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CONDUCTING PRE-FORESIGHT RESEARCH: ORGANISATIONAL ASPECT

The growing uncertainty of economic development increases the interest in future research and its role in determining the priority areas of scientific and technological, socio-economic, regional development. Related to this is the rapid spread of the foresight practice as a process of actively learning about the future and creating a medium- and long-term vision to consolidate the efforts of all stakeholders in making relevant decisions. The scope of foresight, which is already becoming the subject of international cooperation, is also expanding. Methodological recommendations have been adopted for the EU countries to balance the countries' foresight methods when conducting strategic forecast research. Ukraine lags far behind European practices in organising the foresight process, limiting itself to individual initiatives for limited periods. The country has not yet developed the organisational methods required for full-fledged foresight research. Above all, the analysis of organisational and methodological support of the foresight process, the basic aspects of which are formed at the pre-foresight stage of the study. Therefore, the subject of the study was to highlight the organisational aspect of pre-foresight research. The purpose of this publication is a detailed study and analysis of the organisation of pre-foresight research in terms of the formation of informational, communicative, and methodological components of the pre-foresight stage, as well as recommendations for measures to improve the effectiveness of national foresight as a tool for long-term development in the country. Based on bibliographic analysis using systematic, comparative-historical, structural, interdisciplinary approaches, the foreign experience of organising pre-foresight research was generalised, the expediency of improving the information and regulatory framework for foresight research was substantiated, the scope of application of foresight-specific research and criteria were determined by stakeholders of the process, as well as methodological approaches to the formation of a combination of research methods were discovered.

Keywords: *foresight, pre-foresight research, forecasting, strategic planning, public policy.*

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ПРОВЕДЕННЯ ДОФОРСАЙТНИХ ДОСЛІДЖЕНЬ: ОРГАНІЗАЦІЙНИЙ АСПЕКТ

Зростаюча невизначеність економічного розвитку посилює інтерес до досліджень майбутнього і їх роль у визначенні пріоритетних напрямів розвитку науково-технологічного, соціально-економічного та регіонального розвитку. З цим пов'язане стрімке поширення практики форсайта як процесу активного пізнання майбутнього та створення бачення середньо- і довгострокової перспективи, націленого на консолідацію зусиль усіх зацікавлених сторін під час прийняття актуальних рішень. Розширюється також і сфера застосування форсайта, що вже стає предметом міжнародного співробітництва. Зокрема, для країн Європейського Союзу прийнято методичні рекомендації щодо збалансування форсайт-методик країн при проведенні стратегічних прогнозних досліджень. Україна ж суттєво відстає від європейських практик організації процесу форсайта, обмежуючись лише окремими ініціативами в невеликі періоди. У країні досі не відпрацьовані організаційні методики, які потрібні для проведення повноцінних форсайт-досліджень, і, насамперед, аналізу організаційно-методичного забезпечення процесу форсайта, базові аспекти якого формуються на дофорсайтній стадії дослідження. Тому предметом дослідження стало виокремлення організаційного аспекту проведення дофорсайтних досліджень. Метою цієї публікації є детальне вивчення й аналіз особливостей організації проведення дофорсайтних досліджень, зокрема, в частині формування інформаційної, комунікативної та методологічної складових дофорсайтної стадії, а також надання рекомендацій щодо заходів з підвищення дієвості національного форсайта як інструменту управління довгостроковим розвитком на вітчизняному просторі. За допомогою бібліографічного аналізу та використання системного, порівняльно-історичного, структурного, міждисциплінарного підходів, узагальнено зарубіжний досвід організації дофорсайтних досліджень, обґрунтовано доцільність удосконалення інформаційної та нормативно-правової бази для проведення форсайт-дослідження, визначено сфери застосування форсайт-дослідження, критерії відбору основних гравців і стейкхолдерів процесу, а також розкрито методологічні підходи до формування комбінації методів дослідження.

Ключові слова: *форсайт, дофорсайтні дослідження, прогнозування, стратегічне планування, державна політика.*

The growing interest among government agencies in using foresight technology in conducting forecasting research encourages studying the best practices in pre-foresight research to work out the main procedural issues of their conduct. pre-foresight research is a crucial stage of the foresight process. It carries the main organisational load, the primary purpose of which is to systematise and generalise the necessary information for conducting the foresight. At this stage, a certain sequence of actions that need to be taken in the formation of foresight is ensured, and the main issues are addressed: what tasks will be implemented in the foresight process and by what means. Currently, there is an urgent need for an explicit organisational content of such studies in Ukraine, with the generalisation of valuable international experience in conducting pre-foresight preparation of the forecasting process.

Ukraine has already had experience implementing national foresights, primarily to establish scientific, technical and innovation priorities. For the formation of priority areas for the development of science and technology during 2004-2006 and 2008-2012, two state

programs for forecasting scientific, technological, and innovative development of Ukraine were developed and implemented. As a result of their implementation, the system of scientific-technological and innovation priorities of the state was substantiated and presented (2008); and the wording of the Law of Ukraine "On Priority Areas of Innovation Activity in Ukraine"[1] was updated, with the formation of the List of priority thematic areas of research and scientific and technical development for the period up to 2021[2]). Currently, the Ukrainian Institute of Scientific and Technical Expertise and Information (UkrINTEI) is working to identify new priority areas of scientific and technological development of Ukraine for 2021–2030, which provides for foresight research in the context of compliance with global technological trends and achieving the Sustainable Development Goals in Ukraine.

In 2015–2016, the International Council for Science (ICSU) and several leading scientific institutions of Ukraine (in particular, the Institute of Applied Systems Analysis of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute") implemented a thorough foresight of Ukraine's future economy. They formed a group of scenarios for the socio-economic development of Ukraine up to and including 2030. The authors of the study chose the Concept of Sustainable Development as the general methodological framework of their research. At the same time, researchers emphasise the difficulties in translating the methodological framework of the Concept of Sustainable Development into the empirical plane and note that one of the important problems in implementing this concept is "forming a measurement system (metrics) for quantitative and qualitative assessment of this extremely complex process" [1, p. 21].

The peculiarity of the foresight "Economic Strategy of Ukraine 2030", developed in 2020 by the staff of the Ukrainian Institute of the Future, is the formation of a strategic vision for the future development of Ukraine as an influential regional entity, consistent, independent in making economic and geopolitical decisions, will allow the global situation, with a high quality of life of citizens" [2].

Foresight research has not yet become a document that would perform the functions entrusted to foresight in developed countries – the focus on the use of their results by decision-makers at the state level, develop and implement practical measures to approximate selected strategic guidelines. Single developments of long-term forecasts are not considered in decision-making. Thus, Ukraine needs a more consistent and comprehensive approach to foresight research as a systematic process that requires careful planning and organisation.

Today, the main issues regarding the organisation of the foresight process are widely covered in the works of both foreign and domestic researchers. A review of the foresight literature reveals that foresight research is standard in many countries. Moreover, international cooperation between the countries in the field of foresight has already begun. In

[1] Law of Ukraine "On Priority Areas of Innovation Activity in Ukraine" of 08.09.2011, No. 3715-VI. URL: https://zakon.rada.gov.ua/laws/show/3715-17#Text

[2] Resolution of the Cabinet of Ministers "On approval of the list of priority thematic areas of research and scientific and technical development for the period up to 2021" of 07.09.2011, No. 942. URL: https://zakon.rada.gov.ua/laws/show/942-2011-%D0%BF#Text

particular, the World Federation for Future Development Studies and the Association of Professional Futurists are developing materials related to developing a joint policy. Methodical recommendations for the countries of the European Union on balancing foresight methods of the countries at carrying out strategic forecast research are accepted. Ukraine lags far behind European practices in organising the foresight process, limiting itself to individual initiatives in short periods. The country has not yet developed the organisational methods required for full-fledged foresight research.

The novelty of this study is to highlight the organisational aspect of pre-foresight research in the development of scientific and methodological foundations of the national foresight forecast, which in addition to much in common with technological and industry foresight, have their characteristics, in particular, such elements as information and analytical support; formulation of goals and objectives that are formed at the pre-foresight stage; substantiation of the choice of the most effective set of methods for conducting foresight research; study of the principles of selection of stakeholders.

The purpose of the article is a detailed study of the organisation of pre-foresight research, in particular, in terms of the formation of informational, communicative and methodological components of the pre-foresight stage, as well as recommendations for measures to improve the effectiveness of national foresight as a tool for managing long-term development. Methods of system analysis, comparative-historical, structural, interdisciplinary approaches, and bibliographic analysis on improving practical methodological and practical tools are used at the stage of pre-foresight research. In particular, the method of systems analysis was used to select appropriate tools for foresight research and its connection with a set of specific methods, which allowed to obtain objective knowledge about the organisation of pre-foresight research in Ukraine and the world. The comparative-historical method allowed us to investigate the kinship and differences in the combination of the main foresight methods when considering foreign practice and substantiating the possibilities for their use on a national basis. The application of the structural method contributed to the structuring and systematisation of information to ensure the organisation of the pre-foresight stage. The method of bibliographic analysis was used in the bibliographic search and analysis of scientific data to reflect the methodological aspects of the organisation of pre-foresight research in foreign and domestic scientific literature and scientifically sound selection of sources in the specific context of research.

Comparison of foreign and domestic experience in foresight research showed the lack of theory and practice of developments in the organisation of the process; there is a question of a comprehensive approach to organising pre-foresight research to improve the functioning of the research platform. The main factors influencing the quality of the preparatory stage of the foresight are identification of features of formation and systematisation of information and legislative and regulatory support necessary for the national foresight; selection of a practical set of research methods and determination of the necessary tools; improving the interaction between the main stakeholders involved in the foresight study.

In today's world, characterised by the high dynamics of change and unpredictability, the practice of foresight research is becoming more common and covers more areas of application. Based on foresight, medium- and long-term forecasts of science, technology,

individual firms, industries, markets, sectors of the economy, regional and national economies are developed, and the general foresight is becoming more popular, covering socio-economic and socio-political aspects of development. According to foresight, today, scientific, technological and innovative development programs of the world's leading countries are being formed and such international research programs as the European Union Framework Programs for Research and Technological Development.

The importance of foresight research is growing during periods of vital turning points in the structure of the national economy due to global demands for a new level of technology, digitalisation of many sectors of the economy, new global challenges and threats and shocks of uncertainty (for example, economic consequences of COVID-19).

Foresight research in different countries is based on different methodological and organisational principles. World experience of foresight application shows that the range of techniques, methods, and tools of foresight research is quite broad and can differ significantly, depending on the purpose, scope, chosen period, etc. In addition, the approaches and system of methods of compiling foresight, for example, economic or sectoral in a particular country, may be different. They can also change over time, as foresight itself is constantly evolving as a concept of prediction.

This applies to all major formation stages of foresight, which are traditionally distinguished by three:

– pre-foresight stage;

– foresight (foresight stage);

– post-foresight stage.

Summarising the international experience in the development of foresight, it should be noted that there is no general scheme of organisation and management of the formation of foresight or regulation of its stages. Each specific foresight must have its unique regulations, a unique combination of approaches and methods, depending on the object, goals, period, and other specific circumstances. The effectiveness of the formation of foresight and its effectiveness depends on the adequacy of their selection. At the same time, certain general frameworks are inherent in any foresight research, within which unique regulations are formed, depending on the type of foresight, its goals, expected results, and so on.

Foresight's goals can be general – to determine the direction of development; determination of development priorities and priority areas; formation of guidelines for the development of forecasts and strategies; increasing the involvement of state institutions, business, scientists and educators, civil society in determining development guidelines; advocacy of essential problems of development and creation of advocacy coalitions; communication and consensus building in the vision of development prospects and ways to achieve the desired future. At the same time, they need to be adapted to the specific context of the country and the relevant goals and objectives of foresight. They also form the appropriate requirements for the goals, objectives, and methods of the pre-foresight stage.

Thus, among the tasks of foresight research to predict the future development of Ukraine's economy can be identified: 1) promoting the institutional capacity and inter-institutional cooperation to ensure joint agreed solutions and readiness for national and global challenges; 2) ensuring structural transformations in the economy following future

technological trends to ensure its high competitiveness and export competitiveness; 3) increasing welfare and improving the quality of life. Accordingly, the implementation of the main goals and objectives of the pre-foresight stage, including the selection of key players, stakeholders, experts, the selection of a combination of methods and the definition of resources, will be different. Thus, in the first case, among players and experts, preference will be given to representatives of state institutions (main sponsors); in the second – business, in the third – the widest possible involvement of civil society.

The assessment of the current practice of foresight forecasting shows that the main tasks of goal-setting, which are solved by the executive authorities within the expert assessment of foresight projects, include: analysis and formation of the legal framework that ensures the goal-setting procedure; development of scientific and methodological support; organisation of the expert group and evaluation of results [3]. Therefore, in the future coverage of issues related to determining the implementation of goals and objectives of the pre-foresight stage (study of information and regulatory support of its implementation, determining the scope of foresight research, key players and stakeholders, methodology for forming a combination of research methods) for the most typical cases.

Determining the information and regulatory framework for foresight research. The long absence of relevant long-term forecasts of socio-economic development and science and technology in the country, which consider the main objectives of its socio-economic growth, as well as its place in the global division of labour, indicates the need to improve approaches to long-term forecasting in Ukraine, in particular the strategic prediction of its progress. Having studied the information sources and assessed the existing legal framework[3] [3; 4], it was found that the relevant database of documents analysed at the pre-foresight stage of the study should be formed from:

– foreign and domestic sectoral and macroeconomic forecasts, in particular, forecasts of socio-economic development in general, surveys, results of foresight and other documents developed by international, sectoral and analytical organisations, public authorities;

– documents of the state strategic planning in various spheres of economy, in particular in the scientific-technological and innovative sphere, and also normative-legal documents in the field of technological forecasting and subject area of research;

– action plans developed by dedicated ministries (*Strategic Action Plan of the Ministry of Economy, Trade and Agriculture of Ukraine for 2020–2024, Action Plan of the Ministry of Ecology and Natural Resources of Ukraine for 2019–2021, Strategic Action Plan of the Ministry of Finance of Ukraine for 2018–2021* etc.);

– national, sectoral and industry-specific documents of strategic planning (*Strategy for the development of innovation for the period up to 2030, the National Strategy for Education in Ukraine until 2021, the State Strategy for Regional Development for 2021–2027, the Strategy for Sustainable Development "Ukraine – 2020 ", The National Economic Strategy*

[3] Draft Law of Ukraine "On State Strategic Planning". URL: https://me.gov.ua/Documents/Detail?lang=uk-UA&id=e7b8af7a-7c03-4d5b-aaa5-e1c0d7e84388&title=ProektZakonuUkrainipro%20Derzhavne StrategichnePlanuvannia; Law of Ukraine "On priority areas of development of science and technology" of 11.07.2001, No. 2623-III. URL: https://zakon.rada.gov.ua/laws/show/2623-14#Text

for the period up to 2030, the Energy Strategy of Ukraine for the period up to 2035 ("Security, energy efficiency, competitiveness", the Export Strategy of Ukraine ("road map" of strategic trade development) for 2017–2021, etc.);

– documents of corporate strategic long- and medium-term development planning of leading enterprises of industries/sectors of the economy (in particular, technological roadmaps, white papers, strategies, investment development programs);

– general schemes of location and development of productive forces of Ukraine, the rise of sectors of the national economy and economic industries.

When carrying out preparatory work for foresight research, one of the key tasks is collecting, processing, and systematising information. The collected data must have high accuracy, reliability, and completeness. On its basis, it is possible to identify long-term problems, needs and challenges, development trends, and assess development in terms of economic, social, political, technological, scientific, environmental, and other processes, resource opportunities. In particular, when compiling a technological foresight, the structure of information sources used to form the information base at the stage of pre-foresight research should be presented as follows [5]:

– initial documents:

– published documents (official, instructional, directive; statistical information; periodicals; patent documentation; normative and technical documentation, branch strategies and programs of science and technology development, etc.);

– unpublished documents (reports on research and development work; dissertations; reports of line ministries; reports of sectoral organisations and associations, development institutes in the field of science, technology, research and development; preprints);

– secondary documents: reference information publications, analytical reviews and reports, abstract reviews, bibliographic reviews, abstract journals and collections, bibliographic directories.

An important role in the preparation of thematic foresight research is played by the study and use of foreign and domestic statistical databases; foreign and domestic state, international patent databases, information retrieval systems in the patent sphere; bibliometric information resources (abstract databases of scientific citations and full-text databases of scientific publications, as well as systems of analysis of large scientific data); databases of retrospective and forecast values of quantitatively measured indicators; materials of thematic conferences, exhibitions, seminars, round tables and other events that will help to form a holistic view of project participants about the nature and main objectives of the study and to describe the subject area of the study. Given the rapid development of digital processes in the world and the need to meet the urgent demands and challenges of today, foresight should cover modern information systems and advanced technologies for collecting, aggregating and processing data and information, including Big Data and Artificial Intelligence.

Determining the scope of foresight research, key players and stakeholders, and the nature of the expected results.

Defining the scope of foresight is following its objectives. To set goals, it is necessary to answer two basic questions: what are the main problems and challenges for the future

development of the country's economy in the long run (respectively, the time horizon – until 2050) and how foresight research can help solve them?

Determining the scope of foresight is a long and complex process: interviews, discussions, questionnaires, literature reviews. The very potential variability of opportunities and areas of its application requires constant clarification and specification in the study process. At the pre-foresight stage, the discussion on the scope of foresight research should be relevant to assumptions about the interests of sponsors and stakeholders.

If we consider foresight research as a process that supports the development and formation of state economic policy, it can be used to:

– bringing together a wide range of stakeholders and encouraging their interaction, networking and training;

– study of trends, driving forces of development and possible challenges and threats, which allows forming economic policy, given the existing problems and anticipation of future needs;

– research of alternative scenarios of economic development, which will allow to make more reliable decisions and form a common vision based on consensus;

– transition to active formation of the future;

– mobilisation of stakeholders to implement effective policies based on common approaches.

The communicative component of foresight is the most effective tool for strengthening the position of certain communities. Thanks to it, it is possible to direct the activities of organisations in the right direction and focus the attention of project participants on the necessary points. Communication allows you to organise research participants and set specific goals and objectives. The first step in organising a foresight survey is to identify sponsors, as it requires significant resources. In this case, the sponsor, in addition to a high motivation to conduct such a study, must meet the following criteria:

– be financially capable enough to cover a significant part of the project budget or able to attract funds from other sources;

– be stable enough not to jeopardise the implementation of the study and ensure the maintenance of a high level of interest in it;

– be institutionally strong enough to ensure the implementation of the results of foresight research;

– have a clear understanding of what foresight will contribute to achieving its strategic goals and realistic expectations.

As the foresight study on the long-term development of the country's economy is a foresight project at the national level, its main actor and sponsor should be the government (through the relevant ministry). For this type of foresight, the government is expected not only to make a major contribution to the provision of financial resources but also its political will to conduct foresight research. Without the government's interest, it loses its meaning because only the government is institutionally strong to ensure the implementation of its results, while financial resources can be attracted from other sources.

The main sponsors (players) are regional authorities, whose role in building the economy in a decentralised environment is constantly growing. Sponsors can also be

industries, companies and associations. However, they have a slightly narrower focus of interests; for them, such components of foresight as the development of key market segments and technological guidelines are important.

Stakeholders should include everyone who should be involved in the formation of foresight. Typical stakeholders in foresight are the government, industry, academia (scientists and scientists), NGOs, trade unions, the media, banks, political parties, and more. All major government agencies, the private sector, trade unions and other organisations and associations should develop the strategic vision. They should be selected based on their contribution to the foresight process (managing change in their institutions, influencing policymakers, promoting implementation, etc.). Public dialogue should be as broad as possible. As already mentioned, their structure depends on the chosen sector, goals, and topics, so it is important to discuss certain issues (problems, goals, methods) and use quality foresight methods to form groups of stakeholders of the appropriate composition as experts.

The main universal principle of the selection of stakeholders is consistent selection according to the relevant criteria. You can start with leading scientific and research institutions, government agencies, NGOs, industry, and other professional associations. In the future, the selected stakeholders can recommend additional institutions, educational institutions, chambers of commerce, representatives of small and medium enterprises, political parties and public figures, regional associations, and unions, etc. At the same time, it is important to provide adequate institutional and regional coverage for foresight's goals and objectives.

The general algorithm of a choice of stakeholders consisting of two stages is developed by world practice. At the first stage of selection, it is necessary: to make a clear idea of who should participate and who should not be among the stakeholders, who should be included in their composition, what are the expectations of stakeholders from considering the problem / applying the foresight method; assess the possibility of a conflict of interest (comparing the goals of stakeholders and the goals of the task to be solved), whether the participation of stakeholders is conscious and whether there is a possibility that they may create problems in the research process.

The expected results should also be specified in the technical task of the foresight study, and their nature will depend on the chosen goals and objectives. Foresight research can be process-oriented and provide interaction between different groups of sponsors and stakeholders, reconciling their interests to form a shared vision of the desired future and tools to achieve it, remove barriers between ministries and departments and develop more integrated approaches to public economic policy. Alternatively, it can be product-oriented and get a specific result (for example, in the form of a list of promising technologies, necessary skills and abilities, priority areas, etc.). In any case, it is necessary to form a kind of “road map”, which should be spelled out options for action and the possible consequences of using foresight by all stakeholders. As the expected results of a foresight study, not only certain information about the future should be offered, but it should also motivate certain actions, and specific tools should be offered that will allow the government and other stakeholders to solve long-term planning tasks in conditions of uncertainty and dynamic

change, decision-makers to influence and shape events in the long run in a way that best suits the interests of the state and its citizens. In this case, the resources spent on the study will not be in vain, and its efficiency will be high.

Selection of key players, stakeholders, and the basis of interaction between them. No less important in the organisation of the foresight project are human and institutional resources. Much attention is paid to selecting experts involved, who should have interdisciplinary competencies and extensive professional experience in relevant fields. For the initial stage of foresight organisation in the country, it is necessary to have a circle of experts in foresight or future research, able to implement the project based on their competencies and available information, and promote awareness and interest in such research. At the pre-foresight stage of the study, both domestic and foreign specialists should be involved in forming the pool of experts (if necessary).

Anticipation requires a multidisciplinary approach when it comes to solving complex problems. Researching future trends requires multiple interactions with people and experts from different fields of knowledge. This approach and new technologies allow for a greater exchange of ideas and higher coordination between different institutions.

It is difficult for policymakers to reach a consensus on short-term goals, but they can explore common goals for the future. When discussing long-term goals, the dialogue of society, business and other stakeholders with the government becomes more open and relaxed, and the broad involvement of all categories of foresight participants increases the degree of consistency of decisions and reduces polarisation of views.

According to world practise, foresight research requires the establishment of appropriate basic structures and institutions, particularly, centres of competence in the field of foresight, which would unite national experts to work on foresight projects, disseminate information about them and perform educational functions. In the United Kingdom, such centres are the SPRU's Science and Technology Policy Research Division and the PREST Engineering, Science and Technology Research Division at the University of Sussex and the University of Manchester. There is a need for organisations that constantly monitor news and changes in various areas of socio-economic and scientific and technological development, such as the previously mentioned British horizon scanning system (HSC at the Ministry of Business, Innovation and Skills), or a similar German system tracking (Monitoring system) [6].

Methodology of forming a combination of research methods. When choosing a methodology for forming a combination of research methods, it should be borne in mind that foresight differs from forecasting in several respects. Foresight research is network-based and involves a wide range of stakeholders. In addition, foresight research is carried out through a holistic analysis that goes beyond typical forecasting. Foresight research combines a significant set of qualitative and quantitative approaches and provides a link between reflection and action.

The appropriate methodology is a key decision of the pre-foresight stage for conducting foresight research and depends on several factors. The general methodological framework should combine methods that would be relatively easy to use and, at the same time, should provide an adequate evidence base. Typically, the foresight research methodology involves

analysing trends and drivers, which in combination with the regulatory approach form the basis for scenario development and tools for visualisation and road planning. Table 1 shows a number of the most common methods used in the construction of foresight.

Table 1

Basic methods of foresight research

Name of the method	Types of methodological distinctions									
	orientation		method of evaluation			source		kind		
	search engines	program-target	quantitative	qualitative	mixed	expert	analytical	extrapolative	creative	priority
Backcasting		x		x		x			x	
Brainstorming	x			x		x			x	
Citizens panels	x			x			x		x	
Workshop	x			x			x		x	
Scenario technique	x			x		x			x	
Expert panels	x			x		x			x	
Genius forecasting	x			x		x		x		
Interviews	x			x		x		x		
Literature review	x			x			x	x		
Morphological analysis		x		x		x				
Relevance trees		x		x					x	
Acting	x			x					x	
Scanning	x			x						
Simulation gaming	x			x			x	x		
SWOT analysis	x			x			x			
Weak signals	x			x			x	x		
Wildcards	x			x			x	x		
Benchmarking	x		x				x			
Bibliometrics	x		x				x	x		
Time series analysis	x		x				x	x		
Modelling		x	x				x	x		
Patent analysis	x		x				x	x		
Trend extrapolation	x		x				x	x		
Cross impact analysis	x				x		x	x		
Delphi	x				x	x		x		
Critical technologies	x				x		x			x
Multicriteria analysis	x				x		x	x		
Road-mapping	x				x		x	x		
Stakeholder mapping	x				x		x			x
Futures workshops		x		x		x			x	
Robust portfolio models	x				x		x	x		

Source: [7].

In 2007, R. Popper, M. Keenan, I. Miles, M. Butter, G. Sainz de la Fuente mapped the methodologies of foresight [8], which was continued by other researchers and is now widely used in the practice of foresighting.

The combination of methods and tools used in modern foresight research can vary. Since the peculiarity of foresight analysis is the combination of expert-conceptual work with the promotion of a positive scenario of the future in real practice, a specific set of methods and tools cannot be regulated. At the same time, practice shows that there are the most common combinations of methods. According to Global foresight outlook 2007, the most common is the following combination of key foresight techniques:

– if the key method is "expert panels", it is combined with the method of "brainstorming" in 27% of cases; from the "workshop of the future" – 34%; with "literature review" – 65%; with "scenario technique" – 34%;

– if the research is based on the method of "workshop of the future", it is combined with the method of "brainstorming" in 32% of cases; from "expert panels" – 64%; with "literature review" – 61%; with "scenario technique" – 41%;

– when the study is based on the method of "literature review", it is combined with the method of "expert panels" in 57% of cases; from the "workshop of the future" – 28%; with "scenario technique" – 41%;

– if the central method is "SWOT-analysis", it is combined with the method of "brainstorming" in 52% of cases; from "expert panels" – 66%; from the "workshop of the future" – 33%; with "literature review" – 70%; from "questionnaires and observations" – 28%; with "scenario technique" – 42%;

– if the key method is "Delphi", it is combined with the method of "brainstorming" in 42% of cases; from "expert panels" – 61%; from the "workshop of the future" – 25%; with "literature review" – 61%; with "scenario technique" – 38%; with "key technologies" – 28%.

Thus, when constructing a foresight study, the practice of combining techniques should be considered to some extent.

At the pre-foresight stage, high-quality research methods predominate, while "literature review" and "scanning" are important and widespread. In particular, the "scanning" method is a systematic study of potential threats, opportunities and probable future events that are on the verge of modern thinking and planning. The scan can explore new and unexpected problems, as well as persistent problems or trends. The scan focuses on current trends and challenges, identifies new challenges, and approaches, and helps identify and identify existing best practices in policy approaches while exploring and proposing creative and new strategies and actions. The key elements of scanning are scanning focus, timeliness, accuracy, discussion, and presentation. Scanning involves the systematic collection, analysis, and information related to a research problem to develop scenarios, visions, and planning solutions. The scope and depth of scanning activities depend on the context, including the funding available and the requirements for those carrying out the activity.

The purpose of scanning in the pre-foresight stage of foresight research may be to identify scientific and technical, economic, social, and political trends and events important for public policy and identify potential threats, opportunities, and necessary changes in public policy related to these trends. Scanning trends and drivers of economic development

may include demographic change, migration, employment and unemployment, skills and qualifications, structural changes in the economy, new sectors of the economy, leading and new technologies, digitalisation and informatisation, science, technology and innovation, natural resources, ecology and sustainable development, SMART specialisation, globalisation, etc. Ideally, such a scan should be performed on an ongoing basis. To this end, appropriate institutional support should be established, such as the British Horizon Scanning Centre, supported by the UK Government, or the European Foresight Platform (EFP).

Based on the experience of foresight in developed countries and to create appropriate conditions for the practical transformation of foresight into an effective tool of domestic socio-economic, scientific, technological, and regional policy, focused on the long term, it is advisable to take the following measures to improve pre-foresight research:

– ensuring the development of modern technologies for obtaining and processing expert information, as well as technologies for assessing the accuracy and consistency of all available expert assessments, given the scale of the forecasting object and the heterogeneity of the expert environment, involving a significant number of experts and specialists;

– formation of a database of experts, which will contain the collected information about all available and potential specialists with its constant updating and clarification after the next foresight study;

– creation of organisations that will constantly monitor changes in the world of science and technology disseminate information about them among stakeholders (in the experience of leading European countries, where this role is performed by the so-called horizon scanning centres established under the UK ministries (HSC) and Germany (Monitoring System));

– establishing (to comply with the principle of transparency in the organisation of foresight events and strengthening trust between stakeholders) a clear mechanism for selecting participants, clear formulation of foresight goals, criteria for selecting development priorities or analysis of progress in certain areas of science in the country and explaining motives decisions made in the context of foresight projects. In this context, the capacity of parliament and government to participate in foresight should be enhanced (with comparisons with the United Kingdom, where each round of the UK Technology Foresight Program (UK TFP) provided a formal government and parliamentary opinion on prospects for project continuation);

– standardisation of the legal framework, development and approval of regulations, bylaws that will facilitate strategic research in Ukraine and address issues such as the development of models of future development, justification of national (national) and regional development programs and forecasts for their implementation, identification of future directions and formation of a system of goals following the strategic vision of Ukraine's development, solving the most pressing problems of the state and finding possible ways to solve them, etc.

Conclusions. Today's role of foresight as a universal tool for long-term development management is growing. An important requirement for its organisation in Ukraine is compliance with European trends in predicting the future, adaptation of foreign experience,

attracting its potential (information, economic, technological, innovative) for its execution and implementation.

Global practices show that in the organisation of pre-foresight research, an important role is played by the active shaping of the future and concentration in the long term, creating a wide network of participants, providing a comprehensive solution to the problem through systematic and multifaceted expertise, a consensus of stakeholders, maintaining common methodology of foresight research by all project participants, constant interaction with the public.

International experience in organising the foresight process shows the feasibility of widespread use of combinatorial available quantitative and qualitative tools and methods: brainstorming and organisation of expert panels, bibliometric and patent analysis (based on licensed and open resources of peer-reviewed information), time series analysis, trends and drivers, trend extrapolation, economic-mathematical modelling, literature review, stakeholder analysis, SWOT, PEST analysis, Delphi, multicriteria analysis, scanning, road maps, etc. At the same time, the success of foresight will depend equally on the ability to accumulate relevant knowledge and choose the right combination of research methods and on the availability of political will and responsibility on the part of major stakeholders.

Prospects for further exploration are to study the issues of creating an infrastructure for pre-foresight research, developing foresight forecast and monitoring its implementation, which would ensure the receipt, processing, analysis, and dissemination of relevant information on an ongoing basis.

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