

TEM JOURNAL

TECHNOLOGY EDUCATION MANAGEMENT INFORMATICS

Journal of Association for Information Communication Technology Education and Science



Safe Interaction Management of State Institutions and Business Entities Based on the Concepts of Evolutionary Economics: Modeling and Scenario Forecasting of Processes

Yevhenii Rudnichenko¹, Iuliia Dzhereliuk², Larysa Mykhalchyshyna³, Svitlana Savina⁴, Valentyna Pokotylova⁵, Nataliia Havlovska¹

¹ Khmelnytsky National University, Khmelnytsky, Ukraine

² Kherson National Technical University, Kherson, Ukraine

³ National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine

⁴ Vinnytsia National Agrarian University, Vinnytsia, Ukraine

⁵ Kherson economic and law institute, Department of Management, Kherson, Ukraine

Abstract – The basis of management processes at macro and micro levels is the adoption of balanced management decisions. Considering the high turbulence of the business environment and a significant number of threats, we can say that a mandatory requirement is to take into account their impact on the security of individual entities. Traditional approaches to forecasting socio-economic phenomena and processes do not always justify themselves due to their inertness. Therefore, the study proposes to use the postulates of evolutionary economics in order to better understand the existing phenomena and processes of interaction between state institutions and business entities. A scenario forecasting model for the influence of state institutions on the ecological niche of business entities is also developed. If relevant empirical data is available, it allows not only analyzing the behavior scenarios of individual entities within certain ecological niches, but also making forecasts of the certain scenarios implementation.

This is an extremely effective tool for enterprise management from the position of making managerial decisions aimed at ensuring economic security and strategic development of relevant business entities.

Keywords – management, security, modeling, scenario forecasting, evolutionary economics.

1. Introduction

The issues of interaction between state institutions and business entities today remain insufficiently investigated. Therefore, the task of predicting the impact of such entities on the activities of individual enterprises and their industry associations (population) is extremely urgent. Modern developments on the economic security of enterprises [6], [7] practically do not consider possible scenarios of behavior of business entities and their populations in interaction with regulatory entities, although this process significantly affects the state of their economic security and requires theoretical and practical tools to optimize such interaction. Moreover, optimization should provide harmonization of relations within the system, since natural processes are characterized by a desire for a balanced system as a whole and reaching harmony [15], and when this state is achieved, a feeling of safety, comfort and the ability to reproduce the population arises. Such biological parallels are also typical for market relations, although their achievement is an extremely complex task that requires an effective system for assessing the existing situation of interaction between state institutions and business entities, modeling and forecasting such interaction.

DOI: 10.18421/TEM91-33

<https://dx.doi.org/10.18421/TEM91-33>

Corresponding author: Yevhenii Rudnichenko, Khmelnytsky National University, Khmelnytsky, Ukraine.

Email: e.m.rudnichenko@gmail.com

Received: 17 January 2020.

Revised: 09 February 2020.

Accepted: 15 February 2020.

Published: 28 February 2020.

 © 2020 Yevhenii Rudnichenko et al.; published by UIKTEN. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 License.

The article is published with Open Access at www.temjournal.com

Analyzing the development trends of modern economic theory in the context of searching for a theoretical basis for studying the influence of state institutions on the activities of business entities, it is necessary to note a slight decrease in the activity of researchers of classical economic theory and the intensification of research on institutional and evolutionary lines. Sometimes they even single out a united institutional-evolutionary direction, although this approach is ambiguous and does not always find support in the scientific community. However, many authors [1], [17] have no doubts about the prospects of research within the framework of the evolutionary approach, which although does not have a centuries-old history and traditions, corresponds to the trends and processes of the present, but it cannot always be explained by traditional concepts.

Given the historical aspect of the formation and development of evolutionary economy, as well as the specifics of the relationship between its main actors, in the context of the study it is advisable to highlight and briefly consider two areas of economic thought (macro and micro level). The micro level includes research by [3], and the macro level includes scientific works of [5], [2].

Commenting on the main ideas regarding the evolutionary approach, it is worth noting the following. One of its founders at the micro level is actually [20], [21], who developed ideas such as compensation (achieving satisfactory rather than maximum results in decision making), limited rationality and consistent search. It was these ideas that contributed in many respects to the idea that managers are not devices for rational problem solving or calculating machines at all. Decision makers do not work in the conditions of perfect knowledge, hence uncertainty arises, which is the normal state of affairs. In the process of his research, H. Simon created a generalized model of economic behavior - a model of limited rationality [19]. The starting point was the need to review the unrealistic premise of the complete information that neoclassical theory uses. H. Simon's contribution to the theoretical basis of evolutionary theory is the consideration of internal relationships within the organization and the identification of certain dependencies of the behavior of individuals as parts of an integral organism (organization) [18]. The description of the interaction between the enterprise and its external environment from the enterprise positions [4], [8] is interesting, but the description of the enterprise microenvironment itself, a look at the totality of enterprises and their population as a whole subject of influence is not less interesting is not less interesting.

The conditions for interaction and development of organizations within a certain ecological niche and in interaction with the external environment also have

their own specifics. So, H. Aldrich drew particular attention to the conditions for the development of organizations, among which he distinguishes institutional, interpopulation, and internal populations within the framework of evolutionary theory. He also noted that there is cognitive and sociopolitical legitimation, thanks to which the organization is perceived and recognized by the environment, and in the future, the population of organizations can change the external environment [1]. This position is empirically correct (economic agents, when united, are able to create new institutions that change institutional norms in the economic system as a whole), although it is quite atypical for classical economic theory, in which the influence of the external environment on the enterprise is one-sided.

But in the context of economic security, this position is valuable because it directly indicates the way to ensure the economic security of the enterprise - harmonization of relations in the ecological niche and combined efforts of individual enterprises in the population. We fully share the position of H. Aldrich regarding the harmonization of relations with the external environment, since the harmonization processes also logically fit into the canons and principles of the development of ecological natural phenomena and processes. That can be a separate area of deeper research in the framework of the evolutionary approach. Moreover, this point of view becomes the basis for important conclusion about the economic security of the enterprise within the framework of evolutionary theory - the enterprise separately and the population as a whole either establishes harmonious relations within the ecological niche and with the external environment as a whole or ceases to exist in the long term.

The general parameters of the ecological niche will determine both the processes within the niche and the features of interaction with the external environment [16], [22]. The density and capacity of the niche, which are directly related to the number of actual or potential participants in the niche, provide information on its importance to the state and the attractiveness of business entities. Of course, it is necessary to take into account the average size of its participant and the stage of the niche's life cycle. Niche parameters are connected in a certain way, and together give an idea of the ecological niche of the functioning of business entities as a system. Considering the possible variation of the parameters regarding the ecological niche even taking into account their mutual relations, only five parameters can be considered independent: niche capacity, niche density, number of participants, niche aggressiveness, and size of the average participant. In the framework of the existing relationship between such parameters, it is advisable to study the response

of the ecological niche to the change of each of these parameters, which is presented in Table 1.

The value of the analyzed reaction of an ecological niche to a change in parameters under the influence of external factors lies in the fact that it allows us to

determine the main trends in the ecological niche and the interdependence of its individual parameters.

The dependence between the parameters of the ecological niche, defined in an illusory simple form (Table 1), allows making a scenario analysis of changes in the ecological niche.

Table 1. Response of ecological niche to a change of parameters under the influence of external factors

Niche capacity	Niche density	Number of participants	Niche aggressiveness	Size of the average participant
↑	↓	↑	↓	–
↓	↑	–/↓	↑	–/↑
↓	↑	↑	↑	–
↑	↓	↓	↓	–
↑	↑	↑	↑	–/↓
↓	↓	↓	↓	–/↑
↓	↑	–/↓	↑	–/↑
↑	↑	↑	↓	–/↓
–	↓	↓	–/↓	↑
–/↑	↑	–/↑	↑	↓

Explanation for Table 1: a change in the parameter of the ecological niche, which is initiated by external factors is marked in italics; the mark "↑" indicates a growth of the corresponding parameter of the ecological niche; the mark "↓" indicates a decrease in the corresponding parameter of the ecological niche; the mark "–" characterizes the immutability of a parameter or its independence from a change in the parameter by which the analysis is carried out; the reaction of each of the niche parameters due to a change in the parameter, which is initiated by external factors, is presented as an assumption that the other parameters are unchanged.

It is useful both from the viewpoint of state regulation (in the form of a targeted change in a certain parameter regarding the ecological niche, which, like a chain reaction, will trigger others changes in the ecological niche), and from the standpoint of the formation an adequate system of economic security for each of the entities within the ecological niche.

It should be noted that in fact Table 1 presents a concise form of separate scenarios regarding actions - taking into account the dynamic nature of the ecological niche as a socio-economic phenomenon, its reaction to implemented changes is not predetermined in advance, although the number of reaction options is finite. For example, according to Table 1, because of an increase in the capacity of an ecological niche, it can respond by a decrease in density, an increase in the number of participants, and a decrease in aggressiveness. Although, the final number of ecological niche reactions (within the considered set of its parameters fixed by the number of parameters) creates a certain uncertainty (it is often impossible to clearly determine the ecological niche reaction in advance), but fundamentally it does not interfere with both predicting the effects of state influence and forming an adequate "response" on the part of the economic security of enterprises participating in the ecological niche (by identifying all possible options for changing the ecological niche and ensuring readiness for all such options). This fact makes scenario analysis the most justified tool for analyzing both changes in the ecological niche due to the

influence of public authorities, and changes in the individual participant of the ecological niche due to changes in the niche itself.

To explain the author's position regarding the types of interaction between state institutions and business entities, we will characterize these types in more detail:

1) Neutralism - a type of relationship between state institutions and business entities, in which there is no direct interaction and no noticeable effect directly on each other;

2) Competition - characterizing the relations between state institutions and economic entities, in our opinion, it is not quite correct to speak about this type of relationship;

3) Predation - a type of relationship between state institutions and economic entities, in which the role of the state as a predator in relation to the subject of entrepreneurial activity-victim is explained by its exclusive rights and powers;

4) Parasitism - in this type of relationship, one of the parties will act as a donor or host, and the other as a parasite;

5) Commensalism - a type of relationship between state institutions and business entities in which the state lives "at the expense" of the activities of business entities, while they do not experience direct negative impact and are indifferent to this process. That is, the extraction of resources is smooth and systematic, it does not cause indignation in a particular individual subject, and therefore does not lead to obvious disturbances in the system;

6) Amensalism - a type of relationship between state institutions and business entities, in which the state negatively affects the activities of business entities, while itself it does not experience any negative influence on their part;

7) Protocooperation - a type of relationship between state institutions and business entities in which the state and business entities receive mutual benefits;

8) Symbiosis - a type of relationship between state institutions and business entities in which dependence on each other develops through joint coexistence (activity).

In the context of our study, first of all, it is necessary to analyze how the ecological niche entities will act under the influence of state institutions, what patterns of their behavior will be due to the influence of the state institutions, which will be manifested in the changing parameters of the ecological niche.

Behavior patterns of subjects in the ecological niche put a focus on cooperation; the desire for change or the preservation of the existing state, the choice of orientation, a certain mode of reproduction - largely determined by management decisions in the enterprise. On the other hand, such decisions are a direct consequence of changes in the ecological niche of the enterprise. That is, in this case, it seems that each enterprise independently chooses a behavior pattern, but in fact, such patterns, in full accordance with the theoretical foundations of the evolutionary approach in the economy, are simply a reaction of the enterprise to changes in the external environment, in particular, in the ecological niche. The direct dependence of such a reaction on changes in the ecological niche allows making scenario forecasting of behavior changes of subjects in the ecological niche (by choosing a specific pattern) depending on changes in the parameters of the ecological niche.

The ecological niche scenario provides the order of its development in a certain time perspective on the basis of alternative results comprising the practical implementation of management decisions applied on the subjects of such a niche. Possible scenarios for the behavior of participants in a certain ecological niche include the following: homeostasis or auto-correction. Such a scenario is typical for niches that have a relatively stable composition of participants and are able to tolerate negative manifestations of external influences normally. The work system of such participants is so adjusted that the necessary changes in most cases occur automatically or at minimal cost; replication (the creation of absolutely similar entities in order to minimize the negative impact of the environment). It is a well-known practice of avoiding excessive fiscal pressure by creating "subsidiaries" to redistribute revenue and minimize taxes; autopoiesis (self-reproduction). In this scenario, niche participants tend to self-reproduce after periodic interaction with the

environment; deformation. In such a scenario, the size, form and organizational structure of the niche participants change can lead to negative consequences, sometimes during critical deformation it can cause the termination of the niche existence itself; transformation. This is a scenario of significant changes in niche subjects under the influence of the external environment. Both positive and negative results of transformation processes are possible, however, the system does not return to its previous state (which is possible with reverse deformation); gap formation. The formation of heterogeneity occurs in a niche due to backlog, or vice versa, the acceleration of the development of individual subjects, as a result of which gaps and a clear gradation of subjects can be formed by individual grounds. In fact, such a scenario leads to the division of one ecological niche into several independent ecological niches, which will differ by participants, operating conditions, etc.; clustering. Under certain conditions, arising inside a niche and under external influence, it will be beneficial for niche entities to create clusters, while remaining separate legal entities. In addition, as a result of certain processes in a niche, the formation of individual associations or groups of participants may begin, that is complementary or similar in its properties, activity, etc.; agglomeration. The scenario in which certain niche entities will be absorbed (merged), and, unlike the clustering scenario, are fully merged with the formation of one legal entity or holding structure. Its integrity is ensured on the basis of property rights or the formation of super-tight economic ties through the complementarity of the growth chain cost; depression. Scenario of collapse regarding the subjects' activities within the niche, is caused by a number of factors of predominantly negative impact. It can have both positive and negative characteristics, given the basic characteristics of activity such as stability, sustainability, development; regression. The scenario of returning to the previous stage of development regarding the majority of niche entities is due to their inability to function effectively (or withstand competitive pressure) at a higher stage of development. It can manifest itself as a protective reaction of the enterprise economic security system in the form of a "rollback" to the previous state of the system, which is characterized by parameters acceptable to the subject.

Understanding the behavior patterns and the scenario implementation process allows defining and justifying management decisions in order to form an effective system of economic security within the enterprise as a result of internal and external processes and influences. The choice of scenario will depend on a number of patterns that, in a unique combination of four basic (template) behaviors, will lead to the emergence of the highest priority scenarios (or scenario).

2. Results

Based on the given ratios of patterns and scenarios, it can be concluded that the security of the subject existence will depend on the timely identification of changes in the state of the ecological niche, its scenario and the application of appropriate patterns of behavior, minimize risks and threats and allow adaptation to new conditions. To avoid threats of an external nature, it will also be conditioned by a clear definition of the vector of intentions and behavior of

the subject in the external environment. Such information can be a field for harmonious interaction, or vice versa - a critical pressure from external actors. It should be emphasized that for any combination of patterns, only the choice of scenarios that are directly related to each other is possible. That is, for the majority of niche entities and the niche as a whole, the choice of scenarios will be characteristic, the probability of transition of which to each other will be at least 0.5, based on the data of the matrix of pairwise transitions of niche scenarios (Table 2).

Table 2. Niche pairwise transition matrices

Scenario	Homeostasis	Replication	Autopoiesis	Deformation	Transformation	Gap Formation	Clustering	Agglomeration	Degression	Regression
Homeostasis	1	0,2	0,9	0,1	0,5	0,3	0,3	0,3	0,3	0,2
Replication	0,2	1	0,2	0,3	0,9	0,3	0,4	0,1	0,3	0,2
Autopoiesis	0,9	0,2	1	0,2	0,5	0,1	0,3	0,2	0,4	0,8
Deformation	0,1	0,3	0,2	1	0,3	0,9	0,5	0,3	0,9	0,4
Transformation	0,5	0,9	0,5	0,3	1	0,3	0,8	0,8	0,5	0,1
Gap Formation	0,3	0,3	0,1	0,9	0,3	1	0,5	0,4	0,6	0,4
Clustering	0,3	0,4	0,3	0,5	0,8	0,5	1	0,8	0,1	0,3
Agglomeration	0,3	0,1	0,2	0,3	0,8	0,4	0,8	1	0,3	0,2
Degression	0,3	0,3	0,4	0,9	0,5	0,6	0,1	0,3	1	0,2
Regression	0,2	0,2	0,8	0,4	0,1	0,4	0,3	0,2	0,2	1

It is clear that the highest probability (1.0) is typical for transitions of the same scenarios. However, there is a rather significant number of transitions with a probability of (0.1-0.2), which are practically not implemented under ordinary conditions. These include the following transitions: homeostasis-deformation; autopoiesis-gap formation; transformation-regression; clustering-degradation; replication-agglomeration.

An analysis of the relationship between the parameters of the ecological niche, the selected patterns of participants' behavior and the prevailing types of interaction is useful from the point of developing a model for scenario forecasting the state institutions impact on the ecological niche of business entities. In a more formalized descriptive form, the essence of the developed model can be represented as follows (Figure 1).

Commenting on Fig. 1, we note that in accordance with the logic of building the model, regulatory entities initiate a specific target influence on the ecological niche parameters of business entities. Certain changes and transitions occur in the behavior of niche participants, which is reflected in the corresponding proposed matrices, and at the next stage, changes in behavior patterns affect the formation of the most likely ecological niche scenario.

Moreover, there are certain dependencies in this formation, which are reflected in the matrix of the

interconnections of patterns and scenarios. And only with a certain time lag can, a certain influence of the scenario arise on the behavior of state institutions (in accordance with the reflective contour in management) and vice versa - the influence of state institutions on the formation of scenarios in an ecological niche (indirect), which in most cases is directly fiscal by its nature.

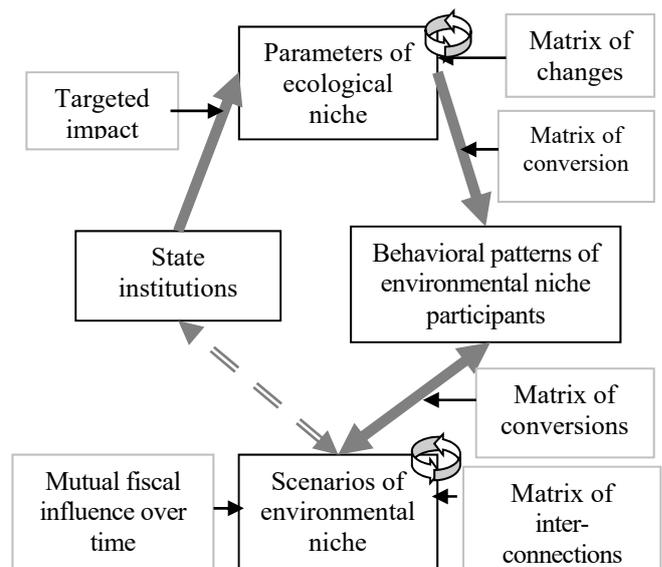


Figure 1. A scenario forecasting model of the influence of state institutions on the ecological niche of business entities

In order to assess the properties of the developed model and study on its basis the actual influence of state institutions on the activities of domestic enterprises, it is advisable to test the developed model on the example of Ukrainian enterprises.

To predict the state and scenarios of individual ecological niches, as well as to test the developed model of scenario forecasting regarding the impact of state institutions on the ecological niche of business entities, we suggest analyzing the development trends

including the global ecological niche of foreign economic activity (FEA) of Ukraine.

The global ecological niche of foreign economic activity includes 36 local niches, 4 niches provide more than 50% of imports and more than 40% of exports. Such niches are engineering, chemical and petrochemical industries, metallurgical and finished metal products, and light industry. A more detailed analysis of the specific gravity of these niches in foreign trade in goods is given in Table 3.

Table 3. Analysis of the share of 4 key niches in foreign trade in goods in Ukraine [9], [10], [11], [12], [13], [14], thousand US dollars

Indicators	Year					
	2013	2014	2015	2016	2017	2018
Export						
<i>Global ecological niche of FEA</i>	63312022,1	53901689,1	38127149,7	36361711,2	43264736,0	47334987,0
Ecological niche – mechanical engineering	10615289,4	7361329,9	4778603,6	4339296,5	5054284,8	5472684,1
Ecological niche – chemical and petrochemical industry	5115110,2	3640495,7	2543400,7	1967376,9	2221746,9	2565510,1
Ecological niche – metallurgical production and manufacture of finished metal products	17570747,8	15229006,2	9470719,2	8338854,6	10124613,3	11632691,7
Ecological niche – light industry	1158783,5	1145323,5	785039,5	963229,3	1091916,5	1220158,1
<i>Total in 4 niches</i>	<i>34459930,9</i>	<i>27376155,3</i>	<i>17692462,2</i>	<i>15608757,3</i>	<i>18492561,5</i>	<i>20891044</i>
<i>Share of 4 niches in the global ecological niche of FEA</i>	<i>54,43</i>	<i>50,79</i>	<i>46,40</i>	<i>42,93</i>	<i>42,74</i>	<i>44,13</i>
Import						
<i>Global ecological niche of FEA</i>	76963965,0	54428717,0	37516443,0	39249797,0	49607174,0	57187578,0
Ecological niche – mechanical engineering	19465787,0	12041833,0	8480844,8	11429046,0	14867662,0	17449892,0
Ecological niche – chemical and petrochemical industry	13028238,0	10420264,0	7655382,2	8486385,5	9791665,6	10616868,0
Ecological niche – metallurgical production and manufacture of finished metal products	5002923,2	3324372,1	2004239,5	2306476,1	3012753,2	3575231,9
Ecological niche – light industry	3486999,7	2536674,1	1830251	2023980,7	2257046	2661687,4
<i>Total in 4 niches</i>	<i>40983948,0</i>	<i>28323143,0</i>	<i>19970718,0</i>	<i>24245888,0</i>	<i>29929127,0</i>	<i>34303679,0</i>
<i>Share of 4 niches in the global ecological niche of FEA</i>	<i>53,25</i>	<i>52,04</i>	<i>53,23</i>	<i>61,77</i>	<i>60,33</i>	<i>59,98</i>

So, given the significant impact of these four environmental niches, they will be further analyzed for more detailed attention. To characterize the main processes of development and functioning of these ecological niches, it is advisable to analyze the change in niche scenarios in the studied time period (Table 4), as well as to form a forecast for 2018-2020.

It is advisable to distinguish three time ranges for the formation of scenarios and forecasts. The period 2012-2013 is more stable in the development of identified ecological niches, since there were no military operations in the country and the socio-economic situation was relatively stable, which affected the formation of the corresponding scenarios.

The period 2014-2017 is characterized by aggravation of contradictions, the loss of traditional markets and instability not only in the socio-economic development of the country, but also in the development of the studied ecological niches. Only the niche of light industry showed relatively stable functioning due to the short cycle of production processes and the efficiency of establishing contacts with potential partners. The information on forecasting the development of environmental niches in 2018-2020 is the most interesting, since the situation is influenced not only by internal factors, but also by significant external ones (expectations of the global economic crisis of 2020, trade wars of the USA and China and others).

So, the most likely scenarios in engineering will be clustering and agglomeration, as it will be extremely difficult for individual enterprises to withstand competition in world markets. The only possible scenario for chemical enterprises would be clustering, due to the need to accumulate significant resources for the acquisition of raw materials.

In addition to clustering, the actual and most likely scenario for light industry and metallurgy will be autopoiesis and regression, which is due to the extremely significant negative external influence of world socio-economic processes and the limited domestic solvent demand. Such information is useful for enterprise management from the point of forming management decisions.

Table 4. Changing environmental niche scenarios during 2012-2020

Period	Niche capacity	Niche density	Number of participants	Niche aggressiveness	Size of the average participant	Analysis of the interaction of the public authority with the entity		Orientation to cooperation (cooperation / struggle)	Aspiration to change or to preserve existing state (mutation / homeostasis)	Orientation (expansive / internal)	Reproduction mode (narrowed / extended)	Scenario	
						At the time of exposure	Given the fiscal effect for the state in the future					The most probable	The most probable*
Mechanical engineering													
2012 - 2013	↑	↑	↑	↑	→↓	amensalism	predation (for a state)	C/S*	M	E/I*	N	transformation, agglomeration	agglomeration
2014 - 2017	↓	↓	↓	↓	→↑	amensalism/commensalism	neutralism / allelopathy	C/S*	H	E/I*	E	clustering	autopoiesis, regression
2018 - 2020	↓	↑	→↑	↑	→↑	amensalism	amensalism / allelopathy	C/S*	M	I	N	clustering, agglomeration	agglomeration
Chemical and petrochemical industry													
2012 - 2013	↓	↓	↓	↓	→↑	amensalism/commensalism	neutralism / allelopathy	C/S*	H	E/I*	E	clustering	autopoiesis, regression
2014 - 2017	–	↓	↓	→↑	↑	neutralism/commensalism/amensalism	neutralism / proto-cooperation / allelopathy	C	M	E/I*	E/N*	transformation, clustering	clustering, agglomeration
2018 - 2020	↑	↓	↑	↓	–	commensalism	proto-cooperation	C	H	E	E	clustering	–
Light industry													
2012 - 2013	↑	↑	↑	↑	→↑	amensalism	predation (for a state)	C/S*	M	E/I*	N	transformation, agglomeration	agglomeration
2014 - 2017	→↑	↑	→↑	↑	↓	neutralism/commensalism/amensalism	neutralism / proto-cooperation / allelopathy	Б	M	E/I*	E/N*	deformation, gap formation	agglomeration
2018 - 2020	↓	↓	↓	↓	→↑	amensalism/commensalism	neutralism / allelopathy	C/S*	H	E/I*	E	clustering	autopoiesis, regression
Metallurgical production													
2012 - 2013	↑	↓	↓	↓	–	commensalism	neutralism / predation (for niche participants)	S	M	E	E	deformation, gap formation	–

2014 - 2017	↓	↑	-↑	↑	-↑	amensalism	allelopathy	C/S*	H	E/I*	E/N*	clustering	autopoiesis, regression
2018 - 2020	↓	↓	↓	↓	-↑	amensalism/commensalism	neutralism / allelopathy	C/S*	H	E/I*	E	clustering	autopoiesis, regression

* a possible scenario, that is, there is an alternative

3. Conclusions

The model of scenario forecasting, regarding the influence of state institutions on the ecological niche of business entities, has been formed taking into account the identified goals of such forecasting and tasks that have to be solved. It is actually based on the selection of ecological niche parameters, the analysis of the relationships between them in the dynamics, the selection and study of changes in the patterns of behavior of participants in the ecological niche due to changes in its parameters, the analysis of selected scenarios of ecological niche that arise as a result of changes in the behavior patterns among its participants, gaps between such scenarios.

Based on the results of the analysis, individual patterns of behavior of participants in the ecological niche and scenarios of the ecological niche as a whole are identified, which allow predicting possible options for the development of these entities and ecological niches. The determination of the relationships between the identified scenarios and patterns allows predicting changes in the scenario in the ecological niche as a result of adjusting patterns of behavior of its participants, that is, predicting both the change in the ecological niche as a whole due to the behavior of its participants and the formation of prerequisites for changing the behavior of participants in the ecological niche due to external influence to such a niche as a whole. This is useful both from the standpoint of ensuring economic security for environmental niche entities, since they can make informed decisions to minimize risks and threats, and from the standpoint of implementing state regulation of entrepreneurial activity, since the reactions of individual entities and their environmental niches to regulatory actions will be predictable.

The developed model of scenario forecasting, with respect to the influence of state institutions on the ecological niche of business entities based on the results of its testing, is characterized by the adequacy and reliability of the results, which is confirmed by the coincidence of the obtained model results with the analysis of retrospective information in the four ecological niches studied. The advantages of this model are relatively low dependence on external data, speed of calculations, the scenario nature and reliability of the conclusions. This allows us to approve that the developed model can be used by

business entities in foreign economic activity to ensure the effective functioning of their economic security system and managerial decisions, given the projected changes in the environmental niche due to the influence of state institutions.

References

- [1]. Aldrich, H. E. (2000). Entrepreneurial strategies in new organizational populations. *Entrepreneurship: The social science view*, 211-228.
- [2]. Carroll, G. (1985). Concentration and Specialization: dynamics of niche in populations of organizations. *American Journal of Sociology*, 90(6), 1262-1283.
- [3]. Crozier, M. (2000). A quoi sert la sociologie des organisations? Paris: Ed. Seli Arslan, 2000. Vol. I. Theorie, culture et societe, 288.
- [4]. Crozier, M. (2000). A quoi sert la sociologie des organisations? Paris: Ed. Seli Arslan, Vol. II. Vers un nouveau raisonnement pour l'action, 352.
- [5]. Hannan, M. T., & Freeman, J. (1977). The population ecology of organizations. *American journal of sociology*, 82(5), 929-964.
- [6]. Havlovska, N., Pokotylova, V., Korpan, O., Rudnichenko, Ye., Sokyrnyk, I. (2019). Modeling of the process of functioning of the mechanism of economic security of foreign economic activity of enterprise taking into account weak signals and identification of risks and threats. *International Journal of Scientific & Technology Research*, 8(12), 2216-2522.
- [7]. Kopytko M., Levkiv G., Vinichuk M. (2018). Macroeconomic Security of Ukraine: Problematic Aspect of Research and Prospects of Strengthening. *Journal of Automation and Information Sciences*, 50(2), 62-70.
- [8]. Parsons, T. (1968). *American Sociology. Perspectives, problems, methods*. Ed. Basic Books, New York, 346.
- [9]. Production structure of foreign trade in 2013. Retrieved from: http://www.ukrstat.gov.ua/operativ/operativ2013/zd/tsztt/tsztt_u/tsztt1213_u.htm [accessed: 20 December 2019].
- [10]. Production structure of foreign trade in 2014. Retrieved from: http://www.ukrstat.gov.ua/operativ/operativ2014/zd/tsztt/tsztt_u/tsztt1314_u.htm [accessed: 20 December 2019].
- [11]. Production structure of foreign trade in 2015. Retrieved from: http://www.ukrstat.gov.ua/operativ/operativ2015/zd/tsztt/tsztt_u/tsztt1315_u.htm [accessed: 21 December 2019].
- [12]. Production structure of foreign trade in 2016. Retrieved from: http://www.ukrstat.gov.ua/operativ/operativ2016/zd/tsztt/tsztt_u/tsztt1216_u.htm [accessed: 20 December 2019].

- [13]. Production structure of foreign trade in 2017. Retrieved from: http://www.ukrstat.gov.ua/operativ/operativ2017/zd/tsztt/tsztt_u/tsztt1217_u.htm [accessed: 20 December 2019].
- [14]. Production structure of foreign trade in 2018. Retrieved from: http://www.ukrstat.gov.ua/operativ/operativ2018/zd/tsztt/tsztt_u/tsztt1218_u.htm [accessed: 23 December 2019].
- [15]. Rudnichenko, Y., Krymchak, L., Kudelskyi, V., Avanesova, N., Sokyrnyk, I., & Havlovska, N. (2020). Minimization of Risks of the Enterprise Foreign Economic Activity through Improving the Interaction Management Quality with Potential Partners. *Calitatea*, 21(174), 61-67.
- [16]. Selznick, P. (1984). *Leadership in administration: a sociological interpretation*. Berkeley: University of California, 149.
- [17]. Shcherbina, V. V. (2015). Population-selectivity model of organization development: essence, sphere and prospect for application (part 2). *Sociological Studies*, 8(8), 100-108.
- [18]. Simon, H. A. (2000). Bounded rationality in social science: Today and tomorrow. *Mind & Society*, 1(1), 25-39.
- [19]. Simon, HA (1982) *Models of Bounded Rationality. Economic Analysis and Public Policy. Vol. 1:* Cambridge, MA: MIT Press.
- [20]. Simon, H. A. (1982) *Models of Bounded Rationality. Economic Analysis and Public Policy. Vol. 2:* Cambridge, MA: MIT Press.
- [21]. Simon, H. A. (1997) *Models of Bounded Rationality. Vol. 3:* Cambridge, MA: MIT Press.
- [22]. Varela, F. G., Maturana, H. R., & Uribe, R. (1974). Autopoiesis: The organization of living systems, its characterization and a model. *Biosystems*, 5(4), 187-196.