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USE OF THE MORPHOLOGICAL METHOD OF EVALUATING THE EFFECTIVENESS OF SCIENTIFIC RESEARCH AS A MODERN APPROACH TO FORMING STATE ORDERS

ABSTRACT. *Ukraine's scientific potential is recognized by the international community as very significant. The domestic system of training scientific personnel and scientific schools is highly regarded. However, according to the consolidated innovation index based on indicators of innovation activity and science intensity of production, Ukraine lags significantly behind highly developed countries.*

Studies have shown that the main reason for this is the low effectiveness of scientific research and the rather low efficiency of a significant number of scientific institutions.

Ukraine's limited resources under martial law do not allow it to fully engage in the development of new approaches. However, this topic remains relevant. There is an urgent need to search for new methods, indicators, and criteria for evaluating scientific and technical activities that would reflect the real state of the effectiveness of scientific institutions.

KEYWORDS: *scientific activity, evaluation of scientific research.*

INTRODUCTION. Ukraine is extremely interested in research conducted by scientists on issues related to the objective assessment of scientific activity. The desire to integrate domestic science into the world's leading science should be based on a comprehensive assessment of the optimal criteria for the effectiveness of scientific activity, stimulating innovation, and demonstrating the real state of science.

State innovation policy should be aimed at transforming and improving the scientific and technological sphere, using international indicators. At the same time, it is necessary to improve the components of the system for monitoring the results of scientific and technical activity in order to make rational use of Ukraine's scientific potential and orient it towards the needs of society.

MATERIALS AND METHODS. Based on a thorough analysis of the Law of Ukraine dated February 01. 2022 No. 2031-IX "On Amendments to Certain Laws of Ukraine Regarding Priority Areas for the Development of Science, Technology, and Innovation" [1] and grouping approaches to assessing the effectiveness of scientific activity in the research of domestic and foreign researchers, the author attempts to identify the most appropriate indicators for the optimal assessment of the effectiveness of scientific activity. Scientific methods of analysis and synthesis, statistical and comparative analysis, morphological grouping, graphical method, and survey method were used. The study is based on the results of a survey of scientific institutions and higher education institutions in the southern region of Ukraine.

RESEARCH RESULTS. Drawing on the experience of leading countries and analyzing their methods of evaluating scientific performance, we can identify the individual characteristics of evaluation methods that are specific to the scientific environment that has developed in each country. For comparison, let us consider the methods used to evaluate research institutions in the US, the UK, and Germany. The expert commission for evaluating institutions in the US includes representatives of leading state research organizations subordinate to the Ministry of Economy or the Ministry of Defense. The task of the experts is

to evaluate improvements in the quality of research, the possibilities for managing it, and its compliance with international standards. Based on the results, the expert commission makes recommendations on increasing investment in the project or closing the unit. The expert assessment of UK specialists is based on reputation criteria assigned to research institutions. Based on an analysis of materials submitted by institutions in the country, their scientific activities are assessed according to criteria of global, international or national impact, and a tool is created for ranking public funds to support the British scientific base. The expert assessment of German research institutions is based on the consideration of relevance and innovation, bibliometric and reputational components at the national and international levels. According to this, the special status of an institution may be lowered or raised. An institution may also be granted membership in scientific societies that are significantly supported by the state [2].

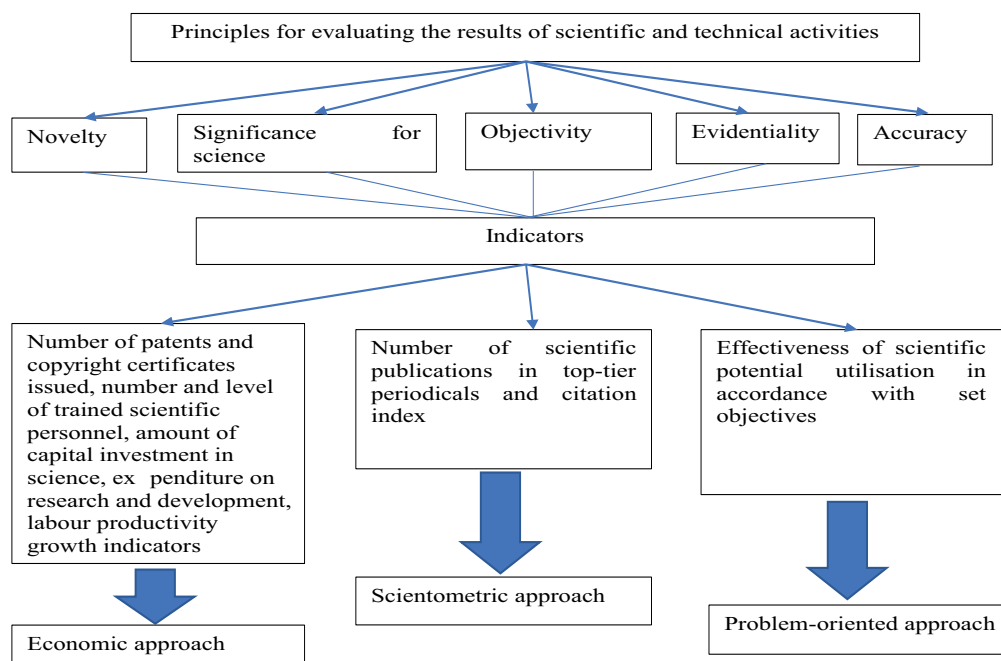


Fig. 1. Principles for evaluating the results of scientific and technical activities of scientific institutions in Ukraine
Source: compiled by the author based on [3,4]

Taking into account the experience of highly developed countries, researchers in Ukraine [3,4] have proposed principles for evaluating the results of scientific and technical activity (Fig. 1).

Existing methods for evaluating the results of scientific and technical activities make it possible to assess overall performance without taking into account the distribution of research by scientific field and priority areas of scientific and technical development and innovation. From the point of view of the new methodology, the use of the morphological distribution method can be proposed. The essence of the method is that when determining the structural nodes of the system, structural units characteristic of this node are identified. The structural units of these nodes represent functional morphological features. For each system node, a maximally informative register of specific parameters for the use of these features is compiled. To obtain the components of the system and determine their significance, a questionnaire is used in the field of scientific activity.

Respondents should be given a questionnaire that includes components that can determine the effectiveness of scientific institutions. Processing the survey results using statistical analysis allows identifying significant components of the effectiveness of scientific institutions, such as financial, human resources, patent

statistics, and others. Next, a quantitative analysis of the significance of the components of effectiveness should be carried out based on the survey data. The next step is to identify quantitative indicators and quality factors that characterise the level of performance of a scientific institution. However, the ambivalence of the concept of scientific institution performance implies only a system of indicators on which the expert assessment of the performance of scientific and technical activities is based.

The morphological distribution approach was tested by the author to assess the effectiveness of scientific research in the southern regions of Ukraine. The fundamental and applied research in 21 scientific fields presented by scientific institutions of various subordination in the Odesa, Mykolaiv and Kherson regions was correlated by the author with six priority scientific fields approved by the Cabinet of Ministers in accordance with the Law of Ukraine dated 01.02.2022 No. 2031-IX 'On Amendments to Certain Laws of Ukraine Regarding Priority Areas of Development of Science, Technology and Innovation'[1].

The survey involved 42 institutions of various subordination in the southern region of Ukraine, including 7 academic institutions (5 institutions in the Odesa region and 2 institutions in the Mykolaiv region), 24 higher education institutions (17 in the Odesa region, 3 in Mykolaiv region, 4 in Kherson region) and 11 institutions subordinate to sectoral ministries (9 institutions in Odesa region, 2 in Kherson region).

The initial information provided was analysed and summarised according to the following indicators:

- the number of fundamental and applied scientific studies provided by institutions in the southern region by field;
- the number of innovative proposals submitted by institutions in the southern region in the field of science;
- quantitative indicator of the distribution of fundamental and applied research provided by institutions in the southern region according to priority areas of science and technology;
- quantitative indicator of the distribution of innovations provided by institutions in the southern region according to priority areas of science and technology;
- novelty indicator for assessing the effectiveness of fundamental and applied research and innovative proposals in the southern region of Ukraine;
- number of patents for fundamental and applied research and innovative developments by institutions in the southern region of Ukraine;
- the source and volume of funding for fundamental and applied research and innovative proposals in the southern region of Ukraine;
- indicator of the dependence of the number of implementations on the source and volume of funding in institutions in the southern region of Ukraine;
- the number of programmes and projects in the field of international scientific and scientific-technical cooperation;
- involvement of scientific institutions in the southern region of Ukraine in scientific networks and infrastructure;
- Human resources component of institutions in the southern region of Ukraine.

This made it possible to evaluate the effectiveness of research according to its scientific direction.

CONCLUSIONS. The morphological approach is considered as a new method for evaluating the effectiveness of scientific research, which consists in identifying and subsequently generalising changes in conceptual approaches for processing and systematising research results in various fields of knowledge and allows analysing Ukraine's scientific potential in terms of current trends.

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ВИКОРИСТАННЯ МОРФОЛОГІЧНОГО МЕТОДУ ОЦІНКИ РЕЗУЛЬТАТИВНОСТІ НАУКОВИХ ДОСЛІДЖЕНЬ ЯК СУЧАСНОГО ПІДХОДУ ДО ФОРМУВАННЯ ДЕРЖАВНОГО ЗАМОВЛЕННЯ

АНОТАЦІЯ. Науковий потенціал України визнано міжнародною спільнотою як дуже значний. Вітчизняна система підготовки наукових кадрів та наукових шкіл високо оцінюється. Однак, згідно з консолідованим індексом інновацій, що базується на показниках інноваційної активності та наукоємності виробництва, Україна суттєво відстає від високорозвинених країн. Дослідження показали, що основною причиною цього є низька ефективність наукових досліджень та досить низька ефективність роботи значної кількості наукових установ. Обмежені ресурси України в умовах воєнного стану не дозволяють їй повноцінно займатися розробкою нових підходів. Однак ця тема залишається актуальною. Існує нагальна потреба в пошуку нових методів, показників та критеріїв оцінки науково-технічної діяльності, які б відображали реальний стан ефективності наукових установ.

КЛЮЧОВІ СЛОВА: наукова діяльність, оцінка наукових досліджень.