

# Modeling the effects of key threats on the economic security of industrial enterprises

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**Abstract.** The current business environment of industrial enterprises is characterized not only by the complexity of transformational processes in the national economy, political and social tensions, increased competition from foreign producers and the introduction of protectionist measures from importing countries, etc., but above all the unpredictability of changes in the environment. This aspect should be considered as the cornerstone in the development of a new approach to the formation of a strategy to ensure the economic security of industrial enterprises. The purpose of the study is to examine the theoretical and methodological aspects of the formation and implementation the strategy to ensure the economic security of industrial enterprises in order to create the basis for their safe development.

## Introduction

In fact, one can speak of the presence of three key approaches, which differ in their interpretation of the essence of strategy and strategic management. According to the first approach, supported by J. Higgins, (1983) strategic management is defined as a decision-making process that combines internal organizational capabilities with threats and favorable opportunities provided by the external environment to interpreting strategic management and forming a modern definition of the management process in order to fulfill the organization's mission through management the organization's interaction with its environment.

According to the second (target) approach, strategic management is a set of tasks, the achievement of which helps the company to maintain its position in the market in the long term. Representatives of this direction are J. Pearce and R. Robinson (1985).

In accordance with the third (effective) approach, strategic management is a process that helps in the implementation of long-term plans of the enterprise. D. Schendel and K. Hatter (1972) characterize it as a process of identifying and establishing the connection of the enterprise with its environment, consisting in the realization of selected goals and in

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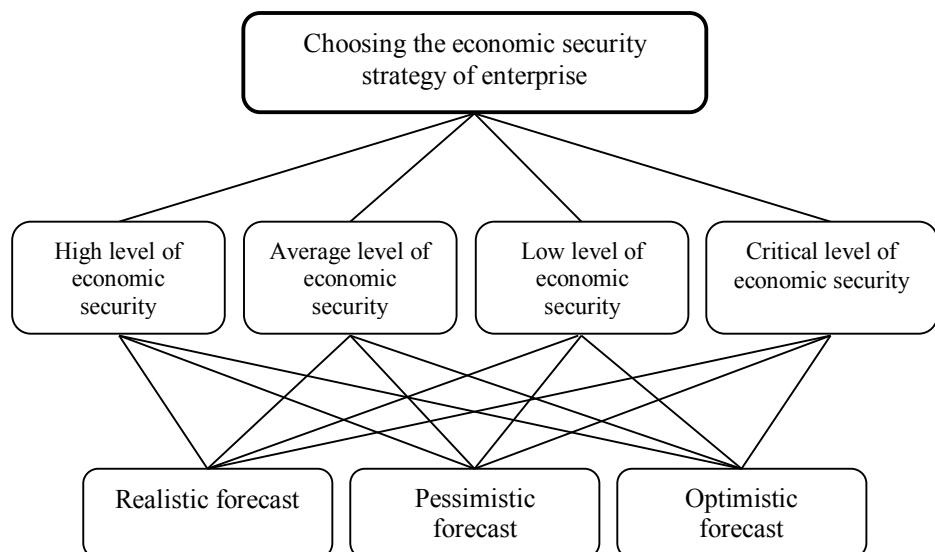
attempts to achieve the desired state of relations with the environment through the allocation of resources, allowing the company and its divisions to operate effectively and efficiently.

The problem of developing and implementing a strategy of ensuring the economic security at the level of individual enterprises has been little studied. This is found in the scientific works of R. Inglehart and R. Abramson (1994), H. Poirson (1998), which actualize the importance of conducting scientific research contributing to the development of the most appropriate strategies for ensuring the economic security of the enterprises.

## **The rationale for choosing a particular strategy option**

During the building possible future scenarios and making management decisions, the decision maker usually encounters complex interdependencies of events that need to be analyzed. To solve such problems, they usually use the method of analyzing hierarchies that is also used in solving economic problems (Saati, 1993; Sylkin, 2018; Sgurovsky 2007; Chernyak, 2016; Shtangret, 2016).

Using the method of analyzing hierarchies, we will justify the choice of a strategy for ensuring the economic security of the industrial enterprise. Therefore, we formulate the essence of the problem as follows: the need to choose a strategy to ensure the economic security of the industrial enterprise in accordance with the hierarchy of scenario choices (Fig. 1), the top of which is the goal "Choosing the economic security strategy of enterprise". The first level of this hierarchy is formed by four levels of economic security (criteria): "High level of economic security", "Average level of economic security", "Low level of economic security" and "Critical level of economic security".



**Fig. 1.** The hierarchy of the problem of choosing a strategy to ensure the economic security of industrial enterprises

At the last level there are three alternative scenarios: "Realistic forecast of the situation development", "Pessimistic forecast of the development of the situation" and "Optimistic forecast of the development of the situation".

Next, the expert needs to make  $\frac{n \times (n - 1)}{2}$  comparisons, where  $n$  is the number of criteria on the same level. In our case, four levels of economic security, respectively, it is necessary to conduct six comparisons of different pairs of security levels.

Since there are three alternatives and four criteria in the hierarchy, it is necessary to carry out  $n \times \frac{m \times (m - 1)}{2}$ , where  $m$  is the number of alternatives, that is 12 comparisons of pairs of alternative scenarios.

Approbation of the theoretical and methodological approach was carried out to select the strategy for ensuring the economic security of Natural Resources CJSC, which was based on analytical materials on the actual level of economic security of this enterprise in 2010-2018. And the forecast changes in the impact of key threats to the oil and gas industry.

## Building a matrix of pairwise comparisons

During the building a matrix of pairwise comparisons of levels of economic security, they were compared in pairs with respect to a common goal (the choice of a strategy to ensure the economic security of the enterprise). The results of the paired comparisons are decorated in the form of a table 1.

During the comparing scenarios for the development of the situation, not one, but four tables are formed, because these options are compared for each of the four levels of economic security (Tables 4).

For each of the matrix of pairwise comparisons of forecasts of changes in the impact of threats on the economic security of industrial enterprises at different levels of economic security of the enterprise, the results of the ranking of forecasts are given (Table 5) and the levels of inconsistency of the matrix of pairwise comparisons are determined. The calculations were performed using a computer program (Gileta, 2012).

**Table 1:** Matrix of pairwise comparisons of the levels of economic security of industrial enterprises

Level of security	High	Average	Low	Critical
High	1	3	5	7
Average	1/3	1	3	5
Low	1/5	1/3	1	3
Critical	1/7	1/5	1/3	1

**Table 2:** The sums of the columns of the matrix of pairwise comparisons of the levels of economic security of industrial enterprises

$w_i$	$w_1$	$w_2$	$w_3$	$w_4$
$S_j$	0.563	0.263	0.117	0.055

**Table 3:** Determining the level of inconsistency of the matrix of pairwise comparisons is presented in the form of Table 1

Indicator	The largest proper number, $k_{max}$	Coefficient of consistency, $CI$	Inconsistency level, $CR$
Calculation results	4.117	0.039	0.043

**Table 4:** Matrix of pairwise comparisons of forecasts of changes in the impact of threats on the economic security of industrial enterprises for a high level of economic security

High level	Realistic	Pessimistic	Optimistic
Realistic	1	5	1/3
Pessimistic	1/5	1	1/6
Optimistic	3	6	1

**Table 5:** The sums of the columns of the matrix of paired comparisons of forecasts of changes in the impact of threats on the economic security of industrial enterprises for a high level of economic security

$u_{1j}$	$u_{11}$	$u_{12}$	$u_{13}$
$S_j$	0.287	0.077	0.634

**Table 6:** Determining the level of inconsistency of the matrix of pairwise comparisons is presented in the form of a Table 4

Indicator	The largest proper number, $k_{max}$	Coefficient of consistency, $CI$	Inconsistency level, $CR$
Calculation results	3.094	0.047	0.081

By analogy, calculations were made for the average, low and critical levels.

The calculations were performed correctly, since the value of the largest eigenvalue  $k_{max}$ , the coefficient of consistency,  $CI$  and the level of inconsistency,  $CR$  for each of the matrices (Table 4,) are within the normal range (Table 3, 6).

The choice of the strategy of ensuring the economic security of the enterprise (synthesis of priorities)  $U_i$  is carried out according to the formula:

$$U_j = \sum_{i=1}^4 w_i u_{ij}, j = 1, 2, 3, \quad (1)$$

where  $w_i$  is the priority of the  $i$ -th level of economic security of the enterprise ( $i = 1, \dots, 4$ );

$u_{ij}$  is the relative weight of each of the forecasts ( $j = 1, 2, 3$ ) of changes in the impact of threats on the economic security of the enterprise according to the  $i$ -th level of economic security of the enterprise ( $i = 1, \dots, 4$ ).

In accordance with (1), we have the following options for calculating the values of priorities for all alternative scenarios:

$$U_1 = w_1 \times u_{11} + w_2 \times u_{21} + w_3 \times u_{31} + w_4 \times u_{41}; \quad (2)$$

Substituting the corresponding values from Tables 2-6 in formulas (2), we obtain the following values of priorities for all scenarios that were considered:

$$\begin{aligned} U_1 &= 0.563 \times 0.287 + 0.263 \times 0.236 + 0.117 \times 0.279 + 0.055 \times 0.319 = \\ &= 0.161 + 0.062 + 0.033 + 0.017 = 0.273; \end{aligned}$$

$$U_2 = 0.082;$$

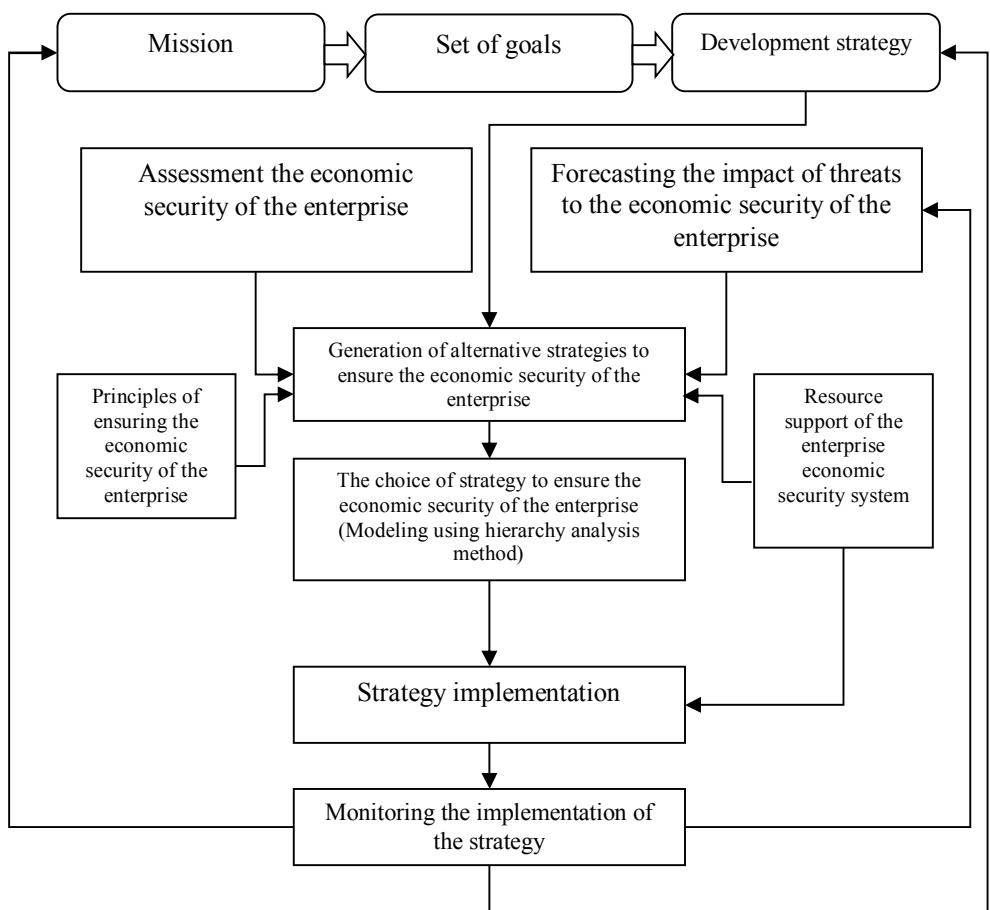
$$U_3 = 0.640.$$

The obtained results allow us to state that the third strategy of ensuring the economic security of industrial enterprises is the most acceptable one. That is, according to the third scenario of the development of the situation for CJSC «Natural Resources», it is necessary

to carry out measures for adapting the activity of the enterprise to the effects of threats, providing for the implementation of the adaptation strategy.

On the basis of the above positions, we have formed a model that includes, in addition to the main stages of formation, the procedure for implementing the strategy to ensure the economic security of industrial enterprises (Fig. 2).

Briefly describing the process of implementing the strategy of ensuring the economic security of industrial enterprises, it is expedient to emphasize that with a quick change of the functioning environment, the role of systematic control and adjustment increases both by clarifying certain parameters of the chosen strategy and implementing tactical protective measures.



**Fig. 2.** Model of the formation and implementation the strategies to ensure the economic security of industrial enterprises

We consider the opinion of individual representatives of the business community to be erroneous regarding the expedient use of exclusive tactical control in the process of ensuring the economic security of industrial enterprises. This is explained by the fact that the essence of key threats to industrial enterprises does not allow organized the effective protection in short periods of time and with the available resource support. The developed strategy makes it possible to adapt gradually economic security system of the enterprise to new tasks and changed business conditions, therefore, to ensure that it can perform all the tasks to create safe conditions for the development of industrial enterprises.

## Conclusions

Summarizing, it can be argued that the discussed methodological and practical aspects determine the procedure for developing and implementing the strategy to ensure the economic security of industrial enterprises are governed by its subordination to the mission and set of objectives, the relationship with the development strategy. Strategic orientation in ensuring the economic security of industrial enterprises contributes to the timely improvement of the economic security system of the enterprise in accordance with changes in the development strategy and level of influence of the operating environment. Constant monitoring and adjustment of the implementation the strategy ensures the stability of the enterprise, mutual consistency and the possibility of achieving economic interests.

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