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A METHOD OF COMPROMISE RESOURCE ALLOCATION IN PLANNING AND CONDUCTING A PSYCHOLOGICAL OPERATION IN THE CONDITIONS OF THE RUSSIAN–UKRAINIAN WAR

Formulation of the problem in general. The purpose of the article is to develop a method of compromise resource allocation to ensure rational planning and optimal allocation of resources during the preparation and conduct of psychological operations by the units of the Defence Forces of Ukraine.

Research methods. The following methods were used in writing the article: content analysis – to study the characteristics of the target audience and its classification depending on its resistance to psychological influence; graph-analytical method - for rational allocation of financial resources allocated for a psychological operation.

Research results. The article analyses the influence of the rate of «aging» of information materials on the effectiveness of psychological influence, taking into account the time of relevance of information materials and their ability to form long-term cognitive changes in the target audience. The article examines the resistance of the target audience to psychological influence, which depends on cognitive characteristics, level of education, critical thinking and socio-cultural environment in the context of the russian-Ukrainian war. The article identifies optimisation of the cost process, which is ensured by selecting the most effective communication channels, among which the most common are social networks, gaming platforms and traditional media, taking into account the demographic characteristics of the audience and its information preferences. The developed method consists of three stages. The first stage involves segmentation of the target audience and analysis of the target audience's resistance to psychological influence, in which the target audience is classified by cognitive characteristics (education, level of critical thinking, socio-cultural environment, etc.). Based on the collected data, a general characteristic of the target audience is formed, allowing us to identify subgroups with different sensitivity patterns. At the second stage, the dynamics of resistance to psychological influence are modelled using a logarithmic function or simulation modelling to assess the growth of resistance of the target population over time, reflecting the nonlinear adaptation to psychological influence. The essence of the third stage is to optimise the allocation of resources through a compromise solution to determine the optimal proportion of resources spent between subgroups of the target audience to achieve maximum effect (the number of people from both target audiences who have changed their behaviour).

Research novelty. The novelty of this study is the inclusion of the dynamics of resistance of the target audience in the form of a nonlinear function that represents the cognitive adaptation of the target audience and the effect of «aging» of information in the context of the russian-Ukrainian war. The use of a compromise approach to the allocation of resources between subgroups of the target audience allows for more efficient use of available resources and achieving the maximum effect of psychological impact on the target audience. Analysing the neuropsychological foundations of information consumption helps to understand how information materials influence the formation of neural pathways that change the attitudes of people who make up a particular target audience. In addition, artificial intelligence tools help generate creative information materials that enhance the effect of psychological influence on the target audience.

The theoretical and practical significance of the article lies in the study of the method of rational allocation of resources in conducting a psychological operation in the context of the russian-Ukrainian war, which allows creating a mathematical basis for predicting the behaviour of the target audience in various scenarios of a psychological operation and increasing the effect of psychological influence under resource constraints. The practical significance of this method is that it provides a tool for maximising the effect of psychological operations on a limited budget by prioritising target audiences with less resistance to psychological influence and selecting the optimal communication channels for different demographic groups.

Keywords: psychological operation, psychological influence, information materials, target audience, mathematical modelling, optimisation, communication channels, resistance, neuropsychology.

Introduction

In the context of the russian federation's large-scale armed aggression against Ukraine, psychological operations (hereinafter – PsO) are an effective tool for influencing public opinion and behaviour of the target audience (hereinafter – TA) and an important component of armed struggle. The effectiveness of PsO largely depends on rational planning and optimal allocation of available resources for the production and distribution of information materials (hereinafter – IM), taking into account the dynamics of changes in the attitude of the target audience to IM topics as a result of psychological influence (hereinafter – PsI). Resources should be rationally allocated between the communication channels used for PsI on the target audience, primarily between social media (hereinafter – SM) and other information platforms (hereinafter – IP).

Scientific research in the fields of information and communication and digital technologies, psychology, etc. shows a complex nonlinear nature of the effect of PsI on the TA in the process of IM spread [1; 2; 3]. The study of the increase in the resistance of the target population to PsI over time is necessary to achieve the desired effect of PsI [4]. Increasing resistance of the TA to PsI over time is especially typical for the TA with a high level of critical thinking and education.

An important aspect when planning PsI is considering the difference in the perception of information by different demographic groups that make up the TA. For example, a younger audience (by age) that actively uses computer gaming platforms [5; 6] may be more receptive to certain types of influence than a TA consisting of older SM users [7]. This difference in perception requires a differentiated approach to resource allocation and choice of communication channels.

Existing approaches often do not consider the dynamics of the growth of the TA resistance to PsI and the specifics of different communication channels, leading to inefficient resource use. In this context, developing (improving) mathematical models and methods for optimising rational planning and optimal resource allocation during the preparation and conduct of civil protection is an urgent scientific task.

Problem statement. The effectiveness of PsO and the effect of PsI on a certain TA largely depends on the compromise allocation of resources available to those planning PsO. To increase the effectiveness of PsO, it is relevant to develop a method of compromise allocation of resources in the process of planning PsO, which will allow optimising their use, taking into account the characteristics of the TA, the capabilities of communication channels and the dynamics of the TA resistance to PsI.

Predicting and effectively managing PsI on the TA during PsO is becoming an essential component of armed struggle. The main purpose of PsO is to change a person's behaviour, beliefs and emotional states using various communication channels, including IM and IP, SM, media space and computer games [8].

Mathematical modelling of psychological processes makes it possible to understand how the thoughts and emotions of the person to whom the PsI is directed are formed. Such processes play an essential role in shaping the person's reactions to the PsI. The human brain, processing the information received, activates neural connections responsible for emotional and cognitive reactions.

Billions of neurons in the brain form complex networks to process and store information. Neurons interact with each other through synapses, which are special connections that allow the transmission of electrochemical signals. These signals are transmitted from one neuron to another, forming neural connections that are responsible for various aspects of cognitive activity, such as perception, memory, attention, and decision-making [4].

As an integral part of PsO, psychological influence affects neural connections, changing the activity of some regions of the human brain, which form new thoughts, increasing or decreasing emotional reactions, resulting in changes in human behaviour.

Literature Review. According to the research methodology, the resource-based approach can be effectively used in planning and conducting PsO, given the limited cognitive resources of the TA, such as attention, memory and information processing [9]. This approach, in the context of PsO, will help to effectively allocate resources (time, attention, intellectual effort) and create strategies that are natural human decision-making capabilities under stress. Such a methodology is appropriate for the study of PsO, in real time, taking into account their teams' cognitive limitations and the operations' goals.

Applying a resource-based approach will help predict errors that may arise due to the underestimation of limited resources, which affects the improvement of the planning and conduct of operations [17; 18].

Firms with significant resources often initiate 20% more investment projects, but also have 15% more terminated projects due to mismanagement of resources. For example, a study [10] shows that companies with limited resources tend to take a more cautious approach, which avoids inefficient allocation. Thus, applying a phased approach to resource allocation in the PsO helps avoid 'escalation of liabilities' and ensures productive reallocation of resources, optimising their use at each stage.

The rational choice approach interprets human behaviour as a purposeful activity aimed at achieving specific goals, contrasting with other sociological and psychological theories that focus on the influence of organisational norms and social pressure. Given the specifics of PsO, the method of compromise resource allocation allows optimising the use of time, material and technical means, which contributes to the effective implementation of strategic tasks. Due to its deductive nature and ideological linkage to the market economy, the rational choice approach is gaining recognition in scientific research [11].

Integrating this methodology in the planning and implementation of PsO ensures efficiency through a systematic approach to resource allocation to balance achieving objectives with the optimal use of available resources.

In [12], the authors substantiate the impact of resource

availability in planning their allocation on the organisation and conduct of PsO. The main idea is that the incorrect allocation of financial resources stimulates subjectivity in management decisions, reducing the efficiency of resource allocation. Using the analogy with real options and the theory of bounded rationality, this approach can be adapted to the method of compromise resource allocation, since different levels of security will affect the effectiveness of choosing options for actions during the PsO.

In the context of modern military conflicts, the report [13] analyses the effects of the spread of disinformation and hybrid threats. The cohesion, resilience of the NATO bloc and its support for Ukraine are key factors in countering such threats, which underscores the relevance of developing reliable mathematical models for predicting the PsI and stability of systems in war [13].

The study [15] focuses on digital technologies of PsI, which significantly affect the optimisation of the resource allocation process in PsO. The use of online platforms and mobile applications provides real-time information, which is relevant in conditions of limited resources. In its first year of operation, the online clinic helped more than 2,000 patients, of whom 70 per cent completed treatment, which confirms the high efficiency of digital technologies in providing PsI. The use of these technologies can significantly reduce the workload of medical staff and at the same time increase the coverage of TA, such as military personnel or civilians who have experienced traumatic events.

The use of digital technologies to personalise interventions allows for the adaptation of PsI to the specific needs of each individual, which contributes to the efficient reallocation of resources and the achievement of optimal outcomes in PsO.

Study [16] demonstrates the significant impact of the use of information and communication technologies (hereinafter – ICT) on the mental well-being of the TA. The study shows that more than 60% of respondents who actively use social media report a positive impact on their psychological well-being, and 45% who spend more than 5 hours a day playing video games show significant signs of stress and depression. The use of the Internet for educational purposes increases the level of psychological resilience to 72% of respondents. Given that psychological support through digital platforms can provide access to the TA over a large area, rational allocation of resources in this context allows for minimising costs and achieving results effectively.

Study [17] proposes an approach to modelling the optimal use of limited cognitive resources within the framework of computational rationality. The article describes an analysis methodology that considers resource constraints and determines how to optimise decision-making processes under such constraints. This approach can be applied to modelling resource allocation in PsO, considering the efficient use of limited resources to achieve maximum impact on the TA. Based on the idea of using heuristics and considering time and resource constraints, this method can be applied to optimise decisions related to allocating resources among different communication channels.

The resource-based rational analysis conducted in [18] provides an opportunity to optimise the allocation of cognitive resources. It allows modelling the decision-making process under limited resources, such as attention, memory and time, which are essential factors for achieving the desired results in complex and uncertain situations. By minimising cognitive effort, this analysis will help to develop strategies that strike an optimal balance between decision accuracy and resource consumption. This approach can reduce cognitive biases, such as high confidence or the anchoring effect (the tendency to rely on the first available information as a basis for decision-making), which affects the success of PsO [19].

According to the theory of rational choice, a person begins the process of evaluation or decision-making using a specific starting point (anchor) [20], based on which they further adjust their decision, taking into account new information. Such adjustments are usually insufficient, which results in the influence of the initial assessment on the final decision remaining. In the context of PsO planning, the anchoring effect can lead to the first estimate of resources or activities remaining the central estimate, even when new information or circumstances change. This leads to underestimating the resources required to implement measures and underestimating the potential risks associated with their use. The resource-based analysis method minimises the expenditure of cognitive and time resources while achieving the most effective results, considering all available data and constraints.

In [21], the principles of rationalising the allocation of resources to government programmes and controlling personnel costs are discussed. These principles can be effectively applied in the planning of PsO, where it is essential to reduce costs and maximise resource use efficiency. To do this, it is necessary to introduce mechanisms for targeting resources to specific groups, clearly defining priorities in allocating time, personnel and material resources.

Optimising human resource costs by monitoring staff numbers and performance helps to maintain budgetary constraints while maximising results. In addition, periodic reviews of the PsO operations can identify redundancies and streamline processes, reducing unnecessary costs and increasing efficiency with limited resources.

Existing models and methods of PsI on the TA do not take into account the resistance and dynamics of emotional reactions of the target audience, which reduces the accuracy of predicting behavioural changes in the TA during PsO.

The conducted analysis of scientific literature forms the scientific basis for developing a new method of compromise resource allocation in planning and conducting PsO. The cited sources outline the effectiveness of approaches and principles for optimising resource-based analysis and the rational choice of using limited resources. This emphasises the importance of constantly adapting these methods to planning and conducting PsO, considering cognitive limitations, socio-psychological factors, and continually correcting resource allocation in real time.

Thanks to the studied publications, a scientific basis for developing a methodology for optimising the resource

allocation and decision-making process by commanders was formulated.

The purpose of the article is to develop a method of compromise resource allocation to ensure rational planning and optimal resource allocation during the preparation and conduct of psychological operations by the units of the Defence Forces of Ukraine.

Research Results

Psychological influence changes a person's information processing processes by providing stimuli that cause the formation of stable neural connections responsible for beliefs or attitudes. This phenomenon is known as brain plasticity – the ability of neural networks to change under the influence of external factors [4].

At the same time, most approaches do not consider the variability of the TA, its resilience to PsI, and the need for efficient use of resources. The diversity of communication channels, including SM and other IP, as well as differences in the perception of information by different demographic groups, necessitate a differentiated approach to different TA when planning PsO.

The basis of the study is the development of a method of compromise resource allocation in planning and conducting PsO, which allows for reasonably distributing the costs of distributing PsI materials among SM agents and gamers, as well as taking into account the dynamics of the decrease in the effect of PsI over time. This method allows optimising the use of resources, especially financial ones, and increasing the effectiveness of PsO by determining the rational proportion of costs between different TA.

The method of compromise allocation of resources involves performing actions in a sequence of three stages, namely:

1. Analysing the ability of the TA to think critically and dividing it into parts depending on their resistance to PsI.

2. Building a function of resistance of certain groups of the TA to PsI over time, which allows us to find the number of people from a particular TA who have changed their behaviour under the influence of widespread IM.

3. Determination of the compromise distribution of the total resource for the spread of IM between the identified groups of the TA using the graph-analytical method.

Let us describe in detail the method of compromise resource allocation in planning PsO activities between the costs of distributing PsI materials to SM agents and the costs of distributing PsI materials to gamers, depending on the dynamics of the effect reduction during the IM distribution process.

Stage 1. Study of the TA to determine the dynamics of growth of the TA resistance to PsI and construction of an appropriate function that allows extrapolating the value of the TA resistance to PsI to future periods (i.e. predicts the result of PsI – the number of people from the defined TA who have changed their behaviour or their own attitude towards the subject of PsI at a particular time in the future). This allows us to predict (using simulation modelling methods) the nature of the growth of resistance of the TA to the PsI and build a corresponding dependence.

A simplification of the method is that among all the costs of resources for conducting PsO, which are limited, only the cost components associated with distributing PsI

materials to SM agents and the costs of distributing PsI materials to gamers are considered.

Many other costs are incurred during PsO, which are recorded $\left(C_{\text{iн}} = \text{const} \right)$ and not considered when optimising the distribution of the expenses into the two components mentioned above:

$$C_{\sum} = C_{SM} + C_G + C_{iн}, \tag{1}$$

where:

C_{SM} – financial resources spent on PsI among SM agents;

C_G – financial resources spent on PsI among gamers.

The total costs of conducting PsO should not exceed the resources available for conducting PsO:

$$C_{\sum} \leq C_{\sum}^{*}, \tag{2}$$

where:

$C_{\sum}^{*}$ – resources at the commander's disposal for conducting PsO.

Stage 2. Determination of the function of dependence of the number of people from the TA who have changed their behaviour on the number of distributed IM. The proposed function of this dependence reflects the non-linear nature of PsI, given the complex dynamics of IM perception, since a significant part of the TA is exposed to PsI from the beginning of their distribution. However, the other part of the TA subsequently requires more and more resources to change their behaviour due to IP. Therefore, over time, the spread of IM becomes inefficient and loses economic sense because the TA includes people with a high level of resistance to PsI, who require much effort to persuade.

The expression can approximate this function:

$$N_{TA} \approx C_0 + \ln\left(C_{SM(G)} - C_{iн} \right). \tag{3}$$

Fig. 1 shows that TA 2 (for example, consisting of mostly older SM agents) is characterised by a slower growth in the number of people who changed their behaviour.
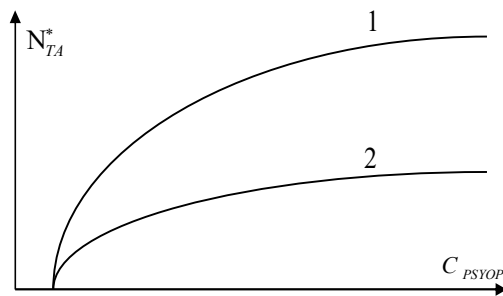

Figure 1 – Dependence of the number of target audience members who changed their behaviour N_{TA}^{*} on the resource spent on the distribution of information materials:
1 – for the TA consisting of gamers;
2 – for the target audience consisting of SM agents.

This is because the components of the target audience that have critical thinking skills (educated middle-aged

people) demonstrate high resistance to PsI. The logarithmic curve shows that people easily susceptible to PsI have already changed their behaviour and quickly «run out of steam». Therefore, after a while, further PsI for this TA loses its meaning, as «acquiring» supporters requires more and more resources.

Figure 1 shows that it is more profitable to «buy» the favour of TA 1 than to «buy» supporters from TA 2. The shape and slope of the curves in Fig. 1 depend on the amount of acceleration of the growth of resistance of the TA to the PsI, which is determined by the results of the analysis of the TA (its socio-demographic indicators) and can be predicted by simulation modelling. But the question arises: how should the available resources be allocated to spread IM among the two defined parts of the TA so that the total number of people from both TA who change their minds under the influence of PsI is maximised? Stage 3 of the method is devoted to solving this problem.

Stage 3. Determining the rational allocation of the total resource for the costs of distributing materials to TA 1 and the costs of distributing materials to TA 2, taking into account the dependence of the growth of these costs on the nature of the acceleration of TA resistance to PsI.

The optimisation criterion for solving the problem of allocating the available resource for the distribution of IM to TA 1 and TA 2 is the maximum of the objective function:

$$N_{\sum TA} \approx \max f \ . \tag{4}$$

In Fig. 2, we can see that for dependency 2 (in which the assessment of resistance to PsI and time dependence for both TA is the same), the rational decision is to distribute the available resource in equal parts between TA 1 and TA 2 (50% and 50% of the total PsO costs, respectively).

For the dependence described by curve 1, the optimal distribution is the distribution in which the cost of IM distribution among TA 1 is a quarter of the total price. For the dependence described by curve 3, the optimal distribution is the distribution in which the cost of IM distribution among TA 2 is three-quarters of the total cost of conducting PsO.
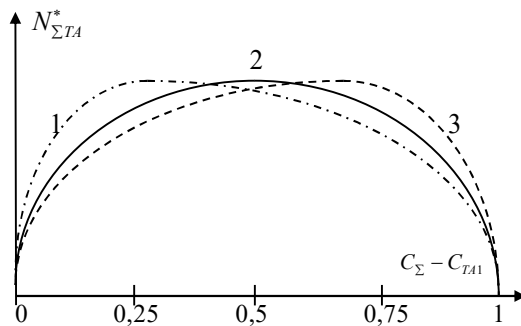

Figure 2 – Example of the dependence of the number of people from both TA who changed their behaviour on the allocation of resources for the distribution of information materials among TA 1 and TA 2

In practice, the task of determining the optimal allocation of resources between the costs of IM distribution among different TA is difficult due to the discrete nature of both the TA and the costs, as well as the influence of additional factors. As a result, the resulting solution can only be considered rational, satisfactory in the current conditions, but not necessarily optimal (which has a single solution – the maximum of the function in these conditions).

Determining the rational proportion of IM distribution costs among different groups of TA, taking into account changes in the level of resistance of these audiences to PsI, allows us to draw practical conclusions to improve the efficiency of the process of planning and conducting PsO. The study has shown that the application of the developed method, by taking into account the dynamics of resistance of the target audience to PsI, makes it possible to accurately predict changes in behaviour and rationally allocate the costs of IM distribution.

The developed method has both theoretical and practical significance. From a theoretical point of view, it reveals an understanding of the dynamics of PsI and the factors that affect its effectiveness. From a practical point of view, it provides a tool for rational planning and conducting PsO with limited resources. The study's results open up prospects for further studying the relationship between the cost of spreading IM and the growth of TA resistance to PsI, as well as for experimental testing of the proposed method in real-world conditions of information attacks.

Conclusions and future work

The article develops for the first time a method of compromise resource allocation in conducting psychological operations, which allows rationally allocating the costs of distributing psychological influence materials among social networking agents and gamers, and also takes into account the dynamics of reducing the effect of psychological influence over time.

The proposed method allows rationalising the expenditure of financial resources allocated for psychological operations, which reduces resource costs while maintaining the effect of psychological influence or increasing the impact of such influence at fixed costs. The scientific novelty lies in the implementation of an approach that integrates the parameters of resistance acceleration and resource expenditure, enabling the analytical representation of identified dependencies and the localization of optimal resource allocation points within a dynamic operational environment.

Further research prospects lie in developing refined mathematical expressions that characterise the impact of costs on the resistance of target audiences to psychological influence. This requires the construction of mathematical models with a larger number of parameters that will take into account not only the resistance of audiences, but also time delays, parameters of the intensity of influence and other variables related to the peculiarities of the information environment and the perception of psychological influence by a person.

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МЕТОД КОМПРОМІСНОГО РОЗПОДІЛУ РЕСУРСІВ У ПРОЦЕСІ ПЛАНУВАННЯ ТА ПРОВЕДЕННЯ ПСИХОЛОГІЧНОЇ ОПЕРАЦІЇ В УМОВАХ РОСІЙСЬКО-УКРАЇНСЬКОЇ ВІЙНИ

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У сучасних збройних конфліктах психологічна операція є важливим інструментом досягнення військових цілей шляхом впливу на громадську думку та поведінку цільових аудиторій. Однак ефективність психологічної операції значною мірою залежить від раціонального розподілу обмежених ресурсів на створення та поширення інформаційних матеріалів для кількох різних цільових аудиторій, враховуючи досвід російсько-української війни. Основною **метою статті** є розробка методу компромісного розподілу ресурсів для забезпечення раціонального

планування та оптимального їх використання під час підготовки і проведення психологічних операцій підрозділами Сил оборони України. Існуючі підходи часто не враховують зростаючу стійкість цільових аудиторій до психологічного впливу залежно від рівня їхнього критичного мислення, демографічних та інших характеристик, які можуть динамічно змінюватися. У дослідженні запропоновано метод раціонального розподілу ресурсів, який максимізує ефект психологічного впливу за певних втрат з урахуванням особливостей цільової аудиторії.

Методи дослідження. *Під час написання статті були використані такі методи: контент-аналіз – для дослідження характеристик цільової аудиторії та її класифікації залежно від стійкості до психологічного впливу; графоаналітичний метод – для раціонального розподілу фінансових ресурсів, що розподіляються на психологічну операцію.*

Аналіз останніх досліджень і публікацій. *Аналіз результатів сучасних наукових досліджень і публікацій свідчить про нелінійний характер психологічного впливу на цільову аудиторію та підкреслює зростаючу роль цифрових платформ у споживанні інформаційних ресурсів. Дослідження, що базуються на раціональному розподілі ресурсної бази, є науковим підґрунтям для підвищення ефекту психологічної операції. Водночас, існуючі дослідження не враховують складну динамічну взаємодію між зростанням стійкості цільової аудиторії до психологічного впливу та ефективністю використання ресурсів під час застосування конкретних каналів комунікації з урахуванням особливостей сегментованих аудиторій. Перспективними є дослідження, які вирішують ці проблеми шляхом використання нейропсихологічних теорій та комп'ютерного моделювання для оптимізації розподілу ресурсів у процесі планування психологічних операцій.*

Отримані результати дослідження. *У статті проаналізовано вплив швидкості «старіння» інформаційних матеріалів на ефективність психологічного впливу з урахуванням часу, актуальності інформаційних матеріалів та їхньої здатності формувати довготривалі когнітивні зміни у цільової аудиторії. Досліджено стійкість цільової аудиторії до психологічного впливу, яка залежить від когнітивних характеристик, рівня освіти, критичного мислення та соціокультурного середовища в умовах російсько-української війни. Визначено оптимізацію процесу витрат, яка забезпечується шляхом вибору найбільш ефективних каналів комунікації, серед яких найпоширенішими є соціальні мережі, ігрові платформи та традиційні засоби масової інформації, з урахуванням демографічних характеристик аудиторії та її інформаційних вподобань. Розроблений метод складається з трьох етапів. На першому етапі проводиться сегментація цільової аудиторії та аналіз стійкості цільової аудиторії до психологічного впливу, в межах якого цільова аудиторія класифікується за когнітивними ознаками (освіта, рівень критичного мислення, соціокультурне середовище тощо). На основі зібраних даних формується загальна характеристика цільової аудиторії, що дає змогу виділити підгрупи з різними моделями чутливості. На другому етапі моделюється динаміка стійкості до психологічного впливу за допомогою логарифмічної функції або імітаційного моделювання для оцінки зростання стійкості цільової аудиторії в часі, що відображає нелінійну адаптацію до психологічного впливу. Сутність третього етапу полягає в оптимізації розподілу ресурсів шляхом знаходження компромісного рішення для визначення оптимальної пропорції витрат ресурсів між підгрупами цільової аудиторії для досягнення максимального ефекту (кількості людей з обох цільових аудиторій, які змінили свою поведінку).*

Елементи наукової новизни. *Новизною цього дослідження є врахування динаміки опору цільової аудиторії у вигляді нелінійної функції, яка репрезентує когнітивну адаптацію цільової аудиторії та ефект «старіння» інформації в умовах російсько-української війни. Використання компромісного підходу до розподілу ресурсів між підгрупами цільової аудиторії дає змогу ефективніше використовувати наявні ресурси та досягти максимального ефекту психологічного впливу на цільову аудиторію. Аналіз нейропсихологічних основ споживання інформації допомагає зрозуміти, як інформаційні матеріали впливають на формування нейронних шляхів, що змінюють установки людей, які складають визначену цільову аудиторію. Крім того, інструменти штучного інтелекту дають змогу генерувати креативні інформаційні матеріали, які посилюють ефект психологічного впливу на цільову аудиторію.*

Теоретична й практична значущість викладеного у статті. *Теоретичним значенням викладеного у статті є дослідження методу раціонального розподілу ресурсів під час проведення психологічної операції в умовах російсько-української війни, який дає змогу створити математичну основу для прогнозування поведінки цільової аудиторії за різних сценаріїв проведення психологічної операції та підвищення ефекту психологічного впливу в умовах ресурсних обмежень. Практичним значенням методу є надання інструменту для максимізації ефекту психологічної операції в умовах обмеженого бюджету шляхом визначення пріоритетності цільових аудиторій з меншим опором до психологічного впливу та вибору оптимальних каналів комунікації для різних демографічних груп.*

Висновки й перспективи подальших досліджень. *Запропонований метод підвищує ефективність психологічної операції завдяки раціональному розподілу ресурсів між підгрупами цільової аудиторії з урахуванням динаміки опору та швидкості застарівання інформації. Подальші дослідження можуть бути спрямовані на розробку моделей психологічного впливу на цільову аудиторію з урахуванням впливу декількох каналів комунікації та використання інструментів штучного інтелекту для генерації контенту в психологічних операціях. Також необхідно вдосконалювати методологію оцінки цільової аудиторії з урахуванням варіацій патернів опору та її когнітивних реакцій, а також проводити експериментальні дослідження під час проведення психологічних операцій. Інструменти нейровізуалізації психологічного впливу допоможуть точніше*

визначати метрики стійкості цільової аудиторії до психологічного впливу та вдосконалити моделі прогнозування довгострокових когнітивних ефектів для різних цільових аудиторій.

Ключові слова: психологічна операція, психологічний вплив, інформаційні матеріали, цільова аудиторія, математичне моделювання, оптимізація, канали комунікації, опір, нейропсихологія.

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