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Identification of the new research areas and development of the existing ones by methods of morphological analysis and synthesis

Abstract. The paper presents methodical recommendations on solution of problems of scientific research in the development of scientific schools, because the choice of long-term research themes is rather complicated and time-consuming process. Also, the choice of research topics is iterative. Economists can determine the direction of development of scientific research using methods of forecasting. It is topical to use the variety of heuristic forecasting methods techniques of the morphological analysis which allow structuring unquantifiable elements and to synthesize the new ones on their basis. Thus, this method effectively combines quantitative and qualitative approaches to research. The purpose of the article is the presentation of technology and the methodological recommendations for the main stages of the using of method of morphological analysis and synthesis applied to scientific research. As an object under study, we examined 29 dissertation researches developed and defended by the teachers of Southwest State University in the last fifteen years (2001-2015) devoted to the solution of problems in various object-subject areas within the scientific school, created at University. The paper proves carrying out the morphological analysis and synthesis of scientific researches on the basis of criteria of combinative and element novelty and quality criteria as well that allowed generating new directions of research and developing the existing ones.

Keywords: Morphological Analysis; Regional Economics; Novelty; Criterion of Scientific Novelty

JEL Classification: C13; C15; C51; O30

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Визначення нових і розвиток чинних напрямів наукових досліджень за допомогою методів морфологічного аналізу й синтезу

Анотація. У статті представлені методичні рекомендації з вирішення завдань наукового пошуку при розвитку наукових шкіл. Для цього пропонується використовувати технології морфологічного аналізу, що дозволяє структурувати кількісно невимірні елементи й синтезувати на їхній основі нові. Обґрунтовано проведення морфологічного аналізу й синтезу наукових досліджень на базі критеріїв комбінаційної та елементної новизни, а також критеріїв якості.

Ключові слова: морфологічне дослідження; регіональна економіка; новизна; критерії наукової новизни.

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Определение новых и развитие существующих направлений научных исследований методами морфологического анализа и синтеза

Аннотация. В статье представлены методические рекомендации по решению задач научного поиска при развитии научных школ. Для этого предлагается использовать технологии морфологического анализа, позволяющего структурировать количественно неизмеримые элементы и синтезировать на их основе новые. Обосновано проведение морфологического анализа и синтеза научных исследований на основе критериев комбинационной и элементной новизны, а также критериев качества.

Ключевые слова: морфологическое исследование; региональная экономика; новизна; критерии научной новизны.

1. Introduction. In modern conditions there is a need to enhance innovatively oriented economic activity, since, according to the world practice, the welfare of the country can be achieved only on the basis of innovative development, the main feature of which is the novelty level.

There are various approaches to the definition of novelty. Having considered the main of them, we found out that novelty is a set of criteria and properties aimed at a significant change of the object, which will allow it to be called a new one. That is why in scientific papers the main criterion of significance and relevance of the study is the novelty defining as well as its evaluation. It should be noted that this category is not only tentative but qualitative as well. And the degree of its measurement differs greatly in variability level.

There exist different approaches and recommendations for finding out a scientific novelty of the research and also for forming areas of its implementation. To identify development scenarios of the research novelty is possible by means of forecasting methods, thus, it is appropriate to use the variety of heuristic forecasting methods, one of which is the method of morphological analysis and synthesis.

The authors propose to carry out the morphological analysis and synthesis of scientific researches using the criteria of combinative and element novelty and on the basis of quality criteria as well.

To identify new research areas and to develop the existing ones, we use morphological analysis as a combinatorial method that implements the creative component in conjunction with the logical analytical approach. An application of this method also allows considering the benefits of an unconventional thinking and strict mathematical calculations.

2. Problem Statement. It is appropriate to use a variety of heuristic forecasting methods that is the method of morphological analysis and synthesis when forecasting the complex processes of formation of the new research areas for the comprehensive assessment of future development. Scientific research must possess novelty, which is a hard structured parameter, and it is not possible to evaluate it on the basis of classical statistical methods. In this case it is advisable to use the method of morphological analysis. This method aims to solve the problems that are difficult to describe with mathematical precision and it is practically impossible to quantify and evaluate.

3. Overview of the recent research and the literature. Theoretical background of morphological analysis in technology was proposed and developed by Fritz Zwicky (1969) [1] and M. Maher (1985) [2].

More recently, morphological analysis has been applied by a number of researchers in the field of policy analysis and future studies, for example M. Godet (1994) [3], R. Rhyne (1995) [4], R. G. Coyle and G. R. McGlone (1995) [5], T. Ritchey (1997) [6].

Besides, the practical aspects of an application of morphological analysis were investigated by such Russian scientists as A. Andreychikov (1997) [7], V. Odrin (1986) [8], A. Popov (1987) [9].

However, despite the fact that a significant number of scientific papers have been devoted to the study of these issues, some methodological and practical issues remain opened. Mainly they are associated with the use of morphological analysis within various topical areas.

4. The purpose of the paper. The paper aims to develop tools and methodological regulations for identifying new scenarios of research development and expanding already existing ones by using the techniques of the morphological analysis and synthesis on the basis of criteria of combinative and element novelty and on the basis of quality criteria as well.

5. Overview of the main results of the study. Economists tend to connect the novelty of scientific research with the emergence, transformation, addition and the concretization of scientific information and data [10].

According to the Government Decree of the Russian Federation «On the order of awarding of academic degrees», the term «scientific novelty» means the first detected phenomenon or fact, etc., in the meantime it must be proved that it has theoretical validity and it should be practically and experimentally confirmed as well. The solution formed by the author should be strictly reasoned and evaluated from a practical point of view. Besides, the comparison with previous results should be made [11].

In the world practice there is a concept called «an absolute world novelty of scientific idea» which is declared as an invention. Thus, the novelty is determined by giving priority to: the date of the first formulation of the idea which is claimed as an invention; the date of publication of novelty in press; the date of informing third parties of novelty by other means [12].

The main challenging issue is to identify the methodological approaches to the identification and assessment of novelty aspects, in particular when carrying out scientific research.

In the study we ran novelty element diagnostics. It allows determining a number of new systems appropriate for this class; the systems are involved in the implementation of the functional subsystems in this combination.

Earlier the authors examined possible applications of this method in this interpretation many times [13-17]. In the current work we study 29 dissertation researches (S), developed and defended by the teachers of Southwest State University (Kursk) within the economic research school created at University in the last fifteen years (2001-2015). The studies were conducted in the direction of «Economics and management of national economy» (industry, regional economics, entrepreneurship, agribusiness and agriculture). The main source of information for the research is the Russian State Library.

The logic of an original approach was to form the morphological box, to construct the relational «similarity» graph and the relational «inclusion» or graph. Regarding these parameters we grouped our study into three main areas:

- 1) analysis of the regional development specific features;
- 2) assessment of individual sectors;

Tab. 1: Efficiency evaluation based on a set of research scenario criteria

Position number	Alternative content of research scenarios			Value of the effectiveness according to the additive indicator	Rank of efficiency	Prototype matching	Value of similarity degree		Rank of similarity with prototype
							with the best (maximum)	with a rational position for the selected criteria	
1	S ₁	S ₂₁	S ₄	1,78	3	0,89	0,92	0,7	5
2	S ₁	S ₂₁	S ₅	2,33 maximum	1	0,89	1	0,7	3
3	S ₁	S ₂₁	S ₁₅	1,34	7	0,83	0,87	0,58	7
4	S ₁	S ₂₁	S ₁₆	2,03	2	0,89	0,93	0,7	4
5	S ₁	S ₂₁	S ₁₇	1,57	5	0,88	0,91	0,63	6
6	S ₁	S ₂₁	S ₂₀	1,28	8	0,88	0,91	0,63	6
7	S ₁	S ₂₁	S ₃₃	1,22	9	0,88	0,91	0,63	6
8	S ₁	S ₂₁	S ₂₄	1,53	6	0,92	0,84	0,7	2
9	S ₁	S ₂₁	S ₂₇	1,62	4	1	0,92	0,7	1

Note: S is an area of scientific research performed in framework of the university research school. It is discussed in detail in [13].

Source: Authors' own research

3) investigation of some production and agricultural enterprises.

Having compared the identified main distinguishing features we have made comparison with the rest of the group, which made it possible to formulate «new» areas of scientific research.

At the next stage we have proposed to carry out morphological synthesis using qualitative classification features, which consider the properties of individual alternatives. The advantage of these criteria is the most informative content allowing to create the original (exotic) options for research areas.

Using the morphological box developed at the previous stage, we are taking into account all selected groups and replace one of the research options with the best available. Thus, the scope of a new alternative research has been created. Table 1 represents an example of analytical calculations performed by one area of scientific research.

All positions were calculated in a similar way. The next step was to synthesize and identify scenarios and areas of the most desirable scientific research, as it is necessary for the scientific school development. Moreover, we have conducted the fragmentary research based on the importance (weight) of used criteria by the selected functional subsystems (Table 2). Feature weights were determined by analytical method of hierarchies.

Based at the identified optimum and fallback options proposed by the authors having used the matching novelty criterion, we generated new areas of scientific research and the development of existing ones.

The matching novelty criterion allows characterizing the new functional component combinations of the considered phenomenon, process, system etc. in number [17].

The components in this case are as follows:

- 1) the regional development concept, the integrated development of the region;
- 2) the control of social and economic asymmetry;
- 3) the difference in resources: integration and asymmetry;
- 4) the management of economic systems using the criteria.

The alternatives are the areas of 29 thesis works.

We have implemented the following steps of the methodological approach (it is addressed in more detail in [14-17]):

1. Considering the morphological box, we determined the number of pair-wise combinative relationship matrices (Nk): $Nk = 4(4-1) / 2 = 6$, which means that 6 matrices were required to be formed.

2. Pair-wise combinative relationship matrices were built.

3. The matching novelty criteria were calculated according to the value of which we have selected the new areas which have greater novelty.

As a result, the options having the greatest novelty are where Kn is equal to 1 or close to it, namely:

- a) «integration and asymmetry research in the field of entrepreneurship on regional markets» (Kn is equal to 0.9);
- b) «forecasting, programming and planning of integration and regional markets asymmetry» ($Kn = 0.87$);
- c) «control of social and economic asymmetry to determine the formation effectiveness and regional business development» ($Kn = 0.86$);
- d) «the social-economic asymmetry analysis while forming and developing regional business» ($Kn = 0.86$);
- e) «assessment of regional business management efficiency using the criteria and indicators» ($Kn = 0.86$);
- f) «analysis of the structure dynamics of regional business using the criteria and indicators» ($Kn = 0.86$).

Tab. 2: Sample of the selected alternatives by research areas

Functional subsystem	Characteristics of selection	Efficiency of selected alternatives	Prototype selected alternatives – continuation of similar to prototype studies	Ideal selected alternatives – subsystem scenario development	Selected alternatives in comparison with rational position			
Socially-oriented research	1, 4, 7, 11, 13, 14, 17, 18	1) Targeting management of regional social infrastructure development 2) Indicative planning of regional social development	1) Planning of small business development (by the example of social regional sector) 2) Planning of business potential in social facility sector	1) Indicative planning of regional social development 2) Trademark management of socially desirable goods 3) Planning of small business development (by the example of social regional sector)	1) Trademark management of socially desirable goods 2) Targeted management of regional social infrastructure development 3) Indicative planning of regional social development 4) Regulation of small business development (by the example of social regional sector) 5) Regulation of business potential in social facility sector			
fragmentary research based on the weights								
Functional subsystem	Characteristics of selection	Weights	Selected rational areas			Total weights by selected areas	Optimum alternative	Fallback position
Socially-oriented research	1, 4, 7, 11, 13, 14, 17, 18.	0,23 0,12 0,14 0,15 0,11 0,11 0,07 0,07	S_1	S_{21}	S_5	1,5	$S_1S_{21}S_5$	$S_1S_{21}S_{27}$
			1	1	1			
			1	0	0			
			1	0	1			
			1	0	1			
			1	0	0			
			0	0	0			
			0	0	0			
			0	0	0			
			0	0	1			
			1	S_{21}	S_{27}	1,39		
			1	1	1			
			1	0	0			
			1	0	0			
			1	0	1			
			0	0	0			
			0	0	0			
			0	0	1			

Note: Characteristics of selection are subject and object areas of scientific research by the university research school.

Source: Authors' own research

Similarly, the matching novelty criteria have been calculated considering other positions. As a result, new areas and topics of research have been determined.

By combining some of the topic options and comparing them with previous methods of calculation for further development, we have proposed the following areas of regional research: «forecasting, programming and planning of integration and asymmetry in regional business», «the control of the integration and asymmetry processes and their performance evaluation using criteria and indicators», «indicative planning of a region, an industry or an enterprise» and others.

6. Conclusions. The article presents the methodological guidelines for carrying out the morphological analysis and syn-

thesis of research. It may also help us to characterize the new combinations of functional components of the phenomenon, process, system. We have identified the aims of the morphological analysis and synthesis as:

- 1) the formation of new areas in already ongoing research;
- 2) the creation of original ideas and the development of existing ones in present or in previously developed area.

Besides, we have proved the procedure for selecting advanced studies with different conceptual novelty, but its development is a priority area in the framework of a separate scientific school. Finally, based on the analytical calculations, we have proposed new areas and themes of the research studies.

References

1. Zwicky, F. (1969). *Discovery, Invention, Research Through the Morphological Approach*. Toronto: The Macmillian Company.
2. Maher, M. L. (1985). Hi-Rise and beyond: directions for expert systems in design. *Computer-Aided Design*, 17(9), 420-427. doi: 10.1016/0010-4485(85)90289-1
3. Godet, M. (1994). *From Anticipation to Action: A Handbook of Strategic Prospective*. Paris: UNESCO Publishing.
4. Rhyne, R. (1995). *Evaluating Alternative Indonesian Sea-Sovereignty Systems Informs*. Institute for Operations Research and the Management Sciences.
5. Coyle, R. G., & McGlone, G. R. (1995). Projection Scenarios for South-east Asia and the Southwest Pacific. *Futures*, 27(1), 65-79.
6. Ritchey, T. (1997). Scenario Development and Risk Management using Morphological Field Analysis. *Proceedings of the 5th European Conference on Information Systems*, 3, 1053-1059. Cork: Cork Publishing Company.
7. Andreychikov, A. (1997). *Economy: mathematical methods for the synthesis of prognostic decisions*. Volgograd: VSTU (in Russ.).
8. Odrin, V. (1986). *Morphological synthesis systems: morphological search methods*. Preprint IR UkrSSR. 86-5 (in Russ.).
9. Popov, A. (1987). *Morphological analysis of technical objects. Methodical development of technical facilities*. Lyubertsy (in Russ.).
10. Vertakova J., & Plotnikov, V. (2013). Russian and foreign experience of interaction between government and business. *World Applied Sciences Journal*, 28(3), 411-415. doi: 10.5829/idosi.wasj.2013.28.03.1914
11. The Government of the Russian Federation (2013). *Government Decree of September 24, 2013 No 842 «On the order of awarding of academic degrees»* (in Russ.).
12. Chalenko, A. (2010). On the issue of novelty of scientific discovery in the economy. *Kapital strany (Capital of the country)*. Retrieved from <http://kapital-rus.ru/articles/article/176748> (in Russ.).
13. Kuzbozhev, E. N., Klevtsova, M. G., & Emelyanov, S. G. (Eds.). (2007). *Indicative transformation of regional economic systems: monograph*. Kursk: Kursk State Technical University (in Russ.).
14. Kuzbozhev, E. N., Babich, T. N., Klevtsova, M. G., & Sukhorukova, O. A. (2007). Application of morphological analysis for the development of regional research. *Ekonomicheskij analiz: teoriya i praktika (The Economic Analysis: Theory and Practice)*, 10, 32-45 (in Russ.).
15. Sukhorukova, O. A., Kuzbozhev, E. N., Babich, T. N., & Klevtsova, M. G. (2007). Morphology of Economic Studies (theory). *Izvestiya Kurskogo gosudarstvennogo tehnikeskogo universiteta (Proceedings of the Kursk State Technical University)*, 3(20), 89-92 (in Russ.).
16. Sukhorukova, O. A., Kuzbozhev, E. N., Babich, T. N., & Klevtsova, M. G., (2007). Morphology of Economic Research (practice). *Izvestiya Kurskogo gosudarstvennogo tehnikeskogo universiteta (Proceedings of the Kursk State Technical University)*, 3(20), 92-102 (in Russ.).
17. Babich, T. N., & Kuzbozhev, E. N. (2013). Selection of research areas by morphological analysis and synthesis. *Ekonomicheskij analiz: teoriya i praktika (The Economic Analysis: Theory and Practice)*, 19(322), 2-7 (in Russ.).
18. Kropelnitska, S. A., & Vusyatytska, M. P. (2015). Institutional and financial support innovative development of the region on the basis of cluster approach *Ekonomicheskij analiz: teoriya i praktika (The Economic Analysis: Theory and Practice)*, 3-4(2), 37-40. Retrieved from http://soskin.info/en/ea/2015/3-4-2/contents_9.html (in Ukr.)
19. Kraus, N. M. (2015). Meso-level institutional design innovation economy, fractal-facet model. *Ekonomicheskij analiz: teoriya i praktika (The Economic Analysis: Theory and Practice)*, 3-4(1), 4-7. Retrieved from http://soskin.info/en/ea/2015/3-4-1/contents_1.html (in Ukr.)
20. Plotnikov, V. A., & Zhigunov, V. P. (2014). The institutions and their impact on economic growth. *Izvestiya Yugo-Zapadnogo universiteta (Proceedings of the Southwestern State University)*, 5(56), 170-179 (in Russ.).

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