

## FUNCTIONAL MODEL OF THE DECISION-MAKING SUPPORT SYSTEM IN THE STRATEGIC COMMUNICATIONS SYSTEM OF THE ARMED FORCES OF UKRAINE

*During the full-scale armed aggression of the Russian Federation, which began on February 24, 2022, against Ukraine, the Armed Forces of Ukraine faced powerful challenges to protect national security and territorial integrity. Military-strategic communications played an important role in maintaining internal stability and ensuring trust in the government and the Armed Forces. Effective decision-making in such conditions requires a decision support system that ensures fast and accurate processing of a large amount of information and provides recommendations with appropriate justification based on data analysis. It is especially important to take into account the large amount of information that comes from various sources and needs to be processed and analyzed in real time. In this article, we have reviewed the functional model of the decision support system in the strategic communication system of the Armed Forces of Ukraine and analyzed the principles of its functioning and impact on the decision-making process. The purpose of this scientific article is to study the functional model of the decision support system in the strategic communications system of the Armed Forces of Ukraine. To achieve this goal, the following tasks have been identified: consider the basic principles of the functional model of a decision support system; analyze the existing theoretical and applied aspects of decision support systems; to study the peculiarities of using decision support systems in the field of strategic communications of the Armed Forces of Ukraine. When writing the article, methods of analysis, modeling and system-structural approach were used in accordance with the tasks defined by the goal. The main focus was not only on describing the structure of this system, but also on identifying specific requirements due to the peculiarities of strategic communications in the modern information environment. The identified requirements include the need to integrate existing solutions and mathematical models, as well as the ability to accumulate and store standard solutions and processes for further use. The described model of the system takes into account the aspects of information analysis and processing in the context of strategic communications, for more effective management and decision-making in the field of defense. The practical significance of this article lies in understanding approaches to optimizing management and making important decisions in the defense sector. The author emphasizes the need to integrate into the current model of the unit for preserving standard solutions for further use and experience building. This paper analyzes the functional model of a decision support system for solving tasks related to strategic communications in the Armed Forces of Ukraine and describes its structure. To build such a system, specific requirements are identified that take into account the peculiarities of strategic communications in the information environment. These requirements include the ability to integrate existing solutions and mathematical models, the ability to accumulate and store standard solutions and processes. The study has the potential for practical application in the management of strategic communications in the Armed Forces of Ukraine and similar areas. The direction of further research could be the development of additional blocks of information accumulation for decision-making in the system of strategic communications in the form of generalization of experience. The use of the "experience" block will make it possible to compare the expert assessment with the decisions already made that have received a positive or negative assessment. Thus, the decision support system is likely to reduce the time for generating a decision, and the introduction of additional relational criteria to check the likelihood of success in the case of making a decision based on the knowledge already acquired will increase efficiency.*

**Keywords:** *decision-making system, decision support model, strategic communications, information technology.*

### Introduction

**Problem statement.** During the full-scale armed aggression of the Russian Federation, which began on February 24, 2022 against Ukraine, the Armed Forces of Ukraine faced powerful challenges regarding the protection of national security and territorial integrity. Military-strategic communications played an important

role in maintaining internal stability and ensuring trust in the authorities and the Armed Forces. Effective decision-making in such conditions requires a decision support system (further – DSS), which provides fast and accurate processing of a large amount of information and provides recommendations with

appropriate reasoning based on data analysis. It is especially important to take into account the large volume of information that comes from various sources and needs to be processed and analyzed in real time. In this article, we will consider the functional model of DSS in the strategic communication system of the Armed Forces of Ukraine and analyze the principles of its operation and its impact on the decision-making process.

In recent years, the use of artificial intelligence, machine learning, the Internet of Things, and other technologies in decision support systems makes it possible to increase the efficiency and accuracy of information analysis and reduce decision-making time. In this context, the study of the functional model of the decision support system in the strategic communication system of the Armed Forces of Ukraine can make a significant scientific and practical contribution to the development of military management and ensuring national security.

**Analysis of recent research and publications (literature review).** The modern decision-making support system in the system of strategic communications and in particular the Armed Forces of Ukraine. In today's world, dependent on rapid changes, decision support systems are an important tool to support the management of various types of organizations. In the strategic communications system of the Armed Forces of Ukraine, where solving complex tasks and making quick decisions can have a significant impact on security and national interests, the use of such systems acquires special importance. In this context, the functional scheme of the decision support system can become an effective tool for managing the information flow and improving the quality of the decisions made.

In this area, many studies aimed at the development and analysis of models of strategic communications in the security sector of Ukraine have been conducted. One of the directions is the study of means of influence on mass consciousness, in particular, the use of social networks, media resources and other information channels [3; 4; 5; 8].

The field of application of decision support systems is actively researched in scientific works. These systems are used in various fields, such as economics, business, medicine, military administration, and others [1; 6].

In the context of military management, decision support systems are used to analyze and interpret large amounts of information, including from various sources, such as satellite images, radar data, intelligence, social networks, and more. Research has shown [2; 8; 9] that decision support systems can help military commands reduce the time it takes to make decisions and ensure more efficient use of resources.

Regarding strategic communication systems, researchers paid attention to the importance of the correct information strategy in the modern conditions of globalization and technological development. Studies have shown that strategic communication systems are a key tool for ensuring effective

information interaction between different groups of stakeholders. Such systems may include information analysis, monitoring of social networks, content management and other elements that ensure effective interaction with the public and military formations [2; 8].

However, studies devoted to the functional model of the decision support system in the strategic communications system of the Armed Forces of Ukraine are limited. In this context, there is a need to research an effective functional model of the decision support system, which ensures the collection and processing of information for the implementation of the strategic goals of the Armed Forces of Ukraine in the field of communications.

*Architecture of the decision support system.* Decision support systems are a set of software and technical tools designed to automate the decision-making process in various areas of activity, including military strategic communications. The main goal of the DSS is to provide support in the decision-making process by providing an appropriate information base, data analysis, building predictive models and developing recommendations [1, 15-16].

**The purpose** of article is to study the functional model of the decision support system in the strategic communication system of the Armed Forces of Ukraine. To achieve the goal, the following tasks were defined:

- to analyze the existing theoretical and applied aspects of decision support systems;
- outline the features of using decision support systems in the field of strategic communications;
- to consider the main principles of the functional model of DSS.

### Principal Research Results

Military strategic communications are an important component of the national security and defense system. They provide for interaction between military and civilian structures in order to ensure effective informational influence on the enemy and society as a whole. In such conditions, DSS can become an important tool in the field of military strategic communications, in particular, in the formation of a strategy of information influence on the enemy, analysis of the information field and monitoring of information flows.

The use of DSS in military strategic communications allows to ensure:

1. Automation of the process of collecting and processing information from various sources.
2. Development of prognostic models based on the analysis of statistical data and the information field.
3. Identification of potential threats and analysis of possible responses to them.
4. Evaluation of the effectiveness of the use of various information channels and tools.

The application of DSS meets the requirements of a modern military strategy, which involves the active use of information technologies and information influence on the enemy. Military strategic communications are an important component of the country's military

potential, which allows it to achieve its strategic goals and ensure effective protection of national interests.

However, the use of DSS in military strategic communications requires certain expertise and specialized qualifications of military and civilian specialists. For the successful implementation of projects in this area, deep analytical initiative and experience in the development and use of information systems and technologies are necessary.

The use of DSS opens up new opportunities for increasing the effectiveness of military strategic communications. This makes it possible to increase the speed and accuracy of decision-making, improve analytical processes and monitor the information field, which in turn increases the overall effectiveness of military operations and ensures effective protection of national interests.

The use of decision support systems opens up new opportunities for ensuring the effectiveness of military strategic communications. The most important opportunities include:

1. Increasing the speed and accuracy of decision-making. The decision support system allows you to collect, process and analyze large amounts of information in real time, which allows you to make decisions based on the most complete and accurate information.

2. Improvement of analytical processes. The use of DSS allows for a more in-depth and accurate analysis of information coming from communication sources and monitoring of the information field. This allows you to make more informed and effective decisions.

3. Monitoring of the information field. The decision-making support system allows monitoring the information field, identifying and analyzing threats and challenges arising in connection with changes in the situation in the region. This allows you to quickly respond to potential threats and take the necessary measures to prevent them.

4. Ensuring effective protection of national interests. The use of decision-making support systems allows for effective protection of national interests, in particular by ensuring monitoring and analysis of information that is part of the information field of military strategic communications.

*Description of the functional model of the decision support system in the strategic communications system of the Armed Forces of Ukraine.* The functional model of the decision support system in the strategic communication system of the Armed Forces of Ukraine includes several main components that ensure its effectiveness and functionality.

One of the main components are "system inputs", which ensure the collection of necessary information from various sources and sources of external information. It can be observational data, as open source intelligence, intelligence of your troops, reports of unmanned aerial vehicle's, aerial reconnaissance units, analytical reports, social networks, messages from networks (Telegram channels, Twitter, other chats), etc.

The second component is an information analysis and processing unit, which allows you to process and

analyze information from various sources and sources of external information. This unit performs a number of functions, such as identifying and defining key issues, analyzing the relationships between key factors and dependencies between them, and making forecasts.

The third component is a modeling and forecasting unit that allows you to develop models using mathematical algorithms and artificial intelligence tools. This block allows you to predict possible scenarios of the development of the situation and the effectiveness of possible solutions.

The fourth component is a block of conclusions and recommendations, which allows you to formulate recommendations for decision-making based on the results of information analysis and modeling.

Let's analyze each of the components in more detail.

*The first block of "system inputs"* consists of the collection of input data necessary for decision-making. The first stage of collecting input data is their identification and sampling from various sources (Fig. 1). For this, specialized software tools are used, which ensure monitoring of certain sources of information, their selection and sorting. After that, the data goes through a selection process that allows you to identify key trends and patterns in the information received. For this, various processing methods are used, such as statistical, linguistic, machine learning and others.

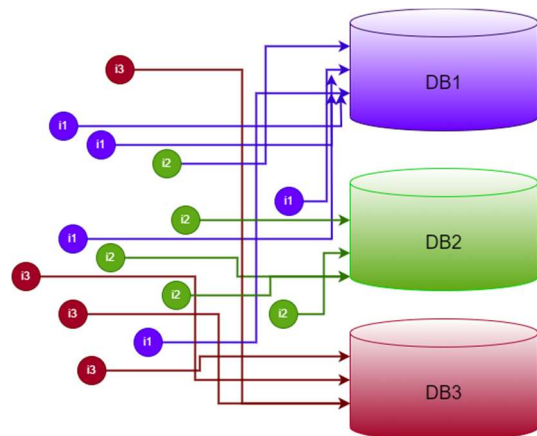


Figure 1 – Identification of information (i1,i2,i3...) and its distribution to databases (DB1, DB2, DB3...) according to the defined criteria

After the databases are formed, the input data are ready for use in the following blocks of the decision support system. The information analysis and processing unit is the main component of the decision support system. This unit collects and processes the information necessary to make a decision in a specific situation.

*The first stage* in this block is the processing of information from various databases. These may be data on the political and social situation in the country, information on armed conflicts and their course, intelligence data, information on existing risks and threats to national security, and other data that influence decision-making. After collecting information, it moves to the *next stage - analysis*. At this stage,

analysis and weighting of information is carried out (Fig. 2). With the help of various methods of analysis, such as statistical analysis, trend analysis, SWOT

analysis and others, the key factors influencing the situation are revealed.

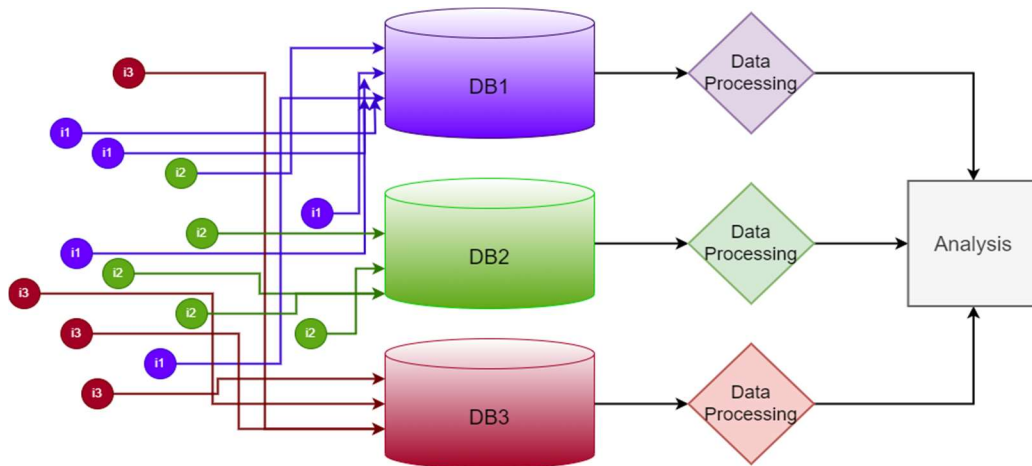


Figure 2 – Processing and analysis

At the end of the information analysis stage, its modeling and forecasting is carried out. For this, various methods are used that allow to evaluate the consequences of various scenarios of the development of events, so the third component of the decision support system is the modeling and forecasting unit. In this block, mathematical models are built in order to predict the possible consequences of decisions, risks and which may be taken.

One of the main tools of this unit is mathematical modeling. It consists in building mathematical models based on collected data and appropriate analytical methods. Models can be different: statistical, economic, social, etc. The use of mathematical models allows forecasting in various spheres: military, economic, political, etc.

After building mathematical models, their analysis and optimization is carried out. The analysis allows you to identify the most significant parameters affecting the simulated processes, as well as to determine the most effective action strategies. Optimization consists in choosing the optimal strategy taking into account various restrictions and conditions (Fig. 3).

In addition, other methods such as analytical graphs, decision trees, statistical analysis, expert evaluations and others can be used in this unit. All these methods help to obtain more accurate and reliable forecasts, which allows you to reduce risks and make more informed decisions.

Based on the results of analysis and forecasting, this unit forms recommendations and decisions regarding effective strategic communications in the military sphere and may include the development of a communication plan, the definition of strategic goals using social network analytics, the development of algorithms for interaction with the media and other stakeholders.

Note that in the system of strategic communications, all decisions are made under conditions of risk and refer to those in which the results

of alternative options are not determined, but their probabilities are known. The sum of the probabilities of all outcomes of a certain alternative must be equal to one, however, under conditions of certainty, there is only one outcome of each option. The most desirable method of determining probability is objectivity.

Probability is objective if it can be determined by mathematical methods or statistical analysis of accumulated experience. Furthermore, the probability will be determined objectively if enough information is obtained to make the prediction statistically reliable.

Most of the decisions in modern complex problems are made by a person individually or collegially in the presence of uncertainties of various nature and types [1, 30-31]. Therefore, the involvement of expert evaluation is an essential component of building a decision-making model in the strategic communications system of the Armed Forces of Ukraine.

An important element of this block is ensuring the adaptability and flexibility of the system. Since military strategic communications are associated with various challenges and situations, the system must be able to quickly adapt to changing conditions and challenges.

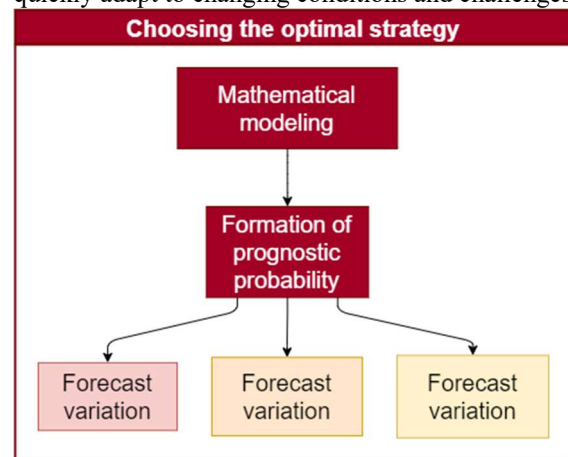


Figure 3 – Construction of forecast variability

The fourth component of the decision-making support system in the strategic communications system of the Armed Forces of Ukraine – the block of conclusions and recommendations – is responsible for forming and displaying the results of analysis and modeling in a user-friendly form. This block provides the user with information on alternative possibilities of actions and evaluation of their consequences, which

allows to make an informed choice and make a decision.

The functional diagram of the decision support system in the strategic communications system of the Armed Forces of Ukraine is a complex model that provides information collection and processing, modeling and forecasting, as well as providing conclusions and recommendations for effective decision-making (Fig. 4).

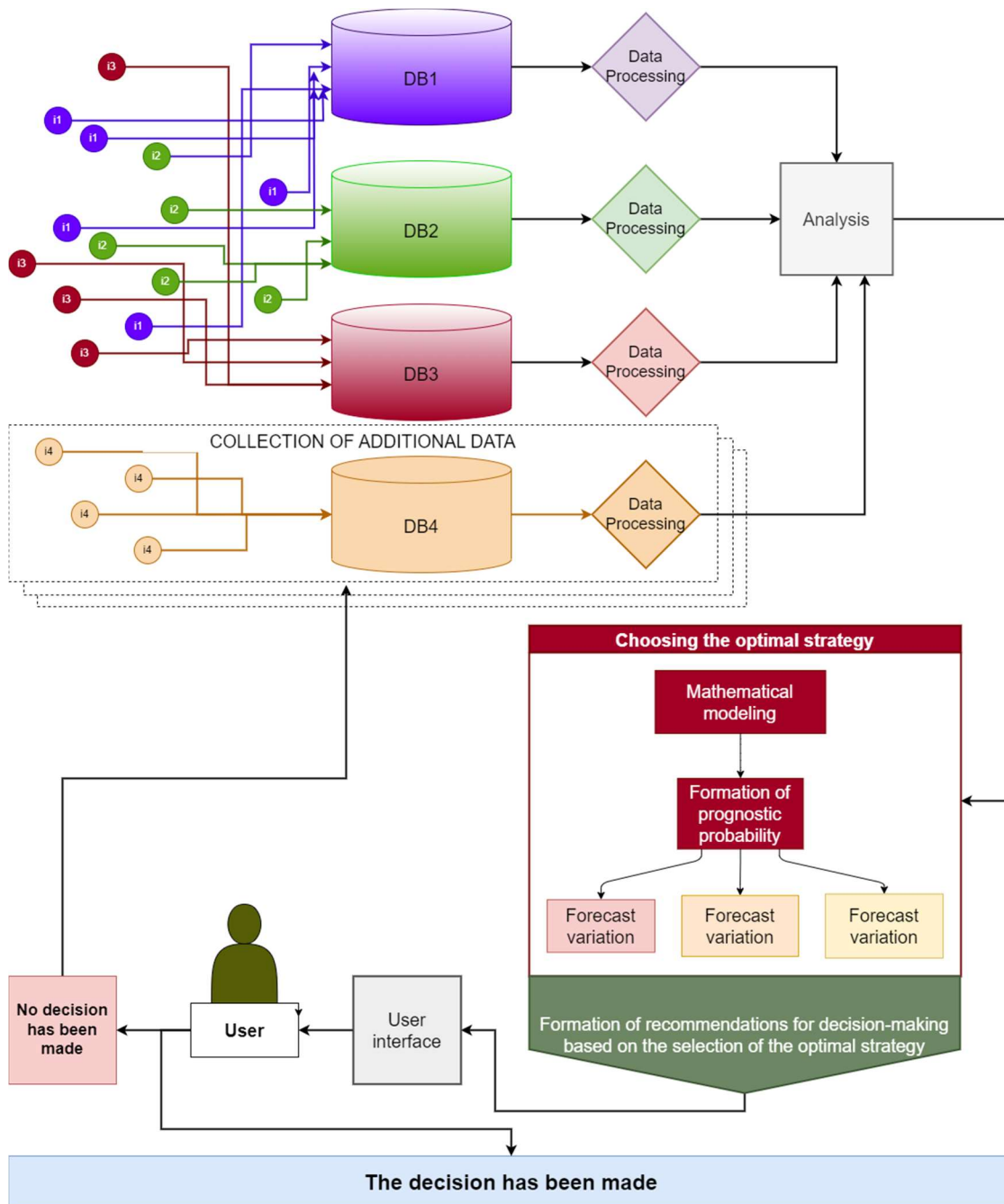


Figure 4 – General decision-making model in the strategic communications system of the Armed Forces of Ukraine

*The principles of the functional model.* The main principles of the functional model relating to the various stages of decision-making include the following aspects:

*Objectivity:* the system should provide an objective assessment of information and make it possible to make

decisions based on reliable data. This is achieved by collecting and analyzing information from various sources, as well as by applying modeling and forecasting methods.

*Systematic:* the system must work systematically and consistently, performing each stage of decision-

making, from gathering information to conclusions and recommendations. The principle of systematicity guarantees the avoidance of omissions and errors in the decision-making process, provided that the following two principles are observed.

*Flexibility:* the system must be flexible and adapt to changing conditions and requirements. This is essential to ensure adaptation to changes on the battlefield and to enable effective real-time decision-making. Another important aspect of adapting to a rapidly changing environment is the ability to quickly assess the situation and adjust plans accordingly. The principle of flexibility involves the possibility of redistributing resources, reassigning tasks or even completely changing the approach to decision-making.

*Information security:* the system must ensure the protection of information from unauthorized access and the preservation of data confidentiality.

### Conclusions and perspectives for further research

In this work, a functional model of the decision support system for solving problems related to strategic communications in the Armed Forces of Ukraine and its structure is described. For the construction of such a system, specific requirements are identified that take into account the peculiarities of strategic

communications in the information environment. These requirements include the ability to integrate existing solutions and mathematical models, the ability to accumulate and store typical solutions and processes.

A group decision support system should help the management to solve various tasks related to strategic communications and ensure their effective solution. The effectiveness of such a system directly depends on the quality and capabilities of the decision support system model. The use of the proposed functional model in practice will increase the effectiveness of the group decision support system and improve the productivity of management work in solving strategic communications tasks in the Armed Forces of Ukraine.

The direction of further research may be the development of additional blocks of information accumulation for decision-making in the strategic communications system in the form of generalization of experience. Using the "experience" block will provide an opportunity to compare the expert assessment with already made decisions that received a positive or negative assessment. In this way, we will be able to increase the speed and introduce additional criteria to check the probability of success in the case of making a decision based on already acquired knowledge.

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## ФУНКЦІОНАЛЬНА МОДЕЛЬ СИСТЕМИ ПІДТРИМКИ ПРИЙНЯТТЯ РІШЕНЬ У СИСТЕМІ СТРАТЕГІЧНИХ КОМУНІКАЦІЙ ЗБРОЙНИХ СИЛ УКРАЇНИ

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*Постановка проблеми у загальному вигляді. Під час повномасштабної збройної агресії російської федерації, яка розпочалася 24 лютого 2022 року проти України, Збройні Сили України зіткнулися з потужними викликами щодо захисту національної безпеки і територіальної цілісності. Військово-стратегічні комунікації відігравали важливу роль у підтриманні внутрішньої стабільності та забезпеченні довіри до влади і Збройних Сил. Для ефективного прийняття рішень у таких умовах необхідна система підтримки прийняття рішень, що забезпечує швидку і точну обробку значного обсягу інформації та надає рекомендації з відповідним обґрунтуванням на основі аналізу даних. Особливо важливо враховувати означену інформацію, що надходить з різних джерел і потребує обробки та аналізу в режимі реального часу. У цій статті розглянуто функціональну*



модель системи підтримки прийняття рішень у системі стратегічної комунікації Збройних Сил України і проаналізовано принципи її функціонування та вплив на процес прийняття рішень. Метою статті є дослідження функціональної моделі системи підтримки прийняття рішень в системі стратегічних комунікацій Збройних Сил України. Для досягнення цієї мети були визначені такі завдання: проаналізувати існуючі теоретичні та прикладні аспекти систем підтримки прийняття рішень; окреслити особливості використання систем підтримки прийняття рішень у сфері стратегічних комунікацій; розглянути основні принципи функціональної моделі системи підтримки прийняття рішень. Під час написання статті були використані методи аналізу, моделювання та системно-структурного підходу, відповідно до завдань, що визначені метою.

**Аналіз останніх досліджень і публікацій.** Сьогодні, висвітленню теми систем підтримки прийняття рішень у військовій сфері й аспектів системи стратегічних комунікацій в інтересах Збройних Сил України присвячено достатню кількість наукових праць провідних вчених. Однак дослідження, присвячені функціональній моделі системи підтримки прийняття рішень в системі стратегічних комунікацій Збройних Сил України, є обмеженими. Через це виникає необхідність вивчення ефективної функціональної моделі системи підтримки прийняття рішень, яка забезпечує збір та обробку інформації для реалізації стратегічних цілей Збройних Сил України у сфері комунікацій.

**Виклад основного матеріалу.** Розглянуто основні принципи роботи функціональної моделі системи підтримки прийняття рішень. Проаналізовано наявні теоретичні та прикладні аспекти таких систем. Досліджено особливості використання цих систем у сфері стратегічних комунікацій Збройних Сил України. Основну увагу надано не лише опису структури системи підтримки прийняття рішень, а й ідентифікації специфічних вимог, обумовлених особливостями стратегічних комунікацій у сучасному інформаційному оточенні. Виявлено вимоги, що містять необхідність інтеграції існуючих рішень і математичних моделей, а також можливість накопичення й зберігання типових рішень і процесів для подальшого використання. Описана модель системи враховує аспекти аналізу й обробки інформації в контексті стратегічних комунікацій стосовно ефективнішого управління та прийняття важливих рішень у сфері оборони.

**Елементи наукової новизни.** У даній роботі проаналізована функціональна модель системи підтримки прийняття рішень для розв'язання задач, пов'язаних зі стратегічними комунікаціями в Збройних Силах України, і описана її структура. Для побудови такої системи виокремлені специфічні вимоги, які враховують особливості стратегічних комунікацій в інформаційному середовищі. Ці вимоги включають можливість інтеграції існуючих рішень та математичних моделей, можливість накопичення та зберігання типових рішень і процесів.

**Практичне значення статті** полягає в розумінні підходів до оптимізації управління та прийняття важливих рішень у сфері оборони. Виокремлена необхідність інтеграції в діючу модель блоку збереження типових рішень для подальшого використання та формування досвіду.

**Висновки та перспективи подальших досліджень.** Дослідження має потенціал для практичного застосування в управлінні стратегічними комунікаціями в Збройних Силах України та схожих сферах. Напрямом подальших досліджень може стати розробка додаткових блоків накопичення інформації для прийняття рішень в системі стратегічних комунікацій у вигляді узагальнення досвіду. Використання блоку «досвід», дасть змогу порівняти експертну оцінку з вже прийнятими рішеннями, що отримали позитивну чи негативну оцінку. Таким чином, система підтримки прийняття рішень, вірогідно, зможе зменшити час на генерування рішення, а ввід додаткових релятивних критеріїв для перевірки вірогідності успіху, у випадку прийняття рішення на основі вже здобутих знань, підвищить ефективність.

**Ключові слова:** система прийняття рішень, модель підтримки прийняття рішень, стратегічні комунікації, інформаційні технології.

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