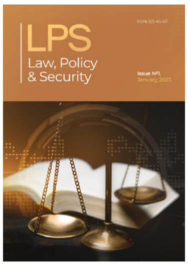

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Strategy of strengthening the economic security of enterprises of network structures: Pragmatics and key vectors of development

Abstract. The study of the current state of network structures in the current conditions of functioning and the need to implement an economic security strategy allow to identify the level of the security component in the future prospects of business structures, the direction and nature of their action in the context of clustering. The purpose of the article is to systematically substantiate the strategy for ensuring economic security of enterprises on the basis of organizational and economic assessment with identification of the maximum and actual levels. In the course of this research, the following methods were used: deductive; comparative analysis of empirical data; abstract and logical generalization; systems theory and systems analysis; comparison; heuristic; factor and logical analysis; scientific abstraction and economic and mathematical modeling; graphical; generalization. This paper substantiates the conceptual and categorical apparatus of "economic security", "strategy for strengthening the economic security of an enterprise of network structures". The current state of enterprises of network structures in the context of modern challenges is analyzed. A detailed algorithm for implementing the strategy of economic security of enterprises of network structures is described, with allocation of the relevant stages. The priority of the functional strategy, which should not contradict the basic strategy, is noted and the main tasks are characterized accordingly. Recommendations for improving the organizational and economic procedures for evaluating the economic security strategy of network structures based on clustering by the Kokhonen approach are developed. The current state of enterprises of network structures in the context of modern challenges is analyzed. A detailed algorithm for implementing the strategy of economic security of enterprises of network structures is described, with allocation of relevant stages. The priority of the functional strategy, which should not contradict the basic strategy, is noted and the main tasks are characterized accordingly. Recommendations for improving the organizational and economic procedures for evaluating the economic security strategy of network structures based on clustering by the Kokhonen approach are developed. The practical tools for a comprehensive study of network system enterprises (*E1-E10*) using the structure of the data set based on the identification of three clusters in the context of the level distribution of security are substantiated. The main provisions of this article will allow

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domestic business structures, based on the application of the network modeling clustering methodology, to form a forecast assessment of the strategy for strengthening economic security and develop appropriate vectors for improving the security component

Keywords: algorithm for forming a security strategy; functional support strategy; security components; organizational and economic assessment of economic security; Kokhonen's methodology; clustering of network structures

INTRODUCTION

In the light of modern challenges, the substantiation of a strategy for strengthening the economic security of an enterprise in network structures is gaining importance and relevance. It is the implementation of the strategy of economic security of network structures that is the main condition for the operation of each structural unit of a market economy in a dynamically changing environment. It should be noted that at this stage of development, the essence of strengthening the economic security of an enterprise of network structures is the formation of appropriate preventive measures, identification and prevention of threats to economic systems. As in any management system, the process of managing the economic security strategy of an enterprise of network structures is based on monitoring and analyzing the information received about the internal state of the business entity and the situation of external factors (Andrushkiv, 2012; Lebedko, 2019; Diunova, 2020).

A large number of scientific works have been devoted to the study of assessing the current problems of strategic guidelines for ensuring the economic security of enterprises in a network structure. Thus, the authors S.A. Lebedko (2019), T.O. Melikhova (2019), M.V. Savchenko & O.V. Shkurenko (2019) focused on the theoretical and methodological foundations of the contexts for strengthening the economic security of enterprises based on an integrated assessment. T.V. Diunova (2020) and M. Ziailyk & J. Krzywkowska (2020) noted that consideration of the mechanism of strategic development of enterprise security depends to a greater extent on the regional characteristics of the development of network structures and the practical functioning of the security component. M. Voynarenko *et al.* (2020) assess the level of security of business structures in the context of clustering based on modeling of economic development indicators. The work of V. Gevko (2020) introduces the modeling of intercompany relationships of enterprises in network structures, where the author proposes an approach to determining the security level based on cluster analysis.

Yu. Kharazishvili (2019) considers the concept of security and strategic implementation scenarios through the prism of the constituent elements of the financial component subsystems. Insufficiently developed are the issues of studying the strategy for ensuring the economic security of enterprises of network structures in the context of evaluation based on clustering with the identification of level distribution. These aspects are analyzed in this paper. The most important goal of the strategy for ensuring economic security is to generate income from activities, maintain a high competitive position in the external environment throughout the entire life cycle and counteract existing threats. It should be noted that in all phases of the cycle of activity of the external market environment, the enterprises of network structures, while developing, should maintain a constant competitive level of efficiency on the basis of achieving the appropriate level of the security component. Thus, the prerequisite for maintaining the maximum value of the security component brings to the fore the requirement to present a strategy for economic security of enterprises in network structures. It is proved that the main indicator of the implementation of the economic security strategy of network systems is to obtain the efficiency of functioning based on the effective degree of profitability. It is impossible to ignore the fact that the strategy for strengthening the security component of network structures should be presented in such a way as to respond in a timely, adequate and flexible manner to changes in the external and internal environments. The main purpose of the scientific research is a comprehensive study of the strategy for ensuring economic security of enterprises of network structures in the context of organizational and economic assessment based on clustering with the allocation of the maximum and actual levels.

MATERIALS AND METHODS

In formulating this article, the deductive method was used. Since the study of scientific issues presents the general conceptual contexts of the strategy for strengthening the components of economic security of an enterprise of network structures, on the basis of which an algorithm for forming an economic security strategy for an enterprise of network structures is proposed with the allocation of the relevant stages. In particular, a study of the theoretical basis and organizational and economic procedures for assessing the economic security strategy of network enterprises based on the Kokhonen methodology for network enterprises using a graphical method to visualize the results of the study was presented, and as a result, a set of project vectors for ensuring the security component using the method of scientific abstraction was proposed.

The method of comparative analysis of empirical data is used to formulate the problem and study the object of strategy for strengthening the economic security of enterprises of network structures. The method of abstract and logical generalization is also used to identify the scientific definition of "strategy for strengthening the economic security of enterprise network structures". The next stage is the content-classification identification of the algorithm for forming the economic security strategy of enterprise of network structures and characterization of the relevant stages, using the method of systems theory and system analysis. The information support for this method is the scientific works of scientists in accordance with the subject of this study (Tesliuk, 2018; Lebedko, 2019; Savchenko & Shkurenko, 2019).

In order to reveal the relevance of this article, the comparison method is used to comprehensively assess and distinguish approaches in the context of the structural distribution of security components of enterprises in network structures. In particular, the practical tools for a comprehensive study of network system enterprises (*E1-E10*) are applied.

That is, the graphical method was used to develop the results of clustering network structures in the corresponding range of "0, 1, 2". On the basis of this, the level distribution of security of enterprises of network structures within the "low", "medium" and "high" level of security is presented using the heuristic method.

The obtained results are analyzed and the maximum and actual level, relative assessment of the security of network structures are structured using the method of factor and logical analysis.

Summarizing the scientific research by the method of generalization, it is argued that this approach of organizational and economic procedures for evaluating the economic security strategy of network structures will provide an opportunity to form a forecast vision of the vectors for ensuring the security component.

RESULTS AND DISCUSSION

Features of formation of the strategy of economic security of network structures

The strategy of ensuring the economic security of enterprises of network structures is of particular importance in periods of stabilization and decline in the activity of the external environment, when the network system is under pressure from the outside due to the emergence of various types of threats. In general, threats to the economic security of enterprises of network structures should be considered as a set of conditions, processes and factors that impede the realization of the economic interests of the enterprise or pose a certain danger to their functioning (Mykhailyshyn & Korovchuk, 2020). Generalization of various conceptual approaches to defining the concept and essence of economic security, analysis of current trends made it possible to find out that the economic security of network structures is a state of the economic system of the appropriate level that protects the implementation of strategic goals from external and internal threats of loss of development stability, in which the level distribution of the security component of the enterprise of network structures will be within the limits of the boundary values during the period of implementation of measures (Vivchar, 2018).

Having analyzed the current state of activity of enterprises of network structures in the focus of modern challenges, it is substantiated that, firstly, information, digital, organizational, production, entrepreneurial processes are taking place in its internal and external environments, which are characterized by specific features and have certain differences determined by the laws of development. Secondly, despite the turbulence of economic processes, production and business activities, and differences in development trends, the processes also have fundamental similarities – they are aimed at accelerating and improving the network system. Thirdly, methodological approaches to substantiating the organizational and economic foundations of the economic security mechanism necessary for the implementation of the economic security strategy of the enterprise of network structures should use a single indicator of strategic flexibility (universality, relevance, adaptability) (Andrushkiv *et al.*, 2018; Kolodiazhna & Bukrina, 2019; Who or what..., 2019).

Based on the research, it is found that the strategy for ensuring economic security is carried out in several areas: determining the types and magnitude of threats, implementing measures to counteract the emergence and elimination of threats, as well as developing a strategic action program for organizing and implementing effective profitability of the structural units of network structures, which will allow to maintain its competitiveness in the market. strategies for strengthening the economic security of the enterprise of network structures. From a practical point of view, the strategy for strengthening the economic security of the enterprise of network structures includes the following stages (Fig. 1).

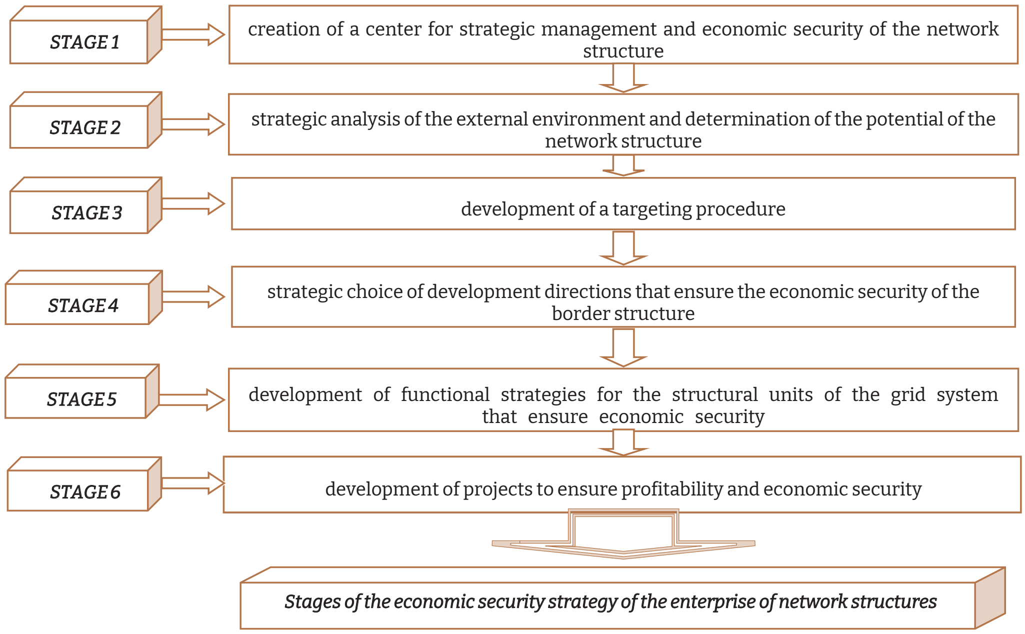


Figure 1. Algorithm of forming an enterprise economic security strategy of network structures
Source: compiled by the authors

Taking into account the results of the study of the categorical apparatus, the definition of the concept of "strategy for strengthening the economic security of enterprise of network structures" has been further developed in scientific circulation, which is defined as a system of strategic management in which a network structure, carrying out a comprehensive diagnosis of the external and internal environments, adjusting its goals and objectives of development, determines the main directions of diversification of functional support for strategic development guidelines to counter threats.

At the first stage of forming the economic security strategy of network structures, a center for strategic management and strengthening of the economic security component is created. This is the most important stage of strategy formation, since a single management center is responsible for its implementation, operating in a multi-level space covering the market environment, strategic planning processes, and ensuring coordination and interconnection of the goals and objectives of the business entity.

The basis of the market mechanism of commodity-money relations is the price. Accordingly, the first task of the strategic management center is to develop a network pricing policy that reflects the economic interests of the entity. The second task is to create realistic and strategic goals for the grid system, calculated for the future, taking into account existing and potential constraints, which will prevent threats to the economic security of the grid. The third is the task of optimizing the system of goals, objectives and actions of the structural units of the grid system to achieve the efficiency of its activities.

From the second to the sixth stages, a practical mechanism for implementing projects to ensure the economic security of network enterprises is developed, taking into account the phased blockiness of the system (Hryhoruk *et al.*, 2019). The second stage involves identifying and analyzing the strategy and potential of the enterprise of network structures. At this stage, to determine the level of significance of strengthening the security component of the economic component of business network structures, the most effective is the use of SWOT and PESTLE analysis methods. SWOT-analysis allows to identify opportunities and threats to the activity of the enterprise of network structures under the influence of the external environment, as well as strengths and weaknesses of the internal environment. It should be noted that the most promising area of strategic analysis is the synthesis of SWOT and PESTLE analysis methods. This synthesis provides an opportunity for a more detailed study of external threats to the activities of the enterprise of network structures, clarification of their types, quantification of the scale of threats, the degree of their impact and time periods of influence of scientific, technical, technological and organizational potential. The value of the strategic analysis stage is that the results obtained make it possible to identify real and projected challenges for network enterprises that need to be countered by applying the measures provided for in the economic security strategy.

The third stage is the targeting stage, where the mission and strategic goals of the network enterprise are determined. The mission of the network enterprise represents the functional support and determines the stability and strengths and advantages for all categories of personnel, as well as the attractiveness of the activity for all stakeholders in the external environment. The strategic goal defines targets (in quantitative and qualitative terms) and level of security support for the security component of network structures as its most important components.

At the fourth stage, the strategic selection of performance benchmarks for network structures that ensure the economic component of the security of the business entity is carried out. Given that the basis of enterprise security of network structures is sustainable development, the most promising strategic choice of directions for the development of the network system is the use of diversification and integration strategies. The diversification strategy allows network enterprises to increase market share, expand the range of services.

At the fifth stage, the structural units that are part of the network system develop strategies in the vector of functional performance that should not contradict the basic strategy. Let us characterize the functional strategies for strengthening economic security, which are components of the basic strategy of network structures. The financial department of entrepreneurial network structures develops a functional strategy for strengthening economic security, which is structurally and logically interconnected with the marketing strategy, social and production strategies. The strategy defines the characteristics of the "order portfolio", i.e. the structure and volume of sales determined on the basis of market research, the level of financial stability and solvency of the network structure, the actual and permissible amounts of accounts payable and receivable, the level of provision with own sources of financing of working capital, etc. The strategy calculates the financial assessment of the company's return on assets, capital intensity, and profitability of sales. One of the tasks of the strategy is financial diagnostics, which accompanies the process of implementing the enterprise's network structures. This method identifies deviations from actual values, characteristics, and planned indicators, which makes it possible to develop appropriate measures to prevent threats to the economic security of the network enterprise (Gevko, 2020; Gevko *et al.*, 2021).

The structural subdivision of the network enterprise that recruits personnel represents the functional support strategy. The human resources component is a crucial part of the business network. Staff cohesion and their interest in achieving the network's efficiency depend on the existence of formed motives for labor activity. The basis of the social development strategy should be a scientifically grounded methodological approach to determining the leading motive for labor activity of the personnel of the network structure. The scientific approach of J. Galbraith is relevant today, according to the research in the context of which the classification of labor motives is carried out according to the following three types: the desire for monetary reward; adaptation of the employee's own goals to the goals; identification of his own goals with the goals of the business entity (Economic views ..., 2021).

The effective operation of network enterprises is achieved if the motivation and purpose of labor activity are unambiguously aligned with the goals of the network system. In this case, on the one hand, the remuneration for the work of different categories of personnel directly depends on the growth of the efficiency of the business entity, and on the other hand, the personnel of the business structure ensures the economic security of the enterprise of the network system as a prerequisite for creating efficiency.

The basic strategy of economic security is the functional strategy developed by the security service (unit) of the enterprise of network structures. The functional strategy of the security service of network enterprises determines the nature of management in two main areas. Thus, according to the first direction, the security service realizes the function of constant control and direct elimination of external and internal threats to the activities of the enterprise of network structures. The security strategy in accordance with the first direction solves the following tasks, in particular, provides: protection of trade secrets and confidential information; security and protection of premises; physical safety of personnel; maintains technical and fire safety; economic security.

In accordance with the second direction, the functional purpose of the security service, reflected in the strategy as a subsystem of procedures, observations and response measures, is determined by the need to recognize potential threats to the operation of the network enterprise in a timely manner, assess their nature and scope, and propose measures to eliminate them in order to achieve future sustainable development. The main guidelines of this component of the functional strategy are as follows:

- justification of the competitive environment;
- diagnosing the security component of the network;
- implementation of information and analytical classification work;
- implementation of control over strengthening economic security (Kharazishvili, 2021).

The results of the security service's activities in accordance with the second direction of the functional security strategy are formalized as calculation and analytical materials. The strategic task of the security service involves the implementation of measures to minimize overall losses from threats and the development of proposals to support the activities of network enterprises to organize new types of cost-effective activities.

It should be noted that the practical mechanism for implementing the direction of the functional strategy of the security service is based on the implementation of the developed recommendations for ensuring economic security in relation to the specific conditions of the external and internal environments of the enterprise of network structures. In the context of large-scale use of modern technologies by network enterprises with the need for continuous improvement and renewal of products, an important factor in ensuring economic security is the intensification of the activities of the structural units of the network system that carry out research and development work (Who or what..., 2019).

The sixth stage involves the development of innovative projects. Project solutions are aimed primarily at expanding the range of products and services. The purpose of developing innovative projects is to ensure the profitability of production and economic security of the enterprise. The organizational and management measures envisaged in the innovative projects of network enterprises involve the use of a new implementation strategy to stay ahead of industry competitors and increase their market share. Analyzing the organizational and economic foundations of the economic security strategy of a network enterprise, it is worth noting that the economic security of the network can be realized if the following principles are observed:

► economic feasibility of strategic decisions in the internalization of joint commercial operations of individual structural units, if this does not lead to an increase in the total production costs of the business structure;

► the enterprises of the network structures – partners participating in the activities of the corporate association – receive a profit that is the sum of the following components: the amount of profit from independent operation and a part of the excess profit from systemic corporate activities.

It is impossible to ignore the fact that the mechanism of forming the economic security strategy of the enterprise of network structures is based on the main vectors of strengthening. The fundamental basis of each is the economic justification of the motives for the functioning of the network system and, accordingly, their implementation within the strategy of the security component. For all vectors of implementation, the condition that the economic security of enterprises of network structures will be ensured and maintained during the period of the network's existence is justified (Fig. 2).

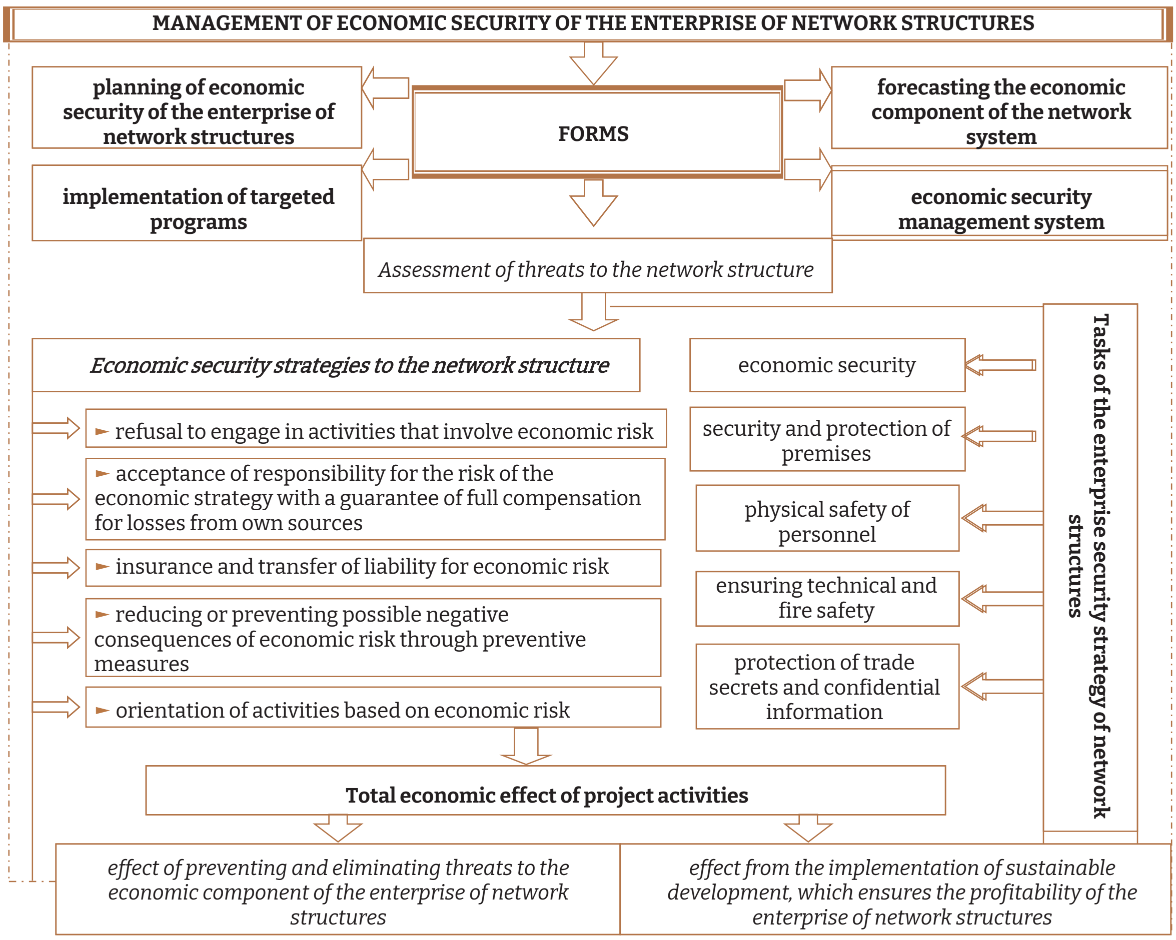


Figure 2. Structural and logical scheme of formation of the strategy for strengthening the economic security of the enterprise of network structures

Source: compiled by the authors

The subject of the study is the processes of ensuring the economic security of enterprises of network structures, and its most important component is the definition of the "lower" and "upper" limits of security of network structures. Studying the security issues, it can be concluded that the decrease in the level of economic security of enterprises of network structures is carried out on the basis of negative trends leading to a decrease in the security of the network system. In particular, this trend means a weakening of the competitive position of network enterprises in the market caused by a decrease in demand for products, a decrease in production volumes and profits.

Practical tools for a comprehensive study of the level of economic security of enterprises of network structures

Another important aspect of the study is determined by the fact that the object of the economic security strategy is the enterprises of network structures. Thus, the "lower" limit of the security component of the enterprise of network structures is reached when there are no incentives and efficiency of implementation in the network system. The organizational and economic basis of the "lower" limit of economic security of enterprise of network structures is analyzed using the theory of transaction costs. When implementing the strategy of economic security of enterprises of network structures, the principles of safe functioning are ensured, the economic basis of which is participation in shares based on the profit received. Thus, the "lower" limit of economic security is achieved by increasing the share of costs of production costs, as well as the share of costs for participation in the organization of a network structure in the estimate of production costs.

The relative increase in organizational costs provides a minimum of benefits achieved by saving transaction costs by individual structural units. It is proved that the "lower" limit of economic security exists for a network structure, but not for individual structural units. The threat to the economic security of an enterprise in network structures begins to act after passing the "lower" limit of their security system. The "lower" limit of economic security for network enterprises is reached when a decrease in sales and production volumes, as well as the emergence of powerful competitors in the market, lead to a decrease in corporate excess profits.

As a result, the activities of business structures are carried out in conditions similar to those of their independent functioning in the long term, when the enterprise, while receiving sufficient profit compared to =the profit of industry competitors, cannot receive monopoly excess profits. At the same time, economically unjustified growth in the volume of services provided by a network company may lead to a situation that can be defined as the "upper" limit of economic security of the network system. By the time the "upper" limit of economic security is reached, the organizational costs required to increase the size of the network enterprise are not compensated by the intensification of sales. The tendency of the influence of production factors makes it possible to obtain a synergistic effect and the need to move to other alternative options for the formation of a new economic security strategy.

It is impossible to ignore the fact that the strategy of ensuring the economic security of enterprises of network structures will be effective only if its implementation provides a high effect. The overall economic effect includes the following two main components:

1) the effect of preventing and eliminating threats to the economy of network enterprises;

2) the effect of implementing sustainable development that ensures the profitability of network enterprises.

These types of effect are the result of controlling the state of the economic component of the security component of the organization of new technologies development. Thus, the organizational and economic assessment of the effectiveness of the strategy for strengthening the economic security of enterprises in network structures is the fundamental basis for assessing the implementation aspects of the strategy for ensuring economic security in general, the economic security strategy as a functional strategy, and the status of innovative technologies and their implementation. On this basis, the article presents a conceptual and methodological framework for the organizational and economic evaluation of the security strategy of enterprises of network structures, taking into account the specifics of processes and their management within the framework of the implementation of the economic security strategy.

The methodology for organizational and economic assessment of economic security of enterprises of network structures should include methods for calculating indicators that reflect the level of uncertainty of the external environment, the types and degree of threats to economic security, the amount of costs for their elimination, as well as the amount of costs for organizing new types of profitable production. The methodology of organizational and economic assessment of the effectiveness of the strategy for ensuring the security of enterprises of network structures should also reflect the structure and ensure the aggregate result of counteracting threats and selling products at the profitability of measures in market conditions (Tesliuk, 2018).

It is established that the assessment of economic security is carried out on the basis of regulatory principles, in particular:

1) according to the traditional approach, the basic indicators are determined in accordance with the main determinants that characterize the activities of the enterprise at the macro-, meso- and micro-level; 2) actual indicators are calculated; 3) maximum indicator values are determined; 4) actual and maximum indicator values are compared; 5) the main indicators are substantiated; 6) determine the minimum (*min*), average (*ave*) and maximum (*max*) time required to achieve the target value of the indicators; 7) set the minimum (*min*), average (*ave*) and maximum (*max*) budget required to achieve the target indicators; 8) rank threats to economic security; 9) present strategic guidelines for strengthening economic security (Melikhova, 2019).

It is substantiated that the strategy of strengthening the security component of the enterprise of network structures can be implemented on the basis of the methodology of organizational and economic assessment according to the following dependence (Savchenko & Shkurenko, 2019):

$$E = 1 + Kr = \frac{Pr + P}{C + Cl + Cc + Cnc},$$

where E is the economic efficiency of the economic security management strategy; Kr is the profitability ratio of the network enterprise; P is a part of the total result from the project implementation of the effective operation of the network structures enterprise (the amount of income from sales of new products), formed to compensate for the costs of threats that it experienced in the period preceding the start of new production; Pr is a part of the overall project result directly related to the costs of organizing, implementing, and developing innovative projects; C is the cost of inefficient operation of network enterprises; Cl – costs of eliminating the impact of inefficient operation of network enterprises; Cc – costs of organizing the efficient operation of network enterprises; Cnc – unproductive costs that accompany the effective operation of network enterprises.

As a practical component of the testing of the economic security strategy, we conducted a comprehensive study and sampled 10 enterprises of the network system (*E1-E10*). The structure of the data set in Table 1 was used for the calculation.

Table 1. Structure of the dataset of network enterprises

№	Parameter name	Parameter type
1	Network structure enterprise (*E1-E10*)	text
2	Name of the security component	text
3	Maximum level	numeric
4	Actual level	numeric
5	Relative assessment	percentage

Source: compiled by the authors

It should be noted that for the analysis of the indicators, the Kokhonen method of clustering was used. According to the Kokhonen method, each unit corresponds to a "cluster", and the number of clusters can be determined by the grid size, which can be represented by a rectangle. This algorithm allows for a variety of interpretations. It is worth noting that the generated "maps" are fairly consistent, which emphasizes the high level of practical relevance in different situations. It was also found that additional information about the class can be modeled as a dependent variable according to which predictive data can be obtained. The original data is represented by X, and the additional information is represented by Y. In this case, a winner-take-all strategy is often used, which is identified as an "expansion network". In accordance with the proposed Kokhonen approach, X and Y are calculated separately, and the maximum distance is 1 and the total distance is a weighted sum that must be applied using the appropriate formula:

$$D(o, u) = \alpha D_x(o, u) + (1-\alpha) D_y(o, u),$$

where $D(o, u)$ is the distance of the object o to the unit u; D_x and D_y are the distances in separate ranges.

Thus, the maximum distance X- and Y- is equal to one and there is a probability of possible differences in the values of X and Y. It is proved that the final result of scientific research consists of "maps": one is the variable X and the other is the variable Y. In the process of evaluating one additional parameter, the share of X (or Y) should be represented by the user. This approach can be extended to a larger number of indicators. For each indicator, a similarity value is calculated and all individual similarities are then combined into a single value, which is used to determine the unit according to the formula (Wehrens *et al*., 2007):

$$D(o,u) = \sum_i \alpha_i D_i(o,u)$$

where α_i is the sum equal to one.

It should be noted that the clustering was divided into three clusters (Fig. 3) to determine the level of economic security of the studied enterprises, namely the "lower", "middle" and "upper" limits.

According to Figure 3 shows a clear distribution of these clusters in the range "0, 1, 2".

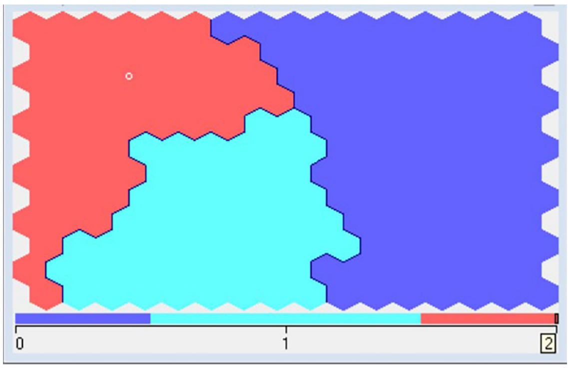


Figure 3. Projected distribution of clusters

Source: compiled by the authors

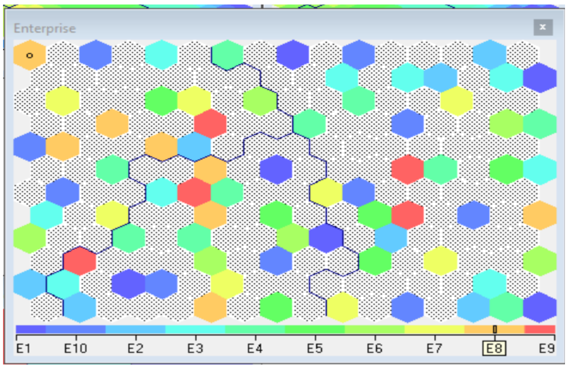


Figure 4. Distribution of network enterprises by clusters

Source: compiled by the authors

Continuing the logic of our research, it was found that the studied network enterprises (*E1-E10*) are located within these three clusters ("0, 1, 2") according to Figure 4.

The next stage of the study is to substantiate the security components of network enterprises (intellectual, personnel, technical, legal, environmental, information, power, financial, market, interface). Thus, according to Figure 5, there is a clear vision of the compliance of the security components of each network system in accordance with the cluster distribution.

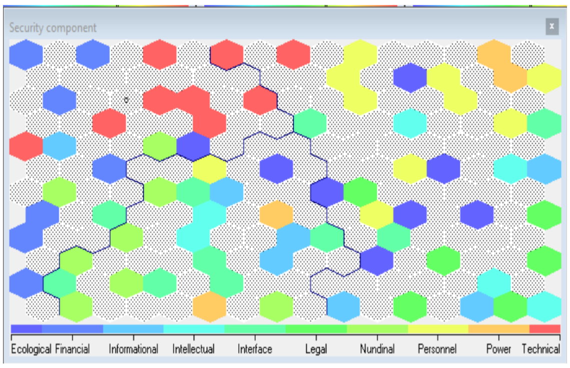
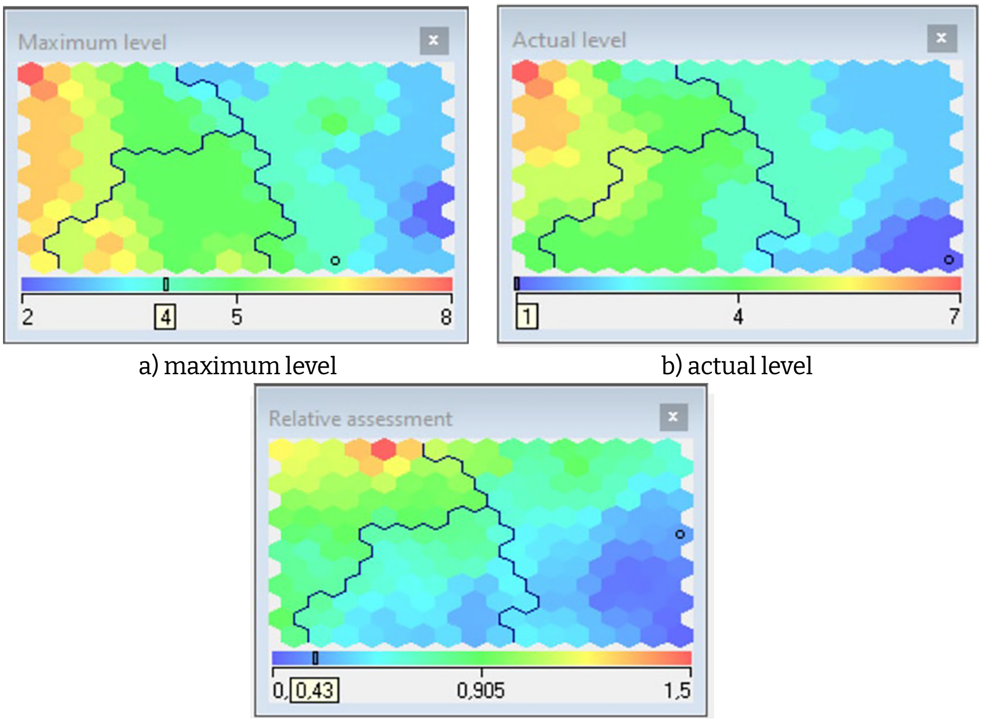


Figure 5. Distribution of the security component at enterprises of network structures by clusters

Source: compiled by the authors

Thus, based on the application of the Kokhonen map, a comprehensive clustering was carried out and security indicators were formed within the level distribution (maximum and actual) with interdependence on the correspondence of the relative assessment (Fig. 6). Figure 6 shows that cluster 0 includes the studied network enterprises with a "lower" level of security, cluster 1 – network enterprises with an "average" level of security, and cluster 2 – with a "high" level of security.



a) maximum level

b) actual level

c) relative assessment

Figure 6. Distribution of security values at enterprises of network structures by clusters

Source: compiled by the authors

The clustering of enterprises of network structures obtained by means of neural processing (Kokhonen maps) showed that the existing network structures can be divided into three clusters. It should be noted that the cluster analysis covers a wide range of indicators of domestic enterprises of network structures, which made it possible, compared to other approaches (Tesliuk, 2018; Lebedko, 2019; Savchenko & Shkurenko, 2019), to take into account the main components of the security of classified objects with a fairly high accuracy. It is impossible to ignore the fact that Tesliuk (2018) conducted a comprehensive diagnosis of multilevel systems in the context of modeling networked hierarchical systems. On the basis of this, a sample of clustering of system distribution based on the financial component was carried out. Particular attention should be paid to the study by S.A. Lebedko (2019), who, using an integral approach, clustered enterprises in the context of assessing the thresholds of the level of economic security. In his research, S.A. Lebedko (2019) presented that the basis in business management is the use of the Kokhonen map for a clear vision of the main vector of development of cloud technologies of business structures in the context of digitalization of economic processes.

As a result of processing, a Kokhonen map (SOFM 52-4) was developed using the STATISTICA 10 analysis system (Fig. 3-6). The practical implementation of the assessment of the level of economic security has necessitated the identification of the impact of threats on the level of security of enterprises of network structures. It has been established that the obtained neural network with unsupervised learning (SOFM 52-4) allows to form a spectrum of enterprises of network structures divided into three ID-neurons (clusters) to identify security levels.

The formed sample based on the input data of the studied enterprises divided into three clusters is shown in the above-described Fig. 3. Please note that the formed clusters are interpreted in the context of the distribution described below:

Neuron 1 (cluster 0) – the level of security is low;

Neuron 2 (cluster 1) – medium security level;

Neuron 3 (cluster 2) – high security level;

Thus, in this paper, based on the results of the calculated Kokhonen diagram, which is based on the data in Table 1, a clear distribution of enterprises of network structures was made according to (Fig. 3). From a practical point of view, the most clear-cut interpretation can be made of the identified cluster 2, followed by cluster 1. The analysis of the structure of the data set in Table 1 has made it possible to divide the enterprises of network structures into three clusters, respectively. Cluster 0 includes enterprises with network structures with "lower" levels of security, taking into account the corresponding level narrative, namely the environmental and financial security components. Cluster 2 includes enterprises with network structures that focus primarily on "high" levels of security – human, technological, power, and market security components. Cluster 1 includes all other network structures not included in clusters 0 and 2. Thus, according to Figure 5, they constitute the majority of network structures with "medium" security levels based on information, intellectual, interface and legal components of the security level.

We would like to draw attention to the fact that the obtained cluster diagrams allow us to identify belonging to the level distribution of the security component, taking into account the actual and maximum security level, respectively.

Analyzing the diagram, it should be noted that the ordinal number of the obtained clusters is not their rating. Thus, the cluster itself in the Kokhonen network outlines only a set of objects that are similar in terms of a set of multidimensional features and properties. In turn, it is noteworthy that one of the features of the clusters in the diagram (Fig. 6) is their size in the context of relative ratings. The cluster analysis of the general indicators of the security level distribution showed that in all three cases there are different security limits: "lower", "middle" and "upper" business structures based on the analyzed indicators (Table 1).

It should be noted that for the practical implementation of the strategy of economic security of enterprises of network structures, it is necessary to take into account the overall economic effect obtained from strengthening the security component. It is substantiated that reducing the amount of losses is an additional result of improving the economic security system of a network structure, taking into account the following strategic security guidelines, namely: protection against financial sanctions; fines; administrative fines; losses due to theft; risks; threats; deliberate attacks; disclosure of commercial information; unreliable counterparties; debt repayment; increase in revenues from product sales. Of course, this list is not exhaustive, depending on the specifics of the functioning and security level of network enterprises in modern conditions. In turn, it is necessary to take into account the economic costs of the security strategy, taking into account all possible external and internal threats. However, it should be noted that in such conditions the planned normative profit from the implementation of the strategy for ensuring the security component will be achieved.

It should be noted that the obtained neural network with unsupervised learning (SOFM 52-4) allows forming a set of enterprise network structures distributed into three ID neurons, which characterizes the position in terms of the maximum and actual security level. The results obtained make it possible, from a practical point of view, to formulate a strategy for ensuring the economic security of enterprises using project measures and the main vectors for strengthening the security component.

It is proved that the obtained neural network (SOFM 52-4) allows to form the whole range of enterprise network structures divided into three ID neurons that characterize the position of the maximum and actual security level. From a practical point of view, the results obtained made it possible to formulate a strategy for ensuring the economic security of an enterprise through project measures and the main vectors for strengthening the security component.

CONCLUSIONS

The strategy of economic security of network enterprises should be justified by project vectors of strengthening. Thus, by implementing the first vector, enterprises of network structures function according to the "price – quality" characteristic, receiving network excess profits due to high product prices, as compared to competitors. According to the second vector, enterprises of network structures operate on the basis of the "low cost – scale effect" characteristic, ensuring the receipt of network superprofits by reducing prices for their products, increasing their attractiveness to consumers and increasing sales volumes, taking into account the digitalization of economic policy. The study of two areas of high profit of network enterprises proves that the organization of management of new profitable projects in the network within the framework of the economic security strategy is carried out by organizing innovative contexts and modernization in the context of practical adaptation of digital tools. From a practical point of view, a plan should be presented that reflects the determinants and indicators of the security component of network enterprises.

It is determined that the economic security of enterprises involves the development of a network, product competitiveness and retention of market share. It is determined that the security component characterizes the economic potential of business structures and counteracting the negative impact of external and internal environments. At the same time, the economic system of various measures reflects the conditions of the security strategy against various threats that have an impact on development in the long term. It is established that an increase in the level of negative impact on the economic security of enterprises of network structures leads to negative consequences (decrease in production volumes, growth of pricing policy, increase in unemployment, reduction in tax payments, environmental degradation, etc.)

Based on the conducted research, it is worth highlighting the key vectors for strengthening the economic security strategy of enterprises of network structures in the focus of modern challenges: development of a mechanism for innovative contexts for the development of those types of entrepreneurial activity that are currently most affected by the war; implementation of a comprehensive diagnosis of risks of entrepreneurial structures in the context of digitalization of the economic component of business processes of the network system; identification of threats to digital tools for ensuring the security of enterprises.

Thus, in the context of modern challenges, the issues of the strategy for strengthening economic security and the impact of challenges on business network structures, the search for ways to counteract them are becoming more relevant than ever and require further scientific developments.

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CONFLICT OF INTEREST

None.

REFERENCES

[1] Andrushkiv, B.M., Holovkova, L.M., & Kyrych, N.B. (2018). State security: A paradigm for ensuring the changes for the better. *Problems of Transport Economy*, 16, 7-14. doi: 10.15802/pte.v0i16.152758.

[2] Andrushkiv, B.M. (2012). *Economic and property security of enterprise and entrepreneurship. Anti-crap*. Ternopil: Ternohraf.

[3] Vivchar, O.I. (2018). *The economic security management of enterprises: Social and humanitarian contexts*. Ternopil: Palianytsia V.A.

[4] Gevko, V., Vivchar, O., Sharko, V., Radchenko, O., Budiaiev, M., & Tarasenko, O. (2021). Cloud technologies in business management. *Financial and Credit Activity: Problems of Theory and Practice*, 4(39), 294-301. doi: 10.18371/fcaptp.v4i39.241318.

[5] Gevko, V.L. (2020). Specificity of pragmatism in the assessment of inter-firm relationships of network structures enterprises in the conditions of macro-trends of business. *University Scientific Notes*, 2(74), 110-116.

[6] Diunova, T.V. (2020). *Economic security management of enterprises: Systems, mechanisms, tools*. Kharkiv: Striped typography.

[7] Economic views of J. Galbraith. (n.d.). Retrieved from https://studfile.net/preview/9246410/page:10/.

[8] Kolodiazhna, I.V., & Bukrina, K.A. (2019). Economic security in the system of sustainable functioning of the enterprise. *Scientific Bulletin of the Uzhhorod National University*, 23(1), 135-140.

[9] Lebedko, S.A. (2019). Integrated assessment of the economic security level for transport enterprises. *Business Inform*, 2, 259-266. doi: 10.32983/2222-4459-2019-2-259-266.

[10] Mykhailyshyn, L.I., & Korovchuk, Yu.I. (2020). Content and typological characterization of threats to the economic security of economic entities in the conditions of modern challenges: Social and humanitarian contexts. In *National economic activity and international economic relations: Current state and development trends* (pp. 223-229). Poltava: "Astraia".

[11] Melikhova, T.O. (2019). *Economic security of the enterprise: Formation, control, efficiency*. Kherson: Helvetyka.

[12] Tesliuk, T.V. (2018). Analysis of functioning dynamics of multilevel systems with the use of models based on hierarchical petri nets. *Scientific Bulletin of NLTU of Ukraine*, 28(8), 149-154. doi: 10.15421/40280830.

[13] Savchenko, M.V., & Shkurenko, O.V. (2019). *An integral approach to assessing the economic security of export-oriented social and economic systems*. Kharkiv: Publishing house"INZhEK".

[14] Kharazishvili, Yu.M. (2021). *Sustainable development system: Evaluation toolkit, reserves and strategic implementation scenarios*. Kyiv: NAN Ukraine.

[15] Who or what is the greatest threat to Ukraine's economic security? (2019). Retrieved from https://www.epravda.com.ua/columns/2019/03/26/646431/.

[16] Hryhoruk, P.M., Khrushch, N.A., & Chuniak, O.V. (2019). Conception of modeling the system of ensuring financial economic security. *Scientific Bulletin of Polissia*, 17(1), 158-165. doi: 10.25140/2410-9576-2019-1(17)-158-165.

[17] Voynarenko, M., Dykha, M., & Mykoliuk, O. (2018). [Assessment of an enterprise's energy security based on multi-criteria tasks modeling](). *Problems and Perspectives in Management*, 16(4), 102-116.
[18] Wehrens, R., Lutgarde, M., & Buydens, S. (2007). Self- and super-organizing maps in R: The kohonen Package. *The Journal of Statistical Software*, 21(5), 1-19. doi: 10.18637/jss.v021.i05.
[19] Ziailyk, M., & Krzywkowska, J. (2020). Assessment of economic security of enterprises formation on the basis of economic and mathematical modeling: Current state and development pragmatics. In *Ukraine in the context of global and national modern servisation processes and digital economy* (pp. 145-154). Praha: OKTAN PRINT.

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Стратегія зміцнення економічної безпеки підприємств мережевих структур: прагматика та ключові вектори розвитку

Анотація. Дослідження сучасного стану мережевих структур в сучасних умовах функціонування та необхідність реалізації стратегії економічної безпеки дозволяють виявити рівень безпекознавчої компоненти в майбутній перспективі підприємницьких структур, спрямованість і характер їхньої дії в контексті кластеризації. Мета статті полягає у системному обґрунтуванні стратегії забезпечення економічної безпеки підприємств на основі організаційно-економічного оцінювання із ідентифікацією максимального та фактичного рівня. В процесі даного наукового дослідження застосовано такі методи: дедуктивний; порівняльного аналізу емпіричних даних; абстрактно-логічного узагальнення; теорії систем і системного аналізу; порівняння; евристичний; факторний і логічний аналіз; наукової абстракції та економіко-математичного моделювання; графічний; узагальнення. У даній роботі обґрунтовано понятійно-категоріальний апарат «економічна безпека», «стратегія зміцнення економічної безпеки підприємства мережевих структур». Проаналізовано сучасний стан підприємств мережевих структур в контексті сучасних викликів. Описано деталізований алгоритм реалізації стратегії економічної безпеки підприємств мережевих структур із виокремленням відповідних етапів. Відзначено пріоритетність функціональної стратегії, яка не повинна суперечити базовій стратегії та охарактеризовано основні завдання відповідно. Здійснено розробку рекомендацій щодо покращення організаційно-економічних процедур оцінювання стратегії економічної безпеки мережевих структур на основі кластеризації підходом Кохонена. Обґрунтовано практичний інструментарій комплексного дослідження підприємств мережевої системи (E1-E10) із застосування структури набору даних на основі ідентифікації трьох кластерів в контексті рівневого розподілу безпеки. Основні положення даної статті дадуть змогу вітчизняним підприємницьким структурам на основі застосування методики кластеризації мережевого моделювання сформувати прогнозну оцінку стратегії зміцнення економічної безпеки та розробити відповідні вектори удосконалення безпекознавчої компоненти

Ключові слова: алгоритм формування стратегії безпеки; стратегія функціонального забезпечення; складові безпеки; організаційно-економічна оцінка економічної безпеки; методика Кохонена; кластеризація мережевих структур