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Issue Article

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Independent researcher

IMPROVEMENT OF THE STATE INTERNAL AUDIT SYSTEM

Abstract: *This paper describes the organizational and functional changes taking place in the system as a result of the reforms implemented in the state internal audit system. In this, the main attention is focused on the nature of internal audit and the content of its main tasks, the organization of internal audit in ministries and agencies, and the specific features of legal and methodological support of internal audit.*

Key words: *state financial control, internal audit, internal control, audit, methodology, independence, impartiality.*

Language: *English*

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Introduction

1. Enter.

Today, reforms are being implemented in Uzbekistan to further improve the system of effective use of budget funds, and to further strengthen control over targeted and rational spending of budget funds.

At the same time, by the decrees and decisions of the President of the Republic of Uzbekistan, ministries and agencies were given independence in spending budget funds and an accountability system was introduced. Also, internal audit services were established in order to prevent cases of illegal spending and looting of budget funds in the ministries and agencies, and to assess the implementation of efficiency indicators.

A number of legislative documents were adopted in order to strengthen the legal basis of internal audit services. However, there are a number of problems regarding the practical application of the adopted legal documents, as well as aspects that should be covered by the legislation, and appropriate scientific research will be conducted to eliminate them.

2. **Literature review**.

To date, in many developed countries, the development of internal audit is seen as one of the factors of economic development, and its implementation in the public sector has been observed in practice to give positive results in the effective and targeted spending of state budget funds.

Over the years, the internal audit function has improved and become more complex: instead of auditors of accounting deficiencies, a class of employees has emerged who assist the managers in making decisions. Also, cooperative relations with higher external audit bodies and other state bodies were established.

Along with the development of the internal audit function, the views given to it have also changed. Based on these views, internal audit was defined.

When looking at the rates given by foreign and domestic scientists to the concept of internal audit, they can be directly divided into two groups. The first group defines internal audit as a part of "auditing" and internal control, while the second group defines internal audit as an independent assessment of the effectiveness of the organization and management bodies.

According to L.A. Bekbotova, internal audit performs the function of assessing the reliability and guarantee of the effectiveness of the internal control system in the process of managing risks determined as a result of corporate management.

Also, according to the scientist, internal audit is an independent department that evaluates the organization's activities, helps to achieve the set goals through systematic and orderly directions.

The purpose of internal audit is to provide advice on improving operations in the organization,

identifying evidence of violations, analyzing and optimizing the quality of control.

N.V. Gamulinskaya, I.O. According to Sanovich's definition, internal audit is an independent and unbiased activity that provides an organization with confidence in how well it controls its operations, makes suggestions for their improvement, and creates added value.

According to these scientists, the increase in demand for internal audit activities in budget organizations is the increase in paid services in them, which can include paid education in higher educational institutions, transportation costs, scientific research, etc.

Of course, the opinion of these scientists is correct on the one hand, the emergence of additional extra-budgetary income creates a task for the management of the budget organization to use them effectively. In this respect, reliable internal auditors play a positive role in ensuring the efficient use of extra-budgetary funds.

Among the scientists of our country Mehmanov S.U. according to his definition, internal audit is an activity aimed at verifying compliance with legal documents and monitoring the preparation and execution of estimates by the organization, ensuring the reliability of financial reporting data, observing budget-estimate discipline, purposeful and rational spending of funds.

Another scientist B. J. According to Jumamuratov's research, internal audit is the study of the correct structure of budget organizations' income and expenditure estimates, staff tables based on the requirements of legislation, and ensuring the reliability and validity of financial reports prepared on their execution, the purposeful and targeted spending of budget funds in compliance with payment discipline, using information technologies remotely. It is an activity directed to monitoring (control) when standing up and going to the place when necessary.

The definition given by these scientists to the internal audit shows that it covers the financial and economic activities of the budget organization, and this definition is one of the most correct definitions for the first periods of the internal audit established in Uzbekistan. At the same time, as we mentioned above, the main task of the internal audit in the budget organization is to control the effective and targeted use of budget funds. For this, it is necessary to study the correctness of income and expenditure estimates, structure of staff tables, and financial reports.

Based on the international experience and the experience of scientists, it can be said that internal audit is an independent and impartial way of providing the head of the organization with reliable information about the internal control system and suggestions and recommendations for its improvement. Internal audit should be aimed at improving the organization's activities.

In this case, the independence of the internal audit means that it operates independently in relation to the activities of other departments and units in the organization in which it is established. Internal auditors are directly subordinated to the first head of the organization in their activities and are accountable only to them. In addition, internal auditors in the organization are not allowed to assign tasks other than those assigned to them, these rules are determined by the relevant regulatory and legal documents of the organization.

Impartiality of internal audit means impartial approach to them in their activities, conducting inspections, formalizing results and drawing up reports, evaluating the activity of the internal audit object. The main task of internal auditors is to provide the head of the organization with unbiased information about the organization's activities.

As a result of the study of information on internal audit activities, the main goal of internal audit is to participate in the development of all available ways to achieve the goals of organizations and to provide advice aimed at timely elimination of potential risks in this process.

It follows that internal audit should first of all help the organization achieve its goals (or goals).

3. Analysis and discussion of results.

Since 2017, the implementation of reforms in the state financial control system has begun. By the decision of the President of the Republic of Uzbekistan dated August 21, 2017 "On further improvement of the financing mechanism of educational and medical institutions and the state financial control system" No. PQ-3231, the internal audit activity of the state financial control system was launched.

In this case, the internal audit activity was directed to improve the financial management in the ministries and agencies, taking the best aspects from the internal audit of the private sector, to increase the efficiency of the use of state budget funds.

Internal audit services are provided by the above decision of the President of the Republic of Uzbekistan in the off-budget Pension Fund under the Ministry of Public Education of the Republic of Uzbekistan, the Ministry of Health, the Ministry of Higher and Secondary Special Education, the Center for Secondary Special Vocational Education of the Ministry of Higher and Secondary Special Education and the Ministry of Finance of the Republic of Uzbekistan was organized in the form of internal audit and financial control services.

It can be explained that the internal audit services are primarily organized in these ministries and agencies, that a significant part of the funds allocated from the state budget goes to them, and that they include the social direction. In addition, these ministries and agencies cover about 20,000 budget

organizations and employ more than 1.4 million employees.

We can see the information about the internal audit activities conducted by the above internal audit services during 2019-2022 from the table below.

Table 1. Information on the results of the activities conducted by the internal audit services of the Ministry of Health, the Ministry of Higher and Secondary Special Education, the Ministry of Public Education and the Ministry of Preschool Education

in billion soums

T/r.	Indicators	The number of objects where the control event was conducted (pieces)				Amount of identified financial errors and omissions				Funds restored to the state budget				Amount of costs avoided as a result of preventive measures			
		2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
1	**Ministry of Health**	366	395	443	320	1.2	16.9	35.1	26.4	1.7	3.2	8.5	0.8	-	22.7	38.7	23.1
2	**Ministry of Higher and Secondary Special Education**	465	328	524	200	0.56	2.5	16.3	16.1	1.9	1.1	6.4	6.3	8.6	4.7	5.7	9.1
3	**Ministry of Public Education**	5 273	1 188	256	662	16.1	228.3	91.1	87.3	11.9	16.8	8.1	23.1	-	135.1	410.1	852.9
4	**Ministry of Preschool Education**	-	611	450	1160	-	51.8	36.6	45.1	-	7.4	8.9	10.1	-	3.2	41.3	8.2
	TOTAL	**6104**	**2522**	**1670**	**2342**	**17.9**	**299.6**	**179.3**	**174.9**	**15.5**	**28.7**	**31.9**	**40.3**	**8.6**	**165.8**	**495.9**	**893.3**

It can be seen from Table 1 that the activities of the internal audit services of the ministries of social sphere in the period of 2019-2022 are mainly focused on prevention and prevention. This can be explained by the norms in the documents adopted in recent years on internal audit activities.

In addition, the number of internal audit services is also increasing in proportion to the expenses of the consolidated budget between the years indicated (Fig. 1).

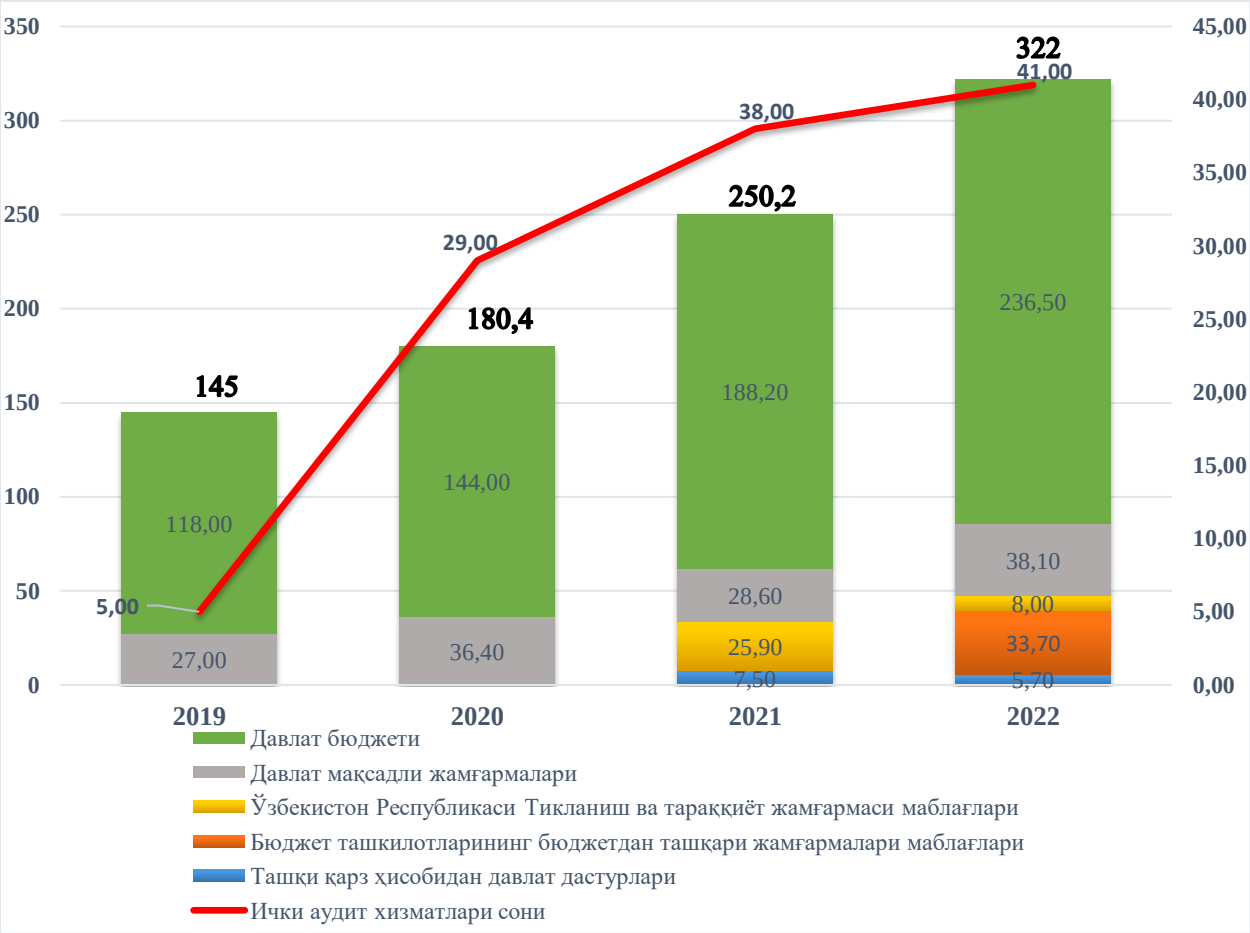

Figure 1. Proportion of the growth of Consolidated budget expenditures and the organization of internal audit services in the period 2019-2022

As can be seen from the figure above, consolidated budget expenditures increased by nearly 2.2 times from 2019 to 2022, while the increase in the number of internal audit services was more than 8 times. These indicators, first of all, create the need to organize effective control over the spending of consolidated budget funds, and secondly, to properly establish the activities of internal audit services organized in ministries and agencies, to provide them with legal and methodological support, to fill internal audit services with potential employees, and internal audit services it will be necessary to perform tasks such as certification and training of employees.

The "Three-level protection" model developed by the International Institute of Internal Auditors (The IIA) is of great importance in establishing an effective management system in the organization. This model provides an opportunity to effectively manage the organization by clarifying (grouping) tasks and functions in the organization. (Figure 2)

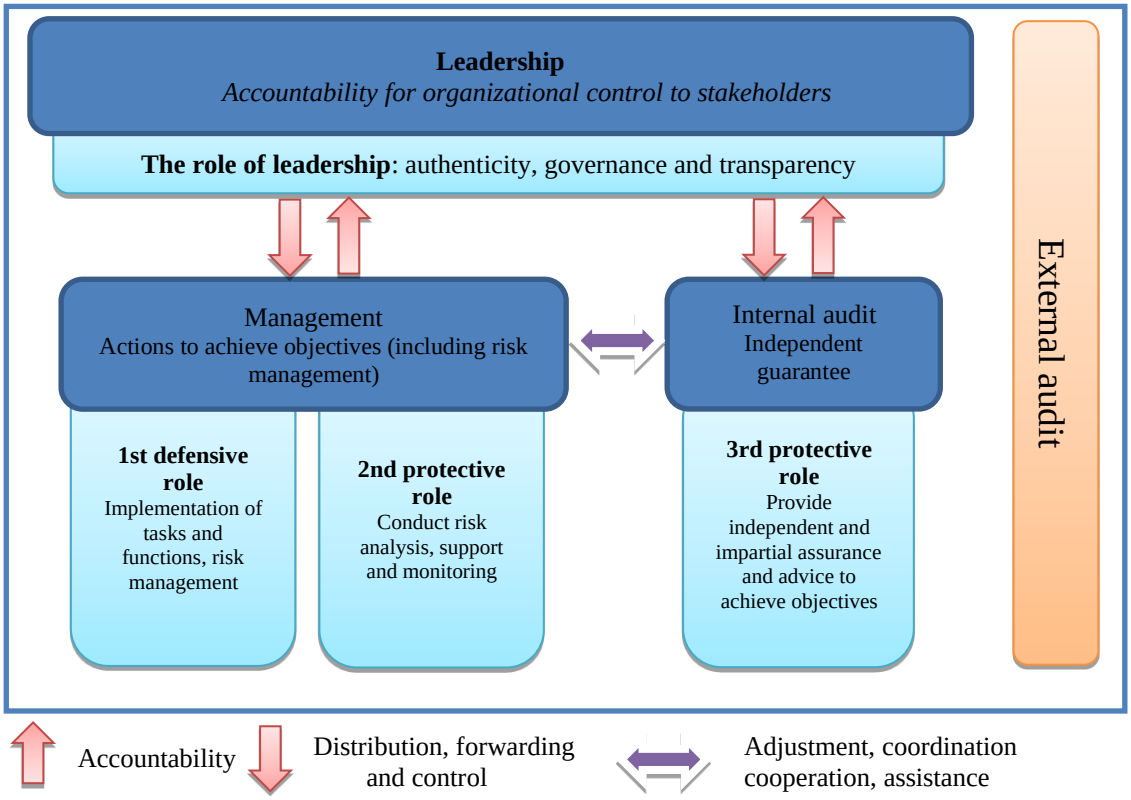

Figure 2. "Three-level protection" model in the public sector[1]

According to this model, the first stage in the organization includes tasks and functions directly related to the organization's activities. As an example, we can cite the activities of the lowest structures in the organization (accounting, departments dealing directly with customers). These structures provide preliminary control by performing the tasks assigned to them and report to the head of the organization.

The second level in the organization includes compliance control, financial control, executive control, legal service, etc. The participants of this stage monitor the activities carried out in the first stage and report on their activities to the head of the organization.

The third stage is the function of internal audit, and its main task is to evaluate and analyze the activities of the participants of the first and second stages and to provide the head of the organization with reliable information about the organization's activities. At the same time, he develops proposals and recommendations for the proper implementation and improvement of activities. The head of the organization uses the information provided by the internal audit to make management decisions.

Therefore, it is important to introduce the internal audit function in the organization. It is necessary to pay attention to the independence of the internal audit function. Because the status of the internal audit service affects the quality of information provided to the head of the organization.

The powers granted to the ministries and agencies by the relevant Presidential documents impose heavy responsibilities on them. In this regard, the financial independence given to them should be taken into account. Until now, the approval of the staff of ministries and agencies and the establishment of structures have been carried out by decisions of the President or the Government.

In addition, the cost estimates of the ministries and departments were registered separately from the financial authorities to the relevant items of the economic classification. Now, registration by financial authorities is determined only by cost groups. This imposes on the heads of the ministries and departments the obligation to spend the allocated budget funds in the directions deemed necessary, and to present a report on the efficiency of the spent funds to the Parliament.

4. Conclusions and suggestions.

In conclusion, it can be noted that it will be necessary to introduce internal audit activities in the public sector of our country based on international experiences.

[1]"The Application of the 'Three Protections Model' in the Public Sector", Institute of Internal Auditors (The IIA), October 2022

Effective management and potential employees are necessary for the head of the ministry and office to implement the above-mentioned tasks. At the same time, it would be appropriate to organize management based on the "Three-level protection" model.

For this, it will be necessary to revise this model from the point of view of the system of ministries and agencies. (Figure 3)

When the documents of the President of the Republic of Uzbekistan give many powers to the ministries and agencies, the use of this model helps in their management, including the financial management of the ministries and agencies. To understand this, let's go through each step.

The first stage includes structures that perform tasks and functions related to the activity of the ministry and office. These structures carry out the tasks and functions assigned to them in accordance with the regulations, job instructions and orders approved by the ministry and the head of the department. At the same time, they are accountable to the management for the work done. From the point of view of control, at this stage control is carried out by these structures themselves in their work.

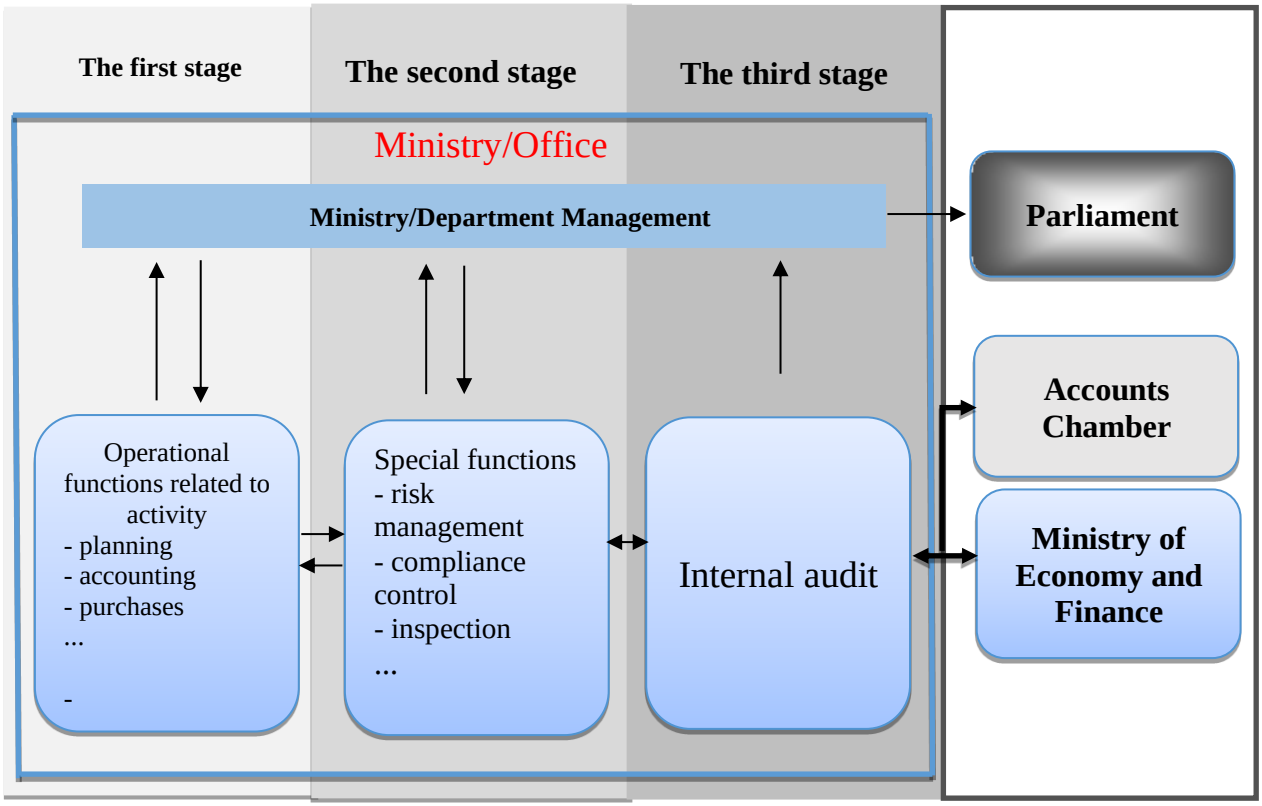

Figure 3. Application of the "three protection model" in ministries and agencies[2]

The second stage is special tasks and functions organized in ministries and agencies. These tasks and functions can be established by the relevant decisions of the ministry and office or by the decisions of the President or the Government of the Republic of Uzbekistan. For example, in the Decree of the President of the Republic of Uzbekistan dated January 25, 2023 "On the first organizational measures to effectively establish the activities of the executive authorities of the Republic" No. PF-14, strategic planning and methodology, public relations (information services), human resources development and management, information analysis and execution discipline, appeals, introduction and digitization of information and communication technologies, legal provision, fight against corruption, finance and economy, international cooperation and ratings,

These structures do not directly perform tasks related to the activities of ministries and departments, but they monitor (control) the performance of tasks and functions performed at the first stage and provide reports (information) about it to the management. For example, the main task of the anti-corruption function is to prevent corruption in the ministry and office, and it carries out activities in this regard in the first-level structures.

The third stage is the internal audit function, the internal audit function is performed by the internal audit structures established in the ministry and office. The main task of the internal audit structures is to

[2]Image prepared by the author

provide reliable and impartial information to the management about the activities of the ministry and the office, to develop suggestions and recommendations for improving the activities, and to prevent systemic problems. Internal audit structures directly evaluate, analyze and coordinate the activities of the first and second stages and are accountable to the first manager.

The information of the internal audit on the activity of the ministry and office helps the management to make appropriate decisions. However, it is not appropriate for the internal audit function to be used as a punitive function in the ministry and office. Internal audit is a function that helps to improve the activity of an independent ministry and office.

Currently, in the state administration of our country, great emphasis is placed on "decentralization". In this regard, ministries and agencies are given wide powers in the implementation of their activities, including the use of state budget funds. In these processes, the suggestions and recommendations of the internal audit are important in making decisions of the head of the ministry and department, especially on the effective use of the state budget funds.

For this, first of all, the internal audit structure should be directly subordinated to the first leader, independent of other structural structures, the knowledge and experience of the internal audit service employees should be high, and the legislation of internal audit activity should be strong.

In addition, a number of regulatory legal documents regulating internal audit activities have been adopted today, which include the following:

directions of development of the internal audit system and tasks of the responsible structure;

organization of internal audit activities, principles;

the purpose, tasks and functions, rights and obligations and accountability of the internal audit service;

internal audit service staff qualification requirements, their certification and training;

ensuring and improving the quality of the internal audit service;

planning, conducting and reporting of internal audit activities.

At the same time, there are a number of issues that need to be regulated in the internal audit activity, and amendments and additions should be made to relevant documents or a separate regulatory legal document should be adopted regarding these issues. Including

1. Development and adoption of a draft law regulating the internal audit system in the public sector. The law on the internal audit system in the public sector regulates relations in the field of internal audit, strengthens, unifies and systematizes the current legal norms. The adoption of a separate law leads to the creation of a solid legal basis for the internal audit system in the public sector.

2. It is desirable to develop a procedure for ensuring and improving the quality of internal audit services, as well as for evaluation, and it should include the following:

- creation and approval of the Quality Assurance and Improvement Program, which includes work to be carried out to ensure the quality of internal audit activities by the head of the internal audit service;

- Implementation of internal assessment of internal audit service activities based on the program. In this case, internal evaluation should include continuous monitoring and periodic evaluation of internal audit activity;

- External evaluation conducted by the Ministry of Economy and Finance, its planning, implementation and formalization of the results, as well as preparation of the external evaluation report;

- Development of performance indicators of internal audit service employees.

The materials of the Institute of Internal Auditors (The IIA) and legal documents adopted by foreign countries can be used in the development of this regulatory legal document.

3. Development of the procedure for cooperation of internal audit services with state financial control bodies.

Today, internal audit services interact with state financial control bodies, share information, and use the results of their activities. However, the detailed mechanism of these processes is not regulated by any legal document. Therefore, in order to prevent various misunderstandings and possible disputes in the activity, it is appropriate to clearly define the relationship of the internal audit services with the state financial control bodies. The regulatory legal document on cooperation with state financial control bodies should include the following:

- in what form of relations between internal audit services and state financial control bodies. This includes memorandums, decisions and orders or agreements signed between the parties;

- issues of coordinating the activities of the parties;

- obligations and liability issues of the parties;

- issues of mutual use and recognition of the results of control activities;

- issues of information and information exchange between the parties;

- issues of conducting joint control measures;

- issues of joint experience sharing, training, meetings, seminars.

At the same time, it is appropriate to cover the relationship of internal audit services with law enforcement agencies and anti-corruption structures with this normative-legal document.

Because in the model regulation on the internal audit service of the Ministries and agencies approved by the decision of the Cabinet of Ministers dated August 1, 2022 No. 416, the internal audit services should take appropriate measures in the event that signs of crime, corruption violations (including by the persons who carried out the internal audit event) are detected. (documentation, taking preventive measures) and the obligation to notify the first head of the ministry and agencies about sending materials to law enforcement agencies, and the mechanism of implementation of this obligation should be clearly defined.

In the event that signs of crime and corruption violations are detected, what information should be provided to law enforcement agencies, in what form and for how long, and the rights and obligations of internal audit service employees before law enforcement agencies should be specified.

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Issue Article

Yulduz Urazimbetovna Matkurbanova
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teacher of the interfaculty department of foreign languages

HISTORICAL IMPORTANCE OF DERIVATION IN STUDYING LANGUAGES

Abstract: *The research deals with the significance of derivation of words within one language or languages. This way appears in all languages' lexicology which are close or far away. The given paper tried to show the value of historical and modern derivation in developing languages. Most importantly, the role of relation of derivation was particularly highlighted.*

Key words: *derivational words, word formation, derivative, modern derivation, comparative-historical method, productivity, the relation of derivativeness.*

Language: *English*

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Introduction

Derivation is a complex notion which has different contexts but in linguistics the concept "derivation" in linguistics is used in two different meanings. In one meaning, it indicates a historical or diachronic development words either from an earlier form of the word or by adding affix to an existing word, especially the Oxford English Dictionary defines derivation as "Formation of a word from a more primitive word or root in the same or another language; origination as a derivative"[1:3]. As for Webster's Third New International Dictionary, it defines it as "The formation of a word from an earlier word or base usu. by the addition of an affix usu. noninflectional. In a second meaning derivation indicates the formation of a word synchronically from a word which is said to 'underly it'; Webster's defines derivation in this sense: "Relation of a word to its base as expressed usu. in terms of presence of an affix, q . . vowel alternation J . . . consonant alternation" . . . difference of accent J . o . absense of one or more sounds, . . . or zero difference J . . . (2) : the relation of a word to its base when the two do not belong to the same inflectional paradigm[2:13].

In modern linguistics, derivation is just beginning to take shape. Much is still unclear about it; a system of terminology has not yet been created, sufficiently reliable research methods have not been developed, not even the whole range of problems to be resolved has been defined. Derivation did not appear in a vacuum. Formation of modern derivation is a well-known summing up, summarizing the results of the development of linguistics. In this regard, we turn to his history.

Already in the ancient world we find separate ideas consonant with the provisions of modern derivation. So, the ancient Indian linguist Panini compiled a grammar that told how the roots of Sanskrit words are formed, what alternations of sounds occur during word formation. It was essentially the world's first derivational grammar. In ancient times, partly independently, partly relying on the Persian and Arabic tradition, scientists made many interesting assumptions about how individual words and their grammatical forms. It is no coincidence that "derivational" linguistic terminology took shape in ancient Greek philology [3:56]. Compare Russian tracing papers: case (indirect cases seemed to fall away from the nominative case), declension (cases deviated from the original, original), etc.

In Russian linguistics, the ideas of this grammar were successfully developed by the so-called logical grammar, the founder which is N.I.Grech. His "Practical Grammar of the Russian Language" had a

huge impact on the development of not only the scientific grammar of the 19th-20th centuries, which is still found in school textbooks on the Russian language.

Participial and participial phrases, applications, introductory words were interpreted by logical grammar as sentences "abbreviated" adjectives. Although in reality these turnovers historically, nor derivatively, they were not reduced to subordinate clauses in the literal sense, but they are "raised" to the sentence, i.e. replace it: As we approached the village, we heard dogs barking. = When we were approaching...

N.I. Grech and his followers, including Buslaev, talked about many other derivational processes: fusion (animals and birds live without difficulty), substitutions (I live in a city where = where I am very bored), omissions (they say there will be peace soon = people say) [2:65].

F.I. Buslaev for the first time made an attempt to consider such processes from a historical point of view, i.e. treat them as "historical", occurring in the history of the language. Supporters of the comparative-historical method in linguistics ("historical grammar") did a lot in this direction, although they denied the scientific significance both universal and logical grammar. However, they denied - does not mean they rejected everything that was done by them predecessors. On the contrary, many fruitful ideas of logical schools found not only support, but also development in the works of representatives of comparative historical linguistics.

It's typical before only for the early period of its development, when the psychological concept was "combined" with the conviction that language is a deeply social phenomenon. This postulate was proclaimed the basis of linguistics in the works of the brilliant W. von Humboldt, a German encyclopedist of the 19th century.

G. Steinthal proceeded from the linguistic concept of Humboldt and A.A. Potebnya. In the latter's book, Thought and Language, an attempt was made concretize and develop the ideas of W. von Humboldt. A.A. Potebnya showed that the historical formation of language is closely connected with mental processes, that the forms of language (words or sentences) are ultimately determined by the need for expression of thought, and that along this path it is necessary to look for laws that govern both languages, as well as thinking.

Language in direct observation is an uninterrupted process, constant activity of communication, expression and formulation of thought in linguistic (material) forms. But every activity has a certain result, a certain product. So the language is activity presupposes language as the product of this activity. Its two sides of the same phenomenon - language: dynamics and statics [3].

They constitute a unity, but a dialectical, contradictory unity. Statics deals with a list of units (it does not matter in what form they are presented, in the form of a simple aggregate or in the form of a strict system) with some given, ready-made material for research and use; she states facts (linguistic data) and captures some relationship between them. On the contrary, dynamics deals with linguistic processes, with the rules for the formation of units, with the functioning of language as a means of communication. It is clear that statics is a moment of dynamics. Figuratively speaking, static is a frame in a film, and dynamics is a film. True, any comparison is lame: a certain sequence of film frames is a film, meanwhile, the sequence of "statics" - static relations of the language - is not its dynamics. Rather, on the contrary, statics, as it were, is extracted from dynamics, statics is always the result of our research, abstraction from the actual state of affairs.

As for the other meaning of this term - the relation of derivativeness - it no longer refers to the dynamics, but to the statics of the language. Indeed, any relation is a relation between given units. We establish the derivative relations after how the process of unit formation took place, we kind of compare coexisting two units and find some difference in them, which allows us to qualify one of them as a derivative from another, i.e. to assume that one was produced (formed) from the other.

For example: in the dictionary of the Russian language, we record two words: tea and teapot. Comparison of these words shows that one of them is more complex and, as it were, “includes” another: a teapot consists of tea + nick. The same is observed in the field of syntax: Snow began to melt - The snow began to melt rapidly. Here the word violently fulfills essentially the same function as the nickname in the teapot. Such an inclusion relation is called a derivative relation. It would seem that we should consider this relationship as a dynamic phenomenon, especially since other relationships that are not directly related to derivation can be established between the units of the language, for example, the relationship of opposition (opposition), which were subjected to a comprehensive analysis in classical structural linguistics , or relations of embodiment, when some abstract postulated unit (linguistic) is put in correspondence with a specific unit (speech); phoneme - the sound of speech, etc.

Derivation as a process of formation of language units is unobservable. It takes place in the minds of the speakers, and how the derivation proceeds can only be judged by some of its results, by indirect data, by some external traces left in the text, in sentence or word structure. In this respect, derivation resembles physics, which also studies unobservable microparticles of atoms, or chemistry, analyzing a chemical reaction based on composition starting materials and end products [3:8].

The fundamental non-observation of the subject of research is one of the distinguishing features of derivation. However, this feature is also characteristic of structural linguistics, which studied not the sounds of speech, but phonemes, i.e. relations between sounds, not words as such in the text, but relations between measchu t sh and - lexemes, etc. Relationships are also an unobservable object, pLdda, of a different kind. One might get the impression that between the theory of derivational relations and derivation there are no fundamental differences, that they investigate, in essence, the same thing, only in different aspects, hence the different terms, we seem to depict in different ways, represent the same phenomenon: to count is a counter, but count the counter. In reality it's not. Theory of derivational relations and derivation have significantly different starting positions - the statics and dynamics of the language, which cannot but affect the entire system of concepts and methodological techniques of either discipline. Derivation — science is functional, and the theory of derivational relations (TAR).

Otherwise, this issue is considered in derivation. Word formation occurs in several stages. At the first stage, some expansion of the object designation is observed, due to which the most general name (generic concept) is specified, limited to the specific concept. For example, the concept of an agent in general can be limited to an indication of what he is reading. As a result, a semantic construction of the type arises in the mind of the speaker: The doer reads = the one who reads. At the second stage, this construction is collapsed, i.e. the process by which a derivative word is obtained. In this case, the figure = the one who is replaced by the affix -tel, the word reads - its basis is reader-. what and gives the reader [4:43].

In conclusion, derivation is important to do some search which requires the exact meaning and a different context. Even some languages are linked to each other by derivate words and they might be a tool which make languages closer.

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Issue Article

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USE OF GROWTH PROMOTER ACTIVATORS FOR ROOTING DECORATIVE CULTURES

Abstract: *The article is devoted to the improvement of the reproduction technology of coniferous (the blue spruce, the savine juniper) and deciduous (forsythia and the shiny cotoneaster) ornamental plants using activators of root formation and development, such as Kornevin, Zircon and HB-101. The research was conducted in 2014-2015 in conditions of protected and open ground of the municipal unitary enterprise "Kyzylzhar" located in the city of Shymkent, Turkestan region. The soils in the nursery were dark grey, middle loamy in texture. Humus content was 3.5%, the supply with labile phosphorus was average (5-10 mg/100 g of air-dry soil) and the supply with exchange calcium was high (15-25 mg/100 g air-dry soil). Rooting of green cuttings took place in plastic foil houses with a system of automated irrigation. As a substrate, a mixture of peat and sand 1: 1 was used. The estimation of the rooting ability of green cuttings of the blue spruce (a poorly rooting culture) and the savine juniper with the use of different types of biologically active substances showed that the best data on this indicator were noted when the cuttings had been processed by Zirkon, the worst data were on the control (water). The development of the roots of the studied coniferous species treated by Zircon was also the best. The use of growth stimulants on ornamental and deciduous plants also increased the yield of rooted green cuttings (%). The maximum number of rooted green cuttings of the cotoneaster was provided by Zirkon, and those of forsythia – by HB-101. Consequently, the processing of green cuttings of coniferous and deciduous ornamental species is a necessary condition for obtaining the maximum number of rooted cuttings for a short period of time.*

Key words: *landscaping, ornamental coniferous and deciduous plants, growth activators, vegetative propagation by green cuttings.*
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Introduction

In connection with the need to provide food for the growing population of the Earth, the issue of increasing plant productivity is becoming more and more acute. Judging by the huge losses of the crop, in order to protect plants and preserve the crop, there is a practical need for a set of protective measures. One of the modern agriculture. Despite the fact that the practical use of synthetic growth regulators in many cases gives excellent results, in terms of consumption, these products are still significantly inferior to pesticides. Not least, this is due to the fact that the results of the use of growth regulators are highly dependent on the effectiveness of all other agrotechnical measures.

At present, for the Republic of Kazakhstan, the development of research in the field of creating new highly effective domestic drugs for the needs of

agriculture based on organic substances obtained from local natural and synthetic raw materials is especially important. In particular, there is very little data on the creation of growth-regulating preparations based on natural organic acids. Scientific schools in various areas of modern science have developed and are successfully developing in Kazakhstan. In the field of chemical sciences, fundamental and applied research is being carried out in the field of creating chemical and medical preparations, new biologically active substances, their properties and mechanisms of action are being studied. Research carried out in the Laboratory of Chemistry of Synthetic and Natural Medicinal Substances JSC Institute of Chemical Sciences. A.B. Bekturov", make a certain contribution to the creation of a database of directed search for a new generation of compounds with specified practically useful properties.

Therefore, in our opinion, it seems interesting to develop a scientific direction for the development of a new generation of growth stimulants obtained by modifying natural and synthetic organic carboxylic acids. A series of works was carried out to search for growth-accelerating properties in oil and products of its processing. Presumably, these properties are attributed to naphthenic acids, on the basis of the sodium salts of which the petroleum growth substance (NRB) was later obtained. Growth preparations are proposed based on the active principle of NRV - naphthenic acids.

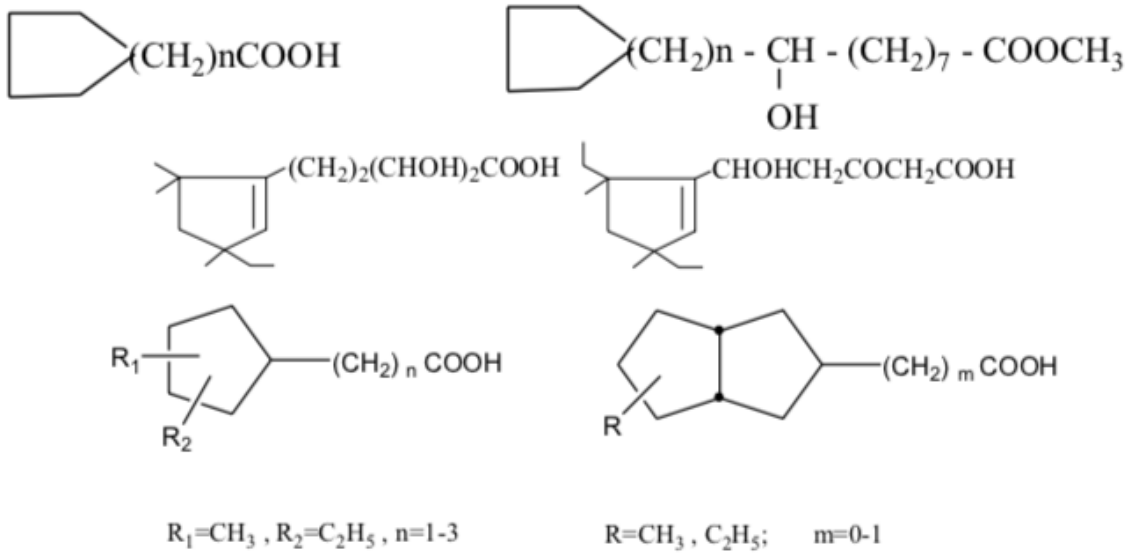
Studies have been carried out on the isolation of individual naphthenic acids, the synthesis of their derivatives and the verification of physiological activity. It has been established that C12-C18 naphthenic acids have the highest growth activity, and the selectivity of their biological action has been shown possible ways to achieve this goal is to accumulate fundamental knowledge in this area, as well as a differentiated scientifically based approach with the maximum realization of the potential of plant growth regulators. Under natural conditions, the growth and development of plants is regulated by substances, endogenous phytohormones (produced by the plant itself). Currently, six main groups of natural plant growth regulators (phytohormones) have been identified, characterized and studied: auxins, gibberellins, cytokinins, brassinosteroids, abscisic acid and ethylene, which control biochemical processes in plant cells. Low consumption rates of regulators, the ability to control the processes of plant growth and development with their help, to change the resistance of plants to various external factors determines their prospects. This allows the growth and development of plants to be shifted in the desired direction and degree, providing practitioners with particular interest.

The way to create growth regulators is a long process lasting 8-10 years and is not inferior to the creation of new medicines in terms of labor intensity. To date, about 5,000 compounds (of chemical, microbial and plant origin) that have a regulatory effect have been discovered and studied to some extent, but about 50 are used in world practice. This indicates that their widespread industrial use is just beginning. Indeed, the share of all industrial formulations of growth regulators in the world market of agrochemicals is currently about 10-12%. However, in terms of the rate of expansion of production, sale and use of plant growth regulators, they surpass all other chemicals that are used in agriculture. The use of plant growth regulators is becoming an increasingly promising and rapidly developing area of intensification.

where R = R1 or R2 R1 = C2H5 R2 = CH3 - alkyl substituents in the ring, n = 1-3
where R = R1 or R2 R1 = C2H5 R2 = CH3 - alkyl substituents in the ring, n = 1-3

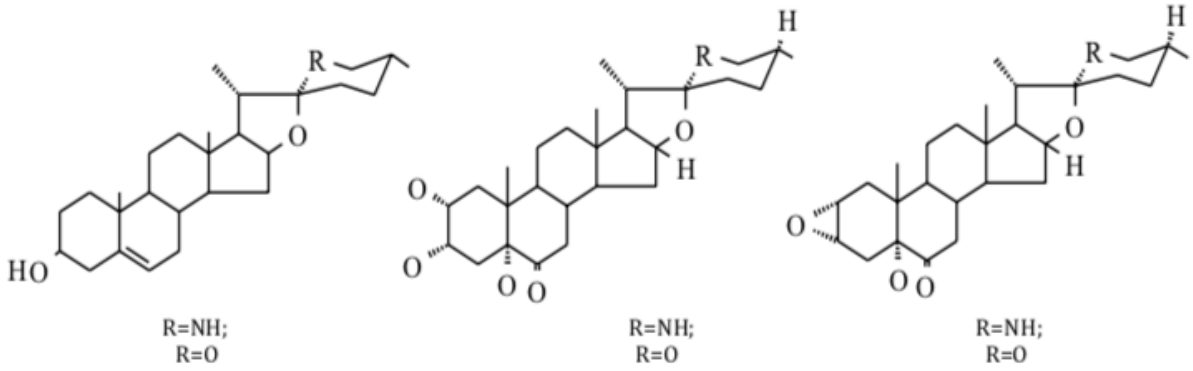
Picture 1.

One of the growth preparations for agricultural crops and animal husbandry was recommended preparations NK-240, NK-270, obtained on the basis of naphatenic acids. When using NK - 240 in feed at a concentration of 2 mg / kg of live weight, it gives an increase of 15-24% Under the leadership of Academician M.I. Goryaev, studies were carried out on the synthesis of growth-stimulating substances structurally close to auxins, gibberellin based on a-pinene, camphor and cedar, a homologous series cyclopentanoic acids with different side chain lengths



Picture 2.

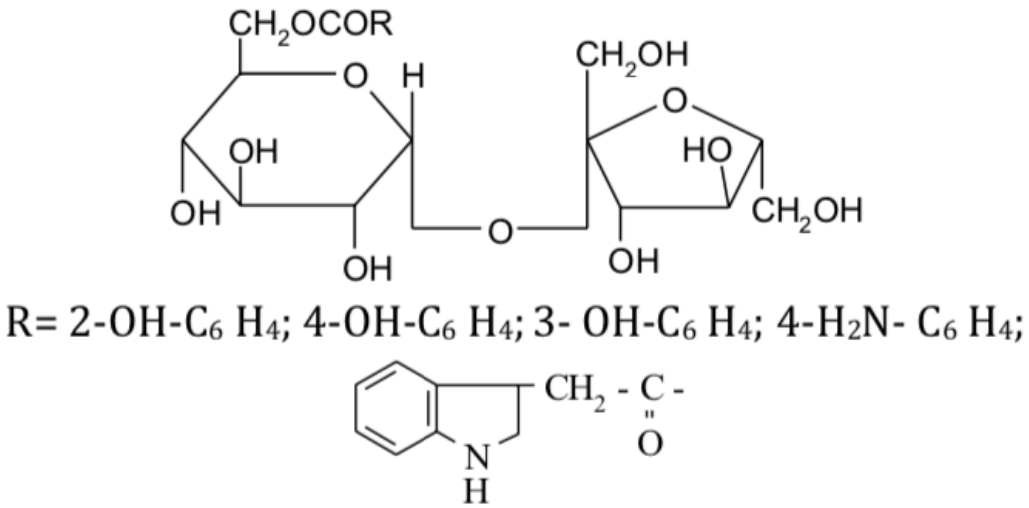
One of the ways to solve the problems of increasing agricultural production is the use of environmentally friendly technology of phytohormonal regulation of plant production processes. A group of phytohormones found in many plant species is commonly called brassinosteroids. The latter are of interest as environmentally friendly plant growth regulators. Being highly effective phytohormones, brassinosteroids are synthesized in plants in very small quantities. Therefore, advances in the study of biological activity and practical application Brassinosteroids is determined by the possibility of their chemical synthesis from available steroids. Biologically active exotic brassinosteroids contain cis-2,3 - diol function, intermediate compounds in the formation of which are substances containing 2-bond. Under the guidance of Professor Irismetov M.P. the synthesis of structural analogs of brassinosteroids was carried out by means of a series of synthetic transformations based on solasodine and diosgenin.



Picture 3.

Compounds are of practical interest as phytoregulatory substances

Under the guidance of d.h.s. Artamonova A.F. simple and accessible methods have been developed for the preparation of esters of synthetic and natural organic carboxylic acids with polyhydric alcohols and carbohydrates, which are of great practical interest. When tested in laboratory and field conditions on various vegetable crops, effective stimulants were identified among them, which have advantages over the drugs used - cineb and heteroauxin



Picture 4.

Tests of esters of aromatic and 3-indolylacetic acids with sucrose for growth-stimulating and antiviral activity on vegetables and potatoes were carried out at the Kazakh Research Institute of Potato and Vegetable Economy. The preparations are environmentally friendly, after treatment of plants they are not found either in the soil or in products. When testing growth-stimulating and antiviral activity on potatoes in laboratory conditions, an effective drug was identified - PC-1 and PC-2. As a result of the studies, it was shown that diseases of viral etiology were less pronounced on potato plantings protected by the drug than in the control (untreated plants). 30-35 days after treatment of plants, during the period of accumulations of inhibitors - substances that inactivate viruses, the nonspecific antiviral activity of potato juice in the experimental variant was 27-35% higher than in the control. All this testifies to the immunizing antiviral effect of the studied drug on plants. The studied drug also had a phytostimulating effect. As a result of the use of RS-2, the potato yield, depending on the variety, increased by 16.1-19.7% or by 20.7-40.0 c/ha (concentration 0.005%, and in the base case by 14.5- 18.4% or by 19.6-37.3 c/ha (0.25% concentration). The use of the drug instead of the standard - TUR for obtaining an analogous crop allows to reduce the amount of the drug applied per unit area by 50 times, which is important ecological value.

The drug is recommended for practical use in potato growing to protect potatoes from viral diseases and increase yields.

One of the areas with a high innovative potential is the development of a technology for presowing seed treatment of agricultural crops, which increases the yield and biological value of plants. Seeds of beets, onions and carrots are tight. Seeds of vegetable crops with different physiological parameters and the ability to germinate often germinate over a long period (30-40 days), which leads to heterogeneity of plants. The use of growth stimulants in the preparation of seeds for sowing increases the vigor of germination, field germination and resistance to adverse environmental factors, prevents the spread of diseases and pests by seed, while improving nutrition for emerging seedlings, as well as early ripening and increased yield. As part of promising research on the development of new environmentally friendly physiologically active plant growth regulators based on sucrose and phenylcarboxylic acids, esters were obtained, conventionally called OFC-1 and OFC-3., onions by 12-27%. The optimal dose for OFC-1 is 0.0001%, and for OFC-3 - 0.001% concentration.

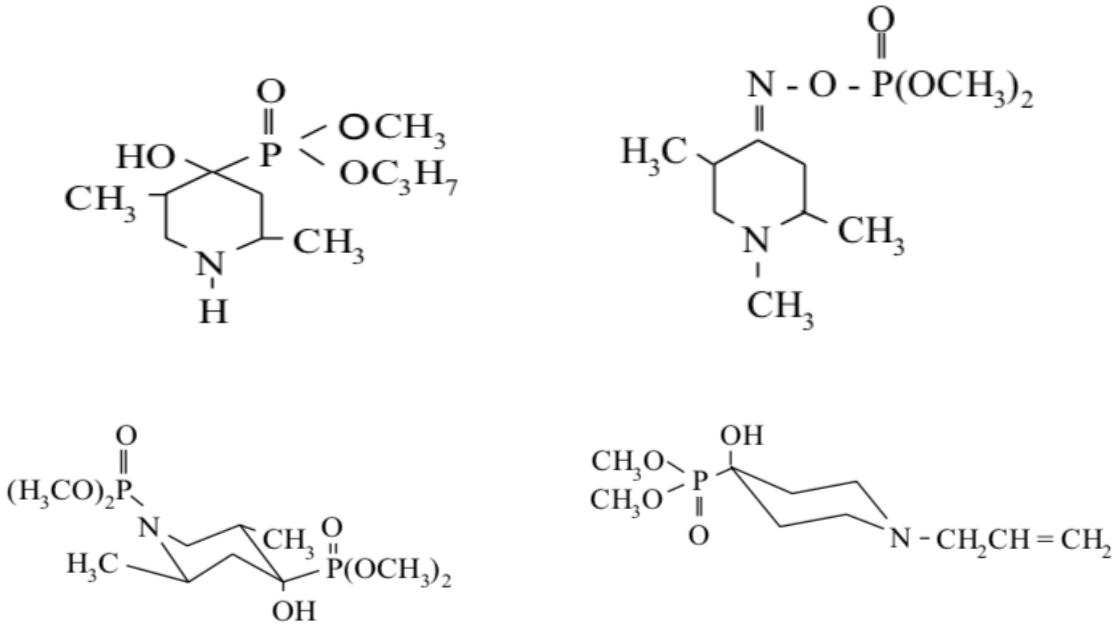
It has been established that pre-sowing treatment of slow-growing seeds of carrots and onions with preparations increases field germination, plant density of carrots and onions, accelerates the dynamics of the assimilation surface of plants and the mass of root crops and bulbs, improves the quality and nutritional value of products, and contributes to an increase in yield by 22-24% (carrots) and 13-14% (onions). An increase in plant resistance against viral diseases by 3-4 times compared with heteroauxin was also noted. Preplant treatment of potato tubers with drugs at a concentration of 0.001% provided an additional yield of 21 t/ha.

It is known that the disadvantages of natural heteroauxin include instability during storage (darkens quickly in the light), phytotoxicity and low efficiency as a stimulator of growth and crop yields. Chemical modification of 3-indolylacetic acid (IAA) with sucrose made it possible to increase solubility in water, storage stability and significantly reduce toxicity, as well as provide active transport of substances due to the carbohydrate fragment, enhance and change physiological activity. At present,

significant factual material has been accumulated, highlighting the effect of the synthesized compounds on the growth and development of vegetable crops. When tested in laboratory and field conditions on various vegetable crops, effective stimulants were identified among them, which have the advantages before the drugs used - heteroauxin and potassium salt of heteroauxin. The monoester of 3-indolylacetic acid and sucrose showed growth-stimulating activity on potatoes. Under laboratory conditions, the effect of substances on the awakening of the kidneys of potato tubers was studied. Treatment of tubers with a 0.001% concentration of the drug promotes bud germination by 48.3%, and when treated with a 0.0001% concentration by 37.9%, respectively. In the field, the effect of the drug on the growth, development and yield of potatoes during preplant soaking of tubers in optimal concentrations was studied. Succinic acid was used as a reference. Plants grown from tubers treated with preparations were distinguished by a more intensive growth of tops, a more developed root system, due to which the number of tubers per bush increased. The positive effect of drugs on the growth and development of potato plants contributes to an increase in the yield of tubers. Preplant treatment of tubers with A-27 preparations at a concentration of 0.001% provided an increase in yield in relation to the control 4.2 t/ha (22.5%), and at a concentration of 0.0001% - 3.4 t/ha (18.6%) respectively.

Field tests of the monoester for the growth-stimulating activity of various types of industrial crops (soybeans, corn) were carried out. The use of the drug in the optimal concentration for the treatment of seeds of corn and soybeans contributes to the maximum increase in the yield of corn to the control by 15.9%, soybeans - by 18.3%. Studies conducted in laboratory and field conditions have shown that when treating seeds of root crops with a preparation (0.0001%), it increases the yield of carrots and beets compared to the reference variant (0.06% heteroauxin) by 1.1-2.3 times 17, 18.

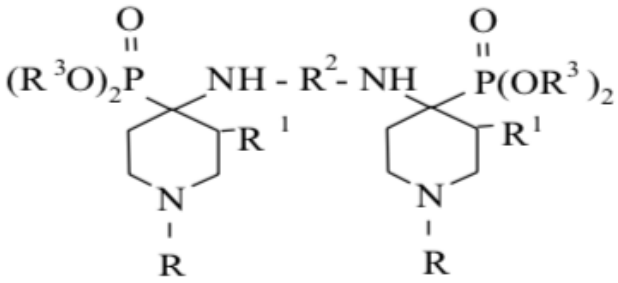
The most promising and intensively developing areas of synthetic organic chemistry is the search for new biologically active substances based on saturated heterocyclic compounds. The dependence of the rostregulating activity of the compounds on their composition and structure was studied. It has been established that the introduction of unsaturated radicals into the phosphonate group reduces the activity of the preparations. In phosphonpiperidols, it increases if the phosphon group contains an alkyl substituent. The nature of the substitution at the nitrogen atom has a significant effect on the activity of oxy- and aminophosphonates of the piperidine series; unsubstituted phosphonpiperidols are less active than their N-alkyl counterparts. Among the phosphorylated derivatives of the piperidine series, drugs were identified: 2,5-dimethyl-4-methylpropyl-phosphonpiperidin-4-ol 1-dimethoxyphosphoryl-2,5-dimethyl-4-dimethoxyphosphorylpiperidin-4-ol; O-dimethoxyphosphoryl - oxime 1,2,5 - trimethylpiperidin-4-one, which has a stimulating effect on the growth and development of potato plants.



Picture 5.

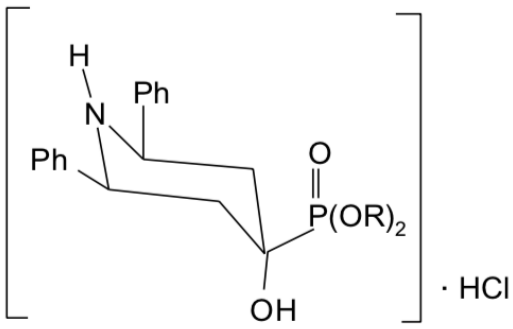
Under the influence of drugs, a greater increase in yield was observed, pre-planting treatment of potato tubers with drugs at a concentration of 0.001% helps to accelerate germination and increase the number of germinated buds of eyes. At the same time, plants are distinguished by a more intensive growth of

tops, a more developed assimilation surface and a root system, which contributes to an increase in potato yield by 17-19%. For further in-depth testing as vegetable growth regulators, a-diaminodiphosphonates of the piperidine series of the general formula are recommended:



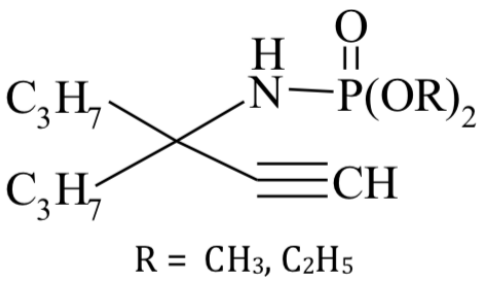
Picture 6.

The preparations had a growth-stimulating activity on cultures of onion varieties "Karatalsky", tomatoes varieties "Soviet 679" and pepper varieties "Bulgarian". The tested preparations in comparison with the control (water) and standards (heteroauxin, gibberellic acid) in the conditions of laboratory and field experiments have a noticeable growth-regulating activity and are recommended for further research. Determined that dimethoxyphosphorylpiperidin-4-ol under the code "Alt-12", as a result of the activation of the vital process, in the treated tubers, the number of germinated buds accelerates and increases by 54% compared to untreated planting material



Picture 7.

As a result, potato plants grown from tubers treated with Alt-12 grew and developed better and sprouts were observed 3-4 days earlier, the additional yield was 4.4 t/ha or 19.6%. According to the results of biological tests in laboratory and field conditions, new effective drugs have been identified in the series of amidodialkoxyphosphorylhexines



Picture 8.

The research results showed that the synthesized compounds exhibit pronounced growth-stimulating activity at the optimal concentration: Alt-10 ($R=CH_3$) at 0.0001%, and Alt-9 ($R=C_2H_5$) at 0.001%.

Under laboratory conditions, the growth-stimulating effectiveness of new domestic preparations was studied in the pre-sowing treatment of potato tubers. At the same time, the effect of new compounds on the germination energy and germination of carrot and beet seeds treated with drugs at different concentrations was studied. An additional yield was obtained when using Alt-10 at a concentration of 0.0001% - 4.5 t/ha or 20.0%, and when using Alt-9 at a concentration of 0.001% - 4.7 t/ha or 20. 9%. When developing new highly effective plant growth regulators, it should be taken into account that establishing the "structure-activity" relationship is a complex function that depends on many parameters, structure, including the presence of biophore groups, their solubility, and a combination of these and other properties. The above brief indicators confirm the feasibility of developing new competitive domestic drugs for the needs of agriculture. The presented research results correlate with the further growth and development of crops, which indicates the expediency of further research on the use of new compounds as a plant growth regulator.

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Issue Article

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RECYCLING OF ORGANIC WASTE BY USING THE TECHNOLOGY OF OBTAINING FODDER PROTEIN FROM INSECTS Hermetia illucens

Abstract: *One of the latest innovations in the agro-industrial complex - the technology for obtaining fodder protein from insects - solves two pressing problems at once: the utilization of organic waste and replenishing the deficiency of fodder protein. And the environmental safety of the technology makes it doubly attractive. And as an outcome receiving biofertilizer for soil and plants.*

Key words: *organic waste recycling, technology of processing, biofertilizers, agriculture innovation, Kazakhstan, farming, insects, flies, Hermetia illucens*

Language: *English*

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Introduction

Already now, the livestock and poultry production in many countries is experiencing a shortage of feed protein, the main sources of which are legumes, meat and bone and fish meal.

Fishmeal is an important component of feed for birds, pigs and fish, but its cost is steadily increasing year by year, and the increase in production volumes is limited. All this forces scientists and agricultural producers to look for alternative sources of protein. However, the history of our project began with completely different goals and objectives.

This invention relates to agricultural production. The method includes bioconversion of a wide range of agricultural (organic) wastes, including manure and dung, distillery stillage, brewer's grains, grain waste, illiquid seeds of various agricultural crops, waste from slaughterhouses, waste from sugar production, various cakes and meals, dairy production waste, food waste, etc., using larvae of the fly Hermetia illucens.

The proposed method involves the processing of organic waste with obtaining a protein product (protein content over 40%) and biohumus.

The main purpose of this method is to obtain high quality protein product as the main alternative to fishmeal or its partial replacement and environmentally friendly biofertilizer suitable for organic farming.

A known method of obtaining vermicompost by processing manure farm animals and mixtures based

on manure with cellulose filler using compost worms (Eisenia fetida, Eisenia anrei). The disadvantages of this method include the duration of the process processing (2-6 months) and the need for preliminary preparation of the substrate by composting or washing with water until key parameters are achieved (acidity, ammonia content, alcoholic fermentation) to the threshold of normal activity of compost worms.There are also methods for cultivating synanthropic fly larvae using multi-tiered transport devices in the form of conveyors as with partitions against the migration of larvae, and without them. Transporters located in insulated channels blown by a heated air stream. However, these are rather bulky and expensive designs; in addition, there are disadvantages associated with the separation of larval biomass and certain limitations - with the moisture content of the feed substrate.

There is a way to process manure directly in the manure removal channels pigsties using a conveyor and portioned supply of processed manure, while there is no mixing of inhabited and uninhabited larvae substrate layers. Biomass of larvae in progress processing is concentrated in the upper layers of the substrate, which facilitates their separation.

Processing of pig manure in this way can be carried out directly inside pig complexes, so that there is no need for extra costs for construction of facilities for the cultivation of larvae. However, this is enough a specialized method applicable in specific conditions on a specific food substrate.

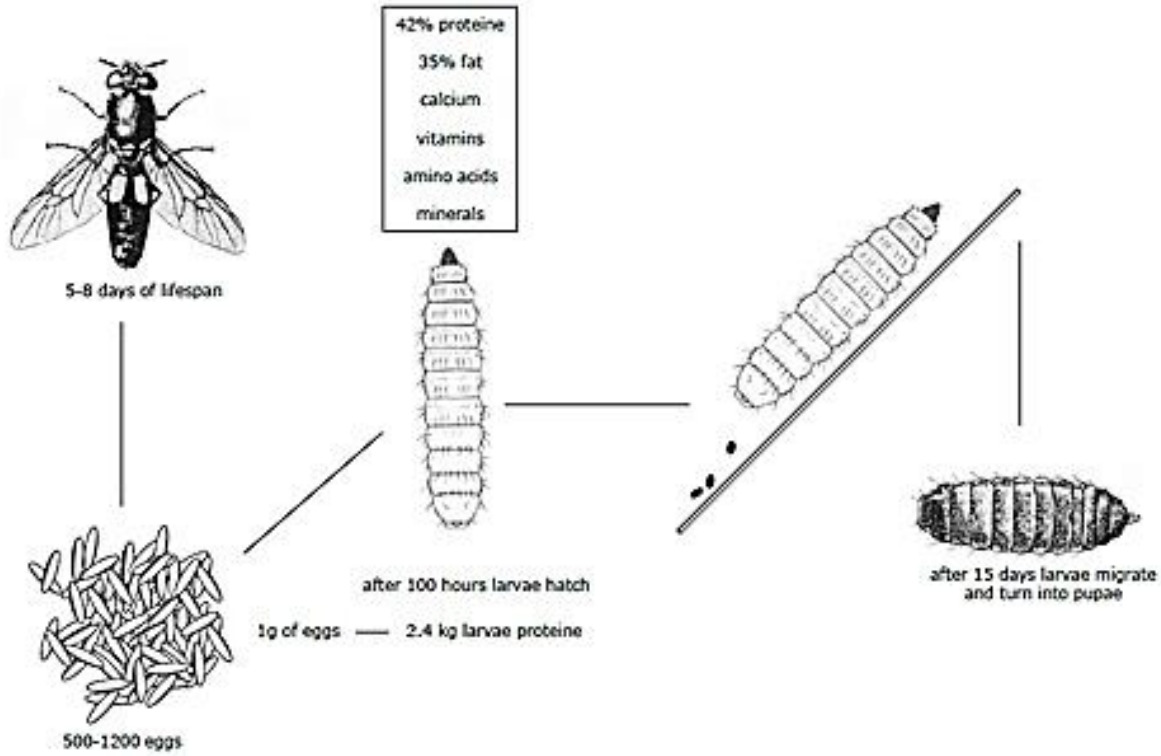
Diptera larvae are known to produce food protein. Flour, obtained after drying the larvae, contains 48-52% protein and up to 27-35% fat.The resulting larval biomass is used in natural or dried form.

Scientific studies conducted on fish, poultry, pigs confirm the possibility of using flour from fly larvae in their diet. In addition, there is method for producing a probiotic feed additive containing fly larvae protein.

Hermetia illucens grown on grain wheat.

This method showed the effectiveness of the use of larvae for enrichment probiotic preparation, which affected its biological activity and corroborated by the material presented.

A known method of processing organic waste (pig manure) by larvae flies Hermetia illucens ("black lion", "black soldier"), which contain imago (adult flies) in an insectarium, oviposition is obtained, those formed from eggs are placed larvae into the manure tank, stand the mass for manure processing and separate larval biomass.



Picture 1.

A known method of cultivation of synanthropic fly larvae on native swine manure with obtaining biomass of larvae for fodder purposes, as well as biofertilizer. The essence of this method is to obtain oviposition of flies in the reproducer, incubation and undergrowth of larvae in the pre-cultivator, processing of feed substrate and accumulation of larval biomass in the cultivator, with subsequent

separation of the larvae of the last age from biohumus. Thanks to the stage 2-stage cultivation of larvae, this method allows you to reduce the total time bioconversion process, as well as the working area of the cultivator. This method is not devoid of some disadvantages, in particular it is not suitable for the processing of substrates with a high content of vegetable polymers (cellulose, heminocellulose,lignin), since synanthropic (house) flies are not able to process vegetable polymers. In addition, the housefly is a potential peddler bacterial and fungal infections.

Picture 2.

Closest to the proposed is a method of processing organic waste by the larvae of the fly Hermetia illucens with the production of protein of animal origin and biohumus, which consists in preparing a substrate from cow manure, which dehydrated, fermented for 1-2 days using fermented milk bacteria, colonize the resulting substrate with larvae of Hermetia illucens flies of age 3-4 days, carry out the bioconversion of the substrate for 5-6 days and separate the obtained biomass of larvae from the obtained biohumus. On a substrate obtained from 100 kg of cow manure, 20 kg of larvae are populated and after processing receive 32.3 kg of larval biomass, that is, there is an increase biomass of larvae only 1.6 times. The disadvantage of the known method is the low larval biomass yield. The technical problem solved by the proposed method is that in order to quickly and cost-effectively dispose of organic waste from a wide range of spectrum, including farm animal manure, poultry manure factories, into a highly efficient environmentally friendly fertilizer, to receive the product animal origin with a high protein content, create a waste-free, highly profitable, environmentally friendly agricultural production. The technical problem is solved by the method of processing organic waste, consisting in the fact that the eggs of the flies Hermetia illucens are obtained, then the eggs are incubated and grow larvae on a nutrient medium, separate larvae of II-III age, colonize the substrate with these larvae with a density of 2.5-5.0 ind./cm2, carry out bioconversion of the substrate within 7-14 days and separate the biomass of larvae fromobtained biohumus.

At the same time, it is preferable as a nutrient medium for rearing larvae. use a cereal-based nutrient mixture. In addition, manure can be used as a substrate for processing. farm animals, or bird droppings, or a mixture of bird droppings with straw, or spirit stillage, or brewer's grains, or grain waste, or bran or non-liquid agricultural seeds, or cake, or meal, or food waste.

Picture 3.

The technical result achieved by the proposed method is that that the separation of larvae of II-III age and the colonization of the substrate by them provides more economical consumption of planting material, which is directly related to the amount queen cells, allows you to exclude from the calculation of unfertilized eggs, which, according to flies can lay off for various reasons, as well as accurately calculate the necessary the number of larvae for settling a certain type of food substrate (ind/cm^2).The proposed method for processing organic waste to obtain biomass insect larvae and biohumus consists of the following stages: obtaining fly eggs Hermetia illucens, incubation of eggs and undergrowth of larvae on a nutrient medium, separation larvae of II-III instars, colonization by these larvae of an organic substrate, located in stackable containers, bioconversion of the organic substrate, separation of biomass of larvae from biohumus, heat treatment of larvae, packaging biohumus. The introduction of the stage of separation of larvae of II-III instars allows more efficient use of planting material: exclude from calculation unfertilized and dead eggs, as well as accurately calculate the required amount larvae to populate a certain amount of food substrate, reduce the area uterine room. Thanks to the homogenization of the feed substrate and the control its humidity in the process of processing separation of the biomass of larvae from biohumus carried out by sieving through a sieve, which simplifies the design of the installation and allows to structure biohumus.

In the proposed method, the eggs are first placed in an incubator on a specially prepared nutrient mixture from a ratio of 1 g of eggs per 0.15 kg of the mixture. Further carry out the separation of larvae, the separation of larvae of II-III age and their weighing to determine their number. The substrate is populated with larvae with a density of 2.5-5.0 ind/cm^2.

The process of bioconversion of organic waste by the proposed method continues from 7 to 14 days depending on the feed substrate and environmental conditions. Manure and other substrates are completely recycled, data on the conversion of various wastes are presented. The average weight of one larva of Hermetia illucens on nutrient substrates is 200 mg.

The proposed method provides the possibility of processing feed substrates with a high content of cellulose, since the characteristics of the digestion of fly larvae the black soldier fly (Hermetia illucens), unlike the larvae of house flies, allows digest substrates with a high content of cellulose. To initiate the process of reproduction and oviposition in the house fly, it a specific protein diet is required.

The Hermetia illucens fly used in this method does not feed at the adult stage, for a successful breeding process, she needs a source of water and light, according to the spectrum close to natural light.

The life cycle of the fly Hermetia illucens (from egg to egg) is about 40 days.

On the second day after the appearance of the flies, they start mating, and after another 2 days - to lay eggs. Eggs are taken daily from the mother liquor, weighed and transferred to nutrient medium for incubation and growth of larvae up to II-III age. As nutrient medium for undergrowth of larvae use a mixture of crushed wheat with fodder yeast (5-7%), humidity 65%. Others may be used cereals. The duration of this stage is about 7 days. Larvae II-III age is separated using a hand sieve (mesh 2 mm) and populate (density 2.5-5 ind/cm^2) for crushed and homogenized organic waste with moisture 65-80% that are in stackable plastic containers. Layer thickness waste is about 10 cm. As a result of microbiological processes the temperature of the feed substrate can rise up to 50°C at a temperature of room 20°C. The duration of the processing stage is 7-14 days, in dependence of the type of organic waste and abiotic conditions. Upon completion during the bioconversion process, the biohumus moisture content is less than 30%, and the biomass of larvae separated from it with a vibrating screen (cell 4 mm). Larvae (humidity of larvae 70%) is dried at 90°C, and biohumus is packaged. Conversion rates and biomass yield larvae obtained on different food substrates are presented in Table 1. In as a result of waste processing in this way, the substrate decreases to 80% (by dry matter). From a ton of feed substrate it is possible to obtain up to 198 kg of larvae (dry matter).

According to the data presented in Picture 1, it can be seen that, although the lowest rates feed substrate conversions and larval biomass yield are observed on substrates with a high content of plant biopolymers, in principle it is possible to processing by the proposed method.

Conclusion.

A method of processing organic waste, which consists in the fact that they receive eggs of Hermetia illucens flies, then the eggs are incubated and the larvae are grown on nutrient medium, separate the larvae of II-III age, populate the substrate with these larvae with a density of 2.5-5.0 ind./cm^2, carry out the bioconversion of the substrate within 7-14 days and separate the biomass of larvae from the resulting biohumus.

2. The method according to p. 1, according to which, as a nutrient medium for growing larvae use a cereal-based nutrient mixture.

3. The method according to p. 1, in which as a substrate for processing use farm animal manure, or bird droppings, or a mixture of bird droppings with straw, or spirit stillage, or brewer's grains, or grain waste, orbran, or non-liquid seeds of agricultural crops, or cake, or meal, or food waste

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Issue Article

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ANALYSIS OF COUPLING PROCESS AND DECOUPLING BETWEEN NEW-TYPE URBANIZATION AND ECOLOGICAL ENVIRONMENT: A CASE STUDY OF HOHHOT, CHINA

Abstract: *The coordinated development of the new-type urbanization and ecological environment is of great significance for the overall development of regional and urban areas during the new development period of china. Based on 2000 to 2019 panel data from Hohhot City, the coupling coordination degree model and the decoupling model were used to calculate and analyze the interplay between urbanization and ecological environment, and the obstacle factor diagnosis model was used to identify the major obstacles. The results show that: (1) the coupling degree and coupling coordination degree of the system evolve from high level coupling-moderate coordination to high quality coupling-good coordination. The degree of coupling precedes the degree of coupling coordination. The gap between the degree of coupling and the degree of coordination decreases year by year, and there is still a lot of room for improvement in the degree of coordination. (2) In the past 20 years, urbanization and ecological environment have shown a dynamic evolution trajectory with strong decoupling types, diverse types and complex processes, reflecting the complex interaction relationship and dynamic evolution characteristics between urbanization and ecological environment. (3) The scores of subsystems and indicator barrier factors showed a decreasing trend year by year, while the ecological pressure showed an increasing trend. The main obstacles show a complex dynamic evolution with different stages of urbanization development.*

Key words: *new-type urbanization; Ecological environment; Coupling coordination degree; Decoupling analysis; Hohhot.*

Language: *English*

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Introduction

The primary challenge for high-quality regional development in China's new development era is to improve the synergistic sustainable growth of new-type urbanization and ecological environment. In China's new period of development, the coupling between urbanization and complex ecological and environmental systems has emerged as the academic focus of regional sustainable development research. The relationship and mechanism between urbanization and the natural environment has been objectively explained by foreign academics using the EKC curve [1], decoupling theory [2], the PRS analysis framework [3], system dynamics [4], and other techniques. Chinese academics have conducted a diverse range of significant findings based on various regions of China, predominantly concentrating on coupling theory and method [5-8], coupling mechanism, pattern, and prediction [9-12], response relationship [13-15], decoupling [16-18], etc., and have produced a wealth of research findings [19-28]. It provides a significant theoretical foundation and practical reference relevance to lead the investigation of a new model for building regional new-type urbanization and harmonizing regional and urban-rural integrated development.

Based on current research trends, academics have categorized studies on the coordinated development of urbanization and the ecological environment under the umbrella of sustainable development research and applied systematic analysis to empirical studies on issues related to urbanization, including economic, social, demographic, resource and environmental. Research techniques typically demonstrate general trends from theory to experiment, ranging from static temporal cross-section analysis to spatio-temporal integrated dynamic process evolution and spatial pattern analysis, and scientifically suggest corresponding optimal regulatory strategies to appropriately guide regional, urban and rural sustainable development in new development periods. The complexity and breadth of the findings of the present study nevertheless suffer as a whole from the following flaws. (1) From a research standpoint, typical industrial cities in the ecologically vulnerable regions of central and western China receive little academic attention; (2) In terms of research methods, the majority of prior studies concentrated on the spatiotemporal evolution process and pattern analysis of the coupling relationship, and lacked the decoupling analysis and the identification of the main obstacle factors affecting the coordinated development of the coupling relationship.(3) In terms of the study topic, the micro-coupled quantitative analysis of Hohhot city is seldom covered. Instead, most studies have focused on macro-regional studies, such as provinces, urban agglomerations and urban belts.

As a major ecological node city in the Yellow River basin of Inner Mongolia, Hohhot is a comprehensive reflection of the sustainable development characteristics of urbanization and ecological environment in typical research areas. It also has a unique natural environment and historical background, as well as a fragile ecological environment in western China. The objective evaluation of the mutual feed mechanism of urbanization and the ecological environment, the identification of its significant barrier influencing factors, the reduction of ecological environment risks, and the promotion of the high-quality development of urbanization in Hohhot are all aided by scientific judgment of the coupling relationship between urbanization and the ecological environment and its effects in Hohhot. As a result, by using the system coupling angle to create a new-type of framework for analyzing how urbanization and the environment interact, analyzing Hohhot's urbanization and ecological environment's evolution mechanisms and processes in-depth from 2000 to 2019, assessing its decoupling relationship's overall development, and accurately identifying the main obstructive factors. On a theoretical level, it can extend the depth and dimension of coupled system theory in the study of high-quality sustainable development in new types of urbanization, and deepen the understanding of the concept of coupled and coordinated development between urbanization and the natural environment in Hohhot. On a practical level, the paper can provide theoretical support for the high-quality coupling and coordinated development of new-type urbanization and ecological environment in Hohhot, which is both theoretically sound and plausible. It could also provide theoretical and practical support for the construction of new-type urbanization in ecologically vulnerable areas of the Midwest.

1. Overview of Study Area

The Inner Mongolia autonomous region is centered in Hohhot, which serves as its political, economic, cultural, scientific, educational and financial hub. Geographically, it is located between 110°46'and 112°10'E and 40°51'and 41°8'N. It has a typical temperate continental desert and semi-arid monsoon climate. 17,200 km^2 constitutes its land area. It controls four districts, four counties and one banner, in addition to one banner and one national economic and technical development zone. The built-up area is 260 km^2, while the built-up area's green covered area is 12906.38 hm^2. It is referred to as the "Milk Capital of China" and has received numerous awards, including those for National Historical and Cultural

City, National Forest City, China Excellent Tourism City, National Ten Happy Cities, National Model City of Ethnic Unity and Progress, National Model City of Double Support, and others. As of 2020, there are 3.4542 million permanent residents living in the city, with an urbanization rate of 79.15%. The GDP was 280.068 billion yuan and the GDP per capita was 81,656 yuan. Mongolians made up 11.57% of the population, while Han Chinese made up 85.42%.

Hohhot, a central city along the Yellow River basin, has highlighted the conflict between the rapid and extensive process of urbanization over the past two decades and the natural and ecological environment, with ecological protection becoming increasingly critical as consumption of resources and energy continues to rise. 17.255 million metric tons of standard coal were used in the overall energy consumption of Hohhot in 2019 and a total of 2778.09 million KWH of electricity was used throughout the community. Overall water supply for the year was 169.35 million tonnes, 12.18 times and 1.62 times more than in 2000. It remains part of the economy's heavily regulated coal-based resources sector. There is a serious tension between the need for ecological water and the growing demand for water for daily use and production. Sulfur dioxide from industrial sources accounted for 16,411 tons of the total industrial exhaust gas volume in 2019 (420,2 billion cubic meters). A total of 73 days, or 20 percent of the annual total, saw ambient air pollution in the city. Industrial wastewater and domestic sewage are major sources of surface water pollution. 2019 saw a benchmark rate of 85.7 percent for water quality in areas with surface water environmental functioning. The total amount of industrial waste discharged each year is 22.3 million tons, the amount of chemical oxygen required is 2,785 tons, and the total amount of industrial solid waste used is only 23.9 percent of the total amount produced. Additional research is needed to address the key issues of energy resources, environmental carrying capacity and creation and conservation of Hohhot's natural ecological environment. It is essential and functional for the construction of new types of urbanization and the protection of the ecological environment of urban agglomerations in the Yellow River basin. The new interactive coupling relationship between urbanization and ecological environment in Hohhot, exploring the urban agglomeration along the Yellow River in Inner Mongolia, is a new model for sustainable development during the period of urbanization.

2 Materials and Methods

2.1 Data source

In order to quantitatively calculate the coupling and coordinated spatio-temporal evolution relationship between the urbanization and ecological environment system in Hohhot City of Inner Mongolia from 2000 to 2019, this study uses the data from Hohhot City of Inner Mongolia as the main research area and the urbanization and ecological environment data from 2000 to 2019 as the research time section. The Inner Mongolia Statistical Yearbook (2001-2020), China Urban Statistical Yearbook (2001-2020), and Hohhot Statistical Yearbook (2001-2020) are the sources of all the original data used in the study, which may be used to confirm the validity, reliability, and originality of the information.

2.2 Research method

2.2.1 Indicator system

Urbanization is a complex coupled system involving a wide range of complex factors including population, resources, economy, society, environment and space. A comprehensive evaluation index system for the urbanization and ecological environment of Hohhot has been created to support scientific rigor in research. It is based on regional data, scientific, comprehensive, and easy to get sex principle, combined with the PRS (pressure-state-response) and PES (population, economy, and society) models. (Table 1).

Table 1. Comprehensive evaluation index system of urbanization and ecological environment

System layer	Subsystem layer	Weight	Index layer	Attribute	Weight
Urbanization system	Population urbanization	0.2131	Year-end population（10,000Person）	+	0.4040
			Urbanization rate（%）	+	0.2981
			Natural population growth rate（%）	+	0.2979
	Economic urbanization	0.1942	Per capita GDP（Yuan）	+	0.1863
			Regional GDP growth rate（%）	+	0.1805
			Gross industrial output value above scale（10,000 Yuan）	+	0.1850
			The proportion of output value of secondary industry in GDP（%）	+	0.1553

			The proportion of output value of tertiary industry in GDP（%）	+	0.1232
			Total foreign trade imports and exports （10,000 U.S. dollar）	+	0.1698
	Social urbanization	0.3029	Total fixed asset investment of the whole society（ 10,000 Yuan）	+	0.1585
			There are buses for every 10,000 people（Unit）	+	0.1425
			Public toilets per 10,000 people（Seat）	-	0.1734
			Number of college students per 10,000 people （Person）	+	0.1294
			Number of beds per 10,000 people（Bed）	+	0.1744
			Number of doctors per 10,000 people（Person）	+	0.2218
	Spatial urbanization	0.2898	Urban construction land area（km^2）	+	0.3747
			Road eara per sitizen（㎡）	+	0.2460
			Urban population density（Person/ km^2）	-	0.3793
Ecological environment system	Ecological environment status	0.3394	Greenery coverage of urban area（%）	+	0.2403
			Park green land area per capita（㎡）	+	0.2492
			Total annual precipitation（mm）	+	0.2314
			Average annual urban temperature（℃）	+	0.2790
	Ecological environment pressure	0.3334	Annual water supply（t）	-	0.1559
			Total annual electricity consumption (KWH)	-	0.1614
			Industrial Waste Water Discharged（t）	-	0.1424
			Industrial sulfur dioxide emissions（t）	-	0.1864
			Industrial soot (powder) emissions（t）	-	0.1585
			Industrial exhaust emission（m^3）	-	0.1952
	Ecological environment response	0.3272	Comprehensive utilization rate of industrial solid waste（%）	+	0.2693
			Percentage of Sewage Disposed（%）	+	0.2651
			Harmless disposal rate of household garbage（%）	+	0.1993
			Afforestation area（ha）	+	0.2663

2.2.2 Evaluation model

The deviation standardized data processing method is used to normalize the original data of new-type urbanization and ecological environment in Hohhot, eliminate the unit difference and order of magnitude difference between data indicators, and calculate the following formula for different nature indicators [24].

Positive index standardization formula：

X'_{ij}=（X_{ij}—minX_j）/（maxX_j—minX_j）；

Inverse index standardization formula：

X'_{ij}=（maxX_j—X_{ij}）/（maxX_j—minX_j）

Where: X'_{ij} is the index value after standardization treatment; X_{ij} is the original index value before standardization treatment; minX_j and maxX_j respectively for the first j indicators of minimum and maximum.

The weight of each subsystem and index factor is calculated using the entropy weighting method, and the calculation formula is as follows [22]：

$$P_{ij} = Y_{ij} / \sum_{i=1}^{n} y_{ij},$$

$$E_j = -\ln(n)^{-1} \sum_{i=1}^{n} P_{ij} \ln P_{ij},$$

$$w_i = \frac{1 - E_i}{n - \sum E_i}$$

Where W_i is the index weight, E_j is the information entropy of j index, and P_{ij} is the proportion of j index in the ith city.

$U(x)$ and $E(y)$ respectively represent the comprehensive development index of urbanization and ecological environment, which is calculated by the comprehensive linear weighted sum of subsystems. Where, n and m represent the number of specific indicators in the subsystem of urbanization and ecological environment respectively [29].

$$U(x) = \sum_{i=1}^{n} w_i x_{ij}, E(y) = \sum_{i=1}^{m} w_i y_{ij}$$

2.2.3 Coupling degree model

The coupling degree model of new-type urbanization and ecological environment is constructed by referring to coupling theory, and the calculation formula is as follows [29] :

$$C = \sqrt{\frac{U(X)\cdot E(y)}{\left(\frac{U(X)+E(y)}{2}\right)^2}}$$

The magnitude of ***C*** value of coupling degree represents the degree of related influence between systems, and the change of ***C*** value from ***0*** to ***1*** indicates the benign resonance between elements within the system from disorder to order. Based on relevant research results, the coupling degree level is divided into five levels [30] (Table 2).

Table 2. Classification of coupling coordination degree

Coupling degree C	Coupling stage	Coupling coordination degree ***D***	Coupling coordination level
0.000＜***C***≤ 0.300	Low level coupling	0.000＜***D***≤ 0.300	Severe disorder
0.300＜***C***≤ 0.500	Antagonistic stage	0.300＜***D***≤ 0.500	Mild disorder
0.500＜***C***≤ 0.700	Running-in stage	0.500＜***D***≤ 0.700	Moderate coordination
0.700＜***C***≤ 0.900	High level coupling	0.700＜***D***≤ 0.900	Good coordination
0.900＜***C***≤ 1.00	High quality coupling	0.900＜***D***≤ 1.00	High quality coordination

2.2.3 Coupling coordination degree model

In order to accurately evaluate the development degree of synergy and interaction between Hohhot's urbanization and ecological environment systems, the coupling coordination degree model is introduced for calculation, and the calculation formula [29] is as follows:

$$T = \alpha U(x) + \beta E(y)$$

$$D = \sqrt{C \times T}$$

Where: ***T*** represents the comprehensive development index; ***D*** is coupling coordination degree; ***α***, ***β*** are undetermined coefficients, ***α***+***β*** = 1. In this paper, urbanization and ecological environment are of equal importance, so ***α*** = ***β*** = 0.5. Based on relevant studies, the coupling coordination degree types of urbanization and ecological environment in Hohhot were divided into five levels [30] (Table 2).

2.2.4 Decoupling model

In order to further objectively evaluate the functional relationship between urbanization and ecological environment system, Tapio's research results [31] were used for reference to construct a decoupling model of urbanization and ecological environment in Hohhot.

$$DI_t = \frac{(E_t - E_{t-1})/E_{t-1}}{(U_t - U_{t-1})/U_{t-1}}$$

Where: DI_t represents the decoupling index of ecological environment to urban development in period ***t***; E_t and E_{t-1} represent the ecological environment comprehensive index of year ***t*** and year ***t-1***, respectively. U_t and U_{t-1} represent the comprehensive urbanization index in year ***t*** and year ***t-1***, respectively. $\triangle E = (E_t - E_{t-1}) / E_{t-1}$, denotes the change rate of ecological environment comprehensive index in year ***t***; $\triangle U = (U_t - U_{t-1}) / U_{t-1}$ represents the change rate of the urbanization composite index in year ***t***. According to the research results of Liu Hehe and Yang Qingshan, the decoupling state types are divided into 3 categories and 8 states [17] (Table 3).

Table 3. Classification criteria for decoupling state types

Degree of decoupling	**Decoupling**			**Inter-linking**		**Negative decoupling**		
	Strong decoupling	**Weak decoupling**	**Recessive decoupling**	**Recessive Inter-linking**	**Expansive Inter-linking**	**Expansive negative decoupling**	**Weak negative decoupling**	**Strong negative decoupling**
△U	***△U>0***	***△U>0***	***△U<0***	***△U<0***	***△U>0***	***△U>0***	***△U<0***	***△U<0***
△E	***△E<0***	***△E>0***	***△E<0***	***△E<0***	***△E>0***	***△E>0***	***△E<0***	***△E>0***
DI	***DI<0***	***0<DI<0.8***	***DI>1.2***	***0.8<DI<1.2***	***0.8<DI<1.2***	***DI>1.2***	***0<DI<0.8***	***DI<0***

2.2.5 Obstacle factor diagnosis model

The obstacle factor diagnosis model is an important econometric analysis tool for scientific diagnosis and identification of the impact degree of indicator factors in urbanization and ecological environment system on the system. The calculation formula is as follows [32-33] :

$$O_j = \frac{I_j \times \omega_j}{\sum_{j=1}^{m} I_j \times \omega_j}$$

Where: ω_j is the weight of item j; I_j is the difference between the optimal target value and the actual value of each indicator, which can be expressed as 1- r_{ij}(the difference between the standardized value of each indicator and 1).

3. Results and Analysis

3.1 Time series analysis of comprehensive level of urbanization and ecological environment

3.1.1 Time series analysis of urbanization comprehensive development level

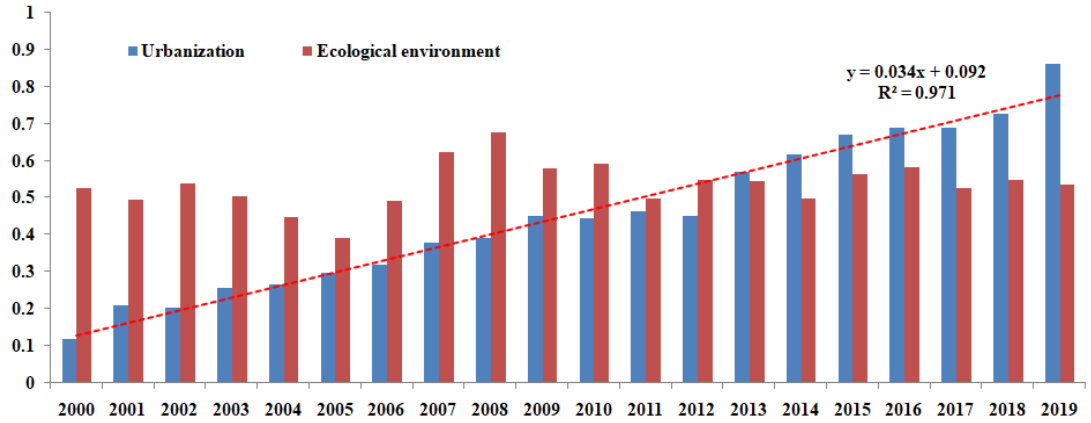

Figure 1. Change trend of comprehensive development index of urbanization and ecological environment system in Hohhot City

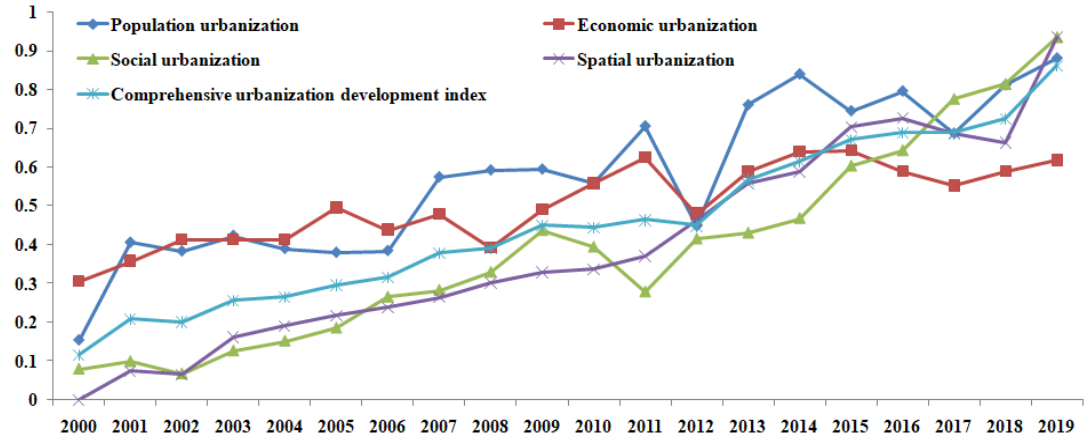

Figure 2. Change trend of Hohhot's urbanization system comprehensive index

The entire integrated urbanization system index for Hohhot shows a moderately fluctuating and rising pattern from 2000 to 2019 as shown in Figs. 1 and 2. The following equation is the result of fitting the urbanization curve linearly: the shape of the curve shifts from 0.1164 in 2000 to 0.8611 in 2019, representing an average annual growth rate of 3.72%. $Y = 0.034x + 0.092$, and $R^2 = 0.971$. The urbanization index has been significantly affected by urbanization, and Hohhot's rapid urbanization is mostly driven by economic development. Due to significant periodic oscillations in the adjustment of regional economic and industrial structural transformation and upgrading, changes in population urbanization and economic urbanization indicators have a significant impact. Three minor changes were made in 2010, 2012, and 2017, corresponding to. After 2012, the regional economy gradually reverted to its previous pattern of cyclical growth. Together, Hohhot's average annual growth rate of 1.578 percent between 2000 and 2019 indicates that economic urbanization is a crucial component of the construction of a new type of urbanization and will be the backbone of the sector's future prosperity. However, the sustained pace of economic growth is insufficient, necessitating the upgrading of the industrial structure through transitional iterations to improve the overall competitiveness of the sector. The rapid development

of new-type urbanization in Hohhot in the subsequent period was greatly aided by social urbanization, which from 2011 demonstrated significant capacity for continued expansion.

3.1.2 Time series analysis of comprehensive development level of ecological environment

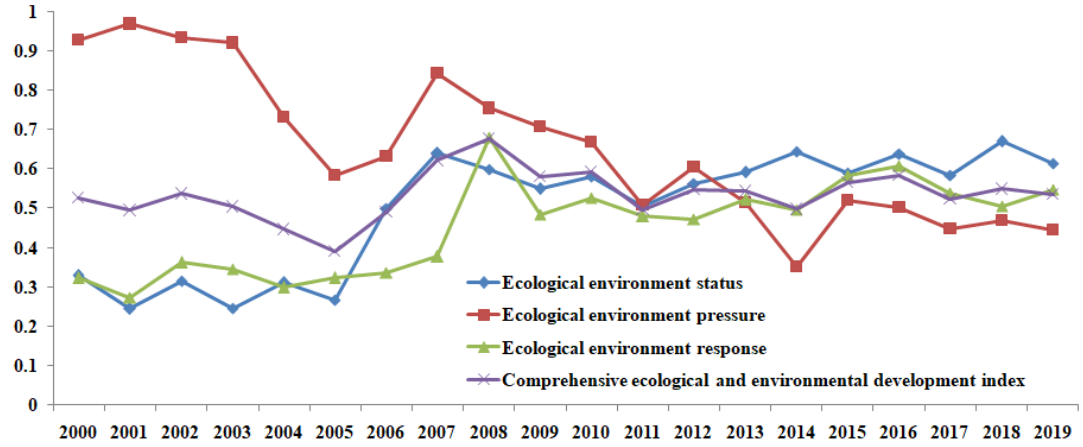

Figure 3. Change trend of comprehensive development index of ecological environment system in Hohhot City

The ecological environment system of Hohhot has seen fluctuations in its overall development index from 2000 to 2019 as shown in Fig. 1 and 3. They showed a distinct upward trend from 2005 to 2008, and from 2009 to 2019, the threshold interval of 0.5 to 0.6 was continuously maintained, displaying the characteristics of a multi-oscillation "W" wave pattern. The ecological pressure index is the most volatile, showing more significant oscillations in its downward trend and accurately reflecting Hohhot's ecological preservation and management. The pressure on the ecological environment will continue to diminish over time, highlighting its advantages, as long as the creation of the ecological environment has been a great success and the total amount of all industrial pollutants has been adequately regulated. The ecological environment status index, the ecological environment response index, and the ecological environment integrated evaluation index can all be seen in Fig. 3, as well as the close mutual constraints and synergistic development and evolution relations among the three. Hohhot has seen significant urbanization since 2012, rising energy and resource use, ongoing industrial restructuring and modernization, and efficient ecological environment integrated development index operation. However, Hohhot still has to improve its capacity for sustainable growth, so its only concern is the long-term and sustainable management of the city's ecological environment. We will increase that capacity.

3.1.3 Time series analysis of comprehensive evaluation index of urbanization and ecological environment

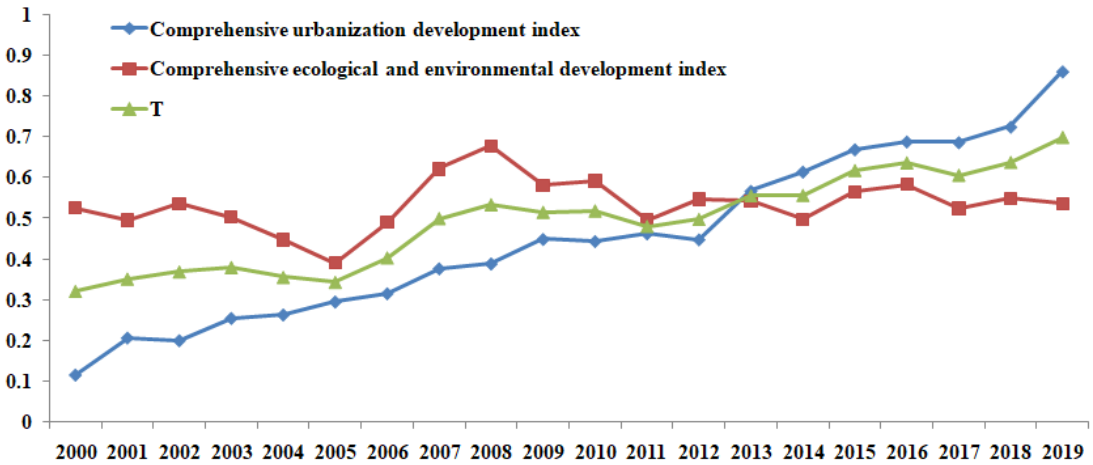

Figure 4. Change trend of comprehensive development index of urbanization and ecological environment system in Hohhot City

Figure 4 demonstrates that from 2000 to 2019, the composite index of Hohhot's new-type urbanization and ecological environment system is consistent with the composite index of urbanization and ecological environment, and the overall trend is consistent with both composite indices. T values are also consistently maintained within the threshold range of 0.3 − 0.7. The significant time nodes for this are 2005 and 2013. Rapid urbanization and development increased pressure on the environment from 2000 to 2005, and the overall development index of the ecological environment showed a downward trend as environmental pollution from broad economic development increasingly came to the fore. Ecological environmental governance and construction began to provide benefits between 2005 and 2013. The integrated development index of the ecological environment has shifted upward, maintaining a consistent pattern of shifting development. The complete index of contemporary urbanization and ecological environmental systems is currently undergoing a period of continuous growth. Following the stabilization of urbanization in 13a, the integrated urbanization index began to outpace the integrated ecological environment index in 2013 and the gap between the two gradually widened after 2017. The ecological environment is a major obstacle to the high-quality growth of new types of urbanization.

3.2 Time series analysis of coupling degree between urbanization and ecological environment

Table 4. Evaluation results of coupling coordination degree between urbanization and ecological environment in Hohhot City

Year	coupling degree	Coupling type	Coupling coordination degree	Coordination type	Year	coupling degree	Coupling type	Coupling coordination degree	Coordination type
2000	0.7704	High level coupling	0.4974	Mild disorder	2010	0.9898	High quality coupling	0.7162	Good coordination
2001	0.9125	High quality coupling	0.5660	Moderate coordination	2011	0.9994	High quality coupling	0.6927	Moderate coordination
2002	0.8905	High level coupling	0.5730	Moderate coordination	2012	0.9951	High quality coupling	0.7037	Good coordination
2003	0.9453	High quality coupling	0.5990	Moderate coordination	2013	0.9997	High quality coupling	0.7450	Good coordination
2004	0.9665	High quality coupling	0.5861	Moderate coordination	2014	0.9944	High quality coupling	0.7438	Good coordination
2005	0.9905	High quality coupling	0.5830	Moderate coordination	2015	0.9964	High quality coupling	0.7841	Good coordination
2006	0.9765	High quality coupling	0.6273	Moderate coordination	2016	0.9965	High quality coupling	0.7961	Good coordination
2007	0.9697	High quality coupling	0.6960	Moderate coordination	2017	0.9909	High quality coupling	0.7746	Good coordination
2008	0.9629	High quality coupling	0.7166	Good coordination	2018	0.9903	High quality coupling	0.7942	Good coordination
2009	0.9919	High quality coupling	0.7146	Good coordination	2019	0.9724	High quality coupling	0.8240	Good coordination

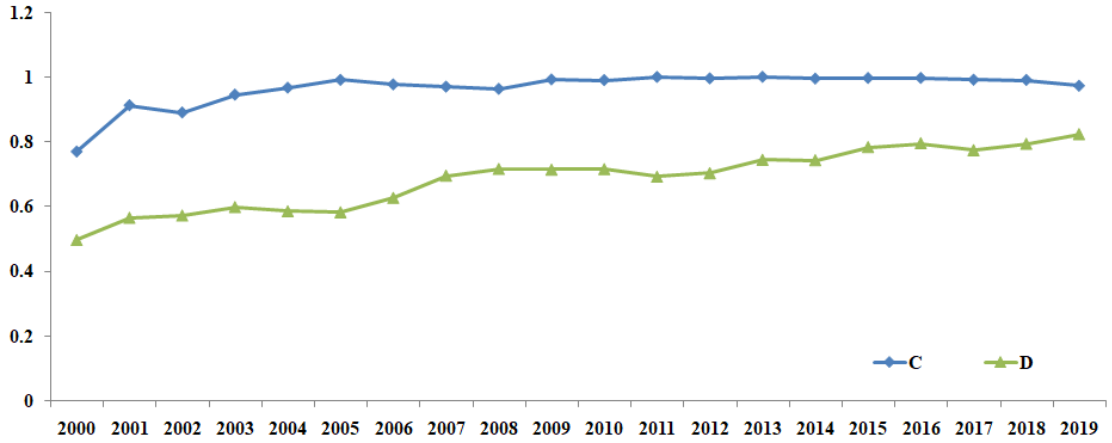

Figure 5. Change trend of coupling degree and coupling coordination degree of urbanization and ecological environment system in Hohhot City

According to the comprehensive analysis in Table 4 and Figure 5, from 2000 to 2019, the coupling degree of urbanization and ecological environment system in Hohhot has been in the development trend of high-quality coupling for a long time after experiencing the interactive evolution process of high-level coupling -- high-quality coupling -- high-level coupling -- high-quality coupling. Comprehensive reflects the Hohhot system of urbanization and ecological environment system since 2002, coordinate with each other for a long time, collaborative development evolution characteristics, excellent natural ecological environment constitute the essential material basis for the development of Hohhot rapid urbanization, urban economy continues to grow, feedback in culture, education, medical treatment, health and other basic facilities construction, Urban residents' living environment and community greening environment have been considerably improved, urban comprehensive social service functions have been continuously enhanced, and ecological environmental protection and governance have achieved results, gradually stepping into the coordinated development and evolution process of urbanization system and ecological environment system. However, despite being in the phase of coupling the quality systems of urbanization and ecological environment, the overall level of development of urbanization and ecological environment is still in the period of adjustment for cooperative optimization. The future still calls for the coordinated development of the composite system towards a sustainable future through continuous urbanization and integrated development of the ecological environment.

Table 4 and Figure 5 show that the coordination system of urbanization and ecological environment coupling in Hohhot increased from 0.4974 in 2000 to 0.8240 in 2019, an increase of 0.3266 and an annual growth rate of 1.63 percent. The growth process is continuous and mainly stable. The system is in the process of dynamically responding to oscillatory variations, as seen by the progressive rise in the trend of the coupling coordination shift. Coupling coordination type experience from junior to senior phase of evolution and development of coupling coordination evolution process, the coupling coordination degree affected and restricted by the ecological environment evolution in the late stage, continued growth momentum is insufficient, the evolution process is relatively slow, the coupling coordination degree after 4 significant time node implementation to a higher stage of the evolution and development: Mild disorder (2000) -- Moderate coordination (2001-2007) -- Good coordination (2008-2010) -- Moderate coordination (2011) -- Good coordination (2012-2019), with moderate coordination and good coordination as the main types. This is a thorough reflection that despite the ongoing optimization and adjustment of the coupling coordination between the urbanization system and the ecological environment system in Hohhot 20a, there is still a significant gap to be closed before high-quality coordination can be achieved. In addition, it was found that 2013 marked a significant turning point in the coupling interactions of complex systems, and that the type of coupling coordination from 2000 to 2012 demonstrated a type of urbanization lag and ecological environment dominated development. The findings come from a comparative analysis of the comprehensive evaluation index of Hohhot's urbanization system and ecological environment system from 2000 to 2019 . From 2013 to 2019, it revealed a lagging ecological environment system and advancing urbanization, with the ecological environment starting to be a major restraint on urbanization development. The ecological environment provides crucial environmental support for urbanization.

3.3 Decoupling path of urbanization and ecological environment

Table 5. Growth rate and decoupling relationship between urbanization and ecological environment comprehensive development index of Hohhot.

Year	△*E*	△*U*	*DI*	Degree of decoupling	Year	△*E*	△*U*	*DI*	Degree of decoupling
2000-2001	-0.0311	0.0911	-0.0756	Strong decoupling	2010-2011	-0.0951	0.0190	-3.7489	Strong decoupling
2001-2002	0.0418	-0.0065	-2.6844	Strong negative decoupling	2011-2012	0.0497	-0.0149	-3.1145	Strong negative decoupling
2002-2003	-0.0331	0.0547	-0.2268	Strong decoupling	2012-2013	-0.0038	0.1190	-0.0263	Strong decoupling
2003-2004	-0.0568	0.0085	-3.3991	Strong decoupling	2013-2014	-0.0451	0.0475	-0.9946	Strong decoupling
2004-2005	-0.0563	0.0318	-1.0462	Strong decoupling	2014-2015	0.0668	0.0546	1.5120	Strong negative decoupling
2005-2006	0.0994	0.0202	3.7312	Strong negative decoupling	2015-2016	0.0185	0.0193	1.1404	Expansive Inter-linking
2006-2007	0.1319	0.0613	1.3893	Strong negative decoupling	2016-2017	-0.0589	-0.0019	36.4093	Recessive decoupling
2007-2008	0.0558	0.0119	2.8408	Strong negative decoupling	2017-2018	0.0245	0.0382	0.8420	Expansive Inter-linking
2008-2009	-0.0972	0.0602	-0.9284	Strong decoupling	2018-2019	-0.0131	0.1358	-0.1277	Strong decoupling
2009-2010	0.0118	-0.0051	-1.7797	Strong negative decoupling	Average	0.0005	0.0392	1.5638	Strong negative decoupling

In order to further reveal the interaction relationship between urbanization and ecological environment in Hohhot, ***ΔE***, ***ΔU*** and ***DI*** from 2000 to 2019 were calculated using the aforementioned decoupling model, and the decoupling relationship between urbanization and ecological environment was determined according to the classification criteria of decoupling state types. As can be seen from Table 5, the average decoupling index of Hohhot over the last 20 years is 1.5638, indicating that the growth rate of urbanization lags far behind the growth rate of the ecological environment, and the average decoupling state is the degree of decoupling. The degree of decoupling between urbanization and ecological environment underwent a complicated transition between 2000 and 2019. It provides strong decoupling, strong negative decoupling, expansive negative decoupling, expansive inter-linking, and reactivity. The five decoupling regimes, such as the decoupling of urban and ecological systems, exhibit long-lasting and repetitive processes of interaction and adjustment. There are three decoupling regimes in the process of strong decoupling, dilated negative decoupling and strong negative decoupling. Although the coupled coordination of urbanization and ecological environment in Hohhot shows a gradual growth trend, its nature is the result of the continuous rise of the urbanization index and the fluctuating decline of the ecological environment index. From 2000 to 2001, 2002 to 2005, 2008 to 2009, 2010 to 2011, 2012 to 2014, and 2018 to 2019, there is a strong decoupling between urbanization and the ecological environment. Urbanization has positive growth characteristics, while ecological environments have negative growth characteristics. This shows that urbanization puts great ecological pressure on the ecological environment. From 2005 to 2008 and 2014 to 2015, urbanization and the ecological environment showed a strong state of decoupling, indicating a relatively coordinated and progressive growth process. In different years, urbanization and the ecological environment have exhibited a process of mutual adaptation and regulatory shift. Together, Hohhot 2000-2019, the urbanization development on the ecological environment in the process of the negative effects of regulation for a long time in the ecological environment carrying capacity threshold range, did not reach the limit bearing capacity of the ecological environment, but the future in the new-type urbanization process for ecological environment caused by the negative effects must be long-term focus and sustained attention.

3.4 Diagnosis of urbanization and ecological environment barrier factors

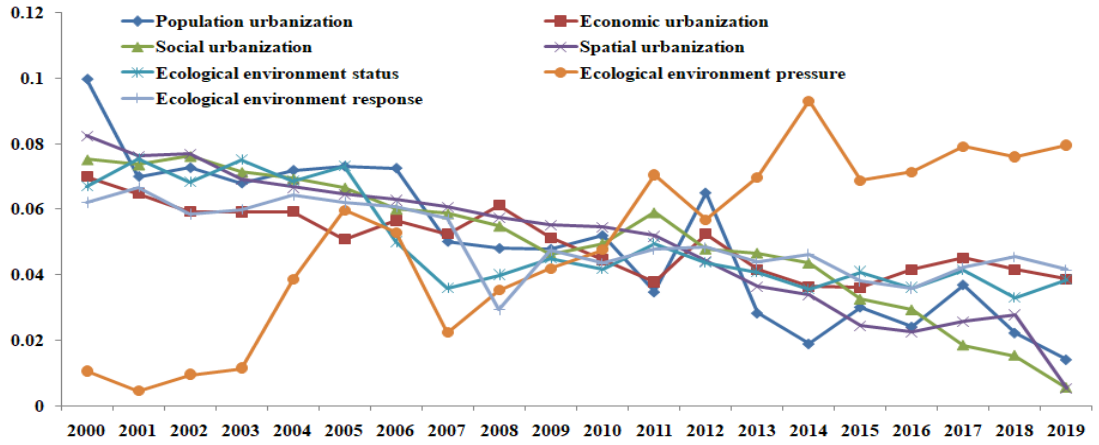

Figure 6. Change trend of urbanization and barrier subsystem of ecological environment system in Hohhot

The urbanization and ecological environment systems of Hohhot from 2000 to 2019 were used as study subjects. Using the obstacle degree diagnosis method, the urbanization and ecological environment subsystem of Hohhot and certain index components were quantitatively measured and analyzed (Figure 6). The obstacle degree of each subsystem to the coordinated development of urbanization and ecological environment of Hohhot city typically exhibits a trend of fluctuation and decrease, and this indicates that the main obstacle factors of the subsystem have characteristics of different stages in different urbanization processes. This is shown by the plot of the trends of the barrier factors for the urbanization system and the ecological environment system. Overall evolution is embodied in the continued ascent of coordinated development between subsystems, but at the same time, the ecological environment pressure subsystem is characterized by abnormal fluctuations rise, comprehensively reflects the rapid development of urbanization and ecological environment suffers from the co-existence of stress is an essential contradiction, forever keep in the process of new type of urbanization construction ecological environment construction, management and protection in the first place.

From the analysis of barriers to urbanization and specific indicators of the ecological environment, it can be seen that the main barriers that limited urbanization in Hohhot from 2000 to 2019 were: industry, foreign trade, population and cultural quality of residents; in the medium term: GDP per capita, urban construction land and health services; later stages: natural population growth rate, GDP growth rate, proportion of secondary industries. Major impediments limiting the ecological environment of Hohhot City, early years: Urban living environment, ecological environment governance; in the medium term: annual precipitation, industrial pollution discharge, sewage treatment rates; later stage: annual average urban temperature, annual water supply, industrial soot (powder), and total exhaust emission. in general, the major obstacles in the development stages of different cities are essentially in line with the actual evolution and development process of urbanization in Hohhot. Therefore, the current development of new types of urbanization in the future period, improving Hohhot city first degrees, enhancing the capacity of urban service functions and agglomeration, vigorously developing modern service economy, speed up the ecological environment management and protection, ecological priority, green development is the inevitable path of realization of Hohhot high quality development.

4. Conclusion and Suggestions

4.1Conclusion

A thorough evaluation index system based on PRS and PES models has been scientifically created for Hohhot using panel data from 2000 to 2019 as a study subject. The integrated development phase, coupled coordination evolution process and decoupling path of the Hohhot system from 2000 to 2019 are thoroughly and comprehensively analyzed using coupled coordination model, decoupling model and obstacle factor diagnostic model. An in-depth analysis and discussion of the major roadblocks to the development of the two in concert. The following are the primary conclusions:

(1) The level of urbanization in Hohhot has maintained a strong linear growth trend from 2000 to 2019, and the levels of urbanization and ecological environment have exhibited a staggered increase trend from the point of view of the integrated development level of the system. The two sub-systems show uneven and insufficient development conditions after 2013, indicating a lagging phase of ecological environment development. Urbanization is currently being hampered in significant ways by the ecological environment. A later phase of urbanization and development has now begun in Hohhot. Accelerating the creation of natural ecological habitats, enhancing and continuously improving the ecological environment, and strengthening the long-term

treatment of ecological contaminants are among the urgent needs. We will continue to promote high-quality development in newly urbanized areas;

(2) Urbanization and ecological environment experience high levels of coupling - high quality coupling - coupling of high-quality coupling interactive evolution process, keep for a long time in high quality coupling stages after 2003, reflecting the relationship between urbanization and ecological environment is constantly in a collaborative interactive development phase, but still have further can improve the space; the coupling coordination degree showed a slowly fluctuating trend of increasing year by year, and the coupling coordination types experienced a coupling coordination evolution process such as mild imbalance (2000) - moderate coordination (2001) - good coordination (2002-2010) - moderate coordination (2011) - good coordination (2012-2019). Although the coupling coordination reaches a maximum of 0.8240 in 2019, there is still a gap from the massive coordination phase.

(3) From the perspective of the correlation and change trend between urbanization and ecological environment, urbanization and ecological environment in Hohhot City show a Strong decoupling-Strong negative decoupling-Strong decoupling-Expansive negative decoupling-Strong decoupling- Strong negative decoupling-Strong decoupling- Strong negative decoupling-Strong decoupling-Expansive negative decoupling-Expansive Inter-linking-Recessive decoupling-Expansive Inter-linking-Strong decoupling complex interactive evolution trajectory. It mainly presents the wave evolution of strong decoupling, strong negative decoupling, and expanding negative decoupling interactions, indicating that the ecological environment has a strong negative effect on urbanization. In the future, more attention should be paid to the construction of sustainable new ecological urbanization.

(4) According to the thorough analysis of barrier factors, the pressure on the ecological environment showed an upward trend, reflecting urbanization's detrimental effects on the environment, while the score of subsystem and indicator barrier factors showed an evolutionary trend of decreasing fluctuation year after year. The main obstacles to the coordinated growth of the complex system in recent years have been environmental indicators such as the use of natural resources, secondary industries, population development, GDP growth rate and industrial pollutant discharge. The only way to achieve coordinated development of new-type urbanization and ecological environment is to effectively improve the quality of urbanization and ecological and environmental benefits.

4.2 Countermeasures and Suggestions

For Hohhot, the new development phase is a crucial time for transformation and growth in order to support the growth of high-quality new-type urbanization. The following policy recommendations are put out in light of the current reality in Hohhot:

First, we should establish the concept of prioritizing ecological and green development, and accelerate the development model of a green, energy-efficient and circular economy. Through analysis on the previous research results, the Hohhot ecological environment comprehensive evaluation index in the process of development of shock wave for a long time, after 2013, due to long-term being affected by the traditional economic development model elements drive, increasing energy resources consumption and the ecological environment pollution control, ecological environment pressure continues to increase. The complex system has gradually changed into an urbanized development model with a lagging ecological environment. In the future, the treatment of pollutants in the ecological environment needs to be sustained over a prolonged period of time, and the green transformation and development of the city's economy is a daunting task. To strengthen ecological and environmental construction, environmental governance and environmental protection, accelerate the transformation of the urban economy into an intensive, green and circular development model driven by efficiency improvement in the direction of modern scientific and technological innovation and energy revolution, and continue to enhance regional ecological and environmental carrying capacity based on scientific and technological progress. To ensure that the intensity of new-type urbanization construction can always be maintained within the threshold range of ecological, resource and environmental system carrying capacity, effectively improve the connotation and quality of new-type urbanization construction, enhance the endogenous driving force and resilient development of urbanization, and scientifically build a coordinated and sustainable man-land relationship.

Second, we will formulate special plans for municipal ecological and environmental protection in a scientific manner to safeguard the bottom line of ecological and environmental safety. In the Inner Mongolia autonomous region ecological protection and high quality development plan "the Yellow River basin and the Inner Mongolia national spatial planning (2021-2035), as the important development opportunity, with the aid of spatial planning lead resource utilization and the ecological environment governance, scientific planning and strictly controlled within the scope of the urban green space, establishing the compensation mechanism of environmental pollution, Perfect the natural ecological environment regulations and policies, strictly according to the state environmental protection standards for ecological environment monitoring and supervision, strengthen the negative list key high polluting enterprises management, policy guide and promote the

technology innovation of industrial enterprises, strengthen ecological environmental protection science and technology support and financial support, guide and encourage enterprises to improve resource utilization efficiency of energy, To energy conservation and environmental protection, green, clean industry development, improve the processing capacity of urban sewage treatment plants, strict control of industrial pollution and industrial waste emissions, guide the industrial and agricultural production efficiency of water resources sustainable utilization, improve regional ecological environmental governance, fully pays attention to natural ecological environment restoration, strong motherland northern border ecological security barrier.

Third, we need to use scientific and technological innovation to guide the construction of a new type of urbanization and comprehensively improve the weak points in urbanization development. We should focus on cultivating the capacity of cities for scientific and technological innovation and sustainable industrial development, and make the development of scientific and technological innovation an essential strategic support to stimulate the driving force of urban innovation and achieve a new path of high-quality sustainable development. Comprehensive optimization of Hohhot regional productivity layout, focus on the production quality of the mass transfer efficiency, speed up the iterative transformation and upgrading of industrial structure of regional economy, energy conservation and emissions reduction for the polluting energy of the city and the environment comprehensive treatment, and enhance the regional collaborative innovation development ability and core competitiveness, take the path of sustainable development of high quality, Through effective policies to guide implementation within the urban area of complementary advantages, stage, differentiation of regional coordinated development strategy, focus on improving urban modern service function, the center of the capital, the depth of the optimization of Hohhot urban and rural human resource quality and structure, accelerate regional ecology civilization construction and the quality of basic public services, gradually narrow the income gap between urban and rural areas, We will continue to promote the coordinated and sustainable development of new-type urbanization and the ecological environment, and take the path of high-quality development of new-type urbanization.

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Issue Article

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COGNITIVE MODEL: ANHOLT HEXAGON

Abstract: *The article formalizes the verbal model, verbal restrictions, assumptions, criteria, rules of the theory (concept) of Anholt's "hexahedron" (the concept of competitive identity). The Inverse Model for the Analysis of Semantic Main Variables has been developed. Introduced numerical parameters, semantic variables for 3 multisense equations with 9=6+3 semantic variables: 6 senses of 6 z-variables and 3 senses of 3 y-variables. The resulting system of 3 semantic equations was transformed into a system of 3 algebraic equations with 3*(m*6) unknown numerical values 9=3+6 types of model variability (deviations from 0). Correspondence of 2 types of sets of senses of indicators, one of them contains the control indicators of the state image (y_1,y_2,y_3), which strongly affect the correlated indicators (z_1,z_2,z_3,z_4,z_5,z_6) of the Anholt hexahedron. In the model described below, the expert controls (using the Anholt 6-hedron verbal model) the meanings and variability of y-variables (within their original contexts) of correlated z-variables (z_1,z_2,z_3,z_4,z_5,z_6), uncorrelated y-variables (y_1,y_2,y_3), 6 of them have given meanings, and the meanings of 3 y-variables are cognitively constructed. The matrices Λ_{66}, C_{66} are modeled, which control meanings and variability. They are 9 indicators, they are indicators of competitive identity and are divided according to their meaning into types: "related to the individual" (z1, z4), political (z3), financial (z2), image (z5, z6). The total meaning of one or another sum of the meanings of the z-scores is equal to the meaning of the y-score. The meaning of the y-score is constructed as a phrase that conveys the meanings of the terms of the phrases. Each term of the phrase is equal to the meaning of one z-score. The overall meaning is constructed without cognitive dissonance. From the verbal model of Anholt's "hexahedron", a Cognitive Model was constructed for 6 suitable points (one from each face) of Anholt's "hexahedron". B The Cognitive Model cognizes the strengths of paired connections for 9 indicators and concretizes 3 meanings of 3 y-variables.*

It is shown how to obtain model numerical values of each non-measurable indicator from. Correspondences of political or other meanings of indicators of competitive identity (national branding) to each mathematically formalized object of the Cognitive Model are described. Visualization of the mutual dynamics of z-variability, which are noticeably present in the formulas of 3 y-indicators of the manifestation of the unmeasured (modeled in the article) "strength" of the state and the simulated variability of 6 points out of 6 faces of the 6-hedron for m = 12 months and intellectual analysis of the model solution (matrices Λ_{66}, C_{66}) showed adequacy and revealed 2 digital figures of sharply different figures of dictatorship and democracy. The initial model strong or weak correlations, corrected by the model for new generated connection forces that obey exact mathematical equalities, adequately reflect the "soft power" factors of power under dictatorial and democratic regimes of power in the state. The cognitive model of Anholt's "hexahedron" is endowed with the property of recognizing the substantive essence of dictatorship and democracy.

Key words: *competitive identity, Anholt's hexagon, Inverse Semantic Principal Variable Analysis Model, Anholt's hexagon Cognitive Model.*

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КОГНИТИВНАЯ МОДЕЛЬ: ШЕСТИГРАННИК АНХОЛЬТА

***Аннотация**: В статье формализованы словесная модель, словесные ограничения, допущения, критерии, правила теории (концепции) «шестигранника» Анхольта (концепции конкурентной идентичности (competitive identity)). Разработана Обратная Модель Анализа Смысловых Главных Переменных. Введены числовые параметры, смысловые переменные у 3-х многосмысловых уравнений с 9=6+3 смысловыми переменными: 6 смыслов 6-ти z-переменных и 3 смысла 3-х y-переменных. Проведена трансформация полученной системы из 3-х смысловых уравнений в систему из 3-х алгебраических уравнений с 3*(m*6) неизвестными числовыми значениями 9=3+6 видов модельных изменчивостей (отклонений от 0). Соответствие 2 видов множеств смылов показателей, одно из них содержит управляющие показатели имиджа государства (y_1,y_2,y_3), различимо сильно влияющие на коррелированные показатели (z_1,z_2,z_3,z_4,z_5,z_6) 6-гранника Анхольта. В нижеописанной модели эксперт управляет (используя словесную модель 6-гранника Анхольта) смыслами и изменчивостями y-переменных (в пределах их исходных контекстов) коррелированных z-переменных (z_1,z_2,z_3,z_4,z_5,z_6), некоррелированных y-переменных (y_1,y_2,y_3), 6 из них имеют заданные смыслы, а у 3-х y-переменных смыслы когнитивно конструируются. Моделируется матрицы $Л_{66},C_{66}$, управляющие смыслами и изменчивостями. Они - 9 показателей, являются показателями конкурентной идентичности и разделены по смылу на виды: «относящиеся к индивиду» (z1,z4), политические(z3), финансовые (z2), имиджевые (z5,z6). Суммарный смысл той или иной суммы смыслов z-показателей равен смыслу y-показателя. Смысл y-показателя конструируется в виде фразы, передающей смыслы слагаемых фраз. Каждая слагаемая фраза равна смыслу одного z-показателя. Суммарный смысл конструируется без когнитивного диссонанса. Из словесной модели «шестигранника» Анхольта сконструирована Когнитивная Модель для 6 подходящих точек (по одному из каждой грани) «шестигранника» Анхольта В Когнитивной Модели познает величины сил парных связей для 9 показателей и конкретизирует 3 смысла 3-х y-переменных. Показано как получить модельные числовые значения каждого неизмеряемого показателя из Описанного соответствия политических или иных смыслов показателей конкурентной идентичности (национального брендинга) каждому математически формализованному объекту Когнитивной Модели. Визуализация взаимных динамик z-изменчивостей, заметно присутствующих в формулах 3-х y-показателей проявления неизмеряемой (моделируемой в статье) «силы» государства и моделируемых изменчивостей 6 точек из 6 граней 6-гранника за m=12 месяцев и интеллектуальный анализ модельного решения (матриц $Л_{66},C_{66}$) показал адекватность и выявили 2 цифровые резко отличающиеся фигуры диктатуры и демократии. Исходные модельные сильные или слабые корреляционные связи, исправленные моделью на новые сгенерированные силы связи подчиняющиеся точным математическим равенствам, адекватно отражают факторы «мягкой силы» власти при диктаторском и демократическом режимах власти в государстве. Когнитивная модель «шестигранника» Анхольта наделена свойством опознавания содержательной сути диктатуры и демократии.*

***Ключевые слова**: конкурентная идентичность, «шестигранник» Анхольта, Обратная Модель Анализа Смысловых Главных Переменных, Когнитивная Модель шестигранника Анхольта.*

Введение

Имидж страны является важным для людей, для бизнеса, для государств. Но «серьезный бюджет, яркий event-менеджмент и профессиональное использование максимального набора различных PR-, ATL- и BTL-инструментов не являются залогом успеха национального брендинга»[1]. «Как известно, сам Анхольт в качестве механизма решения проблемы предложил расширить понятие ***place branding*** путем синтеза бренд-менеджмента с элементами публичной дипломатии [1]. Данный подход нашел выражение в предложенной Анхольтом концепции конкурентной идентичности [1-4] (competitive identity), которая визуализируется в своеобразном «шестиграннике Анхольта»[1] (постоянно изменяющего свой профиль – С.Ж.), на гранях которого зафиксированы 6 смыслов 6 показателей:

1) люди;
2) бизнес, инвестиции и иммиграционное законода тельство;
3) внешняя и внутренняя политика (в т.ч. качество государственного управления);
4) культура и традиции;
5) экспортные бренды;
6) туризм [1-4].

Эти показатели, если имеют значения, коррелируют друг с другом. Например, наличие корреляции между государством и индивидом объяснено в статье [2]. Перечисленные показатели (источники информации) объединяются в шесть

[1] https://moluch.ru/archive/153/43373/

основных каналов информации, которые графически можно отобразить в виде шестигранника (с точками на гранях) конкурентной идентичности. В нашей модели из каждой грани выделена одна точка. Взаимосвязи в рассматриваемых практиках «индивид-государство», выражаются фразами (с пониманием их интенции - бессознательного намерения, т.е. «того, что ведёт меня изнутри туда, куда я хочу») не изучены, не изображены графически. Это дает возможность определять, описывать, объяснять, прогнозировать, конструировать текущую ситуацию в обществе, формулируя фразы-критерии объективности, непредвзятости, авторитетности, правдивости и истинности, увидеть злоупотребление властью на языке, только там, где есть возможность изменений или выбора. «Индивид становится субъектом только тогда, когда пройдет через процедуру властной субординации. Внутреннее принятие власти и формирование субъекта (или субъекция) таким образом выступают взаимосвязанными амбивалентными явлениями [1]». По своим смыслам показатели имиджа страны (национального брендинга) нами разделены на 4 типа: «относящиеся к индивиду» (z_1,z_4), политические(z_3), финансовые (z_2), имиджевые (z_5,z_6). Относящиеся к разным двум видам показатели имеют разные смыслы (ассоциированные со смыслом вида). Фраза суммы 2-х смыслов из разных видов состоит из слов, отражающих смыслы как 1-го смысла, так и 2-го смысла, включая контекстуальные смыслы. Фразы постоянно меняют свой посмысловой профиль. Могут иметь ассоциации с образными характеристиками «мягкой силы»: гибкость, пластичность, ненавязчивость, эфемерность, хрупкость, нежность, соблазнительность [2]. В нашей когнитивной модели имеем дело с безразмерными числами и возможно как смещение смыслов слов из словесной модели, так и появление новых слов при переходе от словесной модели к когнитивной модели, воздействующих на сознание автора моделей. Введенные слова дают возможность не только выразить добытые знания, но и положительные или отрицательные оценки и эмоции, «навязать» слушающему определенное отношение к познающей модели.

Исходные данные

Исходными данными является словесная модель концепции конкурентной идентичности, имеющая 6 смыслов 6 показателей:

1) люди;

2) бизнес, инвестиции и иммиграционное законодательство;

3) внешняя и внутренняя политика (в т.ч. качество государственного управления);

4) культура и традиции;

5) экспортные бренды;

6) туризм [1-4].

Этими показателями управляют государственные структуры через регулируемые государства показатели имиджа государства (y_1,y_2,y_3):

имя-смсл(y_1)=«принуждение со стороны государства»;

- имя-смсл(y_2)=«влияния/давления со стороны государства»;

-имя-смсл(y_3)= «привлекательности со стороны государства» [1-4].

Применяемые вычислительные модели

Применяемые вычислительные модели [5-12] соответствуют 5 шагам решаемых задач для одного из значений s=1,...,20:

а) моделирование пары матриц: матрицы собственных чисел Λ_{66}, s>1 такой, что выполняется условие неизменности (z,y)-корреляций для 2-х матриц R_{66} и R_{66}: $R_{66}C_{66}=C_{66}\Lambda_{66}$, $R_{66}C_{66}=C_{66}\Lambda_{66}$,. Λ_{66}=diag(2.3329, 1.1803,0.9349,0.3906,0.1613), значения элементов матрицы Λ_{66} при s=2,3,…,20 приведены в Таблице 3. Вычисление каждой матрицы собственных чисел $\Lambda_{66}=diag(\lambda_1,\ldots,\lambda_5$ (матрица C_{66}= C_{66}) происходит по формуле $\Lambda_{66}=C^T{}_{66}R_{66}C_{66}$ (после вычисления элементов матрицы);

б) моделирование матрицы собственных векторов C_{66} и собственных чисел Λ_{66}, таких, что выполняется условие: $R_{66}C_{66}=C_{66}\Lambda_{66}$, $R_{66}C_{66}=C_{66}\Lambda_{66}$, их значения приведены в Таблицах 4,5;

г) разработка многосмысловых уравнений с известными и неизвестными семантическими переменными [5-6];

д) моделирование новых матриц Y_{m6}, Z_{m6}, соответствующих своим системам многосмысловым уравнениям с известными и неизвестными семантическими (смысловыми) переменными [6-12].

Государство с диктаторской формой режима власти

Назначим экспертные знания о государстве с диктаторской формой режима власти через назначенные значения коэффициентов. Связь между «бизнесом» (z_2) и госвлиянием (y_1) выразим через значение коэффициента (z_2,y_1)-кореляции: corr(z_2,y_1)=0.7. знак плюс отражает однонаправленность их действий – чем больше производит продукцию бизнес, тем больше государство взимает с него сумму налогов. Разделим z-переменные по смыслу на 4 группы: «относящиеся к индивиду» (z_1,z_4), финансово-политической (z_3,z_2), имиджевые (z_4,z_5,z_6). Ниже индикаторы, внесенных экспертом извлекаемых знаний принадлежат ко всем группам z-

переменных: corr(z_2,y_1)= 0.68, corr(z_3,y_1)=0.7, corr(z_1,y_2)=0.67, corr(z_6,y_2)=-0.3,corr(z_4,y_3)=0.8, corr(z_5,y_3)=0.7, corr(z_6,y_3)=0.3. мозаику этих индикаторов обозначим так: (2, 3), (1, 6,), (1,4, 5,6). Три типа смыслов таковы, что суммы смыслов (z2, z3) можно сложить, ибо смысл(z2)⊕смысл(z3), смысл(z1)⊕смысл(z4),смысл(z4)⊕смысл(z5)⊕см ысл(z6) когнитивно суммируемы, ибо соответствующие слагаемые из 6 смыслов: смысл(z2),смысл(z3), смысл(z1), смысл(z4), смысл(z5), смысл(z6) относятся к своей однородной группе: к финансово-политической (z_2,z_3), «относящиеся к индивиду» (z_1,z_4), к имиджевой (z_4,z_5,z_6). Назначим индикаторы присутствия знаний, такими, чтобы их абсолютные величины доминировали или нет среди 7 выделенных по смыслу элементов из матрицы C_{66}={c_{ij}=corr(z_i,y_j)} (z,y)-корреляций. Смысловая мозаика индикаторов присутствия знаний образована из следующих 7 выделенных по силе связей пар элементов из матрицы C_{66}: corr(z_2,y_1)=c21=0.68; corr(z_3,y_1)=c31=0.7; corr(z_1,y_2)=c12=0.67; corr(z_6,y_2)=c62=0.7; corr(z_4,y_3)=c43=0.3; corr(z_5,y_3)=c53=0.7; corr(z_6,y_3)=c63= 0.3. Рассмотрим 2 значения: corr(z_2,y_1)=c21=0,68 и corr(z_6,y_3)=c63= 0,3. Назначенное значение corr(z_2,y_1)=c21=0,68 превышает другое назначенное значение corr(z_6,y_3)=c63= 0,3. Это формульное изображение факта: сила связи между «бизнесом» (z_2) и «принуждением со стороны государства» (y_1) превышает силу связи между «туризмом» (z_6) и «привлекательностью, выражаемой со стороны государства»(y_3): corr(z_2,y_1) =c21=0,68 corr(z_6,y_3) власти. В странах с демократичным режимом власти другое неравенство: corr(z_2,y_1)=c21< corr(z_6,y_3). Аналогично обосновываются другие равенства и неравенства между известными из статьи [8] коэффициентами парных связей.

Извлеченные из модели знания о государстве с диктаторской формой режима власти следующие

Дисперсия 1-ой y-переменной наибольшая: λ_1=2.9188, следовательно смысл 1-ой y-переменной наиболее важен: $y_{i1}=z_{i1}*0.0006+z_{i2}*0.6800+z_{i3}*0.7000$, здесь модель смоделировала значение «веса» c11 равным c11=0.0006, что означает нулевую значимость людей (смысл(z_{i1})=«люди») в структуре смысла переменной y_1 . Смысл переменной y_1 теперь равен не сумме 3-х смыслов, а сумме 2-х смыслов z-переменных: z_2,z_3, конструируемого из усеченного смыслового равенства смысл(y_{i1})=смысл(z_{i2})*0.6800+ смысл(z_{i3})*0.7000. с заметными «весами» c21=corr(z_2,y_1)=0.6800, c31=corr(z_3,y_1)=0.7000, отражающих заметно тесную связь y-переменной y_1 (принуждающую роль государства) с z-переменными z_2,z_3 (для бизнеса, инвестиций, иммиграционного законодательства, для внешней и внутренней политик. Когнитивно сложив фразы 2-х смыслов: смысл(z_{i2})*c_{21}⊕смысл(z_{i3})*c_{31}, имеем фразу, выражающую смысл(y_{i1})=смысл(z_{i2})*c_{21}⊕смысл(z_{i3})*c_{31}. Смысл y-переменной формулируем так: смысл(y_{i1})=«принуждения со стороны государства на бизнес, на инвестиции, на иммиграционное законодательство (z_2), на внешнюю и внутренную политики (z_3)». Модельно полученная после решения ОЗ незаметная сила (c11=corr(z_1,y_1)=0.0006 показывает отсутствие влияния людей (z_1) на принуждающую роль государства. Значит у государства имеются свои органы принуждения – полиция, силовые структуры. Вывод: при диктаторской форме режима власти люди «живут сами по себе», государство – «само по себе».

Продолжим конструирование смыслов следующих 2-х y-переменных, вычисленных по формуле $y_{ij}=z_{i1}*c_{1j}+z_{i2}c_{2j}+z_{i3}c_{3j}+ z_{i4}c_{4j}+z_{i5}c_{5j}+z_{i6}c_{6j}$), j=1,2,3; i=1,…,m. Для y-переменных y_2,y_3 мы выделили следующие «веса» из матрицы C55 corr(z_2,y_1)=0.68, corr(z_3,y_1)=0.7, corr(z_1,y_2)=0.67, corr(z_6,y_2)=0.7, corr(z_4,y_3)=0.3, corr(z_5,y_3)=0.7, corr(z_6,y_3)=0.3, соответствующей своему спектру Λ_{55}=diag(λ_1,…,λ_6) =diag(2.9188,1.0204,1.0204,1.0204, 0.0100, 0.0100).

Рассмотрим y-переменную y_3 с исходным (из смысловой модели «шестигранника») смыслом(y_{i3})=«страновой имидж привлекательности». Эта y-переменная наиболее стабильная: ее дисперсия λ3=1.0204 наименьшая, это означает устойчивость ниже перечисленных ее аддитивных смысловых факторов. Соответствующая y–переменная y3 имеет минимальную дисперсию disp(y_3)=λ3=1.0204. Фраза, соответствующая не сумме фраз со смыслами z-переменных (z_1,z_4,z_5,z_6), а сумме фраз со смыслами z-переменных: {смысл(z_{i1})=«люди», смысл(z_{i4})=«культура и традиции»», смысл(z_{i5})=«экспортные бренды», смысл(z_{i6})=« туризм»}. Сумма фраз с перечисленными смыслами z-переменных принимает форму другой фразы, передающей смысл «привлекательности со стороны государства», конструируется так: смысл(y_{i3})=«государство имеет имидж привлекательности: оно соблюдает на должном уровне только 5 критерия национального брендинга (имиджа страны), кроме z3». Её внешняя и внутренная политика (в т.ч. качество государственного управления) совершенно не достигают уровней названных 5 критериев. Из 5 критериев только 4 положительно влияют через свои «веса»: z_i*0,3000+z_{i2}*0,4637+z_{i3}*0,0000+z_{i4}*(0,7000+ z_{i5}*0,3000+z_{i6}*(-0.3391), отрицательно влияет один «вес» c63=(-0,3391), этот смысл показателя

относится к типу «относящийся к индивиду». Показатель z3, его смысл(z3)=«внешняя и внутренняя политика (в т.ч. качество государственного управления)» не влияет на опознанный нашей моделью новый смысл привлекательности: смысл(y_{i3})=«государство имеет имидж привлекательности: оно соблюдает на должном уровне только 5 критерия национального брендинга (имиджа страны), кроме z3». Динамика значений переменной «туризм» (z_{i6}) с «весом» c63=(-0,3391) противоположна по тренду динамике значений переменной «страновой имидж привлекательности» (y_3): это означает «в этой стране (с диктаторской формой режима власти) туризм (смысл переменной z_6) не привлекателен для людей». Такое наблюдается обычно в государстве с диктаторской формой власти, следовательно наша модель правильно моделирует (познает, ибо является когнитивной моделью), правильно моделирует устойчивость эту реальность. После когнитивного моделирования 3-х смысловых уравнений с 6 смысловыми переменными смысл(y_{i3})=«принуждение со стороны государства на бизнес, на инвестиции, на иммиграционное законодательство (смысл(z_2)), на внешнюю и внутреннюю политики (смысл(z_3))». Значения «весов» (сил влияния на смысл(y_{i3})) при смыслах z-переменных присутствуют в смысловом уравнении, являются уникальными. Они вычислены в рамках данной модели и при приведенных выше исходных данных эксперта.

Смысловое уравнение смысл(y_{i3})=смысл(z_i)*0,3000⊕смысл(z_{i2})*0,4637⊕ смысл(z_{i4})* (0,7000⊕ смысл(z_{i5})*0,3000 ⊕смысл(z_{i6})*(-0,3391) является приоритетным уравнением изучаемого явления. При практической значимости его параметров («весов» из матрицы C_{66}) будут правильно интерпретированы z-переменные (z_1,z_4,z_5,z_6), без которых невозможно установить смыслы в смысловых уравнениях.

Рассмотрим y-переменную y_2, по словесной модели «шестигранника» Анхольта его смысл=«страновой имидж «давления на». Наша познающая модель изменит эту фразу. Теперь, имея исходные данные, назначенные экспертом смысл(y_{i2})=«давления со стороны государства», назначенные экспертом значения c12=0.67, c42=0.7,c62=0.7, модель вычислила иные индикаторы: c12=0.67, c42=0.7, c62=0.7. Эти индикаторы («веса») отражают наличие смыслового уравнения смысл(z_{i1})*0.6700⊕смысл(z_{i4})*0.7000.
Соответствует ли это смысловое уравнение реальности выяснит дальнейший интеллектуальный анализ. Соответствующая y–переменная y2 имеет минимальную дисперсию disp(y_2)=λ2=1,0204. Фраза, соответствующая сумме фраз «люди», «культура и традиции» имеет смысл «страновой имидж давления», конструируется так: «государство имеет имидж привлекательности: оно соблюдает на должном уровне только 3 критерия национального брендинга (имиджа страны). Из 5 критериев только 3 положительно и одинаково влияют 2 «веса»: z_i*0.67+z_{i4}*(0.70+z_{i6}*(0.0006, не влияет – один «вес» со смыслом показателя №6, смыслы показателей №1,№4,№6 относятся к типу «относящийся к людям и их эмоциям». После когнитивного моделирования 3-х смысловых уравнений с 6 смысловыми переменными смысл(y_{i1})= «давление людей (z_1) к выгодной культурной политике со стороны государства, давления на патриотические (z_4)». После интеллектуального конструирования системы смысловых уравнений мы имеем право проводить числовое моделирование значений изменчивостей по m числовым многомерным уравнениям
y_{i3}=z_i*0.3000+z_{i2}*0.4637+z_{i3}*0.0000+z_{i4}*0.7000+z_{i5} *0.3000+z_{i6}*(-0.3391, i=1,…,m, имеем смысловое равенство
смысл(y_{i3})=смысл(z_i)*0.3000⊕смысл(z_{i2})*0.4637⊕ смысл(z_{i4})*(0.7000⊕смысл(z_{i5})*0.3000⊕ смысл(z_{i6}) *(-0.3391). Заметим: в уравнении y_{i3}=z_{i1}*c_{13}+$z_{i2}c_{23}$+$z_{i3}c_{33}$+ $z_{i4}c_{43}$+$z_{i5}c_{53}$+$z_{i6}c_{63}$) отсутствует один смысл z-переменной z_3 имеет нулевой «вес» c33=0.0000. Тогда мы должны найти фразу, суммирующую смыслы 5 z-переменными (z_1,z_2,z_4,z_5,z_6).

Рассмотрим y-переменную y_1. По словесной модели «шестигранника» Анхольта его смысл=«страновой имидж «принуждения со стороны государства». Наша познающая модель изменит эту фразу. Теперь, имея исходные данные, назначенные экспертом смысл(y_{i2})= «давления со стороны государства», назначенные экспертом значения c12=0.67, c62=0.7, модель вычислила иные индикаторы: c12=0.67, c42=0.7. Эти индикаторы («веса») отражают наличие смыслового уравнения смысл(z_{i1})***0.6700**⊕смысл(z_{i4})*0.7000.
Соответствует ли это смысловое уравнение реальности выяснит дальнейший интеллектуальный анализ. Соответствующая y–переменная y2 имеет минимальную дисперсию disp(y_2)=λ2=1,0204. Фраза, соответствующая сумме фраз «люди», «культура и традиции» имеет смысл «страновой имидж давления», конструируется так: «государство имеет имидж привлекательности: оно соблюдает на должном уровне только 2 критериев национального брендинга (имиджа страны). Из 5 критериев только 2 положительно и одинаково влияют 2 «веса»: z_i*0.67+z_{i4}*(0.70, отрицательно – ни один

«вес», смыслы показателей №1, №4 относится к типу «относящийся к людям и их эмоциям». Динамика значений переменной «туризм» (z_{i6}) с «весом» c16=0.0006 мало изменчива по тренду и не влияет на динамику значений переменной «страновой имидж привлекательности» (y_3): это означает «в этой стрне (с диктаторской формой режима власти) туризм (переменная z_6) не насаждается со стороны государства. Такое отношение к туризму типично в государстве с диктаторской формой власти, следовательно наша модель правильно моделирует эту реальность. Смысловое равенство смысл(y_{i1})=смысл(z_{i2})*0,6800⊕смысл(z_{i3})*0,7000 порождает фразу, соответствующую сумме фраз «бизнес, инвестиции и иммиграционное законодательство», «внешняя и внутренняя политика», имеющей смысл «принуждение со стороны государства», конструируется так, как показано выше: смысл(y_{i1})=«принуждения со стороны государства на бизнес, на инвестиции, на иммиграционное законодательство (z_2), на внешнюю и внутренную политики (z_3)». Матрица C_{66} приведена в Таблице 1.

Таблица 1. Матрица $C_{66}=\{c_{ij}=corr(z_i,y_j)\}$ (z,y)-корреляций, соответствующая диктатуре

0,0006	**0,6700**	0,3000	0,0684	0,6630	0,1300
0,6800	0,2471	0,4637	0,4914	0,1331	0,0477
0,7000	0,0000	0,0000	0,0000	0,6590	0,2751
0,0000	**0,7000**	0,7000	0,0000	-0,0005	-0,1414
0,2182	-0,0049	0,3000	0,8682	0,3292	-0,0138
0,0001	**-0,0006**	-0,3391	0,0039	0,0085	0,9407

Таблица 2. Матрица z–изменчивостей Y_{m6}

№	y1	y2	y3			
1	1,9786	0,3821	0,9635	0,7371	0,1588	-0,0558
2	-0,4788	1,6802	0,7221	-1,6702	-0,0404	0,0343
3	-1,979	1,3167	0,6828	1,6211	0,0599	-0,0283
4	-0,9992	-0,3246	1,3935	0,1588	0,0418	0,1302
5	-1,7576	-1,119	-1,7358	0,5762	0,1137	-0,0708
6	0,5668	1,7191	-1,56	0,4595	-0,1424	-0,0792
7	-0,7528	-1,1993	0,7484	0,4693	-0,1509	-0,0939
8	1,5925	-1,0871	0,9902	0,036	-0,1148	-0,0987
9	1,7682	-0,5339	-0,6371	0,1829	-0,0575	0,1971
10	2,5918	-0,1351	-0,4692	-1,4516	0,1231	-0,0841
11	0,5246	-0,1743	-0,841	0,6081	-0,0037	0,149
12	-3,0552	-0,5246	-0,2574	-1,7272	0,0127	0,0002
	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
	2,918795	1,020383	1,020383	1,020363	0,009998	0,010001

Таблица 3. Матрица z–изменчивостей Z_{m6}

№	z1	z2	z3	z4	z5	z6
1	0,5141	-0,9825	-1,1507	1,0276	-0,9325	-0,3241
2	0,2349	0,5634	1,3218	0,2037	-0,8749	0,0981
3	0,9382	0,4848	-0,0353	0,4453	0,7606	0,4896
4	-0,021	-1,6753	-1,3146	-0,3187	-0,7213	0,1137
5	-0,3051	0,5253	1,1617	-0,0414	-0,7706	-0,155

6	-1,2721	0,4916	1,1284	-1,574	0,1981	0,3746
7	-0,0135	-0,418	-0,6879	-0,4142	0,4178	0,3035
8	0,6234	1,4912	0,9745	0,7851	0,6851	-0,2807
9	0,5111	-0,4638	-1,7501	1,386	0,5431	-0,6984
10	-1,1776	0,7487	0,4815	-1,3097	1,5692	-0,118
11	0,9225	2,2844	1,5281	1,2623	1,122	-0,283
12	-0,9549	-3,0497	-1,6575	-1,4519	-1,9965	0,4796
	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
	0,559256	1,877935	1,435289	1,000181	1,001085	0,126196

Таблица 4. Матрица y–изменчивостей Y_{m3} показателей имиджа государства (y1,y2,y3):

№	y1	y2	y3
5	-1,7576	-1,119	-1,7358
6	0,5668	1,7191	-1,56
11	0,5246	-0,1743	-0,841
9	1,7682	-0,5339	-0,6371
10	2,5918	-0,1351	-0,4692
12	-3,0552	-0,5246	-0,2574
3	-1,979	1,3167	0,6828
2	-0,4788	1,6802	0,7221
7	-0,7528	-1,1993	0,7484
1	1,9786	0,3821	0,9635
8	1,5925	-1,0871	0,9902
4	-0,9992	-0,3246	1,3935

Визуализация знаний о государстве с диктаторской формой режима власти

На рисунке 3 визуализирована взаимная динамика переменных z2, z3, y1. Отклонения от нуля (z –изменчивости, y-изменчивости) изменяются в интервале (-3.5;2). При монотонной возрастающей динамике y-изменчивости y1 влияющие на нее 2 динамики z–изменчивости z2, z3, имея близкие значения (z_{i2}, z_{i3}), i=1,…,12, сильно отклоняются от нуля: 9 (из 12) значений (z_{i2}, z_{i3}, yi1) отрицательны. Фактор диктатуры: принуждение со стороны диктаторского государства смсл(y1)=«принуждение со стороны государства» здесь более выражен более сильно, чем в других диаграммах. Видна асимметричность распределения значений (z_{i2}, z_{i3}, yi1) (показателей населения при диктатуре) относительно точки 0 на вертикальной оси. Людей преимущественно принуждает диктаторское государство, это иллюстрируют отрицательные значения на графиках: выглядит на сцене - государств тянет людей.

На рисунке 4 визуализирована взаимная динамика переменных z1, z4, y2. Отклонения от нуля (z –изменчивости, y-изменчивости) изменяются в интервале (-2;2). При монотонном возрастающей динамике y-изменчивости y2 влияющие на нее 2 динамики z–изменчивости z1, z4, имеют близкие значения (z_{i1}, z_{i4}), i=1,…,12, слабо отклоняются от нуля: 6 (из 12) значений (z_{i1}, z_{i4}, yi2) отрицательны. Фактор диктатуры: принуждение со стороны диктаторского государства смсл(y2)=«давление со стороны государства» здесь менее выражен, чем в других диаграммах. Видна симметричность распределения значений (z_{i1}, z_{i4},z_{i6},yi2) (оздоровляющих людей показателей (z_{i1},z_{i4}, z_{i6}) при диктатуре) относительно точки 0 (безразличия) на вертикальной оси. Людей, оздоровляющихся, преимущественно заставляют при диктаторской форме власти, это иллюстрируют менее возрастающие динамики показателей (z_{i1},z_{i4},z_{i6},yi2) на графиках Рисунка 4 по сравнению с динамиками показателей (z_{i2},z_{i3},yi1) на графиках Рисунка 3. На Рисунка 3 видна асимметричность распределения значений (z_{i2},z_{i3},yi1), на Рисунке 4 - симметричность распределения значений (z_{i1},z_{i4},z_{i6},yi2). Государственный план мероприятий по оздоровлению людей жестко соблюдается:

мешающих факторов здесь нет – смещения в облаке точек (z_{i1},z_{i4},z_{i6},yi2). Совсем другое мы увидим ниже при визуализации идентичных по смыслам показателей, присущих государству с демократической формой режима власти.

Рисунок 5 показывает в общем такую картину, что и Рисунок 4. Только имеем интерпретацию по иным аспектам *неоздоровляющих* людей показателям (z_{i2},z_{i3}, z_{i5},yi2) дает также асимметричность распределения значений (z_{i2},z_{i3}, z_{i5},yi2).

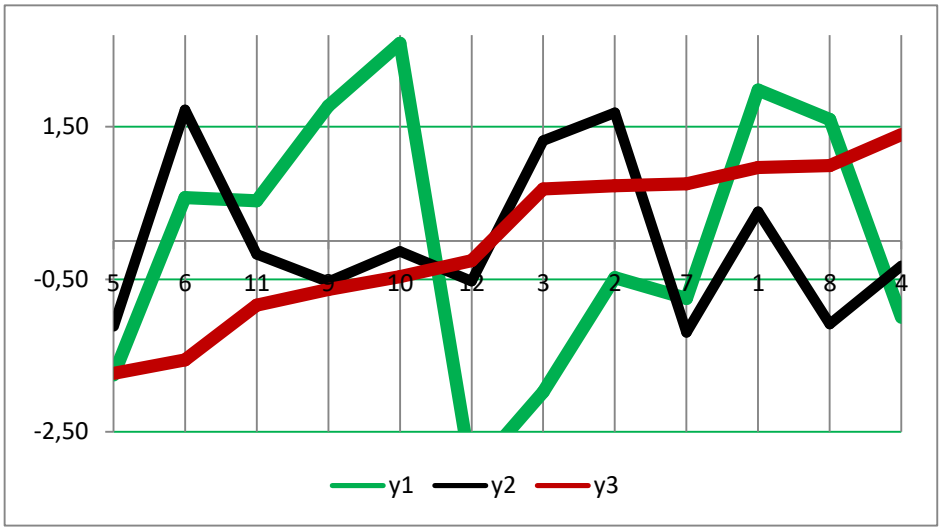

Рисунок 1.

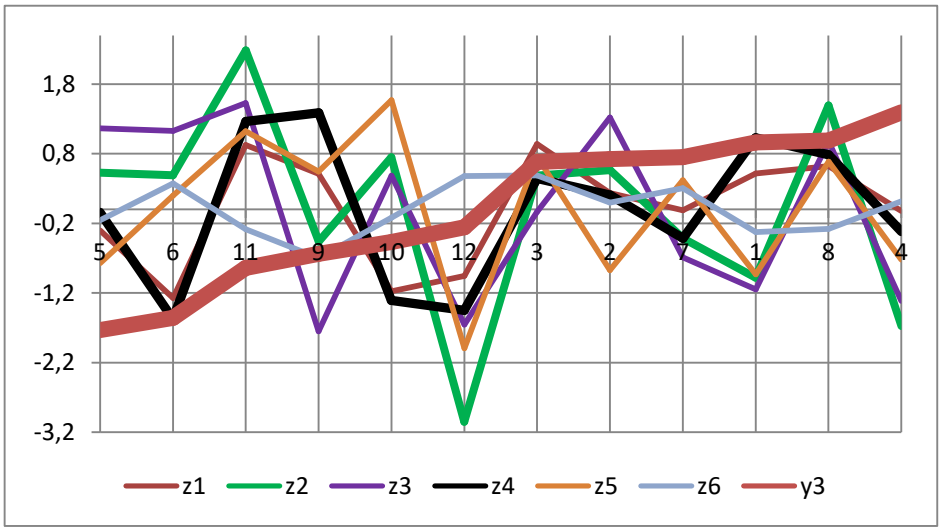

Рисунок 2.

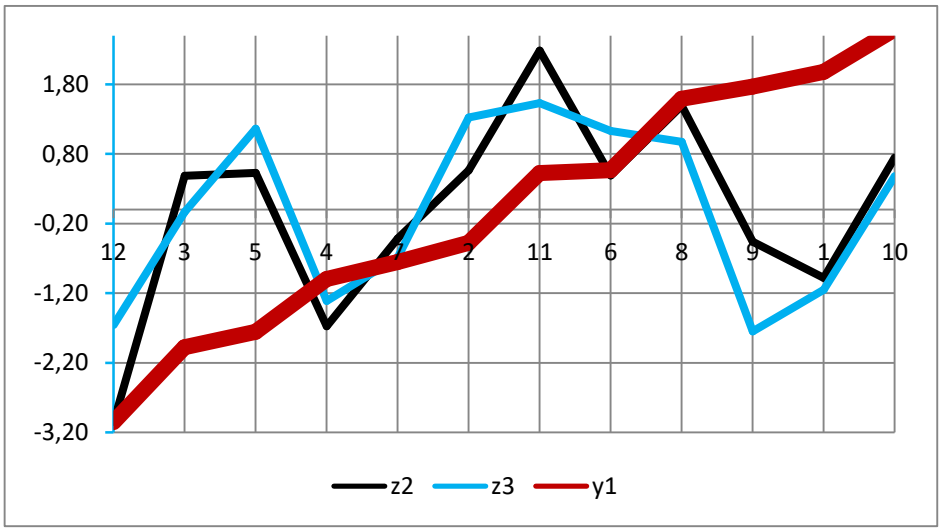

Рисунок 3.

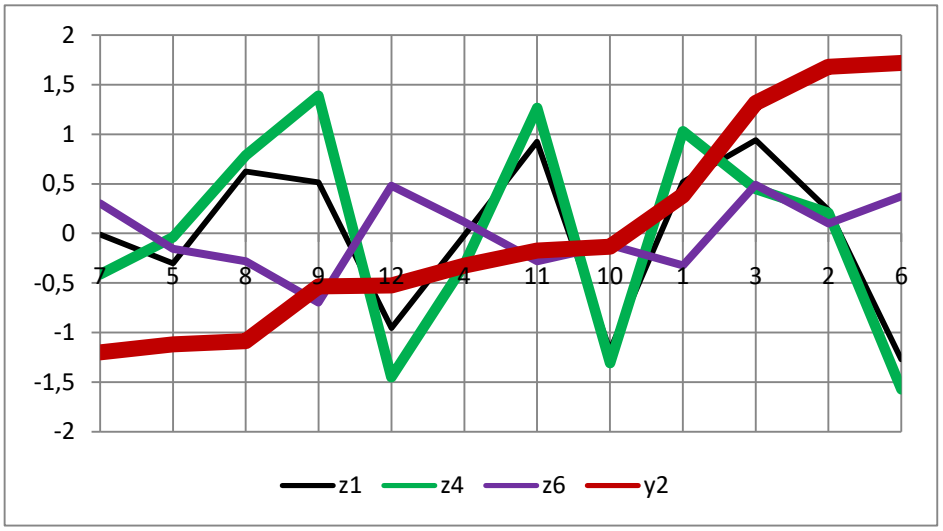

Рисунок 4.

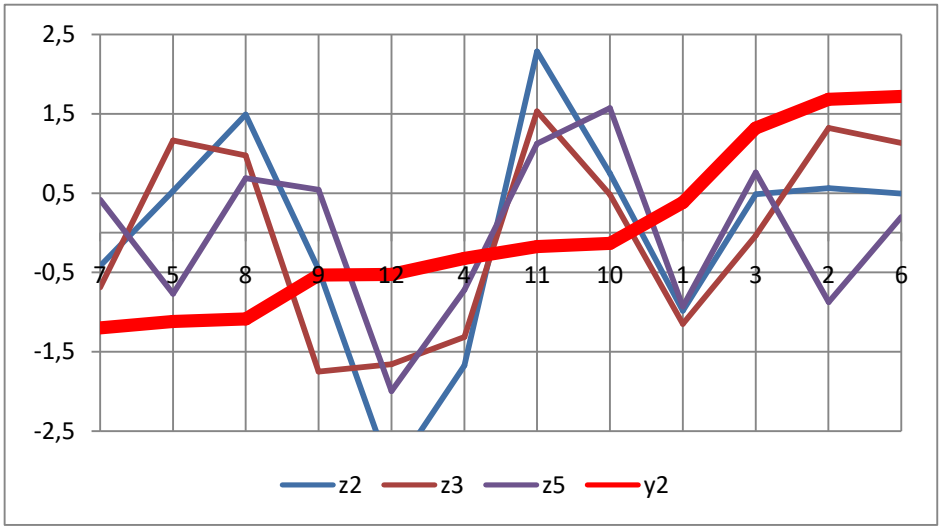

Рисунок 5.

Государство с демократической формой режима власти

Режим с демократической формой власти государства удовлетворяет одному из следующих признаков демократии: назначение лидеров управляемыми ими людьми происходит путём честных и состязательных выборов. Народ является единственно легитимным источником власти. Люди осуществляют самоуправление ради общего блага и удовлетворения общих интересов.

Это словесное описание заставляет нас по новому осмыслить рассмотренные выше (для с диктаторской формы режима власти) исходные данные. Мы провели достаточное исследование значений коэффициентов (z,y)-кореляций из прежней смысловой мозаики индикаторов наличия (введенных нами выше) знаний. Распределение значений коэффициентов (z,y)-кореляций иное, можно утверждать – противоположное.

Отсутствие принуждения (y_1) со стороны государства к бизнесу (z_2) численно выразим через нулевое значение коэффициента (z,y)-кореляции: corr(z_2,y_1)=0.0. выше мы назначили значение этого коэффициента равным 0.68, отражая факт: «чем больше производит продукцию бизнес, тем меньше принуждает (y_1) государство. Значение corr(z_3,y_1)=0.1 отражает слабую принуждающую функцию (y_1) демократичного государства на внешнюю и внутреннюю политику (z_3), ибо рыночные факторы сильно регулируют внешнюю и внутреннюю политику (z_3). Значение corr(z_1,y_2)=0.0 отражает отсутствие давления со стороны демократичного государства (y_1) на людей. Значение corr(z_6,y_2)=0.0 отражает отсутствие давления со стороны демократичного государства (y_3) на туризм (безвизовый въезд и т п.). Заметную привлекательность (y_3) в демократичном государстве имеют культура и традиции (z_4, музеи, театры, музыка и т п.). Этот факт в нашей модели отражает величина corr(z_4,y_3)=0.4. По сравнению с культурой, традициями (z_4) экспортные бренды (z_5) и туризм (z_6) являются (в нашей модели) менее привлекательными (y_1) факторами имиджа демократичного государства государства: corr(z_5,y_3)=0.1, corr(z_6,y_3)=0.1. Сравнительная таблица 4 наглядно показан контраст в цифровых позициях (имиджа) диктатуры и демократии.

Таблица 5. Назначенные экспертом индикаторы присутствия знаний

	c_{21}	c_{31}	c_{12}	c_{62}	c_{43}	c_{53}	c_{63}
Диктатура	**0,68**	**0,7**	**0,67**	**0,7**	**0,3**	**0,7**	**0,3**
	c_{21}	c_{31}	c_{12}	c_{62}	c_{43}	c_{53}	c_{63}
Демократия	**0**	**0,1**	**0**	**0**	**0,3**	**0,1**	**0,1**

В результате решения Оптимизационной Задачи 2 мы получили другие значения «весов» из матрицы C_{66}. Так как ℓ=3, то мы можем найти смыслы только 3-х y-переменных y1, y2, y3.y1. Извлеченные из модели новые знаия следующие.

Смысловой познающий (когнитивный) анализ конструирует фразу для смысла y-переменной y1 в виде смысл(yi1)=«принуждение (y1) людей (z1) к производству качественныых изделий на экспорт (экспортных брендов (z5)». При этом «вес» (сила) принуждения людей более заметен и равен c11=0.7867, а «вес» (сила) принуждения экспортных брендов менее заметен и равен c51=0.5741. Для формулы y2=0,9795*z2+z3*0,2015 смысловой портрет ее смыслового уравнения следующий.

Смысловой познающий (когнитивный) анализ конструирует фразу для смысла y-переменной y2 в виде смысл(yi2)=«сильное влияние (y2) государства (с «весом» 0,9795) на бизнес (z2) и слабое влияние (с «весом» 0.2015) государства на внешнюю и внутренную политики (z3). Это показывает меньшее (в 5 раз меньше) влияние государства, более сильное (в 5 раз больше) влияние оказывает крупный бизнес.

Для формулы y3=z3*0,9434+z4*0,3000+z5*0,1000+z6*0,1000 смысловой портрет ее смыслового уравнения следующий. Смысловой познающий (когнитивный) анализ конструирует фразу для смысла y-переменной y3 в виде смысл(yi3)=«привлекательные (y3) для туристов (z6) высочайшие качества культур и традиций (z4), хорошие качества экспортных брендов (z5).

Это результат решения Оптимизационной Задачи 2, А перед решением ОЗ 2 мы назначили экспертным путем значения 9 индикаторам известные знания об отсутствии связей в парах переменных. Эти являются хорошими и общепринятыми свойствами государства с демократической формой режима власти.

Назначенные знания следующие. Связь между «бизнесом» (z_2) и госвлиянием (y_1) выразим через значение коэффициента (z_2,y_1)-кореляции: corr(z_2,y_1)=0. Знак плюс отражает однонаправленность их действий – чем больше производит продукцию бизнес, тем больше государство взимает с него сумму налогов.

corr(z_2,y_1)=0.0, corr(z_3,y_1)=0.1, corr(z_1,y_2)=0.67, corr(z_6,y_2)=**-0.3**, , corr(z_4,y_3)=**0.8**, , corr(z_5,y_3)=0.7,

$corr(z_6,y_3)=0.3$ принадлежат группам: «относящиеся к индивиду» (z_1,z_4), финансово-политической (z_3,z_2), имиджевые (z_4,z_5,z_6). Соответствие назначенных опознанных индикаторов следующее: c21=0.68; c31=0.7; c12=0.67; c62=0.7; c43=0.3; c53=0.7; c63=0.3; c21=0.1; c31=0.7; c12=0.2; c62=0.1; c43=0.5; c53=0.3; c63=0.3.

Цифровизация этих 6 показателей в рамках когнитивной модели (с применением «теоретического осмысления «мягкой силы» из статей [1,2]) позволило познать взаимные динамики зависимых показателей, этим мы развиваем теорию. «Обычная модель понимания этого процесса такова: власть внедряет себя в нас, и, ослабленные ее силой, мы интернализуем или принимаем ее термины …»[2,с.175]. «Батлер предлагает рассматривать власть в качестве интерсубъектной силы, представляющей инстанцию коллективного без-сознательного, находящуюся внутри самого субъекта и устанавливающую его идентичность» [2, с.175].

Представляется принципиально важным рассматривать «однопри́борное» измерение показателя. Например, показатель «люди» можно измерять по разной шкале с их единицами измерения: количество, плотность населения, рейтинг стран мира по уровню развития людей (Human Development Index). Поэтому мы должны использовать одну единицу измерения (метризуемого показателя, значения которого реагируют на изменяющие воздействия, принуждения, влияния/давления и привлекательности) для одного (из 9-ти рассматриваемых) показателя. К одной грани 6-гранника Анхольта (не 6-угольника!) может принадлежать несколько шкал измерения показателя. Но мы выбираем только одну шкалу измерения из каждой грани, например, на 1-ой грани единица измерения показателя имеет имя «ludi», но мы моделируем его безразмерные стандартизованные значения - z-значения. Безразмерные величины можно умножать\делить, складывать\вычитать, что позволяет найти значения Свобода выбора у нас имеется, ибо теоретически имеем несколько шкал измерения показателя, соответствующего своей грани.

Суммы смыслов имеют содержательный смысл, если слагаемые смыслы состоят из слов, отражающих смыслы (одного смысла, 2-х смыслов или всех участвующих в формуле смыслов) z-переменных. Поэтому можно будет когнитивно «объединить» в одну фразу, отражающую смысл y-переменной. Но в нашей когнитивной модели мы имеем дело с безразмерными числами, ибо мы моделируем стандартизованные значения величин, равные $y_{ij}=z_{i1}*c_{1j}+z_{i2}c_{2j}+z_{i3}c_{3j}+z_{i4}c_{4j}+z_{i5}c_{5j}+z_{i6}c_{6j}$. Линейная форма зависимости ***y=z*c*** количественно выражает силу «веса» **c** z-переменной, умноженного на *величину стандартизированной изменчивости переменной* **z**: чем больше «вес» *c>0* z-переменной, тем больше отклоняется величина y-переменной (***y=z*c***) от нуля– влево от 0 (при z<0) или вправо от 0 (при z>0). Чем ближе значение z к 0, тем меньше изменяется y-переменная (ее i–ое значение вычисляется по формуле $y_{ij}=z_{i1}*c_{1j}+z_{i2}c_{2j}+z_{i3}c_{3j}+ z_{i4}c_{4j}+z_{i5}c_{5j}+z_{i6}c_{6j}$), а знакопеременный ряд таких значений $y_{ij}=z_{i1}*c_{1j}+z_{i2}c_{2j}+z_{i3}c_{3j}+z_{i4}c_{4j}+z_{i5}c_{5j}$ может показать нивелирование динамики стандартизированной изменчивости (y-переменной) №j. Нивелирование означает стабильное развитие показателя. Наша *j*-ая *z*-переменная z_j (влияющая на *y*) такова что ее значения тоже образуют знакопеременный ряд**,** сумма отрицательных слагаемых равна сумме положительных слагаемых: $(1/m)*(z_{1j}+\ldots+z_{mj})=0$. Каждой *z*-переменной присуще индивидуальная z-изменчивость, а *j*-ая *y*-изменчивость равна линейной комбинации 6 индивидуальных *z*-изменчивостей $z_{i1},z_{i2},z_{i3},z_{i4},z_{i5},z_{i6}$ 6-ти z-переменных z_1,z_2,z_3,z_4,z_5,z_6, причем *z*-изменчивости «измеряются» m>6 раз, i=1,…,m, i-номер измерения, равный номеру момента времени «измерения» 3-х показателей конкурентной идентичности страны.

Цель нашего цифрового моделирования – псевдореальные динамики данных и адекватные им модельные неизвестные значения параметров (известных коэффициентов парных связей) взаимосвязей z-изменчивостей, впервые обнаруживаемых (численно и визуально) взаимных динамик 3 y-изменчивостей эмпирическим квазиреальным взаимным трендам 6 показателей национального брендинга и 3-х показателей конкурентной идентичности страны (принуждения, влияния/давления и привлекательности). При визуализации динамик модельных изменчивостей (реальных изменчивостей не существует) мы должны увидеть разные начала для момента времени наступления нивелирования 3-х показателей принуждения, влияния/давления и привлекательности. Мы моделируем величину стандартизированной изменчивости **z**: чем больше «вес» c>0 z-переменной, тем больше отклоняется величина y-переменной («принуждения») от нуля– влево от 0 (при z<0) или вправо от 0 (при z>0). Различные измерения «силы» в современном мире (принуждения, влияния/давления и привлекательности) с позиций их неодинаковых значений дисперсий или хотя бы сопоставление значимости троек значений дисперсий. Моделирование при тройке значений дисперсий в зависимости от отношений их величин дает свои динамики вышеназванных модельных изменчивостей. Им соответствует своя совокупность динамик 6 показателей

национального брендинга и 3-х показателей конкурентной идентичности страны, т е каждой совокупности можно поставить в соответствие страну с развитой экономикой, с развивающейся экономикой.

Как управлять управляющими показателями имиджа государства (y_1,y_2,y_3)?

Их количество равно 3, а в математической модели сумма дисперсий 6 y-переменных y_1,y_2,y_3, y_4,y_5,y_6 равна 6. Из них первые 3 дисперсии (их доля превышает 90%) используются в модели, остальные 3 дисперсии – их доля пренебрежимо мала, не имеют содержательного смысла. Следовательно в модели могут присутствовать коффициенты(z,y)-корреляций для пар (смысл(x),смысл(y)), где смысл(x)∈{социальные, политические, культурные, экспертные}; смысл(y)∈{принуждения, влияния/давления и привлекательности}.

Три обобщенных показателя будем «рассматривать» как различные «проявления измеряеиой «силы» (ПИС) в современном мире»: «принуждения, влияния и привлекательности» [1]. («Дж. Най выделил принуждение, влияние и привлекательность в качестве равнозначных измерений силы» [1]).

В нашей модели зафиксируем соответствия имен-смслов y-переменных и «проявления измеряеиой «силы» в современном мире»:

- имя-смсл(y1)=«принуждение со стороны государства»;

-имя-смсл(y2)=«влияния/ давле ния со стороны государства»;

-имя-смсл(y3)=«привлекатель ности со стороны государства».

Полагаем, что, соответствую щие этим показате лям имена-смсли смсл(y1), смсл(y2), смсл(y3) являются семантическими переменными.

Существование реального смысла у каждой (из 3-х) выделенной семантической переменной смсл(y1), смсл(y2), смсл(y3) является необходимым условием для существования числовых значений y-переменных y1, y2, y3. Отсутствие реальных смыслов у семантических переменных смсл(y1), смсл(y2), смсл(y3) означает отсутствие модельных значений у 6-ти z-переменных z_1,z_2,z_3,z_4,z_5,z_6. Отсутствие реальных смыслов у семантических переменных смсл(y1), смсл(y2), смсл(y3) означает безсмысленность моделирования значений элементов матриц из матричного равенства $Y_{m6}=Z_{m6}C_{66}$ и матричных равенств из моделей. Без смысленных чисел в модели Хотеллинга-Жанатауова нет. Смысл каждой выделенной семантической переменной равен сумме смыслов весомых z-переменных. Весомые z-переменные (из множества { z_1,z_2,z_3,z_4,z_5,z_6}) имеют «веса», равные значениям заметных элементов $c_{kj}=corr(z_k,y_j)$ матрицы C_{66}. Весомый «вес» $c_{kj}=corr(z_k,y_j)$ (как коэффициент корреляции между j–ой y-переменной и k-ой z-переменной) умножается на изменяивость z_{ik} k-ой z-переменной со смыслом k-ой z-переменной смсл(z_k). Сумма произведений смыслов изменчивостей z-переменных на вес z-переменной.

Если не получается (из-за разделения на 4 типа смыслов 6 показателей имиджа страны) конструирование фразы смысла из смыслового уравнения смысл(y1)= смысл(z1)*c11+ смысл(z2)*c_{11}+…+смысл(z_6)*c_{61}, то находится решение системы смыловых уравнений с 3-мя неизвестными семантическими переменными смсл(y1), смсл(y2), смсл(y3), для которых в правой части уравнения присутствуют выделенные слагаемые - свои известные z-смысловые переменные с выделенными «весами». Поэтому для государства с диктаторской формой режима власти мы смогли ниже найти решение системы смыловых уравнений вида с известными z-смысловыми переменными с более заметными выделенными «весами»:

Вместо назначенных экспертом для демократичного государства значений коэффициентов (z,y)-кореляций {c43=0,3, c53=0,1, c63=0,1} (смыслы z-переменных с номерами 4,5,6, составляющие по мнению эксперта суть привлекательности демократии) **модель** вычислила дополнительно (познала еще один смысл) свои (подходяшие для демократии) приметные для демократии набор значений коэффициентов (z,y)-кореляций {c33=0.9434**,** c43=0.3, c53=0.1, c63=0.1} (нашла смыслы z-переменных с номерами 3,4,5,6). Дополнительным фактором, опознанным моделью, является смысл №3 с очень высоким «весом c33=0.9434»: смысл(z_3)=«внешняя и внутренняя политика (в т.ч. качество государственного управления)». Этот фактор при диктатуре не входит в качестве слагаемого (смотрите выше) в смысл, сконструированный выше: смысл(y_{i3})=«государство имеет имидж привлекательности: оно соблюдает на должном уровне только 5 критериев национального брендинга (имиджа страны), кроме критерия z3».

Итак, для государства с демократической формой режима власти мы смогли найти решение системы смыловых уравнений вида:
смысл(y_{i1})=смысл(z_{i1})*0.7867+смысл(z_{i3})*0.1000+ смысл(z_{i4})*0.2036+смысл(z_{i5})*0.5741;
смысл(y_{i2})=смысл(z_{i2})*0.9795+ смысл(z_{i3})*0.2015;
смысл(y3)=смысл(z4)*c46+смысл(z5)*c53+ смысл(z6)*c_{63}.

Визуализация знаний о государстве с демократической формой режима власти

Опознанная моделью зависимость y-переменной y1 от большого количества (равного 4) z-переменных z_1,z_3,z_4,z_5 с заметными «весами» c_{11}=0.7867, c_{31}=0.1000, c_{41}=0.2036, c_{51}=0.5741 соответствует реалиям демократии.

Связь между «бизнесом» (z_2) и демо-государственным влиянием (y_1= «») выразим через значение коэффициента (z_2,y_1)-кореляции: corr(z_2,y_1)=0.7. знак плюс отражает однонаправленность их действий – чем больше производит продукцию бизнес, тем больше государство взимает с него сумму налогов. Смотрите значения модельных индикаторов: c_{21}=0,c_{31}=0.1, c_{12}=0, c_{62}=0, c_{43}=0.3, c_{53}=0.1, c_{63}=0.1; corr(z_2,y_1)=0.0, corr(z_3,y_1)=0.0, corr(z_1,y_2)=0.0, corr(z_6,y_2)=**-0.0**, corr(z_4,y_3)=0.3, corr(z_5,y_3)=0.1, corr(z_6,y_3)=0.1. эти индикаторы принадлежат к типам «относящиеся к индивиду» (z_1,z_4), финансово-политической (z_3,z_2), имиджевые (z_4,z_5,z_6).

Дисперсия 1-ой y-переменной наибольшая: λ_1=3.0024, следовательно смысл 1-ой y-переменной наиболее важен и на нее влияют z-переменные с заметными «весами»:
$y_{i1}=z_{i3}$*0,7867+z_{i2}*0,0000+z_{i3}*0,1000+z_{i4}*0,2036+ z_{i5}*0,5741+z_{i6}*0,0001.

Выделив заметные «веса» имеем новое смысловое уравнение с одним неизвестным смысл(y_{i1})=смысл(z_{i1})*0.7867+смысл(z_{i3})*0.1000+ смысл(z_{i4})*0.2036+смысл(z_{i5})*0.5741 при известных смыслах смысл(z_{i1}), смысл(z_{i3}), смысл(z_{i4}), смысл(z_{i5}) 4-х z-переменных z_1, z_3, z_4, z_5. Смысловое уравнение соответствует своей математической модели $y_{i1}=z_{i1}$*0.0006+z_{i2}*0.6800 +z_{i3}*0.7000, здесь модель смоделировала значение «веса» c_{21} равным corr(z_2,y_1)=0.0, c_{31}=corr(z_3,y_1)=0.1, что означает независимость людей (смысл(z_{i1})=«люди») от «принуждения со стороны государства». Такова скрываемая властью роль людей в структуре смысла переменной y_1. Смысл переменной y_1 теперь равен сумме 3-х смыслов 3-х смыслов z-переменных: z_1, z_2, z_3, конструируемого из смыслового равенства смысл(y_{i1})= смысл(z_{i1})* 0.0006*смысл(z_{i2})*0.6800+смысл(z_{i3})*0.7000. с заметными «весами» c_{11}= corr(z_2,y_1)=0.0006, c_{21}=corr(z_2,y_1)=0.6800, c_{31}=corr(z_3,y_1)=0.7000, отражающих заметно тесную связь y-переменной y_1 (принуждающую роль государства) с z-переменными z_1,z_2,z_3 (для бизнеса, инвестиций, иммиграционного законодательства, для внешней и внутренней политик, мало заметно - для людей).

Когнитивно сложив фразы 3-х смыслов: смысл(z_{i1})*c_{11}⊕смысл(z_{i2})*c_{21}⊕смысл(z_{i3})*c_{31}, имеем фразу, выражающую смысл(y_{i1})=смысл(z_{i2})*c_{21}⊕смысл(z_{i3})*c_{31}=смысл(y_{i1})=«принуждения со стороны государства на людей (z_1), на бизнес, на инвестиции, на иммиграционное законодательство (z_2), на внешнюю и внутренную политики (z_3)». Модельно полученная после решения Оптимизационной Задачи 1 незаметная сила (c_{11}=corr(z_1,y_1)=0.0006 показывает отсутствие влияния людей (z_1) на принуждающую роль государства. Значит у диктаторского государства имеются свои органы принуждения – полиция, силовые структуры. Вывод: при диктаторской форме режима власти люди «живут сами по себе», государство – «само по себе».

Продолжим конструирование смыслов из усеченного смыслового уравнения смысл(y_{i2})=смысл(z_{i2})*0.9795+смысл(z_{i3})*0.2015. на 2-ую y-переменную y_2 влияют 2 z-переменные с заметными «весами» $y_{i2}=z_{i2}$*0.9795+z_{i3}*0.2015 (Таблица 10), с смыслами z-переменных, относящихся к менее принуждающей роли государства. Вторая y-переменная y_2 по формуле зависит от z-переменных z_2,z_3. Мы сконструируем фразу, связывающую давлеющую роль государства (левая часть уравнения) с бизнесом, инвестициями, иммиграционное законодательство, внешную и внутренную политики (правая часть уравнения). Неизвестная семантическая переменная смысл(y_{i2}) рава фразе «государство через свою внешную и внутренную политики (z_3) проводит принуждение всех к бизнесу (z_2), к инвестициям, развивает иммиграционное законодательство (z_3)». Смысл зависит от следующих 2-х z-переменных, соответствующих вычисленным по формуле $y_{i2}=z_{i2}$*0.9795+z_{i3}*0.2015, i=1,…,m.

Отметим познания работы модели. В исходных данных для y-переменных y_2,y_3 мы выделили следующие «веса» из матрицы C55 corr(z_2,y_1)=0.68, corr(z_3,y_1)=0.7, corr(z_1,y_2) =0.67, corr(z_6,y_2)=0.7, corr(z_4,y_3)=0.3, corr(z_5,y_3)=0.7, corr(z_6,y_3)=0.3. Эксперт назначил зависимость y-переменной y1 от большого количества (равного 4) z-переменных z_1,z_3,z_4,z_5 и с заметными «весами» c_{11}=0.7867, c_{31}=0.1000,c_{41}=0.2036, c_{51}=0.5741. они соответствуют своему спектру Λ_{66}=diag(2.9188,1.0204,1.0204,1.0204,0.0100, 0.0100).

Рассматриваемая нами y-переменная y_2 по словесной модели «шестигранника» Анхольта имела смысл=«страновой имидж «давления на». Наша познающая модель изменила эту фразу. Теперь, имея исходные данные, назначенные экспертом смысл(y_{i2})=«давления со стороны государства», назначенные экспертом значения c_{12}=0.67, c_{42}=0.7, c_{62}=0.7, модель заменила (вычислила) на иные индикаторы: c_{12}=0.67, c_{42}=0.7, c_{62}=0.7. Эти новые индикаторы («веса») отражают наличие смыслового уравнения смысл(z_{i1})*0.6700⊕смысл(z_{i4})*0.7000.

Соответствует ли это смысловое уравнение реальности выяснит дальнейший интеллектуальный анализ. Соответствующая

этому смыслу y–переменная y2 имеет минимальную дисперсию disp(y_2)=λ_2=1.0204.

Фраза, соответствующая сумме фраз «люди», «культура и традиции» имеет смысл «страновой имидж давления», конструируется так: «государство имеет имидж привлекательности: оно соблюдает на должном уровне только 3 критерия национального брендинга (имиджа страны). Из 5 критериев только 2 положительно и одинаково влияют (с 2-мя «весами»): смысл(z_{i1})*0.67+смысл(z_{i4})*(0.70). «Вес» c_{62}=0.0006 очень слабо влияет, но его смысл наряду со смыслами показателей №1, №4 относятся к типу «относящийся к людям и их эмоциям».

Динамика значений переменной «туризм» (z_{i6}) с «весом» c_{16}=0.0006 при диктатуре мало изменчива по тренду и не влияет на динамику значений переменной «страновой имидж давления» (y_2): это означает «в этой стрне (с демократической формой режима власти) туризм (переменная z_6) не регулируется со стороны государства: люди свободны в вопросе: хочешь заниматься туризмом или нет – это не зависит от государства (c62=corr(z_6,y_2)=0.0006). Такое отношение к туризму типично в государстве с демократической формой власти, следовательно и в этом случае наша модель правильно моделирует такую реальность.

Рассмотрим y-переменную y_3 с исходным (из смысловой модели «шестигранника») смыслом(y_{i3})=«страновой имидж привлекательности». Эта y-переменная наиболее стабильная: ее дисперсия λ3=1.0204 наименьшая, это означает устойчивость ниже перечисленных ее аддитивных смысловых факторов. Соответствующая y–переменная y3 имеет минимальную дисперсию disp(y_3)=λ_3=1.0204 . Фраза, соответствующая не сумме фраз со смыслами z-переменных (z_4,z_5,z_6), а сумме фраз со смыслами z-переменных(z_1,z_4,z_5,z_6): {смысл(z_{i1})=«люди», смысл(z_{i4})=«культура и традиции»», смысл(z_{i5})=«экспортные бренды», смысл(z_{i6})=« туризм»}.

Сумма фраз с перечисленными смыслами z-переменных (модель добавила смысл еще одной z-переменной: смысл(z_{i1})= «люди») принимает форму другой фразы, передающей смысл «привлекательности со стороны государства», конструируется так: смысл(y_{i3})=«государство имеет имидж привлекательности: оно соблюдает на должном уровне все 5 критериев национального брендинга (имиджа страны), но его внешняя и внутренняя политика (в т.ч. качество государственного управления) далеко не достигают уровней названных 5 критериев». Из 5 критериев только 4 положительно влияют через свои «веса»: z_i*0.3000+z_{i2}*0.4637+z_{i3}*0.0000+z_{i4}*(0.7000+z_{i5}*0.3000. отрицательно - один «вес» c63=(-0.3391), смысл показателя относится к типу «относящийся к индивиду». Динамика значений переменной «туризм» (z_{i6}) с «весом» c_{63}=(-0.3391) противоположна по тренду динамике значений переменной «страновой имидж привлекательности» (y_3): это означает «в этой стране (с диктаторской формой режима власти) туризм (смысл переменной z_6) не привлекателен для людей». Такое наблюдается обычно в государстве с диктаторской формой власти, следовательно наша модель правильно моделирует (познает, ибо является когнитивной моделью), правильно моделирует устойчивость (застойность) этой реальности.

После когнитивного моделирования 3-х смысловых уравнений с 6 смысловыми переменными смысл(y_{i3})= «принуждение со стороны государства на бизнес, на инвестиции, на иммиграционное законодательство (смысл (z_2)), на внешнюю и внутренную политики (смысл(z_3))». Значения «весов» (сил влияния на смысл(y_{i3})) при смыслах z-переменных присутствуют в смысловом уравнении, являются уникальными. Они вычислены в рамках данной модели и при приведенных выше исходных данных эксперта.

Смысловое уравнение смысл(y_{i3})= смысл(z_3)*0,9434⊕смысл(z_{i4})*0,3000⊕смысл(z_{i5})*(0,000⊕смысл(z_{i6})*0,1000 является приоритетным уравнением изучаемого явления. При практической значимости его параметров («весов» из матрицы C_{66}) будут правильно интерпретированы z-переменные (z_3,z_4,z_5,z_6), без которых невозможно установить смысл в смысловом уравнении.

После когнитивного моделирования 3-х смысловых уравнений с 6 смысловыми переменными наша модель познала следующие факты:

государству с демократической формой режима власти присущи «проявления измеряеиых «сил» в современном мире» делятся на 3 типа:

1) «принуждения (y_1) со стороны государства на бизнес, на инвестиции, на иммиграционное законодательство (z_2), на внешнюю и внутренную политики (z_3)» (смысл(y_{i1}));

2) «выгодная для государства политика давления (y_2) на культуру и традиции (z_4) людей (z_1), чтобы управлять их патриотическими настроениями» (смысл(y_{i2})).

3) «привлекательная политика (y_{i3}) государства для бизнеса, для инвестиций, для иммиграционного законодательства (смысл(z_2)), для внешней и внутренней политики (смысл(z_3))» (смысл(y_{i3})).

На Рисунке 6 приведено окно программы в Solver решения Оптимизационной Задачи 1.

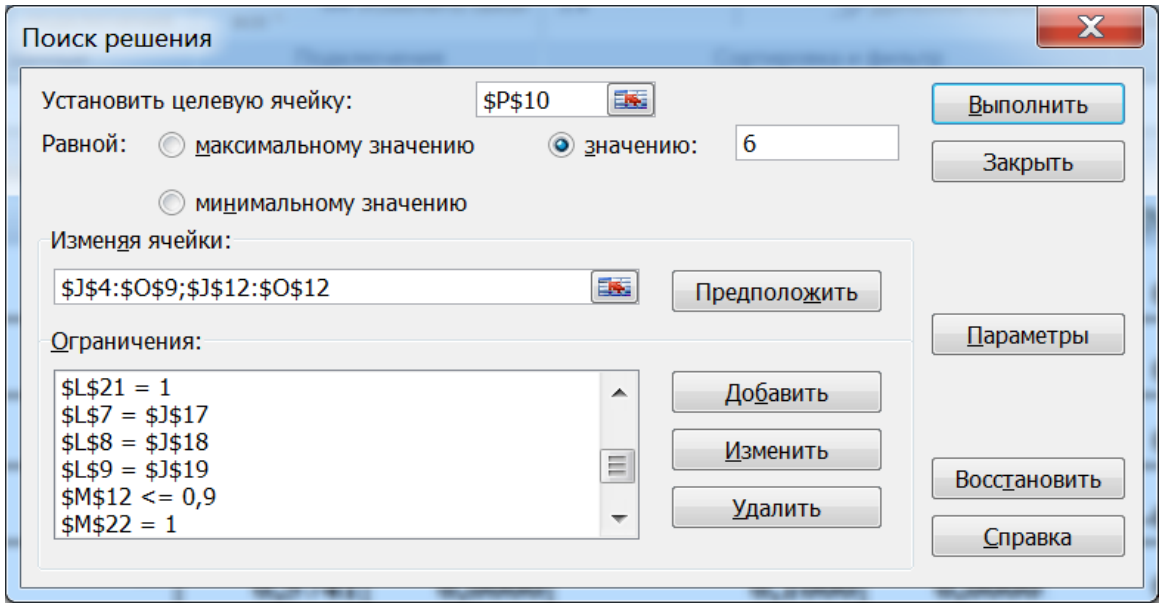

Рисунок 6.

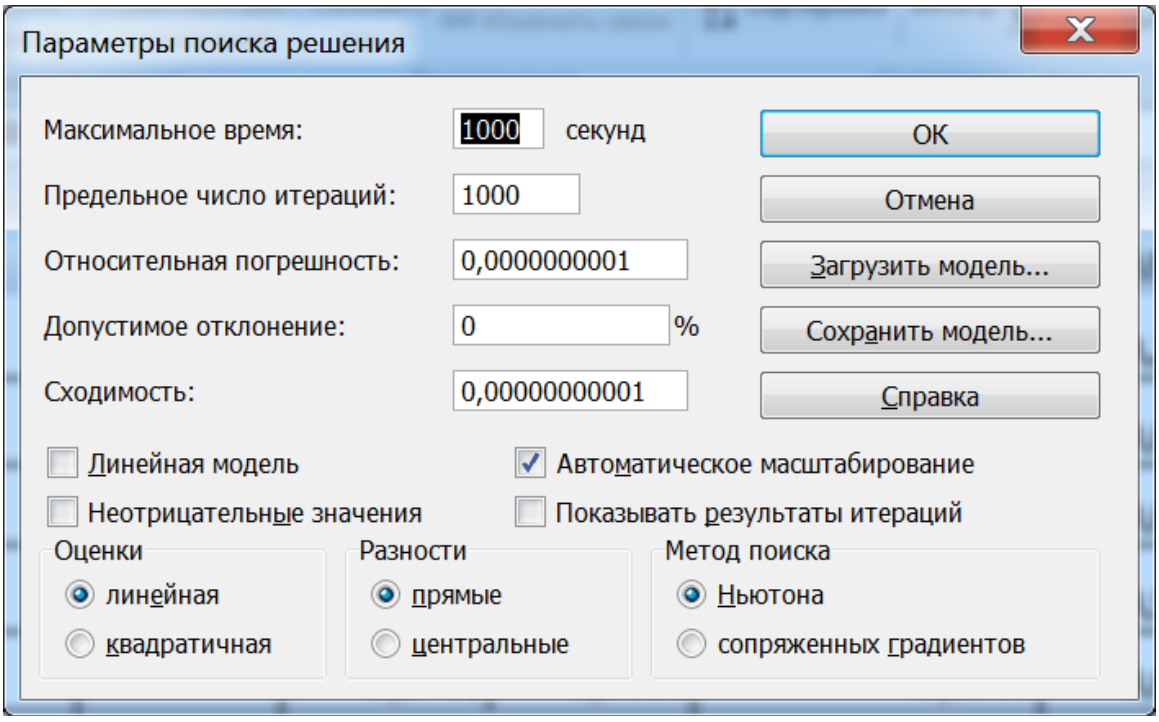

Рисунок 7.

Таблица 6. Матрица корреляций $R_{66}=\{r_{ij}=corr(z_i,z_j)\}$ (z,z)-корреляций для матрицы $C_{66}=\{c_{ij}=corr(z_i,y_j)\}$ (z,y)-корреляций при демократии

1	1,0000	1,0000	1,0000	1,0000	1,0000	0,0000
2	0,1096	0,3285	-0,2139	-0,3654	0,0000	0,0000
3	0,3888	0,0539	0,7258	0,3026	0,0000	0,0000
4	-0,6098	-0,0285	-0,6098	-0,0285	0,0000	0,0000

5	0,3026	0,3888	0,0539	0,7258	0,0000	0,0000
6	0,1096	0,3285	-0,2139	-0,3654	0,0000	0,0000

Таблица 7. Матрица z–изменчивостей Y_{m6} (при демократии)

№	y1	y2	y3	Y4	Y5	Y6
1	2,0068	0,3861	0,9738	0,6922	0,1588	-0,0558
2	-0,4856	1,6981	0,7298	-1,5686	-0,0404	0,0343
3	-2,0071	1,3308	0,6901	1,5225	0,0599	-0,0283
4	-1,0134	-0,3281	1,4083	0,1492	0,0418	0,1302
5	-1,7826	-1,1310	-1,7544	0,5411	0,1137	-0,0708
6	0,5749	1,7374	-1,5767	0,4315	-0,1424	-0,0792
7	-0,7635	-1,2121	0,7564	0,4408	-0,1509	-0,0939
8	1,6152	-1,0987	1,0008	0,0338	-0,1148	-0,0987
9	1,7933	-0,5396	-0,6439	0,1718	-0,0575	0,1971
10	2,6287	-0,1366	-0,4742	-1,3633	0,1231	-0,0841
11	0,5320	-0,1762	-0,8500	0,5711	-0,0037	0,149
12	-3,0986	-0,5302	-0,2602	-1,6221	0,0127	0,0002
	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
	3.0024	1.0423	1.0423	0.9000	0.0100	0.0100

Таблица 8. Матрица y–изменчивостей Y_{m3} показателей имиджа государства (y_1,y_2,y_3) (при демократии)

№	y1	y2	y3
5	-1,7826	-1,1310	-1,7544
6	0,5749	1,7374	-1,5767
11	0,5320	-0,1762	-0,8500
9	1,7933	-0,5396	-0,6439
10	2,6287	-0,1366	-0,4742
12	-3,0986	-0,5302	-0,2602
3	-2,0071	1,3308	0,6901
2	-0,4856	1,6981	0,7298
7	-0,7635	-1,2121	0,7564
1	2,0068	0,3861	0,9738
8	1,6152	-1,0987	1,0008
4	-1,0134	-0,3281	1,4083

Таблица 9. Матрица z–изменчивостей Z_{m6} (при демократии)

№	z1	z2	z3	z4	z5	z6	y3
5	0,8666	-0,4007	0,3906	-0,7830	0,9933	-0,0189	-1,7544
6	1,3508	-1,4267	-0,9314	0,2233	0,7902	0,0214	-1,5767
11	1,8267	0,7603	1,4065	1,0779	1,3850	0,1941	-0,8500
9	-1,8228	-0,2459	1,8124	0,6017	-1,2597	0,2882	-0,6439

10	1,0384	-2,0989	-0,0928	1,5222	0,4687	0,0000	-0,4742
12	-2,3346	-0,7352	-1,6441	-1,9964	-1,5112	-0,1026	-0,2602
3	0,3461	1,6499	-0,6146	0,7695	-0,1589	0,0669	0,6901
2	0,9872	0,4871	0,1340	-0,9330	1,0951	0,0188	0,7298
7	-0,3416	0,4980	-1,0971	0,4788	-0,7033	-0,1985	0,7564
1	-1,6149	0,5208	0,8099	-0,8859	-0,8862	0,0792	0,9738
8	1,2843	0,8521	0,5224	0,6798	0,8765	-0,1989	1,0008
4	-1,5860	0,1392	-0,6958	-0,7549	-1,0893	-0,1496	1,4083

Таблица 10. Матрица корреляций $C_{66}=\{c_{ij}=corr(z_i,y_j)\}$ (z,y)-корреляций (при демократии)

	c_1	c_1	c_3	c_4	c_5	c_6	
1	0,7867	0,0000	0,0000	0,3625	0,4896	0,0999	1,0000
2	0,0000	0,9795	0,0000	0,0006	0,2013	0,0086	1,0000
3	0,1000	0,2015	0,9434	0,0000	0,2437	0,0000	1,0000
4	0,2036	0,0000	0,3000	0,9319	-0,0005	0,0000	1,0000
5	0,5741	0,0000	0,1000	0,0000	0,8127	0,0000	1,0000
6	0,0001	0,0000	0,1000	0,0077	-0,0019	0,9950	1,0000
	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	6,0000

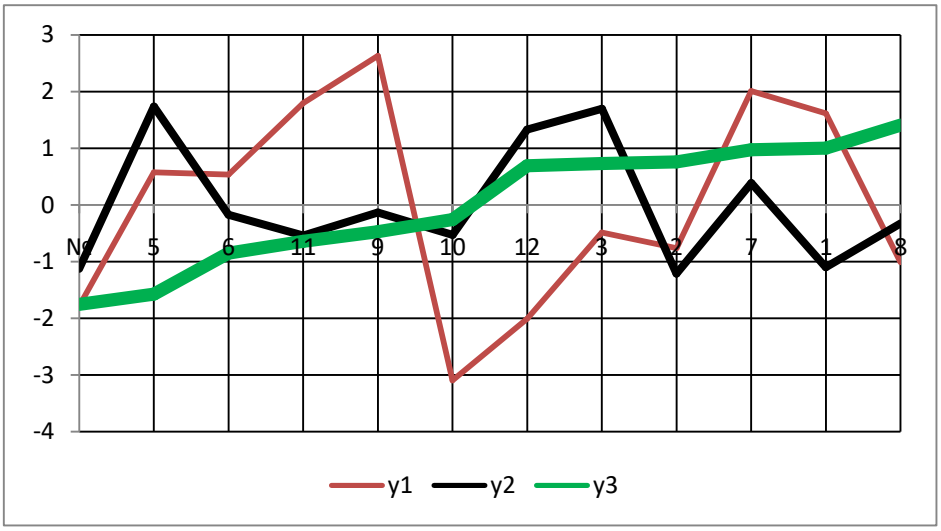

Рисунок 8.

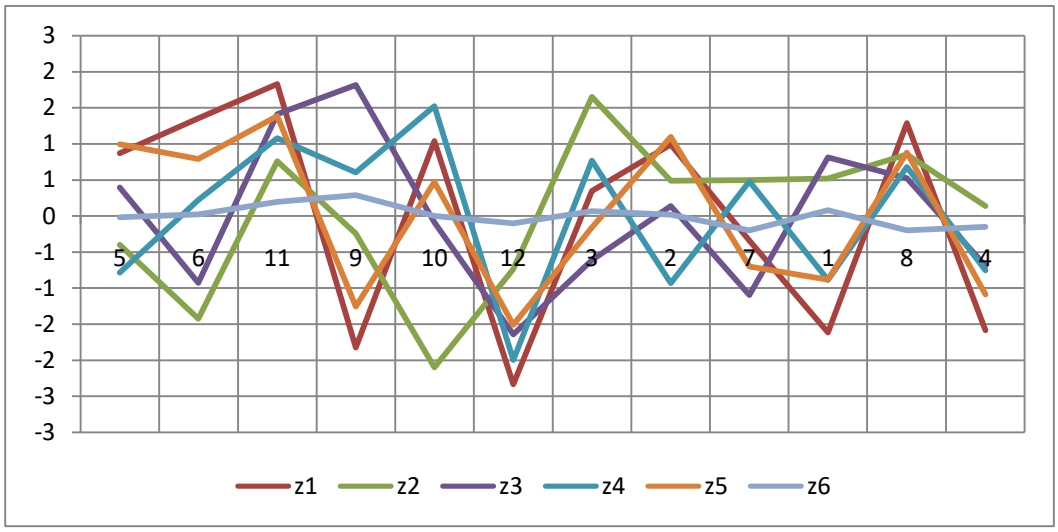

Рисунок 9.

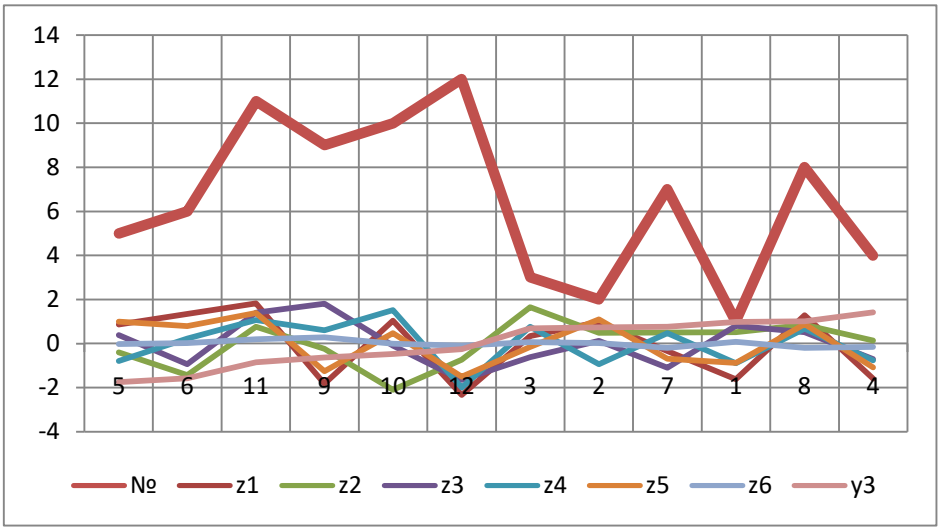

Рисунок 10.

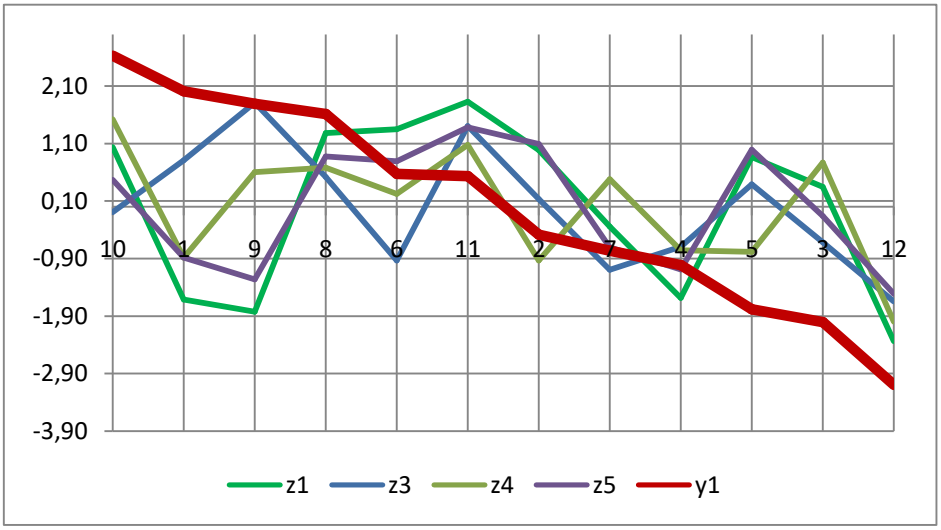

Рисунок 11.

На Рисунке 8 видна стабильность динамики кривых «y3» и «y2» (disp(y3)= 1.0423, disp(y2)=1.0423) и сильная изменчивость относительно нее динамики кривой «y1» (disp(y1)=3.0024)). Это объясняется зависимостью при демократии y-переменной y1 от 4-х (большого количества) z-переменных z_1,z_3,z_4,z_5 с заметными «весами» c11=0.7867, c31=0.1000, c41=0.2036, c51=0.5741. y1= z1*0.7867+z3*0.1000+z4*0.2036+ z5*0.5741

На рисунке 11 визуализированы модельные взаимные динамики переменных z2, z3, y1, полученные по когнитивной модели для государства с демократической формой режима власти. Кривая «y1» со смыслом смсл(y1)=«принуждение со стороны демократического государства» имеет убывающий тренд, так как сила принуждения (за счет институального развития) при демократии ослаблевает с течением времени. Дисперсия здесь λ1=3.0024>2.9188 больше, чем при «диктатуре» 1=2.9188. Визуализация динамик числовых 5 переменных, соответствуют их смыслам. Динамика кривой «y1» соответствует смысловому равенству смысл(y_{i1})=смысл (z_{i1})*0,7867+смысл(z_{i3})*0,1000+смысл(z_{i4})*0,2036 +смысл(z_{i5})*0,5741, взаимные динамики выглядят так, как показано на Рисунке 9. На кривую «y1» влияют 4 кривых «z1»,«z3»,«z4»,z5». Сильно влияют 2 - кривые «z1»,z5» со смыслами «люди», «экспортные бренды». Это принуждение богатых людей со стороны государства (при демократии). Два показателя: «внешняя и внутренняя политика (в т.ч. качество государственного управления)» (z_{i3}), «культура и традиции» (z_{i4}) слабо влияют на принуждающую функцию государства (Рисунок 11).

смысл(y_{i1})=смысл(z_{i1})*0,7867+смысл(z_{i3})*0,10 00+смысл(z_{i4})*0,2036+смысл(z_{i5})*0,5741; (1 3 4 5) здесь более выражен более сильно, чем в других диаграммах. Видна асимметричность распределения значений (z_{i2}, z_{i3}, yi1) (показателей населения при диктатуре) относительно точки 0 на вертикальной оси. Людей преимущественно принуждает диктаторское государство, это иллюстрируют отрицательные значения на графиках: выглядит на сцене - государств тянет людей.

Отклонения от нуля (z –изменчивости, y-изменчивости) изменяются в интервале (-3.5;2). При монотонном возрастающей динамике y-изменчивости y1 влияющие на нее 2 динамики z–изменчивости z2, z3, имея близкие значения (z_{i2}, z_{i3}), i=1,…,12, сильно отклоняются от нуля: 9 (из 12) значений (z_{i2}, z_{i3}, yi1) отрицательны. Фактор диктатуры: принуждение со стороны диктаторского государства смысл(y_{i2})= смысл(z_{i2})*0.9795+смысл(z_{i3})* 0.2015

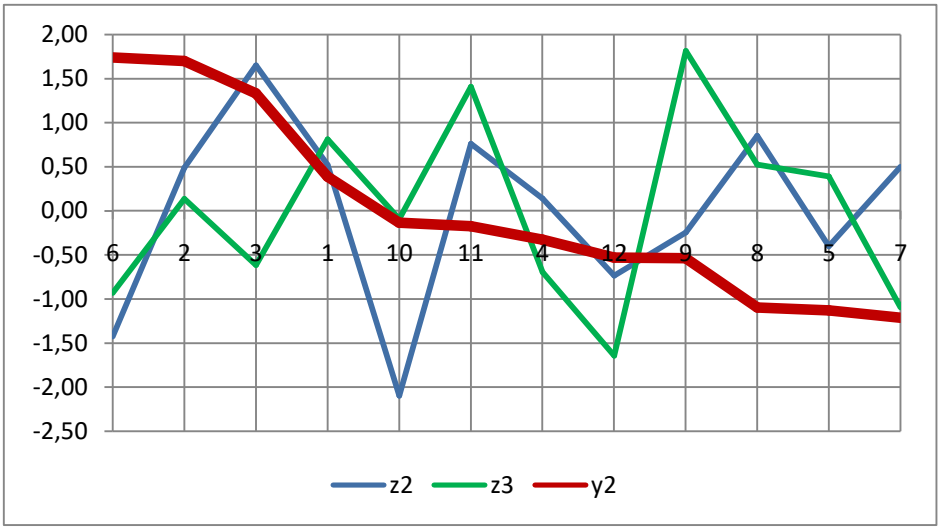

Рисунок 9.

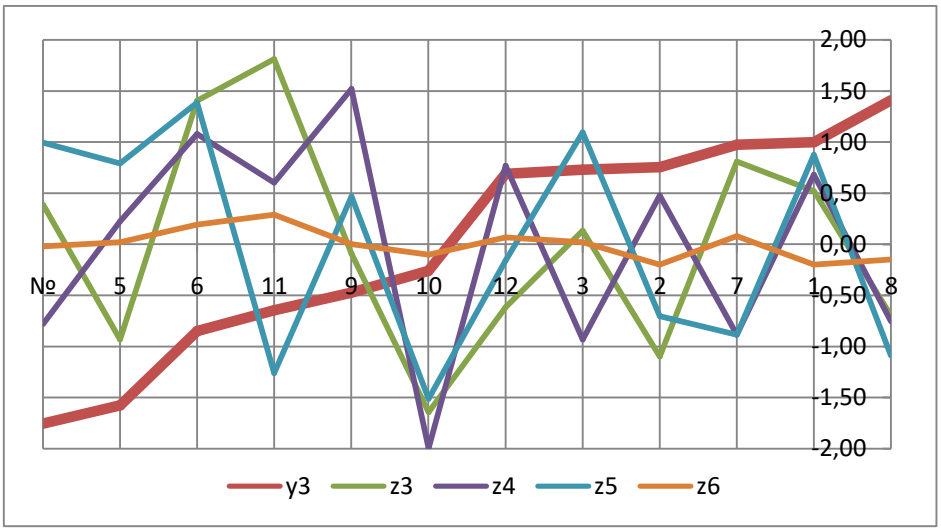

Рисунок 10.

смысл(y_{i3})=смысл(z_{i3})***0.9434**⊕смысл(z_{i4})***(0.3000**⊕смысл(z_{i5})***0.1000**⊕смысл(z_{i6})***0.1000.**

Дисперсия здесь λ_3=3.0024 >1.0423 больше, чем при «диктатуре» λ3=1.0204. Визуализация динамик числовых 5 переменных, соответствуют их смыслам. Динамика кривой «y3» соответствует смысловому равенству смысл(y_{i3})=смысл(z_{i3})*0.9434⊕смысл(z_{i4})* (0.3000⊕смысл(z_{i5})*0.1000⊕смысл(z_{i6})*0.1000, взаимные динамики выглядят так, как показано на Рисунке 10. На кривую «y3» очень влияет кривая «z3» («внешняя и внутренняя политика»), другие кривые: «z4»,«z5»,z6» - в меньшей степени, как сопутствующие основному фактору - «внешняя и внутренняя политика». Эта привлекательность государства (при демократии) ориентирована на богатых людей.

Заключение

Формализованные словесная модель, словесные ограничения, допущения, критерии, правила теории (концепции) «шестигранника» Анхольта (концепции конкурентной идентичности (competitive identity)) образуют Когнитивную Модель для «шестигранника» Анхольта. Она познает суть антаногизма диктатуры и демократии, модель вычислила, познала дополнительные знания, соответствующие заданным исходным данным. Для предметной области «политология» разработана Обратная Модель Анализа Смысловых Главных Переменных. Введены числовые параметры, смысловые переменные у 3-х многосмысловых уравнений с 9=6+3 смысловыми переменными: 6 смыслов 6-ти z-переменных и 3 смысла 3-х y-переменных. Проведена трансформация полученной системы из 3-х смысловых уравнений в систему из 3-х алгебраических уравнений с 3*(m*6) неизвестными числовыми значениями 9=3+6 видов модельных изменчивостей (отклонений от 0). Соответствие 2 видов множеств смыслов показателей, одно из них содержит управляющие показатели имиджа государства (y_1,y_2,y_3), различимо сильно влияющие на коррелированные показатели (z_1,z_2,z_3,z_4,z_5,z_6) 6-гранника Анхольта. В нижеописанной модели эксперт управляет (используя словесную модель 6-гранника Анхольта) смыслами и изменчивостями y-переменных (в пределах их исходных контекстов) y_1,y_2,y_3. Моделируемая матрица C_{66} управляет и изменчивостями коррелированных z-переменных (z_1,z_2,z_3,z_4,z_5,z_6), имеющих заданные 6 смыслов. Они - 9 показателей, являются показателями конкурентной идентичности и разделены по смыслу на виды: «относящиеся к индивиду» (z1,z4), политические(z3), финансовые (z2), имиджевые (z5,z6). Суммарный смысл той или иной суммы смыслов z-показателей равен смыслу y-показателя. Смысл y-показателя конструируется в виде фразы, передающей смыслы слагаемых фраз. Каждая слагаемая фраза равна смыслу одного z-показателя. Суммарный смысл конструируется без когнитивного диссонанса. Показано как получить модельные числовые значения каждого неизмеряемого показателя из Когнитивной Модели «шестигранника» Анхольта, сконструированной нами из словесной модели «шестигранника» Анхольта. В Когнитивной Модели для «шестигранника» Анхольта познаются величины сил парных связей для 9 показателей. Описаны соответствия политических или иных смыслов показателей конкурентной идентичности (национального брендинга) каждому математически формализованному объекту

Когнитивной Модели. Визуализация взаимных динамик z-изменчивостей, заметно присутствующих в формулах 3-х y-показателей проявления неизмеряемых (моделируемой в статье) «сил» государства и моделируемых изменчивостей 6 точек из 6 граней 6-гранника за m=12 месяцев и интеллектуальный анализ модельного решения (матриц Λ_{66},C_{66}) показал адекватность и выявили 2 цифровые резко отличающиеся фигуры диктатуры и демократии. Исходные модельные сильные или слабые корреляционные связи, исправленные моделью на новые сгенерированные связи подчинящиеся точным математическим равенствам, адекватно отражают факторы «мягкой силы» власти при диктаторском и демократическом режимах власти в государстве. Когнитивная модель «шестигранника» Анхольта наделена свойством опознавания содержательной сути диктатуры и демократии. Когнитивная модель забила гвоздь в гроб диктатуры.

Суммарные смыслы полезны для политологов новых государств. Когнитивная Модель отражает поведение субъектов «мягкой силы». «Осознаия политических изменений избирателями» и наличие 2-х видов множеств валидных показателей. Например, «национальный бренд, модель казахстанского единства – Институт Ассамблея народов Казахстана. В этом бренде больше всего идеи толерантности, единства, дружбы народов мира, несмотря на то что в Казахстане живут 134 этноса» [3]. «Новые образы, Прежние смыслы» - считают авторы статьи[3].

Предложенный выше новый визуальный образ Казахстана построен на слиянии природных красот, традиций и современных решений. Миролюбивый и прогресссивный образ вдохновит туристов на визит в страну, а инвесторов - на вложения в Казахстан»[2]. Но указанные национальные бренды, были созданы зарубежными экспертами и экспертами Казахстана в 2012 году. На этом эксперты Казахстана не остановились и дальше стараются создать свои бренды. Началом создания именно конкретного культурного брендинга является 2003 год: появляется крупная, интересная государственная программа «Культурное наследие» [13].

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