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ANALYSIS OF THE MODELS OF PROTECTION OF THE STATE SECURITY

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SUMMARY

The article analyzes the possibilities of modeling the state security. The connection between the economic, political, military and technological sphere of the public administration is determined. The requirements for the models of the state security that should be in line with the principles of openness, comprehensiveness, object-orientation, accessibility for understanding are explored.

The state security model must reproduce the real processes that characterize its state. The study of the structure of the models of the state security has been conducted, which has led to the establishment of a lack of comprehensive approaches to assessing the overall level of security of the country.

Also, the article presents a number of scientific disciplines that are used in the process of modeling the state security. These include: mathematical sociology, economic cybernetics, political cybernetics, public administration, econometrics, software engineering, legal cybernetics.

A number of components are described that characterize the main spheres of the state security modeling.

The principles of assessing the economic security, which are presented in the methodology for calculating the level of economic security developed by the Ministry of Economy, are considered. This indicator covers all the spheres of the economic activity in Ukraine and is constantly evaluated by this agency.

In general, the article highlights the need for a comprehensive system for monitoring the national security based on existing approaches to the analysis of its components.

Key words: models, state security systems, public administration, citizens, society.

АНАЛИЗ МОДЕЛЕЙ ОБЕСПЕЧЕНИЯ ГОСУДАРСТВЕННОЙ БЕЗОПАСНОСТИ

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АННОТАЦИЯ

В статье проведен анализ возможностей моделирования государственной безопасности. Определена связь между экономической, политической, военной и технологической сферой государственного управления. Исследованы требования к моделям государственной безопасности, которые должны соответствовать принципам открытости, комплексности, объектно-ориентированности, доступности для понимания.

Модель безопасности государства должна воспроизводить реальные процессы, характеризующие ее состояние. Проведено исследование структуры моделей государственной безопасности, что в результате позволило установить отсутствие комплексных подходов к оценке общего уровня защищенности страны.

Также в статье представлен ряд научных дисциплин, используемых в процессе моделирования государственной безопасности. К таким следует отнести: математическую социологию, экономическую кибернетику, политическую кибернетику, государственное управление, эконометрику, инженерию программного обеспечения, юридическую кибернетику.

Определен ряд компонентов, которые характеризуют основные сферы моделирования государственной безопасности.

Рассмотрены принципы оценки экономической безопасности, которые представлены в методике расчета уровня экономической безопасности, разработанного министерством экономики. Данный показатель охватывает все сферы экономической деятельности в Украине, которые постоянно оцениваются этим ведомством.

В целом статья освещает необходимость создания комплексной системы мониторинга национальной безопасности на основе уже существующих подходов к анализу ее составляющих.

Ключевые слова: модели, системы государственной безопасности, государственное управление, граждане, общество.

Formulation of the problem. The level of security in the country can be defined as the probability of occurrence of negative events that entails certain losses and damages. There are two ways to determine this level: the establishment of relationships between the circumstances on the basis of which logical conclusions can be drawn and based on the results of statistical studies. None of them can be considered as an empirical research method, since it is almost impossible to take into account all the factors that affect the state security. However, using state-of-the-art imitation modeling of various processes, including political, economic, social, military, etc., the state of security can be set to a high degree of probability.

Unfortunately, in Ukraine there is no methodology for integrated modeling of the national security. The mass media does not represent objective indicators to assess its level. The critical indicators of the threats in one or another sphere are not defined, nor complexes are created for such modeling, based on the algorithms of which objective data from different sources should be used, the vast majority of which are freely available. Therefore, most civil society does not participate in such studies, which reduces the lobbying of the state security issues to no avail.

Analysis of the recent publications and research. According to G. Friedman, security forecasting processes are not carried out at the expense of work with sources, but through modeling, which is based on the notion that there is no difference between the economic, political, military and technological spheres. The basis of political analysis must be predictability [1, p. 73].

Considering modeling, as a method of studying various phenomena, social, economic, political and other processes, it should be noted that the main purpose of the model is to reproduce the original of the object to which the modeling is applied.

In the field of the state security, modeling should be carried out taking into account internal, external, real and potential threats that are the main objects of research in the modeling of the state security system. In addition, the modeling objects should include conditions in which these dangers can be transformed into threats, losses and damages. Also, a significant number of factors that act on both the threats themselves and the objects of protection should be taken into account. Thus, the question of the diagnosis of the security of a number of objects of national interest for the country should be solved not only expertly, but also with the use of accurate mathematical methods based on mathematical modeling.

Taking into account that the modern challenges are more informative in nature, where the tools of struggle in information wars and means of conducting information operations are social engineering technologies, computer engineering and digital systems, it is difficult to imagine a national security modeling without the use of exact mathematical methods. The disciplines of this scientific direction include mathematical sociology, economic cybernetics, political cybernetics, public administration, econometrics, software engineering, legal cybernetics, and others like that. On the practical and theoretical level, more broadly, these questions were solved by the researchers V. Horbulin, O. Dodonov, D. Lande [2].

The problem of complex national security modeling remains open, not because there are no possibilities for interpretation to solve it, but because new factors of security influence appear every minute, new links between these factors are created, threats are transformed.

Therefore, among the scientists the national security model has been adopted for a number of components that characterize the relevant area of the public administration. These include external economic processes, internal politics, economic components, geopolitical, and others.

Thus, for example, H. Vynokurov proposed a model for calculating the geopolitical potential of a country at a certain point in time (1).

$$G(t)0,5\left(1X_M^{0.43}\right)X_T^{0.11}*X_D^{0.19}*X_E^{0.27} \, , (1)$$

where:

where X_i (i = T, D, E, M) – share of the state in global indicators (territorial, demographic, economic and military).

The values of the degree indices in the proposed formula were calculated by the method of least squares, with data for the particles X_i taken from the corresponding statistics obtained by the scientists (in relation to the leading countries) [3].

V. Shumov proposed a model of regional security that is a component of the national security the main components of which were the indicators of the development and preservation of the potential of national resources.

$$u_i = w_i*q_i \, , (2)$$

where:

w_i – function of sovereignty of i-th state;

q_i – function of preserving the national resources of the i-th state [4, 5].

Also, the scientist offers comparative models that characterize the level of sovereignty of the country [6]:

$$w_{bi} = \left(\frac{Z_i}{Z_{max}}\right)^\omega \left(\frac{S_i}{S_{max}}\right)^{1-\omega} , (3)$$

where:

Z_i – population of the i-th country;

S_i – its area;

S_{max} – area of the largest country in the world;

Z_{max} – size of the largest country in the world;

ω – parameter of the importance of the demographic factor.

The parameter of the importance of the demographic factor is calculated in the expert way (weighted coefficient).

In addition to the area and demographic features of the country, its national security characterizes the level of the technological development, that, taking into account the above indicators, can be represented as a product of two coefficients:

$$w_i = \lambda_i w_{bi}, \ \lambda_i \geq 1 \, , (4)$$

where:

λ_i – an indicator that reflects the level of technological development;

w_{bi} – basic sovereignty of the country.

In this model one can also take into account the index of innovations, that, according to the world standards, provides detailed indicators on innovations in 126 countries, which make up 90.8% of the world's population and 96.3% of world GDP, and embodied in the open project Global Innovation Index (GII) [7]. This index is determined by more than 80 indicators that characterize the broad vision of innovation, including the political environment, education, infrastructure and business complexity.

Since the Global Innovation Index GII takes values from 0 to 1, the expression for the indicator can be represented as follows:

$$\lambda_i = (1+I_i)^x, 0< I_i \leq 1, X > 0, (5)$$

where:

I_i – index of the social technologies in the i-th country;

X – technological index.

The distribution of Pareto [8] is used quite often in the study of the social, economic, physical and other phenomena in the public administration. This distribution is one of the varieties of the statistical analysis, where the function and density of the random variable $x > x_0 > 0$ obeys the Pareto law, and has the following form:

$$F(a, x_0, x) = 1 - \left(\frac{x_0}{x}\right)^a, f(a, x0, x) =$$
$$= 1 - \left(\frac{x_0}{x}\right)^{1+a}, a > 0$$
(6)

where:

x, x_0 – value of the random variables of a particular sample;

a – scale of this sample.

There are approaches to modeling the national security where an assessment of the overall level of threats and dangers is proposed. So, H. Sytnyk proposed his own model for determining the readiness of the country to confront the negative influences.

$$Y_1 i(t) = U_{pd}, i(t) / U_o, i(t),$$
$$Y_2 i(t) = A_o, i(t) / And, i(t), (7)$$

provided if $U_o, i(t) > U_{pd}, i(t)$,
or $A_o, i(t) > And, i(t)$
where:

$Y_i(t)$ – potential of the national security system at the time t, in the area that

belongs to the group of priority measures for countering threats;

$Y_2 i(t)$ – degree of adequacy of the protective mechanisms of the country at the time t, in the field of the national security, belonging to the group of secondary measures of the countering threats;

$U_o, i(t)$ – expected (forecasted) losses of the country in the i-th sphere of its national security at the time t;

$U_{pd}, i(t)$ – value of the country's maximum allowable losses in the i-th sphere of its national security at the time t;

$A_o, i(t)$ – anticipated losses in the i-th sphere of the national security of the state – taking into account measures to minimize them;

at time t;

$And, i(t)$ – critical-minimum value of unacceptable losses in the i-th sphere of the national security of the state at the time t.

Of course, the presented general structure of this model can be implemented in practice, but the greatest difficulty in assessing the level of the threats and dangers are the components of this model, which are not presented here. Therefore, the most urgent tasks of modeling national security, both at the scientific and practical level, should focus on the elements of such moles. In modern conditions of an informative society it is expedient to establish the relationship between the real processes that affect the state of security, determine its level quantitatively not only according to the experts' estimates, but also using the real statistical indicators, where the material role is played by the financial possibilities to counteract the threats and dangers.

In large measure, the state of the national security has a direct proportional dependence on its economic security, since the above measures to counteract negative factors have their value. Unlike the mathematical models of the national security, the model of the economic security in Ukraine has a legal framework. Thus, in 2007, the Ministry of Economy of Ukraine developed a methodology for calculating the economic security of Ukraine in accordance with the order of the Ministry of Economy No. 60 of 02.03.2007, which was abolished in 2013 [9]. According to this method, the level of the economic security is determined by a number of criteria that are embodied in the form of an integral indicator.

Thus, the main components of such an index are:

1) industrial safety;
2) demographic security;
3) energy security;
4) foreign economic security;
5) investment and innovation safety;
6) macroeconomic security;
7) food security;
8) social security;
9) financial security.
10) Financial security, which in turn includes the following components:
1) banking security;
2) security of the non-bank financial market;
3) debt security;
4) budget security;
5) currency security;
6) monetary security.

The integral index itself is determined hierarchically. At the lower level, there are separate indices, on the upper level, a generalized index.

For each sphere of security, the integral indicator is calculated by the formula:

$$I_m = \sum_{i=1}^{i} d_i y_i, \qquad (8)$$

where:

I_m – aggregate indicator / subindex of the m-th area of the economic security, where m = (1, 2, 3 ... 9);

d_i – weighting factor determining the contribution of the i-th indicator to the integral index of the component of the economic security;

y_i – normalized evaluation of the i-th indicator.

The general integral indicator of Ukraine's economic security (I) is calculated according to the formula:

$$I_m = \sum_m d_m I_m \qquad (8)$$

where:

d_m – weighting factor determining the degree of contribution of the index / subindex of the m-th area of the economic security to the integral index of the economic security of Ukraine;

I_m – aggregate indicator / subindex of the m-th area of the economic security, where m = (1, 2, 3 ... 9).

The annex 1 of the recommendations for calculating the level of economic security in Ukraine provides sources that can be used to obtain settlement data [9], among which the essence of each economic security field of the country is widely disclosed by possible evaluation criteria.

The Ministry of Economy conducts relevant calculations that can be obtained formally by contacting the department. Thus, at the request of the citizen Yu. Sydorenko to the Ministry of Economic Development and Trade of Ukraine in order to provide information on the level of economic security of the country during 2010–2016, the answer was given, where this indicator was within the average level (Fig. 1).

Considering these models, one should pay attention to the fact that there are no common approaches to resolving issues of the state security modeling today. The essence of the economic security of Ukraine, as a component of the national security, is described in detail in the methodology proposed by the Ministry of Economy of Ukraine, taking into account a number of socio-economic, demographic, technological and financial indicators.

Unsolved earlier parts of the general problem. The problem of modeling the state security is the need to combine different valuation approaches to each administration area, to create common criteria for evaluation and to coordinate them with the changes that are taking place very quickly in the information environment of the country.

The models studied are of a general nature, which do not always make it possible to assess the impact of the risks of the development of the domestic and world economy on the level of the national security of the country, the impact of demographic, social, military and other factors. They have a more abstract nature, where the internal political, interethnic and other problems of Ukraine's development are ignored. Therefore, closer scope of national security should be applied to more approximate models with a high level of detail of the variables.

The purpose of the article is to: analyze the models of the state security, evaluate the possibilities of their application to solve the issues of establishing its quantitative level, which characterizes all the areas of the public administration. Providing proposals for the creation of a comprehensive system for assessing the security of the state based on existing approaches.
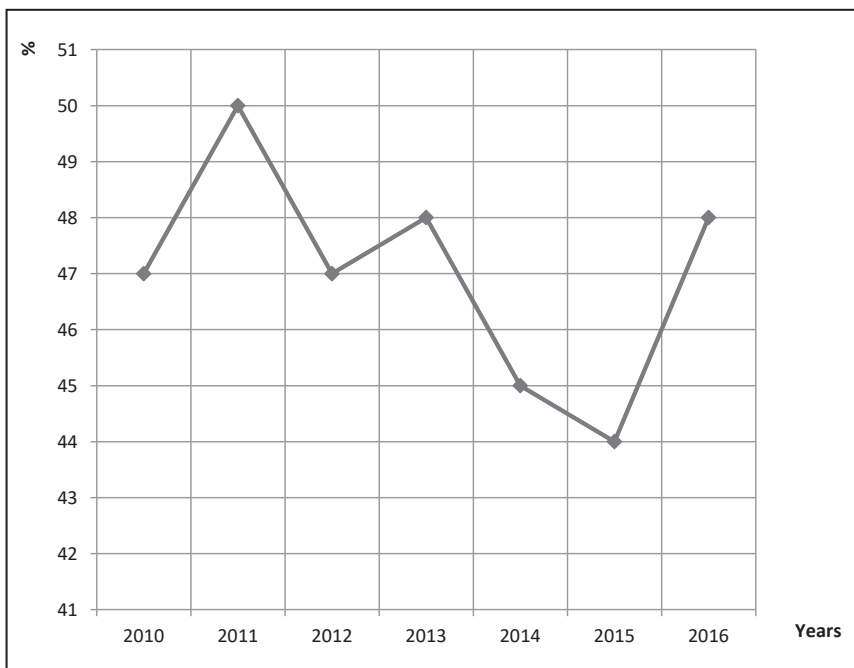
Fig. 1 Dynamics of the changes in the integral level of the economic security of Ukraine and by individual components, % (2010–2016)

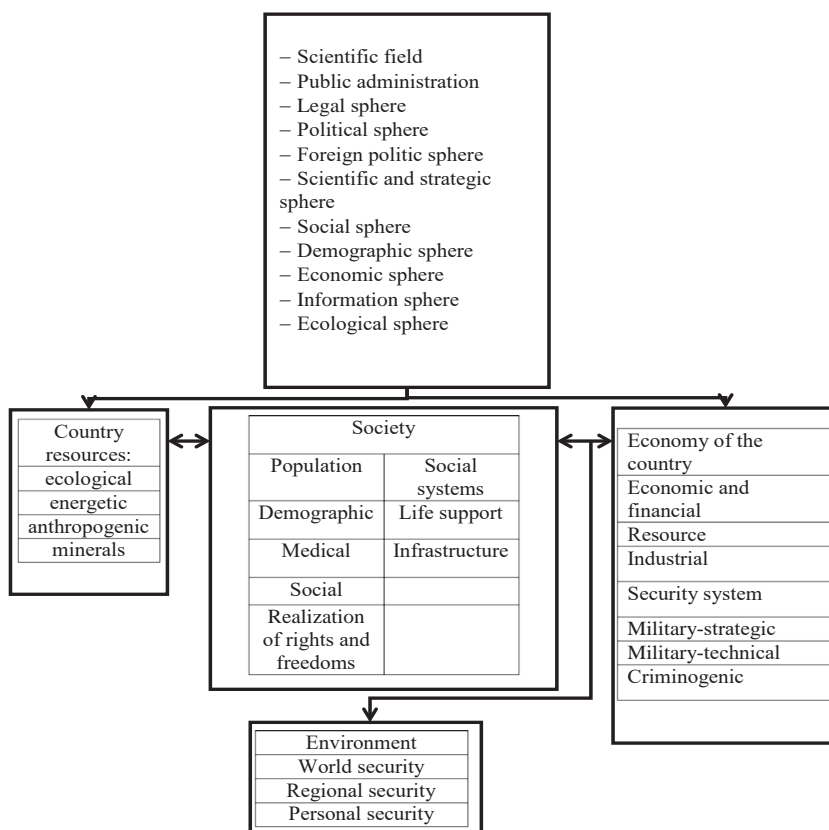*Developed on a source [10].*

Fig. 2 Indicators of probable losses for the country that can be considered in the model of the national security of Ukraine

Developed by the author

Presentation of the main research material. The models that describe the state of the national security are very generalized, should be improved, taking into account the high level of detail. Therefore, a more detailed description of those processes affecting the level of security in the country should be made. According to the decision of the National Security and Defense Council of Ukraine dated May 6, 2015 "On the Strategy of the National Security of Ukraine", that, according to the Presidential Decree, was put into effect, identified the main threats to the national security [11]. Thus, according to this document the current threats to the national security of Ukraine to date are:

1) aggressive actions of Russia;

2) inefficiency of the system of ensuring national security and defense of Ukraine;

3) corruption and ineffective system of the public administration;

4) economic crisis, depletion of the financial resources of the state, decrease of the living standards of the population;

5) threats to energy security;

6) threats to information security;

7) threats to cyber security and security of the information resources;

8) threats to the security of the critical infrastructure;

9) threats to environmental safety.

The evaluation of each of them can be done by a series of criteria and indicators. The most relevant are listed in the document.

Taking into account the already existing approaches to creating models of evaluation of certain spheres of the public administration, it is expedient to generalize them into a single system of monitoring the level of the national security of Ukraine. For example, for the analysis of the economic component of the national security it is more expedient to use modern tools of the economic analysis, for research of the social processes, the social statistics, etc. Thus, it is necessary to conduct a more in-depth analysis taking into account the complex consideration of the social, economic, environmental, political, scientific and technical and other factors.

From the point of view of the aspects of the state security modeling considered,

the information categories that can be explored and taken into account in the integrated model are presented in Fig. 2.

Based on the above, shown in Fig. 2 criteria can be described by the following indicators: current unemployment rate; current level of price growth; current value of the country's external debt; current value of domestic debt of the country; level of health care resources; level of cultural security; level of education and science; level of armament, military and special equipment; level of material security of the military personnel; level of material security of the engineers and technical personnel; minimum wage; inflation rate; labour force; labour supply; GDP; taxes; population; average wage; number of private entrepreneurs average per capita income; deficit of the state budget; budget surplus of investment; total income of the population; number of higher educational establishments; migration of personnel abroad; average annual volume of scientific researches; amount research funding; volume of the state defense order; renewal fixed assets of the enterprises of military-industrial complex; number of the contract soldiers; export of weapons; training and retraining costs; consumer price level; money issue.

These indicators can be presented quantitatively, which satisfies the need for assessing the security of the state and provides an opportunity for further development of modeling of such systems.

Conclusion. The modeling of the state security in the country should reproduce the real processes that characterize its state of protection from the external, internal, potential and real threats and dangers. The existing approaches provide an opportunity to get a general level of security, but the decisive attempts to assess its state for the country are not fully observed. The models have a more abstract nature, where internal political, interethnic and other developmental issues are ignored. Therefore, to the scope of the national security models with a high level of detail of variables should be used and a more profound analysis should be taken into account, taking into account the complex consideration of the social, economic, environmental, political, scientific and technical and other factors.

Typically, the state security modeling takes place on the principles of scientific induction – from individual components to the general level, where the overall level is formed in the form of an integral indicator that represents the individual indicators.

In order to optimize the results of assessing the level of security of the state it is necessary to create a comprehensive monitoring system based on the existing approaches to the analysis of its components.

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