

# Developing a strategy for the development of small enterprises in the energy sector of the economy

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**Abstract.** As a part of the study, the problems of forming the investment strategy of energy companies were considered. Possible ways of choosing the most rational forms of investment in the assets and a comprehensive assessment of the strategy's effectiveness were proposed. A methodology for the qualitative and quantitative assessment of the investment strategy for the development of an enterprise has been developed by analyzing the Cobb-Douglas production function. In the paper, when solving specific problems, general economic methods of analysis, probabilistic and statistical methods, the method of expert assessments, and methods of system and comparative analysis were used. The practical application of the proposed assessment methodology is considered on the example of comparing two options for the investment strategy of an enterprise operating in the field of energy processing.

## 1 Introduction

The current macroeconomic situation cannot be called favorable for the expansion of investment activities of enterprises. It requires managers to have a scientific approach to managing the investment activities of companies, whose methodological support is still at a low level. The actual volume of funds of enterprises used for investment purposes has decreased in recent years due to their difficult financial situation, including the growth of unprofitable industries [1].

This indicates the low professionalism of managers in assessing the macroeconomic and market situation, as well as the lack of a well-thought-out investment strategy for participants in the investment process, which would cover a strategic period of five years or more, which ultimately can lead to low competitiveness of enterprises.

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## 2 Materials and Methods

Investment strategy belongs to the class of functional strategies and is an essential element of the strategic planning of the enterprise. The process of developing an investment strategy is closely related to the development of a basic corporate strategy, so they should be considered together.

The analysis showed [2, 3] that, despite the positive trends in the development of small business, not all enterprises manage to carry out the restructuring and full-fledged technical re-equipment necessary for effective competition.

The analysis of the problems of forming an investment strategy made it possible to develop and group them into four main groups:

1. The group of macroeconomic problems that are relevant for most enterprises of various activities.
2. The group of market problems typical to specific product markets.
3. The group of technological problems specific to specific types of activities.
4. The group of production problems typical to an enterprise of a chosen type of activity.

All groups are considered on the example of a specific type of economic activity - energy processing. The main directions of solving problems by taking into account this type of economic activity in the investment strategies of enterprises are presented in Table 1.

**Table 1.** The main problems of forming an investment strategy.

No	Problems	Directions of solution, accounting into investment strategy
<b>Macroeconomic - macroeconomic level</b>		
1	Low economic activity of consumers	Investing in the development of new products or products with improved properties.
2	High interest rate on loans	Diversification of investment sources.
3	Low availability of loans	Development of investment projects that meet the requirements of VEB and MFA for the purpose of obtaining loans. State support.
<b>Market - product market level (region)</b>		
4	Oligopolistic nature of the market	Investing in the production of products with improved properties, including deep oil refining using innovative technologies
5	High barrier to market entry	
6	Binding market prices for products to the price of oil	Taking into account in the investment strategy risks associated with fluctuations in oil prices.
<b>Sectoral - level of type of economic activity, industry</b>		
7	Low competitiveness of products due to insufficient depth of processing of raw materials	Investing in the production of products with improved properties, including deep oil refining using innovative technologies. Use of lobbying resource.
8	A fee system that does not encourage innovation	
<b>Production - enterprise level</b>		
9	Incremental type of behavior of most enterprises	Transition to strategic planning and management, development and implementation of a complex of enterprise strategies, including an investment strategy
10	Age and depreciation of assets	Investment in assets, in the reconstruction and expansion of enterprises
11	Low asset growth	
12	The presence of onerous assets (buildings and structures)	Investment in the disposal and replacement of depreciated assets. Priority for enterprise expansion
13	Low innovative potential of enterprises	Investment in deep oil refining using innovative technologies

14	Lack of own funds	Diversification of investment sources. Development of investment projects that meet the requirements of VEB and MFA for the purpose of obtaining loans. State support.
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Investment planning as a part of strategic planning is based on principles, but also has specificity, the analysis of which allowed identifying seven specific principles for the formation of an investment strategy of an enterprise as a part of the strategic planning of its activities:

1. The principle of compliance
2. The principle of economic feasibility
3. The principle of balanced sources of investment
4. The principle of alternativeness
5. The principle of responsibility
6. The principle of prioritization
7. The principle of innovative approach

On their basis, a methodological approach has been developed to select forms of investment in the assets of an enterprise based on an analysis of the Cobb-Douglas production function by comparing the indicators of the efficiency factors of various production factors, which makes it possible to increase the efficiency of investments by ensuring their target orientation [4].

The choice of the investment strategy of an enterprise is considered on the example of the Cobb-Douglas two-factor production function, which includes capital (K) and labor (L) as factors of production. The analysis showed that the production model described by this function can be used to describe the processes of investing in assets. The overall production efficiency is determined by a combination of three factors:

1. A – showing the combined effectiveness of K and L factors in production ( $A > 0$ );
2. a and b – characterizing the effectiveness of each resource separately.

The general view of the Cobb-Douglas production function is:

$$Y = A K^a L^b, \quad (1)$$

$$0 < a < 1, b = 1 - a,$$

where Y – volume of production; A, a and b – coefficients characterizing the efficiency of resources in the aggregate and separately; K – payment for capital; L – payment for labor.

The production function in the technical re-equipment of the enterprise:

$$Y = A_2 K^{a_2} L^{b_2}, \quad (2)$$

$$Y_2 > Y, A_2 > A, a_2 > a, b_2 < b$$

The production function in the reconstruction of the existing enterprise:

$$Y_3 = A_3 K^{a_3} L^{b_3}, \quad (3)$$

$$Y_3 > Y_2 > Y, A_3 = A_2, a_3 = a_2, b_3 = b_2, K_3 > K, L_3 > L$$

The production function in the expansion of the existing enterprise through new projects:

$$Y_4 = A_4 K^{a_4} L^{b_4}, \quad (4)$$

$$Y_4 > Y_3 > Y_2 > Y, A_4 > A_3$$

The results of the analysis presented in formulas 2,3,4 are as follows:

1) From the point of view of capital investments, the most effective are such forms of investment in which the higher value of the overall indicator of resource efficiency (coefficient  $A$ ) - the technical re-equipment and expansion of the existing enterprise.

2) The second most important indicator of efficiency is labor productivity, whose growth is manifested in an increase in the capital utilization rate ( $a$ ) and a proportional decrease in the labor utilization rate ( $b$ ), which is also typical for such forms of investment as technical re-equipment.

3) Reconstruction of real estate, which is not accompanied by an appropriate modernization of active funds, is ineffective.

To analyze the indicators characterizing various forms of investment in the assets of an enterprise and determining the choice of an investment strategy, we used the tools of fuzzy logic - a section of mathematics that operates with categories of fuzzy numbers and fuzzy sets. The boundaries of the fuzzy set of values of indicators reflecting the efficiency of investments in assets can be determined by the following factors:

- the probability of achieving the considered values of the indicators;
- the possibility of achieving the considered values of the indicators;
- the permissibility of achieving the considered values of the indicators;
- the desirability of achieving the considered values of the indicators.

We propose to determine the indicated limits using the norming method. As a result of the procedure of norming quantitative indicators, one can get the “good” and the “bad” answer, set the boundaries of the “good” subset and determine the gradation of quantitative indicators inside it [5].

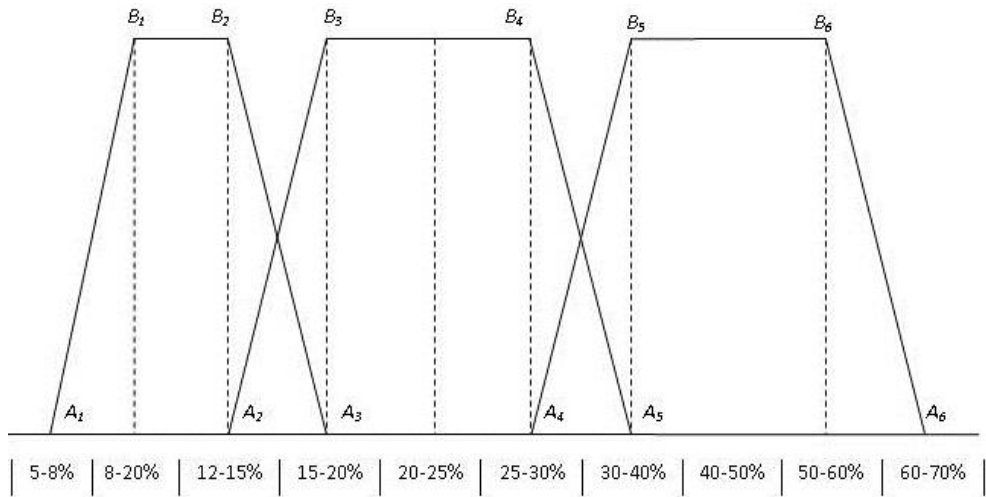
Table 2 shows the norming on the example of the values of the assessment indicator of the investment strategy “share of investments in new projects”.

**Table 2.** Assessment of the indicator “share of investments in new projects”.

Indicator	Qualitative assessment	Quantitative assessment	Preference score
1	2	3	4
Share of new projects in investments	Very high	60-70%	1
		50-60%	2
	High	40-50%	3
		30-40%	4
		25-30%	5
		20-25%	6
	Medium	15-20%	7
		12-15%	8
	Low	8-12%	9
		5-8%	10

The ranges of values of the indicator “share of new projects in investments with their various forms” are shown graphically in Figure 1.

Polygon A<sub>1</sub>, B<sub>1</sub>, B<sub>2</sub>, A<sub>3</sub> shows the indicator value ranges for an investment strategy involving only technical re-equipment of an enterprise, in which the share of new projects is relatively small, while segment A<sub>1</sub>, A<sub>3</sub> indicates the range of maximum permissible values of the indicator, and segment B<sub>1</sub>, B<sub>2</sub> - range of rational values, which is the target for this strategy. Similarly, polygon A<sub>2</sub>, B<sub>3</sub>, B<sub>4</sub>, A<sub>5</sub> shows the ranges of the indicator values for the investment strategy involving reconstruction, and polygon A<sub>4</sub>, B<sub>5</sub>, B<sub>6</sub>, A<sub>6</sub> - the expansion of an enterprise.



**Fig. 1.** Graphic display of the assessment of the indicator “share of investments in new projects”.

The method of integrated multi-criteria assessment of the investment strategy of investing in the assets of an enterprise makes it possible to take into account the maximum number of indicators characterizing the economic, social and budgetary efficiency of investments and provides a correct comparison of various strategy options [6, 7]. As a methodological basis for multi-criteria assessment of investment strategies, it is proposed:

- methodology for quantitative and qualitative assessment of options using the method of expert assessments, which is based on interval expert forecasting of the impact of various factors;
- methodology for solving the task of setting priorities by drawing up a matrix of pairwise comparisons, filled in by experts;
- methodology for the preparation of expert groups and the selection of experts.

### 3 Results

As comprehensive performance indicators used to compare alternative investment strategies, we suggest taking the indicators used by the World Bank in the analysis and selection of investment projects for lending and financing [8]. These indicators are considered as characteristics of the investment strategy, and each of them includes characteristics of the second level (Table 3).

**Table 3.** The indicators used to assess the investment strategy of an enterprise.

№	Indicators
1	Group of technical indicators (technical characteristic)
	1.1 Product (technology) innovation
	1.2 Product compliance with worldwide examples
	1.3 Readiness of project documentation
	1.4 Availability of transport capacity
2	Group of institutional indicators (institutional characteristic)
	2.1 Enterprise size
	2.2 Nature of the organizational structure
	2.3 Availability of trained personnel
	2.4 Availability of land for expansion
	2.5 Government regulation

3	Group of economic indicators (economic characteristic)	
	3.1	Share of an enterprise's product in a region's product
	3.2	Share of new projects in investments
	3.3	Attraction of budget funds
	3.4	Attraction of foreign investment
4	Group of financial indicators (financial characteristic)	
	4.1	Share of borrowed funds in investments
	4.2	Estimated payback period
	4.3	Net present value
	4.4	Sensitivity of payback period to negative factors
5	Group of commercial indicators (commercial characteristic)	
	5.1	Level of demand for products
	5.2	Level of competition
	5.3	Export potential of products
	5.4	Trends of market development
6	Group of social indicators (social characteristic)	
	6.1	New jobs
	6.2	Social infrastructure development
	6.3	Transport infrastructure development
	6.4	Wage level
	6.5	Increase the share of qualified personnel
7	Group of environmental indicators (environmental characteristic)	
	7.1	Compliance with green building standards
	7.2	Energy saving compliance
	7.3	Availability of own treatment facilities
	7.4	Reclamation and landscaping
	7.5	Compliance with the World Bank requirements for emission levels

The composition and number of indicators may vary depending on the industry sector of the enterprise, market parameters and other factors specific to a particular case. The most important element in the formation of a strategy is the assessment of its effectiveness and the comparison of alternatives with the aim of choosing the best. The overall assessment sequence is presented in the flowchart (Fig. 2.).

The practical application of the proposed assessment methodology is considered on the example of comparing two variants of an investment strategy of an enterprise operating in the field of energy processing:

1. Investment strategy aimed at the development of the production of octane-increasing additives for motor fuel - a strategy for technical re-equipment (Strategy 1).

2. Investment strategy aimed at introducing the technology of deep oil refining and production of a new product of high-octane motor fuel of the Euro-5 standard - expansion strategy with modernization (Strategy 2).

The results of the norming and scoring conducted by the method of expert survey, as well as the final comparison of the two strategies are presented in Table 4 and Figure 3.

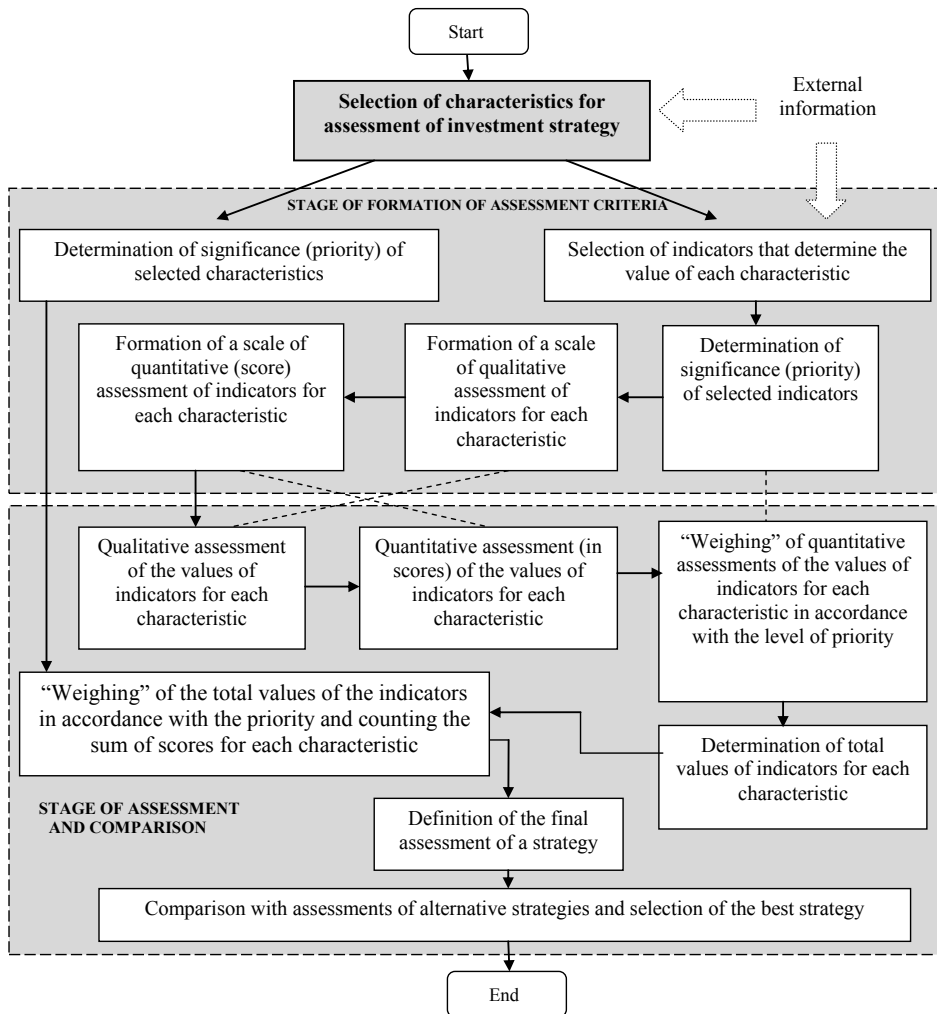
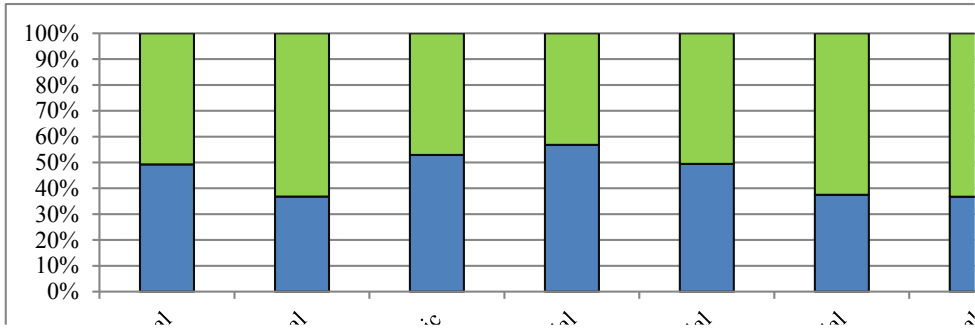


Fig. 2. Flowchart of a multi-criteria assessment of investment strategies.

Table 3. Total scores of comparable investment strategies.

№	Name of the characteristic	Significance	Assessment		Assessment including significance	
			Strategy 1	Strategy 2	Strategy 1	Strategy 2
1	Technical characteristic	0.252	5.976	6.159	1,506	1,552
2	Institutional characteristic	0.225	5.214	8.954	1,174	2,015
3	Economic characteristic	0.224	7.404	6.580	1,659	1,474
4	Financial characteristic	0.152	8.096	6.151	1,231	0,935
5	Commercial characteristic	0.071	6.800	6.948	0,483	0,494
6	Social characteristics	0.051	4.876	8.135	0,249	0,415
7	Environmental characteristic	0.024	5.076	8.714	0,122	0,210
			<b>TOTAL</b>		<b>6.424</b>	<b>7.095</b>



**Fig. 3.** Comparison of two investment strategies.

## 4 Conclusion

According to the results of the assessment, Strategy 2 - expansion of the enterprise - was recognized as preferable. She got higher marks for five of the seven characteristics. The effectiveness of the long-term development of industrial entrepreneurship in modern conditions is determined by the quality of the strategic planning of an enterprise, the most important element of which is its investment strategy. Investments in the assets of an enterprise form the material basis for its development for many years to come.

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