Practice Analysis of the Effectiveness of the Components of the Process Functioning System: Energy Aspect

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Abstract. The article presents the author's measuring method for the effectiveness of the functioning processes the system's components based on the models of the efficiency components in terms of the energy approach and reports the applied aspects of its application. The three types of the rates for measurement effectiveness of the processes functioning system' components outlined in previously published author's works, were analyzed. The newest approaches to a method of measurement of newly created authoritative rates for effectiveness of components of process of functioning of system are presented. These approaches are based on the use of the share of profits and cost of processes in total production, and are implemented on the examples of specific industrial enterprises. The technique of approaches differs slightly from the technique used in the examples presented in the previous author's work, making it more accurate. In this sense, innovation lies in the fact that our approaches solve the problem of simultaneous measurement of the efficiency of the system components (using the effectiveness rates of the three indicated types) regardless of the units of measurement of their total, net production and costs, since all this boils down to a dimensionless unit of measurement of the share of benefits and of the share of costs in their total production, moreover, the average values of the effectiveness rates of the functioning of the components of the system to some extent (approximately) can be considered as characteristics of the corresponding rates for the process of the functioning of the system. The examples show the practical implementation of this technology.

Keywords: system components; energy approach; energy products of the process of the system functioning; total, clean, cost and scale products of the process; rates of the effectiveness for process; scale, effectiveness and efficiency of the process; models of components of efficiency of Burennikova (Polishchuk) - Yarmolenko

1 Introduction

Modern challenges, contradictions and risks in economics and its management cause the need for theoretical and applied research on the construction of systems and processes of functioning of their individual components both separately and in the relationship and interdependence. Systems function not only on their own accounts, they are correlated and associated with the external environment, they are subsystems for higher-level systems. They act accordingly, change themselves and change their environment. The unstable development of systems at micro (enterprises), meso (regions of the country) and macro levels requires an updated model of such development, focused on qualitative structural changes. Quest of the ways of newest methods of management by activity and development of the systems (in particular, of the enterprises) on the basis of the energy theory of development (in particular, the energy approach) become relevant.

Consideration of the concept of energy for process of the functioning of the system in the works of scientists suggests that this energy as the engine of any changes is such a generalized characteristic of the system, which determines its qualitative and quantitative state. From the point of view of the energy approach the theory and practice for measurement of efficiency of functioning of the system which allow to estimate the specified changes are actual. This explains the need to develop and improve methods of the measuring the efficiency of components for process of the functioning of the system based on models of efficiency components in terms of energy approach to management.

The aim of the work is presentation of the author's method for measuring effectiveness of the functioning of the system components on the basis of models of the efficiency components and use of the benefit and cost shares of the processes in their total products with standpoint of the energy approaches and for interpretation of the applied aspects of its application.

2 Problem Statement

For the first time to use for analysis of economic processes the natural sciences were made by Greeks (in particular, by Plato). Further development of this problem occurred in physiocrats in the eighteenth century. In particular, in F. Kahn there is an energy approach to determining the value added. Almost a century later, Ukrainian scientist S. Podolinsky became a follower of physiocrats. The followers of the energy approach are further F. Soddy, N. Gergescu-Rougen and others. New trends are emerging in the economic sciences (in such as econophysics). The use of the energy approach contributes to solving the problem of taking into account the laws of nature in the economy, to developing the methodological synergy of the sciences. Combining physical teaching with the laws of functioning of the economy allows us to move to the newest principles of its development.

In accordance with the energy approach, the main condition for the development of the system is the activation of its internal energy. This energy, as the driving force of any change, determines its quantitative and qualitative states and causes of structural transformations by the spatial and temporal locations of the system elements. From the point of view of the energy approach, the theory and practice for the effectiveness estimation of the process functioning system (in particular, the economy as a complex system) as ability of the system to produce some result based on the use of an appropriate aggregate of rates are relevant. Therefore, in time there is a problem in the form of developing and disclosing a method for measuring the effectiveness of the processes functioning of the system components based on the author's models of the constituents of the efficiency, using the share of benefits and costs of the processes in their common products, taking into account the energy approach, which we present.

3 Literature Review

Undoubtedly, the energy principles of the economy, perceived by S. Podolinsky, deserve attention [25]. These principles were developed in the researches of [4, 11, 12, 15, 16, 28, 29, 35, 45] and others. The energetic theory developed by S. Podolinsky was studied by many scientists without reference to it [6, 7, 13, 23, 27, 30] and others. Designs of others researchers are tightly coupled with searches of these scientists; they studied processes of the development systems [1, 9, 10, 22, 33]. The article presented by us is a continuation of the works [37–40] by the authors V. Yarmolenko and N. Burennikova, in fact, it is a review of the theoretical results of these articles, the practical implementation of which is shown according to the data of specific industrial enterprises. Therefore, when presenting the results that we obtained in this article, it became necessary to use some textual and semantic repetitions of these works. Works [17, 18, 21, 32, 36] seemed interesting to us in the context of our research from the point of view of methodology for solving problems. Energy as the driver of any change is such a generalized characteristic of a system that determines its qualitative and quantitative state and causes the transformation of its structure by changing the spatial and temporal arrangement of the elements of the system [39] p. 261. From the point of view of the energy approach, the theory and practice for measuring of the force (effectiveness, efficiency) of the processes of functioning of the system components that allow estimation these corresponding changes are relevant. The component of the system, the subsystem (subsystem) is called any element that is part of the system as the set of the simplest parts of an arbitrary nature, indivisible in view of solving a specific problem and naturally related [37] p. 103.

A complex system can be divided into components in various ways, depending on the purpose of the study. System components have the properties of the system; ensure the functioning of the system and the existence of its main properties [34]. To measure the efficiency of the processes of functioning of the components of the system and the system as a whole is important not only the structure of system partitioning into components, but also the method of measuring the specified efficiency (both from theoretical and practical points of view); this once again demonstrates the relevance of the research topic.

Modeling any processes and their results requires the use of appropriate metrics. As you know, some scientists when considering such rates use the concept of effectiveness, considering it as a concept identical to the efficiency [14,19,20] and others. Such a vision, as a rule, leads to incorrect or generally misinterpretation of the concepts of both efficiency and effectiveness. Other scientists do not see the efficiency and effectiveness of processes with identical concepts [5,8,24,31,44] and others. The ambiguity of the interpretation of the essence of the categories of efficiency and effectiveness leads to a certain inconsistency in theoretical and applied research and requires a principled view of the meaningful content of these concepts. This also required from authors a deep study of these concepts with the separation of the force category for the functioning systems based on the category of efficiency of any process as a category, which at the same time characterizing the process from both the quantitative side (in the form of its scale product) and the qualitative one (taking into account the effectiveness of the process). Authors of the works [2,3,26,37–43] etc. prove of more twenty years on concrete examples for systems of various levels and types what this is sense to do just so, and to use a set of interrelated authoritative rates (models) for estimation of force of the system functioning process; this in a way innovates approaches to cognition of the system functioning process. Dynamics of novelty for research results to solve the problems associated with evaluating of processes effectiveness was as follows: first studied the basic process (the process of labor [41], 1996), then researched any economic process (1998), and then studied any process ([43], 2012). We are still investigating various processes in this context. An example of continued research from this perspective is the article, which presented.

With respect to the energy aspect of the results of the study, we found the following: since the values of rates for the energy of general products, products as costs (losses) and net products (products in the form of benefits, benefits) of the subprocesses of the systems functioning processes are equal respectively to the values of the rates for these products (this was proved by us in the publication [40] p. 118), it can be assumed that the study of certain processes based on the rates of these products means their scientific consideration in the energy aspect. Modeling the effectiveness of the energy conversion process can be done on the basis of the output-input ratio (OIR) of the process. This factor is known to always be less than one hundred percent, since without loss conversion of energy is impossible in principle. In the publication [39] p. 263, we define OIR as the ratio of the net product rate of the process to the rate of its total product. The specified coefficient describes the effectiveness mainly in terms of benefit. Previously, in publications, we described the effectiveness of the process using the effectiveness rate in the classical sense (as the ratio of the rate of the total product of the process to the rate of its costs); this rate determines the features of effectiveness with standpoint of cost. The effectiveness level of the energy conversion process in turn can be characterized by the effectiveness rate in the classical sense.

Therefore, OIR is a characteristic of process effectiveness in terms of benefit, and effectiveness rate in the classical sense is a characteristic of process effectiveness in terms of cost. In the article [38] we implemented the following idea that emerged from us: on the basis of modeling, to characterize the process effectiveness at the same time, both from the point of view of profit and from the point of view of cost; this determined the purpose of the study of this article. In the article [38] we have formed other new characteristics of the efficiency for the process of the functioning system: rates of the efficiency of the process in terms of both benefits and benefits and costs. They were naturally attached to the cost efficiency rate that we had proposed before. The article [37] presents the method of measuring the effectiveness of the processes of functioning of the system components based on models of the components of efficiency in terms of energy approach, developed by use.

4 Materials and methods

The presented article is a continuation of our work [37–40], being essentially an overview of the theoretical results of these articles. In addition, the application aspects of specific industrial enterprises are presented in these examples.

The process of functioning of the system, in our view, is a set of actions of the system in space and time under certain internal and external conditions (circumstances) under the influence of any factors (driving forces). The process of functioning of the system, in turn, is a collection of certain subprocesses (component, component processes). Theoretical and practical significance and novelty of the article are that it presents advanced approaches to the theory and practice of measuring the effectiveness of the processes of functioning of system components on the basis of models of components of efficiency using the share of benefits and costs of processes in their total products.

In the article (as always, if necessary, in our works) we will use models of components of the effectiveness of any process and the corresponding rates as indicators of process force [43] and [3] pp. 48-50, where the basis of models, as we believed and believe, is that the consequence of any process is its products: as a benefit; as a costs; a total product in the form of a product as a benefit and a product as a costs; scale product in the form of product as a benefit and of that part of the product as a costs, which is proportional to the product share as a benefit in the total product.

Rates as indicators of process force are as follows: V is rate of the total product of the process; Z is rate of its product as a charge; $G = (V - Z)$ is rate of the product as a benefit of the process; $E = V/Z$ is rate of the process effectiveness as a ratio of rate of total product V and of rate product as cost Z (qualitative component of process efficiency rate); $K = (G + Z \times G/V)$ is rate of process product scale (quantitative component of process efficiency rate);

$R = K \times E = KxV/Z = G \times V \times (1 + V/Z)$ is rate of process efficiency as the product of the rate K of process product scale to rate E of the process effectiveness. This was reflected in our publications [2, 3, 26, 37–43].

In [39] p. 262 we are reminded that information bases for calculating efficiency rates, for example, at the micro level, are the annual financial statements of enterprises; these figures should be taken into account in monetary terms at actual prices per employee. In other cases, a certain information base is used, given that the practical application of the proposed approaches to the study of a particular process based on simulation depends on the specifics of this process and requires special consideration, which is related to the peculiarities of measuring the products of the process [43] and [3] pp. 48-50. We also recalled the validity of our hypothesis about the existence of a efficiency reaction (a reaction to the appropriate type of communication: social, economic, environmental, technological, organizational, etc.), which contributes to a certain level of efficiency, the evaluation of which is related to energy consumption, relative the process of system functioning requires simultaneous consideration of both quantitative and qualitative components of efficiency [39] p. 262.

We use the foregoing to develop and disclose a method for measuring the effectiveness of the processes of functioning of the system components based on the author's models of the components of efficiency, using the benefits and costs of the processes in their total products. We have emphasized above that energy is a generalized characteristic of matter motion. Energy is produced, transmitted, converted, and its quantity measured. The consequence (result) of the energy of the process of functioning of the system is its products, so we used the opportunity to measure the efficiency and the related factor of the process by its products. We did this on the basis of the authoritative indicators of the performance components for the purpose of finding risks, reserves and incentives for further development of the system, and used to improve and disclose the method of measuring the efficiency of the subprocesses of the system functioning while taking into account the costs and benefits. In the article [39] p. 263 we proposed to calculate output-input ratio of the process (η), using formula (1) as the ratio of the benefit rate product of the process G to the total rate product of the process V:

$$\eta = G/V \tag{1}$$

In the publication [38] p. 181 we emphasized that this coefficient describes effectiveness mainly in terms of benefit (benefit), and that the effectiveness of the process energy conversion can also be described by the effectiveness rate in the classical sense (in the form of the ratio of the rate for the total product of the process to the rate of its cost), and this rate identifies features of effectiveness in the form of dependency (2):

$$E = V/Z \tag{2}$$

On the basis of modeling in [38] p. 181 the characteristic of process effectiveness has been formed from the standpoint of both benefits and costs in the form of the geometric middling for product of the effectiveness rate $E = V/Z$ and the rate $\eta = G/V$, that is:

$$E_1 = \sqrt{E \times \eta} = \sqrt{V/Z \times G/V} = \sqrt{G/Z}. \tag{3}$$

Therefore, this rate is equal to the square root of the quantitative component G/Z of the effectiveness rate E [38] p. 181. In the same article, we considered the practical use of the obtained results relative to measuring the new process effectiveness rate, along with the other two author performance metrics $(E = V/Z; \eta = G/V)$ and the three performance metrics we introduced (cost, benefit and cost, benefit) as an example of the implementation process capital investments and running costs for the protection and rehabilitation of soil, groundwater and surface water in Ukraine in the five of studied years [38] p. 181-182. These efficiency rates are as follows:

$$R = K \times E,\ R_1 = K \times E_1,\ R_2 = K \times \eta. \tag{4}$$

The new effectiveness rates of the process, given in [38], along with other metrics we used in [37] to reveal a method for measuring effectiveness of the system component processes based on efficiency component models using of the benefit and cost shares of the processes in their total products. Significant in this method is the following: if $z_i = Z_i/V_i$ is the share of the product as a cost, and $g_i = G_i/V_i$ is the share of the product as a benefit in the total product, then: $z_i + g_i = 1\,(z_i < 1,\ g_i < 1),\ V_i = 1\ (i = 1, 2, ..., n)$. The appropriate formulas for calculating effectiveness rates are as follows:

$$g_i = G_i/V_i = \eta_i;\ E_i = 1/z_i;\ E_i^1 = \sqrt{g_i/z_i}\ (i = 1, 2, ..., n), \tag{5}$$

where $z_i = 1 - g_i$.

The innovation of the research results presented in article [37] is that the approaches, proposed by its authors, solve the problem of simultaneously measuring for the effectiveness of the processes of functioning of the system components (by means of effectiveness rates of three types: $\eta_i,\ E_i,\ E_{1i}$) irrespective of the units of measurement of their common, pure products and cost, because it comes down to a dimensionless unit of measure in terms *of the benefit and cost shares of the processes in their total products*, and the mean values of effectiveness rates for processes of functioning of the system components to a certain extent (approximately) can be considered characteristics of the appropriate effectiveness rates for the process functioning of the system.

Using the methods, invented by then, the authors of Article [37], applying two conditional examples, related to the components of the country's economic energy system, showed how the issues of the characterization of the effectiveness of current economic energy of the country (in particular concerning of the characteristics of the OIR) can be addressed on the basis of authoring models for efficiency components using *of the benefit and cost shares of the processes in their total products.*

We consider the practical implementation of this methodology on specific examples of industrial enterprises. This technique is somewhat different from the technique implemented in the examples given in [36, 37], refining it.

5 Experiment, Results and Discussion

For an example of an object of study, we choose the process of production activity of the enterprise, breaking it into three components: the creation of gross income, the formation of financial results before tax, the creation of a net financial result. It is known that the process of formation of gross income is a labor process and forms part of the creation of gross value added (GVA) of a region, country. It is characterized by material and depreciation costs. The process of generating results from operating activities depends on the cost of sales, other operating income, administrative expenses, sales costs, and other operating expenses. The process of formation of financial results before tax depends on the formation of results from operating activities, that is, the cost of sales, other operating income, administrative expenses, sales expenses, other operating expenses, as well as other financial and other income, financial and other expenses.

The process of generating net income is significantly affected by the income tax on ordinary activities. Having identified the object of the study, we will consider the above process of four commensurate leading mechanical engineering enterprises (A), (B), (D), (E). Due to the confidentiality of information under Article 21 of the Law of Ukraine "On State Statistics", we do not provide specific statistics for each of these enterprises. Nevertheless, it should be noted that the following companies are: Private Joint-Stock Company "Vinnytsia Research Plant", Private Joint-Stock Company "Kalynivskyi Machine-Building Plant", Private Joint-Stock Company "Bar Machine-Building Plant", Private Joint-Stock Company "Vinnytsia Plant "MAYAK"". Privacy is ensured by the draw concerning these businesses.

The Table 1 shows the annual values of rates to production activity of these enterprises for 2014-2018 and their average values for this period, which authors are calculated as the arithmetic averages. After Table 1 we have indicated Table 2 and Table 3.

Table 1: Rates of production activity of enterprises for 2014-2018

Rates	Years					Average
	2014	2015	2016	2017	2018	
1	2	3	4	5	6	7
Enterprise (A)						
1. Net income (revenue) from sales of products, thousand UAH	16579	17407	25096	44069	44505	29531,2
2. Material costs and depreciation, thousand UAH	11861	11653	22424	24842	33422	20840,4

Table 1: *continuation*

1	2	3	4	5	6	7
3. Average annual number of employees, persons	90	80	83	77	78	81,6
4. Gross income, thousand UAH	-	-	-	-	-	8690,8
5. Financial results before taxation thousand UAH (profit, loss)	5204	4134	2333	8112	11048	6166,2
6. Net financial result thousand UAH (profit, loss)	4701	3384	1895	6641	9040	5132,2
Enterprise (B)						
1. Net income (revenue) from sales of products, thousand UAH	49586	96786	74478	164767	186037	114330,8
2. Material costs and depreciation, thousand UAH	28259	51563	53385	90664	149373	74648,8
3. Average annual number of employees, persons	385	344	368	383	396	375,2
4. Gross income, thousand UAH	-	-	-	-	-	39682
5. Financial results before taxation thousand UAH (profit, loss)	5347	17747	loss 6090	12653	12391	8409,6
6. Net financial result thousand UAH (profit, loss)	4940	14553	loss 6672	10406	10161	6677,6
Enterprise (D)						
1. Net income (revenue) from sales of products, thousand UAH	96084	120475	128701	141782	157979	129004,2
2. Material costs and depreciation, thousand UAH	63461	87082	88460	108417	122811	94046,2
3. Average annual number of employees, persons	427	420	389	354	320	382
4. Gross income, thousand UAH	-	-	-	-	-	34958
5. Financial results before taxation thousand UAH (profit, loss)	4872	8450	6975	7565	7144	7001,2
6. Net financial result thousand UAH (profit, loss)	3695	6839	5266	6404	5951	5631

Table 1: *continuation*

1	2	3	4	5	6	7
Enterprise (E)						
1. Net income (revenue) from sales of products, thousand UAH	186400	244270	296312	311874	382858	284342,8
2. Material costs and depreciation, thousand UAH	102944	172202	200542	243811	279980	199895,8
3. Average annual number of employees, persons	781	790	794	705	582	730,4
4. Gross income, thousand UAH	-	-	-	-	-	84447
5. Financial results before taxation thousand UAH (profit, loss)	32234	28230	18936	9929	loss 1581	17549,6
6. Net financial result thousand UAH (profit, loss)	27144	22586	12239	4818	loss 5063	12344,8

The Table 2 presents the values of certain rates of production activity of enterprises A, B, D, E and the average values of rates for these enterprises (PES) for the period 2014-2018, which the authors are calculated according to the Table 1 as arithmetic means.

Table 2: Average annual values of production rates of enterprises (A), (B), (D), (E) and average values of rates for these enterprises (WES) for the period 2014-2018

Rates	Enterprises				WES
	(A)	(B)	(D)	(E)	
1	2	3	4	5	6
1. Net income from sales of products (V_{1i})	29531,2	114330,8	129004,2	284342,8	139302,25
2. Material costs and depreciation (Z_{1i}), thousand UAH	20840,4	74648,8	94046,2	199895,8	97357,8
3. Average annual number of employees, persons	81,6	375,2	382	730,4	392,3
4. Gross income ($G_{1i}, (V_{2i})$, thousand UAH	8690,8	39682	34958	84447	41944,45
5. Financial results before taxation ($G_{2i}, (V_{3i})$, thousand UAH (profit, loss)	6166,2	8409,6	7001,2	17549,6	9781,65

Table 2: *continuation*

1	2	3	4	5	6
6. Net financial result (G_{3i}), thousand UAH (profit, loss)	5132,2	6677,6	5631	12344,8	7446,4
7. Fraction $g_{1i} = G_{1i}/V_{1i} = \eta_{1i}$ part 4 of point 1	0,294292	0,347081	0,270983	0,296990	0,3023365
8. Fraction $g_{2i} = G_{2i}/V_{2i} = \eta_{2i}$ part 5 of point 4	0,709509	0,211925	0,200275	0,207818	0,33238175
9. Fraction $g_{3i} = G_{3i}/V_{3i} = \eta_{3i}$ part 6 of point 5	0,8323116	0,7940449	0,8047192	0,7034234	0,78362479
10. Fraction $z_{1i} = Z_{1i}/V_{1i} = 1 - g_{1i}$ part 4 of point 1	0,705708	0,652919	0,729017	0,70301	0,6976635
11. Fraction $z_{2i} = Z_{2i}/V_{2i} = 1 - g_{2i}$ part 5 of point 4	0,290491	0,788075	0,799725	0,792182	0,66761825
12. Fraction $z_{3i} = Z_{3i}/V_{3i} = 1 - g_{3i}$ part 6 of point 5	0,1676884	0,2059551	0,1952808	0,2965766	0,21637522

The Table 3 shows the average annual of the effectiveness component rates for the production activity of enterprises A, B, D, E, and their average values (WES) for period 2014-2018.

We calculated these rates in accord with Table 2.

Table 3: Average annual values of the effectiveness component rates for the production activity of the enterprises A, B, D, E, and their average values (WES) for period 2014-2018

Rates	Enterprises				WES
	(A)	(B)	(D)	(E)	
1	2	3	4	5	6
Gross Revenue Generation Process (component 1)					
$g_{1i} = G_{1i}/V_{1i} = \eta_{1i}$	0,294292	0,347081	0,270983	0,296990	0,3023365
	(3)	(1)	(4)	(2)	
$z_{1i} = 1 - g_{1i}$	0,705708	0,652919	0,729017	0,703010	0,6976635
$E_{1i} = 1/z_{1i}$	1,417017	1,531583	1,371711	1,422455	1,502775
	(3)	(1)	(4)	(2)	
$E^1_{1i} = \sqrt{g_{1i}/z_{1i}}$	0,645768	0,729097	0,609681	0,649965	0,709089
	(3)	(1)	(4)	(2)	0,835263

Table 3: *continuation*

1	2	3	4	5	6
The process of generating financial results before tax (component 2)					
$g_{2i} = G_{2i}/V_{2i} = \eta_{2i}$	0,709509	0,211925	0,200275	0,207818	0,33238175
	(1)	(2)	(4)	(3)	
$z_{2i} = 1 - g_{2i}$	0,290491	0,788075	0,799725	0,792182	0,66761825
$E_{2i} = 1/z_{2i}$	3,442447	1,268915	1,250430	1,262336	1,806032
	(1)	(2)	(4)	(3)	1,497862
$E^1_{2i} = \sqrt{g_{2i}/z_{2i}}$	1,562833	0,518570	0,500430	0,512188	0,773505
	(1)	(2)	(4)	(3)	0,705593
The process of generating a net financial result (component 3)					
$g_{3i} = G_{3i}/V_{3i} = \eta_{3i}$	0,8323116	0,7940449	0,8047192	0,7034234	0,78362478
	(1)	(3)	(2)	(4)	
$z_{3i} = 1 - g_{3i}$	0,1676884	0,2059551	0,1952808	0,2965765	0,21637522
$E_{3i} = 1/z_{3i}$	5,963442	4,855427	5,120831	3,371811	4,82787875
	(1)	(3)	(2)	(4)	4,62160142
$E^1_{3i} = \sqrt{g_{3i}/z_{3i}}$	2,227878	1,963524	2,029983	1,540068	1,94036325
	(1)	(3)	(2)	(4)	1,90305056
Mean values (arithmetic mean)					
$g_{average}$	0,6120375	0,451017	0,4253257	0,4027438	0,4727810
	(1)	(2)	(3)	(4)	
$z_{average}$	0,3879625	0,548983	0,5746743	0,5972562	0,5272189
$E_{average}$	3,607635	2,551975	2,580991	2,018867	2,540744
	(1)	(3)	(2)	(4)	1,896745
$E^1_{average}$	1,478826	1,070397	1,046698	0,900740	1,14098575
	(1)	(2)	(3)	(4)	0,946966
Performance metrics calculated from $g_{average}$ and $z_{average}$					
$E = 1/z_{av}$	2,577569	1,821550	1,740116	1,674323	1,896745
	(1)	(2)	(3)	(4)	
$E^1 = \sqrt{g_{av}/z_{av}}$	1,256013	0,906394	0,860300	0,820485	0,946966
	(1)	(2)	(3)	(4)	

** The second row of the row with respect to effectiveness rates of column 6 indicates their values, which are calculated by the corresponding formulas of column 1, and the first row indicates arithmetic mean values of the enterprise rates. The parentheses indicate the rankings of the rates.*

Source: Calculated by the authors according to Table 2.

With regard to the content of the components, which are shown in Table 3, note the following:

- the process of generating gross income (component 1) is reflected in the enterprise in monetary terms for the value of newly created products. Gross income is defined as the difference between revenue and material costs and depreciation and amortization in the cost of sales;

- the process of formation of financial results before tax (component 2) is the process of determining the algebraic amount of profit (loss) from operating activities (i.e., the main activity of the enterprise, which is associated with the production and sale of products (works, services), provides the bulk of income and is the main purpose of creating an enterprise) financial and other income (profits), financial and other expenses (losses);

- the process of creating a net financial result (component 3) is the formation of the enterprise's net profit (loss) and is calculated as the algebraic amount of profit (loss) before tax, income tax and profit (loss) on discontinued operations after tax. The process of generating financial results can be seen as part of the overall economic system, which is associated with management decisions to ensure that they are sized at the enterprise level to achieve strategic, tactical and operational goals.

The data obtained in Table 3 give an opportunity to characterize the production activity of enterprises in terms of its efficiency as a whole by enterprises and by its components. For example, it can be argued that enterprise A managed more efficiently than other enterprises through the process of generating financial results before tax (component 2) and the process of creating a net financial result (component 3), although it performed worse than other enterprises in terms of the gross margin creation process income (component 1). The level of efficiency of the enterprise functioning process can be arranged as: A, B, D and E (from higher level to lower). By the levels of efficiency of the processes of functioning of the components of the enterprise can be arranged as (from the highest level to the lower): B, E, A, D (relative to component 1); A, B, E, and D (relative to component 2); A, D, B, E (about component 3). On average, enterprise A was the best-managed enterprise, and enterprise E had the worst economic performance. Studying the causes and consequences of operating a business requires further exploration. It is planned to do this with the help of the authoring tool SEE-analysis and SEE-management.

6 Conclusions

We in the article made a short excursion into the latest author's approaches to the measuring method of the effectiveness for the processes of functioning of the system components, which were presented in the articles previously published by the authors; examples of specific industrial enterprises show its application. This technique is somewhat different from the technique implemented in the examples given in [37], refining it. The following is revealed: since the values of the energy rates of the total products, products as costs and net products of the subprocesses of the system functioning process are equal respectively to the values of the rates of these products (this was proved by us in the publication [40] p. 118), then the study of certain processes (in particular the processes of functioning of the components systems) on the basis of the rates of these products means their scientific consideration in the energy aspect. Rates of force for systems, showed in [3, 37–39], together with the updated approaches to measuring of the effectiveness rates implemented in the presented article, we used to uncover innovative methods of measuring the effectiveness of the processes of functioning of system components based on models of components of efficiency with the use *of the benefit and cost shares of the processes in their total products.* The example of four industrial enterprises of Vinnytsia region shows the practical implementation of this methodology.

An innovation of the results of the study is that the approaches, proposed by the authors, solve the problem of simultaneously measuring the effectiveness of the processes of functioning of the system components (using effectiveness rates of three types: $\eta_i,\ E_i,\ E_{1i}$) independently of the units of measurement of their total, pure products and costs, since it all comes down to a dimensionless unit of measurement of the benefits and costs the share of the processes in their total products, and the average values of the effectiveness rates of the processes of functioning of the system components to some extent can be considered as the characteristics of the respective effectiveness rates for the process of the functioning of the itself system. Further studies are intended to address the role played by the measurement of newly created metrics for the functioning of systems in author's SEE-analysis and SEE-management.

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