determined by the cause-effect relationship, as well as by the specifics of methodology for calculating them. Some of the indicators are determined according to the reports of organizations and enterprises. In these reports, the data are ordered by a balance sheet identity. In this case, the functional dependence appears when the value of one indicator determines the value of the other. This is especially important for distribution and coordination coefficients. The distribution coefficients allow us to estimate the specific weight of a part in the total magnitude of the phenomena, and the coordination coefficients allow us to determine the content of new characteristics of the studied field.

Foreign techniques of economic evaluation of the functioning efficiency of the integrated association of enterprises [18, 19] are based on the following methods:

1. The method of economic added value (EVA). The EVA method was developed by US specialists B. Stewart and D. Stern in the early 1990s. This method is based on the concept of residual income, which shows the difference between the operating profit and capital expenditure. The concept of residual income was proposed by Alfred Marshall in 1890. According to this method, the enterprise should be considered as an investment project, and the profit generated by it should be evaluated in terms of maximizing the net present value of the project. Thus, the object of evaluation is the volume of excess return on invested capital versus alternative investment options.

2. The Olson method (EBO) expresses the value of the company through the current value of its net assets and the discounted stream of "super profits" (profit deviations from the average value for this sector); combines the elements of the profit and cost approach. In this case, the logic of calculating the Olson model is close to the concept of economic added value. The main difference between them is that EVA is calculated based on the invested capital, whereas the economic profit, determined by the Olson model, is calculated based on its own capital.

3. Real Options Valuation (ROV). A real option is some kind of a right, but it is not the responsibility of a company's managers to make any managerial decision relating to the company's operation during a certain period of time. This decision implementation under certain conditions will allow the company to obtain additional economic benefits. Thus, real options give the right to make changes in the course of realizing the project, which makes possible to insure its strategic risks. However, there is another approach to the concept of a real option, when it is identified with a certain asset of a company, for example, with a patent or a license.

**IV. DEVELOPING THE METHODOLOGY OF EVALUATING THE FUNCTIONING EFFICIENCY OF THE VERTICALLY-INTEGRATED ASSOCIATIONS OF ENTERPRISES**

Despite the existing extensive system of indicators for making the economic evaluation of the enterprises functioning efficiency, there is a need to develop a methodology for economic evaluation of the functioning efficiency of the integrated structure. This methodology should take into account the performance of integration processes of several organizations and enterprises during implementing their joint operating, financial and investing activities.

The authors propose the methodology for evaluating the functioning efficiency of integrated structures. This methodology consists of three stages (Figure 1).

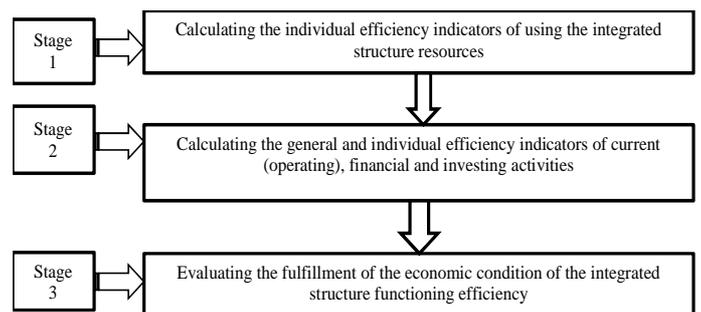


Fig. 1. Stages of evaluating the functioning efficiency of an integrated structure in industry

The developed methodology is based on calculating and comparing efficiency indicators of current (operating), financial and investing activities at the level of organizations

(enterprises), sectors and the integrated association of enterprises as a whole.

In the developed methodology, the key indicator that characterizes the functioning efficiency of the integrated association of enterprises is the profitability of sales. This indicator determines the amount of profit from sales for each ruble of the sold products of the enterprise. This indicator can also act as a benchmark in evaluating the competitiveness of the sold products of the enterprise, since a decrease in the profitability of sales can mean a drop in demand for its products.

The profitability of sales ( $P_s$ ) is presented in the form of the seven-factor multiplicative model. It consists of the profitability of borrowed capital ( $P_{bc}$ ), capital coefficient ( $C_c$ ), fixed assets turnover ratio ( $R_f$ ), turnover ratio ( $R_t$ ) and capacity ratio ( $R_c$ ) of current (circulating) assets, debt ratio ( $R_d$ ) and capital intensity ( $I_c$ ):

$$P_s = P_{bc} * C_c * R_f * R_t * R_d * I_c, \quad (1)$$

The model allows us to divide the selected indicators into several groups:

- 1) Individual indicators of the efficiency of using resources.
- 2) General indicators of the efficiency of current (operating), financial and investing activities.
- 3) Integral index of the functioning efficiency.

Individual indicators of the efficiency of using resources and general indicators for economic evaluation of the functioning efficiency of vertically-integrated associations of enterprises are presented in Table 2.

TABLE II. GENERAL AND INDIVIDUAL INDICATORS FOR EVALUATING THE FUNCTIONING EFFICIENCY OF THE VERTICALLY-INTEGRATED ASSOCIATIONS OF ENTERPRISES

A type of activity	Individual indicators of the efficiency of using resources	Formulas for calculating the general indicators of the functioning efficiency
Current (operating) activity	$R_f$ – fixed assets turnover ratio; $R_t$ – circulating assets turnover ratio, turnover per year	$E_{ca} = R_f \times R_t$ $E_{ca}$ – Efficiency ratio of current (operating) activity
Financial activity	$R_d$ – debt ratio; $P_{bc}$ – profitability of borrowed capital, coefficient	$E_{fa} = R_d \times P_{bc}$ $E_{fa}$ – Efficiency ratio of financial activity
Investing activity	$C_c$ – capital coefficient; $R_c$ – circulating assets capacity ratio; $I_c$ – capital intensity	$E_{ia} = C_c \times R_c \times I_c$ $E_{ia}$ – Efficiency ratio of investing activity

With the help of the fixed assets turnover ratio and capital coefficient, one can evaluate the efficiency of using the fixed assets of the research object. With the help of the turnover ratio of circulating assets and the capacity ratio of current (circulating) assets, one can determine the return of used

labour tools of the research object. And with the help of the debt ratio, the profitability of borrowed capital and capital intensity, it is possible to estimate the level of dependence of the object of the research on external sources.

The authors propose to evaluate the current (operating) activity, namely the efficiency of using fixed assets and business activity, by means of combining the fixed assets turnover ratio and the turnover of circulating assets.

The authors offer to evaluate the financial performance of the organization (enterprise), sector or integrated association of enterprises, namely the level of financial dependence and, accordingly, the level of financial autonomy, and also the efficiency of borrowed capital by means of combining the level of debt ratio and the profitability of borrowed capital.

The authors propose to evaluate the investment activity of the organization (enterprise), sector or integrated association of enterprises in the agroindustrial complex by combining the three indicators - capital coefficient, turnover of current (circulating) assets and capital intensity.

The Integral index of the functioning efficiency of an organization (enterprise), a sector or a vertically-integrated association of enterprises (EF) is calculated as the product of general efficiency indicators for different activities:

$$EF = E_{ca} \times E_{fa} \times E_{ia} \quad (2)$$

The Integral index of the functioning efficiency of an organization (enterprise), a sector or a vertically-integrated association of enterprises (EF) shows the amount of economic return from the invested capital.

The integrated association of enterprises functions efficiently only under the following condition:

$$E_{ca} > E_{fa} > E_{ia} \quad (3)$$

The current activity is the main type of activity, therefore, the efficiency ratio of the current (operating) activity ( $E_{ca}$ ) should be higher than the efficiency ratio of financial ( $E_{fa}$ ) and investing activities ( $E_{ia}$ ). In addition, taking into account the principle of location of activities used in making up the Cash Flow Statement, the efficiency ratio of financial activity ( $E_{fa}$ ) should be higher than the efficiency ratio of investing activity ( $E_{ia}$ ).

The proposed methodology was tested on the data about functioning of the integrated structure of the joint-stock company (JSC) “Kirov Dairy Plant”, which is the leader of raw milk processing in the Kirov region nowadays.

According to the results of the evaluation, it is found out that the condition of the functioning efficiency of the integrated structure of the JSC “Kirov Dairy Plant” has not been fulfilled (Table III).

TABLE III. INDICATORS OF THE FUNCTIONING EFFICIENCY OF THE JSC "KIROV DAIRY PLANT" BEFORE AND AFTER THE INTEGRATION

A group of indicators	The name of an indicator	Before integration	After integration
Individual indicators of the efficiency of using resources	Fixed assets turnover ratio	1.28	1.87
	Circulating assets turnover ratio, turnover per year	3.34	4.50
	Debt ratio	0.27	0.51
	Profitability of borrowed capital, coefficient	0.41	0.87
	Capital coefficient	0.78	0.54
	Circulating assets capacity ratio	0.30	0.22
	Capital intensity	0.54	0.83
General indicators	Current (operating) activity, coefficient	4.28	8.39
	Financial activity, Coefficient	0.11	0.45
	Investing activity, Coefficient	0.13	0.10
The actual fulfillment of the condition of the efficiency of functioning		$E_{ca} > E_{fa} < E_{ia}$	$E_{ca} > E_{fa} < E_{ia}$

It should be noted that the dynamics of changes in the values of the considered indicators of the economic functioning efficiency of the integrated association of enterprises is positive.

First, the integration process has favourably affected the current activities of the integrated association of enterprises. This fact proves the growth of the total functioning efficiency indicator for the current activity from 4.28 to 8.39. In addition, the integration process has contributed to the growth of the value of the total financial performance of the integrated association of enterprises. Before the integration (in 2009), the integral index of the functioning efficiency was 0.06, that is 6%. Then after integration (in 2014), it increased to 0.37. The efficiency of the current (operating) activity of the integrated association of enterprises of the JSC "Kirov Dairy Plant" is determined by the growth of the fixed assets turnover ratio and the strengthening of the business activity level (growth in the turnover ratio of circulating assets). Despite the growth of the integral index of the integrated association of enterprises, the condition of the functioning efficiency is not fulfilled, that is, the total efficiency index for financial activity is less than the total efficiency index for investing activity.

The positive point in the functioning of the integrated association of enterprises is that after the integration, all the

indicators, except for the general indicator of the efficiency of investing activity, have significantly increased.

Under the condition when  $E_{ca} > E_{fa} > E_{ia}$ , the integrated structure has the task to improve production technologies through its modernization.

Receiving the condition when  $E_{ca} < E_{fa} < E_{ia}$ , the integrated structure needs to aim at developing the material-technical base and its infrastructure. It should be done in order to make economic security parameters of industrial complexes satisfy modern standards.

Under the condition when  $E_{ca} > E_{fa} < E_{ia}$ , the integrated structure needs to improve its logistics schemes of promoting finished products, to create and promote its own brands, to raise its brand name recognition.

In the case of the condition when  $E_{ca} < E_{fa} < E_{ia}$ , the integrated structure needs to focus on forming sustainable relationships between its constituent organizations with clear indication of their role and functions. This is solved through realizing major investment projects, implementing measures for modernization and development of the infrastructure network.

For further sustainable development, as well as for preserving the positions on the food market, the following activities can be offered for the JSC "Kirov Dairy Plant":

- the increase in the level of productivity indicators in agricultural organizations and enterprises by improving the composition of the breeding stock, the quality characteristics of feed and animal care technologies will lead to an increase in the level of labour productivity;
- the increase in the number of participants in the sectors of production and processing of agricultural raw materials, which is caused by constructing new production facilities for producing dairy products with high quality parameters due to the growing demand for them;
- expansion of the own sales system of dairy products produced in the regional and interregional markets; and also creating the conditions for forming customer loyalty by enhancing the brand of manufactured dairy products;
- due to the modernization of production facilities, it is necessary to increase the production of finished dairy products and to expand the assortment of dairy products in order to maximize the development of regional and interregional markets.

Thus, the realization of the proposed managerial decisions will enable the integrated structure of the JSC "Kirov Dairy Plant" to carry out the efficient functioning and to achieve the level of sustainable development in the long term.

## V. CONCLUSIONS

The authors propose making an economic evaluation of the functioning of the vertically-integrated association of enterprises according to the following stages:

1. Calculating the individual indicators of the efficiency of using resources of organizations (enterprises), sectors and the integrated association of enterprises as a whole.

2. Calculating the general efficiency indicators of current (operating), financial and investing activities of organizations (enterprises), sectors and the integrated association of enterprises as a whole.

3. Calculating the integral functioning index of organizations (enterprises), sectors or the integrated association of enterprises.

4. Evaluating the fulfillment of the economic condition of the functioning efficiency of organizations (enterprises), sectors or the integrated association of enterprises.

With the help of the proposed methodology, it is possible to conduct an economic evaluation of the functioning of a vertically-integrated association of enterprises as a whole, subdividing it into sectors and organizations (enterprises).

### References

- [1] T. V. Baibakova, "Evaluating the efficiency of the integration processes in the agro-industrial complex", in *Economics and Management: problems and solutions*, Russia, no. 8, vol. 2 (56), pp. 119-123, 2016.
- [2] S. A. Korobov, V. O. Moseiko, E. U. Marusinina, E. G. Novoseltseva, V. S. Epinina, "The substance of a rational approach to entrepreneurship socio-economic development", *Integration and Clustering for Sustainable Economic Growth. Contributions to Economics*, pp. 207-223, 2017.
- [3] A. V. Gordeev, "Economic efficiency of agroindustry and the quality of products", in *AIC: Economy, management*, Russia, no. 4, P. 8, 2002.
- [4] L. Kosholkina, N. Borhunov, O. A. Rodionova, "Methodology for determining the parity relations in the agricultural sector", in *AIC: Economy, management*, Russia, no. 1, pp. 43-48, 2009.
- [5] Yu. D. Schmidt, I. M. Romanova, I. S. Mihin, "Complex technique of evaluating the efficiency of the integration processes in bakeries", in *The economic analysis: theory and practice*, Russia, no. 30, pp. 13-19, 2009.
- [6] T. V. Sitnikova, "Possibilities of forming the vertically integrated industrial enterprise", in *The Industrial economics*, Russia, no. 6, 2013.
- [7] S. A. Shubin, "Development of the mechanism of forming and evaluating the performance of the vertically-integrated structures", the dissertation for the scientific degree of a candidate of economic sciences, Russia, Moscow: Russian state library, 2007.
- [8] A. N. Serduk, "Development of agro-industrial integration in the dairy-products subcomplex", the dissertation for the scientific degree of a candidate of economic sciences, Russia, Voronezh: Russian state library, 2005.
- [9] L. A. Suvorova, "The synergetic effect of the industry clustering: the analysis, evaluation, forecast", monograph, Russia, Kirov: the Vyatka State University, 2015, 100 p.
- [10] A. E. Kozhin, "Economic efficiency of the vertical integration of timber enterprises (in the example of the Arkhangelsk region)", the dissertation for the scientific degree of a candidate of economic sciences, Russia, Moscow: Russian state library, 2003, (from the collection of the Russian state library).
- [11] T. A. Kozenkova, "Forming the financial strategy in the integrated entrepreneurial structures", in *The Finances*, Russia, no. 8, pp. 66-71, 2008.
- [12] Willson Oliver E. *Vertical Integration and Related Variation on a Transaction-Cost Economics Theme*. In: *New Developments in the Analysis of Market Structure*, Cambridge (Mass), 1986. P. 151.
- [13] A. A. Popov, "The integration of economic entities in the market economy", the dissertation for the scientific degree of a candidate of economic sciences, Russia, Moscow: Russian state library, 2005, (from the collection of the Russian state library).
- [14] O. A. Rodionova, N. A. Borhunov, O. A. Grebenkova, etc. "Large and small unities: analysis, trends of development and mechanisms of interaction", Russia, Moscow: "NIPKTS Voshod-A", 2013, 164 p.
- [15] M. F. Tazetdinov, "Evaluating the economic efficiency of enterprise integration", the dissertation for the scientific degree of a candidate of economic sciences, Russia, Kazan: Russian state library, 2006, (from the collection of the Russian state library).
- [16] Yu. V. Yakutin, "Conceptual approaches to evaluating the efficiency of corporate integration", in *Russian Economic Journal*, Russia, no. 5, pp. 71-81, 1998.
- [17] J. Spengler, *Vertical Integration and Antitrust Policy*, in *Journal of Political economy*, Vol. 58, pp. 347-35, 1950.
- [18] Lo, Kin and Lys, Thomas Z. *The Ohlson Model: Contribution to Valuation Theory, Limitations, and Empirical Applications*: Sauder School of Business Working Paper. - February 2000.
- [19] The model of Edwards-Bell-Olson (EBO), – <http://www.valnet.ru/m7-232>.