OPTIMIZATION OF THE ECONOMIC POTENTIAL OF THE INDUSTRY ON THE BASIS OF MATRIX ALGORITHM OF DECISION MAKING

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Abstract

The article is devoted to the issues of modeling the optimization of economic potential of the industry on the basis of matrix algorithm of decision-making. The article considers the algorithm of economic potential optimization based on matrix modeling (state matrices, indicative dynamics matrices, strategic decision-making matrices, matrices of economic potential optimization scenarios).

The adopted modeling format provides systematicity, comprehensiveness, integrity, hierarchy of numerous evaluation parameters, multilevel aggregation of dynamics indices, normalization of sub-indices, point positioning of the level of development of the economic potential of microeconomic systems with the choice of a variant of working out scenarios of strategic priorities of its development.

According to the results of approbation of the model of optimization of economic potential in the information field of the textile industry (Concern Bellegprom), clusters of similar enterprises were identified and variants of working out scenarios of market strategies for optimization of economic potential were developed.

Keywords: economic potential, matrix, dynamics, development, potential-efficiency, index, optimization, strategic scenario, means of scenario development

I. Introduction.

Optimization modeling in the trends of economic potential (EP) development in the industry provides for the development of actual models and methods that provide information-analytical decision support system (IAS DSS). In this direction, the least studied aspects include system interrelations and interdependencies of multifactor modeling of the level of ES development.

The purpose of the conducted research is the algorithmization, methodology and practical tools for selecting the optimal model of effective development of economic potential based on the results of its point positioning in the strategic decision-making matrix of the meso-level.

II. Methods and materials

The author's model of optimization of the EP industry based on a matrix decision-making algorithm is designed on the basis of a systematic, integrated and holistic approach. The EP optimization algorithm included the following steps:

- identification of the goals and objectives of the projected information and analytical decision support system for optimization of EP in the trends of mesorevelopment of the industry;

- carrying out the decomposition of the EP on the basis of structural, process, resource and market (product) approaches with the project of a two-level system of interrelations and interdependencies of

indicators of local resource (productive) and institutional potentials (factor);

- formation of a system of indicators for assessing EP in the decomposition of local and private potentials (personnel, production, marketing, innovation and investment, scientific and information potentials);

- construction of matrices of the state of local potentials with an emphasis on the blocks of potential profitability, potential return, potential intensity in a series of dynamics;

- design of indicative dynamic matrices of local potentials with subsequent aggregation of indices of the first and second levels of generalization of potential profitability, potential return, potential intensity (subindexes: Irpi, Iipi, Irp, Iip,);

- point positioning of the level of EP development by integral subindices and the indicator of the third level of generalization (Iep) in the strategic decision-making matrix;

- economic interpretation of interrelations and interdependencies, comparisons, characteristics: identification of imbalances; factors that negatively affected the dynamics of the qualitative state and quantitative development of the EP;

- an extended study of individual structural elements of the EP with detailed factor parameters in particular efficiency matrices in the specific object analytical environment of microeconomic systems of the industry;

- development of options for working out scenarios for optimizing EP at the meso-level; building a vector of priorities for optimizing the sustainable development of EP of industry enterprises with the distribution of public-private partnerships;

- analysis of the compliance of indicators with the objectives of optimization of EP using perspective diagnostics of the effectiveness of decisions made in the reverse order of analytical procedures.

The distinctive features of the industry's EP optimization model based on a matrix algorithm consist in the continuity of the decision–making process: ensuring the consistency, complexity, integrity of a multidimensional, dynamic phenomenon - the economic potential inherent in economic systems; the implementation of structural, process, resource and market methodological approaches in the procedure of its decomposition; a qualitative assessment of the development of the EP, built in the matrix field of efficiency and allowing to establish the relationship and interdependence between the resource potential and the institutional potential ensuring its effectiveness; solving the problem of multi-criteria convolution at several levels of generalization in the construction of aggregated indices, which ensures the point positioning of the level of development of the EP in the strategic decision-making matrix; the formation of relationships and interdependencies in the format of induction, deduction with a vector of priority growth of the effectiveness of the EP in the long term both in its individual elements (the method of private matrices) and the EP as a whole in the context of sustainable development, structural optimization.

III. Literature review

Today, multidimensional scientific developments have been formed within the framework of optimizing the economic potential of enterprises. The theory of determining economic potential from a general theoretical standpoint is studied in the works of Malinovskaya (2006); Kleiner (2008). Many scientists dealing with the problems of economic potential consider this category as part of improving the efficiency of the national economy: Shimov (2012), Lapin (2006). The most common is the resource approach to determining economic potential, which is supported by scientists: Khanov (2007); Vinogradova et al. (2008); Malinovskaya (2008); Timofeeva (2009).

The studies of Kiseleva (2012), Ryazantseva and Aristarkhov (2012) determined the ability of an enterprise as a socio-economic system not only to achieve results in its current state, but also to fulfill strategic goals of sustainable development. The system of functions of the economic potential of the economic system has received theoretical development in the works of such scientists as Medvedeva et al. (2014), Nadvornaya et al. (2016), Artemyeva (2010).

Various aspects of the dynamism of economic potential are studied in the works of Rafikova

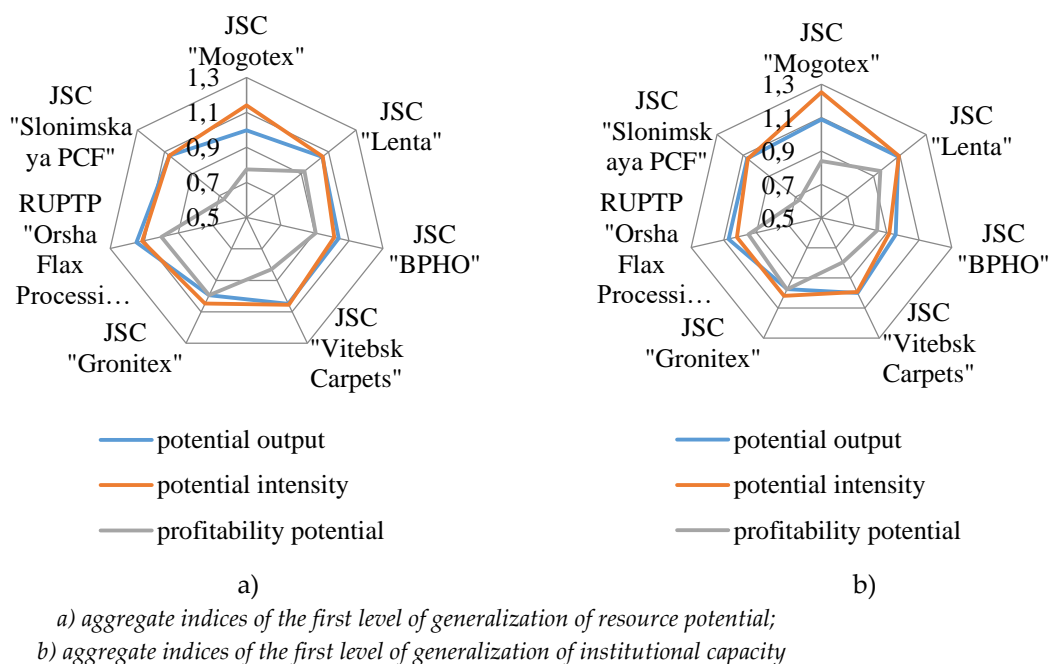(2006); Babaeva et al. (2015); Nekozyreva (2008); Vrublevsky (2016).

Some methodological aspects of economic potential assessment have been studied by scientists: Afinogenov et al. (2019), Khvorostov (2005), Gorbunova (2014), Vapne (2019), Gonin et al. (2014),), Sheshukova et al. (2013), Shcherbakov et al. (2019), Kovalev et al. (2006), Morozova (2009), Mogilina (2015), Nizamutdinov (2017), Peshkova (2017), Pisareva (2018), Rakhmanova (2018), Tashkinov (2018), Terekhova-Pushnaya (2019), Podolsky et al. (2020), Yarygina (2016), Gurieva (2018), and others.

At the same time, despite a sufficiently deep and thorough level of scientific elaboration of theoretical directions for optimizing economic potential, management science involves the development of key provisions of mathematical modeling of EP optimization procedures in modern conditions of globalization and international integration of national economies to solve many relevant theoretical, methodological and practical problems. Among the most important theoretical, methodological and practical directions of EP management are: the formation of the concept of optimizing economic potential at all levels of management in the context of economic globalization; the development of conceptual models of EP optimization that ensure consistency, complexity, program-target orientation of EP optimization strategies.

IV. Results and discussion

Approbation of the model of optimization of ES on the basis of the matrix algorithm of decision-making was carried out in the methodological blocks of information processing for the leading enterprises of the textile industry. Analytical calculations of private indicators of efficiency of local potentials use with the subsequent convolution and calculation of generalizing indices of potential-efficiency were made for strategic enterprises of Concern "Bellegprom": JSC "Baranovichi Production Cotton and Paper Association" (Blakit; JSC "BPHO"), JSC "Gronitex", RUPTP "Orsha Flax Factory", JSC "Mogotex", JSC "Lenta", JSC "Vitebsk Carpets", JSC "Slonimskaya KPF".

According to the results of the analytical data system, the following conclusions can be drawn: the best results of the level of ES development in the considered time interval were demonstrated by RUPTP "Orsha Flax Mill", JSC "Gronitex" (Figure 1).

a)

b)

a) aggregate indices of the first level of generalization of resource potential;
b) aggregate indices of the first level of generalization of institutional capacity

Figure 1: *Graphical interpretation of the partial values of the potential efficiency of the enterprises of the Bellegprom Concern*

Source: in-house development

Coordinates of the index of potential profitability of enterprises respectively made up in the composition (1.0; 0.994); (0.948; 0.976), which, taking into account the significance coefficient, provided higher values of the integral index (values of aggregated indices are higher than one). RUPTP "Orsha Flax Factory" is the only enterprise that has an integral aggregated index of the level of economic potential development with a small excess of one (Figure 2).
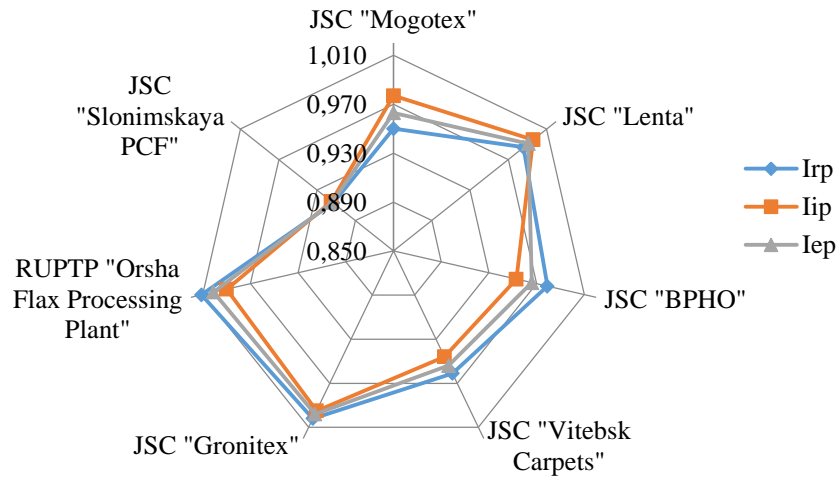
Figure 2: *Radar of the level of development of the economic potential of the enterprises of the Bellegprom Concern*

Source: in-house development

The lowest values of the considered aggregated indices were obtained for JSC «Slonimskaya PCF», JSC «Vitebsk Carpets», JSC «Mogotex», JSC «BPHO»: the aggregated index of the third level of generalization, respectively, amounted to 0.914; 0.954; 0.963; 0.966.

The integral indicator of the efficiency of using the economic potential of JSC «Lenta» (0.991); JSC «Gronitex» (0.998) has almost reached the criterion value.

The analysis of the dynamic series of indexed estimated parameters of the use of EP according to the selected vectors of its development diagnoses: the level of effectiveness of its use according to private indices of potential efficiency within the framework of local potentials; trends in the parameters of the effectiveness of the use of local potentials; development priorities according to criteria of potential efficiency; the need for preventive measures to optimize EP in order to prevent a crisis in the results of the system (Table 1).

Table 1: *Summary of average annual performance indicators for the first section of the output array of aggregated indices of textile industry enterprises*

Dynamics comparison form	Local resource potential			Local institutional capacity		
	potential output	potential intensity	profitability potential	potential output	potential intensity	profitability potential
2013 / 2012	1,229	1,228	0,650	1,108	1,072	0,599
2014 / 2013	0,917	1,027	0,602	0,970	1,095	0,630
2015 / 2014	0,976	0,928	0,310	0,826	0,768	0,268
2016 / 2015	1,040	1,028	2,965	1,251	1,273	3,490
2017 / 2016	1,109	1,163	1,332	1,062	1,095	1,288
Average annual index	1,049	1,070	0,863	1,034	1,047	0,854

Source: in-house development

The lowest index values in the selected time interval fall on the profitability potential:

respectively, according to the local potentials of 2015 / 2014 in the amount of 0.310; 0.268. Accordingly, 2016 marked a significant increase in profitability potential: index values within the composition of 2.965; 3.490.

In 2016-2017, the level of indices of local resource potential is lower than the values of indices of potential return, potential intensity, potential competitiveness of local institutional potential, which corresponds to a decrease in the volume parameters of resources and expenditures of the providing potential and a corresponding increase in these efficiency fields (Figure 3).
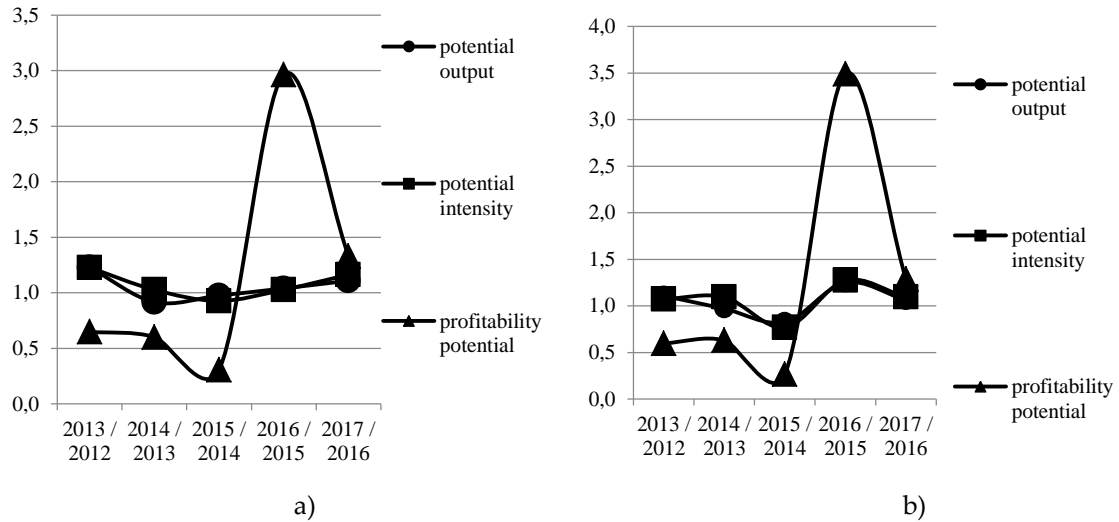
Figure 3: *Diagram of the level of development of the potential efficiency of the Bellegprom Concern in the cluster of selected enterprises: a) resource potential; b) institutional potential*
Source: in-house development

The average annual index of potential return and potential intensity for 2012-2017 in local potentials were marked by growth indices, while potential profitability decreased (average annual decrease indices 0.863; 0.854). Taking into account the importance of the considered parameters in the decision support system, the average annual index of changes in economic potential as a whole was marked by a decrease.

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In this block of analysis of the dynamics of the level of use of resource and institutional potentials of textile industry enterprises, an imbalance has been established, which was expressed in a more intensive development of potential output, potential intensity, potential profitability of the providing component of the composition – institutional potential. The aggregated indices on the right side of table 2 (the results of the institutional capacity analysis) indicate higher values of the development indices relative to the data of the local resource potential. For individual enterprises, for example JSC «Mogotex», the level of development of potential output, potential intensity, potential profitability of institutional potential is higher than similar indicators of

resource potential, which corresponds to higher growth rates of production, sales, profit from sales relative to the costs of marketing activities, innovation– investment and scientific and information activities. The cluster of these enterprises also includes JSC «Lenta», JSC «Slonimskaya PCF».

Table 2: *The second section of the output array of aggregated indices of the second and third levels of generalization of the economic potential of enterprises in the textile industry*

The enterprise of the textile industry	Resource potential subindex	Institutional subindex capacity	Integral aggregated index of the level of development of the EP
JSC «Mogotex»	0,950	0,977	0,963
JSC «Lenta»	0,986	0,996	0,991
JSC «BPHO»	0,979	0,953	0,966
JSC «Vitebsk Carpets»	0,961	0,946	0,954
JSC «Gronitex»	1,002	0,995	0,998
RUPTP «Orsha Flax Processing Plant»	1,011	0,990	1,001
JSC «Slonimskaya PCF»	0,913	0,915	0,914

Source: in-house development

For all the studied enterprises of the textile industry, low values of integral indices of potential profitability were determined, which corresponds to a less intensive dynamics of profit growth from sales relative to production capital and fixed costs. The lowest values of the indices of profitability dynamics of resource and institutional potentials were noted for JSC «Slonimskaya PCF», JSC «Mogotex», JSC «Vitebsk Carpets»: the profile of integral indices of potential profitability of resource potential 0.667; 0.774; 0.830; institutional potential 0.671; 0.839; 0.795. The EP optimization system should provide for monitoring and controlling pricing in terms of profit generation as a source of own financing for extensive and intensive factors of positive EP development. Aggregated indices of potential output, potential intensity of textile industry enterprises are almost at the same level in both blocks of the composition. Certain «scissors» of the indicated indicators were obtained at JSC «Mogotex», which is due to the export orientation of production, the influence of external factors of globalization and international integration.

The format of the point positioning of the level of economic potential development was obtained based on the results of linear normalization of aggregated indices of the second level of generalization (Figure 4).
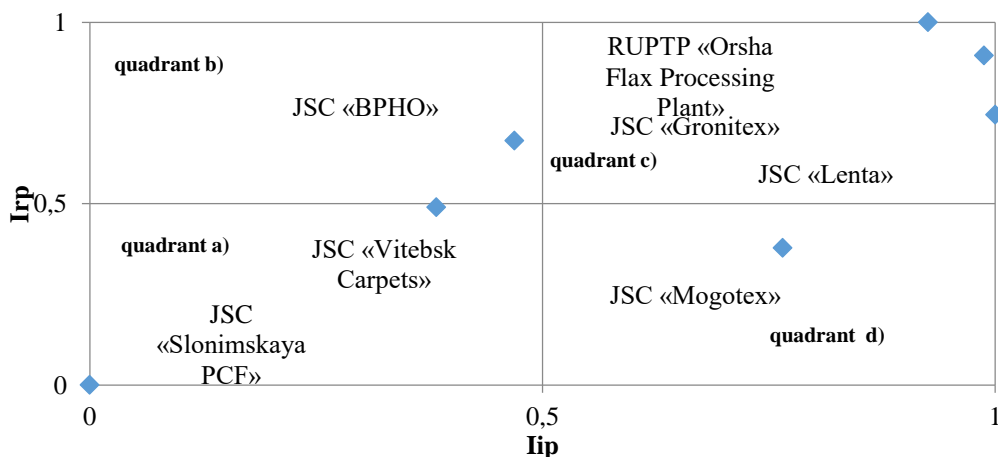

Figure 4: *Positioning textile industry enterprises in the strategic decision-making matrix*
Source: in-house development

According to the results of econometric estimation of interrelation of sub-indices (Irp, Iip) of the

level of formation, use and development of economic potential of textile enterprises, the matrix of scenarios for optimization of the meso-level EP (textile industry) is constructed and variants of working out scenarios are established.

V. Conclusion

Thus, the developed model of optimization of the EP industry based on a matrix decision-making algorithm has the properties of complexity and integrity, which make it possible to substantiate the role and place of the process of optimizing economic potential in the trends of mesorevelopment, to determine the content of decision support processes for the sustainable development of the meso-level economic system.

The coordinates of the point positioning of the level of development of the EP enterprises of the textile industry made it possible to identify clusters of similar enterprises and develop options for working out scenarios. For example, JSC «Gronitex» and JSC «Lenta» (coordinates of points before normalization, respectively (1,002;0.995); (0.996; 0.986)) occupy approximately the same position in the subindex of local institutional potential: the aggregated index of resource potential is lower than the institutional one as a result of an insignificant parameter of potential profitability (with a high coefficient of significance when integrated) in the structure of the index of economic potential.

For these enterprises, it is advisable to implement elements of centered diversification strategies (SD-1) with an emphasis on investment and innovation activities in the production of new products based on the use of modern organizational and technological tools of the company's operational activities; the implementation of the most effective innovation and investment projects to reduce production risks.

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