

The object of research is the process of psychological influence on the target audience of gamers using information technologies. The problem of the lack of effective methods for assessing and correcting the psychophysiological state of players was solved. The proposed method of psychological influence on the target audience of gamers provides for the study of aspects of the use of interactive platforms in psychological operations and educational platforms based on gaming technologies. The features of the proposed method and the results obtained consist in taking into account the types of the target audience and influencing this audience by appropriate methods through the information content of a computer game. The method, which is based on the developed stochastic model, allows predicting the behavior of users of information technology – a computer game. The results of the study show that for the effective use of information technologies to increase the effect of psychological influence, it is necessary to adapt the information content to the peculiarities of perception of different types of gamers target audience. The proposed method provides in the dynamics of creating the prerequisites for the formation of a method of psychological influence on target audiences of gamers using modern information technologies. The developed method should be implemented in the following conditions for the use of information technologies: organizational (orientation on the desired audience); technical (requirements for computer equipment, software, etc.); social (introduction to game scenarios of the distribution of the game environment and game characters to different categories of social groups). The predicted psychological effects when using a computer game have been formed: emotional impact; increased motivation; formation of critical thinking; technical recommendations

Keywords: *information technology, psychological impact, computer game, performance evaluation, target audience*

DEVELOPMENT OF A METHOD OF PSYCHOLOGICAL IMPACT ON TARGET AUDIENCES OF GAMERS USING MODERN INFORMATION TECHNOLOGIES

Serhii Yevseiev

Corresponding author

Doctor of Technical Sciences, Professor, Head of Department

Department of Cyber Security*

E-mail: Serhii.Yevseiev@gmail.com

Stanislav Milevskyi

Doctor of Technical Science, Associate Professor

Department of Cyber Security*

Yurii Pribyliev

Doctor of Technical Sciences, Professor

Department of Information Warfare**

Yevhen Melenti

PhD, Associate Professor

First Vice-Rector***

Andriy Nalivayko

PhD, Associate Professor, Leading Researcher

Military and Strategic Research Centre**

Serhii Bazarnyi

Doctor of Philosophy, Head of the Research Laboratory

Research Department of Development and Implementation of Strategic Communications**

Oleksandr Morozov

Doctor of Technical Sciences, Professor, Senior Researcher

Scientific and Methodological Centre for Organization

and Coordination of Educational Activity**

Iryna Kazak

PhD, Associate Professor

Department of Chemical, Polymer and Silicate Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Peremohy str., 37, Kyiv, Ukraine, 03056

Alla Hrebeniuk

PhD, Senior Researcher

Scientific Laboratory***

Oksana Ivashchenko

PhD, Associate Professor

Department of Software Engineering and Management Intelligent Technologies*

*National Technical University "Kharkiv Polytechnic Institute"

Kyrpychva str., 2, Kharkiv, Ukraine, 61002

**National Defence University of Ukraine

Povitryanikh Sil ave., 28, Kyiv, Ukraine, 03049

***National Academy of the Security Service of Ukraine

Maksymovycha str., 22, Kyiv, Ukraine, 03066

Received 31.03.2025

Received in revised form 12.05.2025

Accepted date 09.06.2025

Published date 25.06.2025

How to Cite: Yevseiev, S., Milevskyi, S., Pribyliev, Y., Melenti, Y., Nalivayko, A., Bazarnyi, S., Morozov, O., Kazak, I., Hrebeniuk, A., Ivashchenko, O. (2025). Development of a method of psychological impact on target audiences of gamers using modern information technologies. *Eastern-European Journal of Enterprise Technologies*, 3 (9 (135)), 55–64. <https://doi.org/10.15587/1729-4061.2025.332271>

1. Introduction

Information warfare in the information space has become a prerequisite for achieving not only political but also military goals [1, 2]. Information technologies in the form of popular computer games have a significant impact on the tar-

get audience (TA), especially young people [3]. Special attention should be paid to interactive content (IC) and the possibilities of conducting psychological influence measures (PsI), aimed at performing psychological actions when conducting psychological operations (PsO) to influence specific TA of the enemy [4]. It is advisable to analyze approaches to con-

tent development, approaches to assessing the effectiveness of its psychological impact. The results of assessing the effectiveness of the impact of information content on the psychological state of the target audience allow to develop recommendations for the use of information technologies when conducting PsO. The mechanism of integrating narratives into information technologies for changing public sentiment, forming patriotic beliefs, and countering hostile propaganda using the example of computer games is analyzed.

In the struggle for dominance in the information space, the question arises of using modern information and communication and digital technologies, interactive platforms and media to influence the target audience. As a rule, young people form the basis of the target audience – computer game players and quickly perceive the achievements of modern information technologies. Therefore, for example, this type of target audience corresponds to the potential mobilization resource of both one's own state and the enemy's state. This determines the relevance of developing a model of PsI on the enemy's target audience, based on the use of information technologies.

2. Literature review and problem statement

The paper [5] examined the role of personality and psychological state in problematic Internet gaming. However, the study has a number of limitations. First, the cross-sectional design does not allow for the establishment of causal relationships between personality traits, psychological factors, and gaming behavior. Second, the selection of participants through advertising could have led to sample bias, particularly in the group of frequent gamers. In addition, the lack of a detailed analysis of game genres or the social context of the game limits the generalization of the results. Despite the high accuracy of the proposed model, the authors did not provide a complete description of the psychometric instruments used, which makes it difficult to assess the reliability of the conclusions obtained. The possible influence of external stressors, such as the pandemic, which can change both psychological state and gaming behavior, was also not taken into account. Finally, the clinical group was formed on the basis of self-referral to the hospital, which does not guarantee representativeness for all problem gamers. Analysis of the results of work [6] in the field of research on information technologies and information content indicates insufficient research into the process of their influence on the target audience during PsO. In particular, the issues of forming patriotic sentiments, neutralizing hostile propaganda, and achieving political and military goals using information technologies and information content have not been sufficiently researched. In [7], aspects of the influence of CG on human brain activity are presented, namely: improvement of the thinking process, reaction speed and decision-making skills. It has been proven that interactive digital environments activate the prefrontal cortex and hippocampus in the human brain, which provide improved memory, spatial orientation and cognitive flexibility. This is accompanied by structural changes in the brain, which in parallel affects the reduction of critical thinking and increased susceptibility to manipulative narratives, which contributes to the influence on the target audience. However, issues related to the development of effective models of psychological influence on the target audience with the involvement of CG remain unresolved.

In [8], the concept of CG as an information technology tool that provides an immersive experience and forms social narratives is proposed. The results of the study confirm that CG not only transmit information, but also create interactive content that affects the emotional perception of reality, contributes to the deep involvement of the player, emotional connection with the plot and identification with the characters. It is noted that addiction to games correlates with a decrease in social activity, increased excitability and the formation of new behavioral patterns. However, the authors do not consider the issue of evaluating CG as an element of psychological influence on the target audience – players. In [9], it is stated that CG significantly affect the psychophysiological state of players, in particular, include emotional involvement, increase the level of anxiety, influence cognitive processes and social interaction. This is the approach used in [10]. Taking into account the neuropsychological aspects of CG, specialized scenarios of influence through game mechanisms, characters and plot elements have been developed that contribute to the implementation of long-term PsI on the CA – users. But in works [9] and [10], issues related to the identification of PsI on the enemy's CA, with a neutral impact on neutral CA, remained unresolved. In the work, gamers from states that are not part of the coalition of one of the opponents are taken as neutral CA. The reasons for this are the lack of research results in the works on predicting PsI on the CA and determining its behavior model after impact. The results of research on the speed of cognitive analysis of players, adaptation to changing conditions, and making optimal decisions during the game are given in work [11]. The integration of narrative structures into the gaming experience helps to strengthen the emotional interaction of the target audience with the virtual environment, which contributes to a stable cognitive fixation on given concepts. This allows using video game content as an effective tool for modifying the consciousness of players, consolidating certain ideological attitudes and forming long-term beliefs. The disadvantage of this work is the lack of results of practical use of the theoretical justification of the impact on players – the authors do not consider CG as a tool of PSV on the enemy's target audience. In [12], the influence of CG on cognitive development and modification of states of consciousness was determined as key factors in the formation of perceptual and behavioral patterns in digital interactive environments. The results of the study substantiate that CG act as a powerful module of cognitive plasticity, contributing to deep sensory integration, increasing the selection of attention, and strengthening executive functions. The use of gamification mechanisms, immersive narrative design, and algorithmic modeling of adaptive behavior creates the prerequisites for semantic representations of the player, which is a means of transforming worldview orientations within hybrid information conflicts. All this gives grounds to argue that it is advisable to conduct research devoted to the development of a model of psychological influence on the target audience as a tool of information warfare. The study [13] has a limited sample ($n = 18$), which makes it difficult to generalize the results to wider gaming audiences. The analysis focuses only on the short-term impact of video games, without taking into account possible long-term psychological changes. There is no consideration of players' motivations, which is key for targeted psychological impact. The role of game mechanics, plot, or visual style as factors of influence is not analyzed. Individual sensitivity to content and the psychotype of the player are

also ignored. These limitations reduce the applied value of the study for developing methods of influencing target audiences of gamers using information technologies. The results of [14] are based on a small sample (28 people), which limits the possibility of generalizing the results. The main methodology – focus groups – has a risk of bias due to group dynamics and subjectivity of statements. There is no quantitative analysis, which reduces the accuracy in identifying patterns in the development of problematic gaming behavior. The research focuses mainly on the negative aspect of addiction, and does not consider the potential of video games to have positive, targeted psychological effects. It does not analyze the role of specific game genres, mechanics, or design elements that may cause or exacerbate problematic behavior. In addition, there is no consideration of how modern information technologies (e.g., personalization algorithms or adaptive content) may influence the formation of psychological addiction. Research [15] focuses on clustering players according to psychological characteristics, but does not take into account the dynamics of typologies changing over time under the influence of external information stimuli or technological interfaces. Although the sample is large and international, its distribution by age, culture, or level of gaming experience is not disclosed, which limits the interpretation of the results for specific target groups. There is no analysis of specific games or genres that could differently affect immersion or avoidance, which is important for targeted psychological influence. The article does not consider how modern technologies, such as algorithmic personalization, game stimuli, or social interaction in the network, modulate the type of player behavior. In addition, no practical recommendations are provided on information technology tools for adapting or correcting the identified typologies within the framework of psychological influence. [16] focuses mainly on the commercial behavior of gamers, ignoring the deeper psychological aspects that underlie repeated purchases. There is no analysis of the emotional or cognitive impact of aesthetic design on users, which limits understanding of psychological impact. Social context, including the influence of norms or group identity, is not taken into account, although it can significantly influence player behavior. The use of snowball sampling calls into question the representativeness of the data. The typology of players does not consider their motivation or psychological profiles, which are important for personalized impact. It also ignores the possible development of addiction or other long-term consequences of repeat purchases.

The relevance and practical significance of this study are also confirmed by the results of works [17, 18]. Thus, in work [17] it is shown that gamers of the Russian Federation (RF), who are a potential significant target audience for PsI, constitute a significant segment of the global gaming community. According to statistics, the Ukrainian CG – STALKER, has achieved significant success. It was determined that this IC is highly popular among gamers of the former CIS countries [17]. Gamers in the RF are active consumers of online games and sensitive to PsI due to game elements that support narratives and influence the moods and social behavior of the target audience. In work [18] the scale of the target audience – players were investigated. It is shown that there are more than 3.2 billion gamers in the world, of which 1.17 billion actively play online, and this number is constantly growing [18]. Mobile games account for 60% of the total number of computer games. Young people, in particular generation “Z”, are the main audience, which indicates open-

ness to interactive content and a high level of involvement. All this gives grounds to argue that it is advisable to test the proposed model of psychological influence on the example of the STALKER CG.

In [19], key aspects of the use of game-based learning in computer science, the methods of which are integrated through CG, are identified. The paper presents a trend towards the growth of object-oriented programming (58% of the analyzed studies) and educational thinking (42%). The implementation of such approaches in learning may include the development of games with feedback, adaptive plots and teamwork mechanics. Games such as “Capture the Flag” or “Privacy Awareness Games”, created to increase cybersecurity awareness among adolescents, demonstrate the effectiveness of interactive methods in learning. However, the paper does not contain results on the study of the emotional and psychological impact on the target audience (players) depending on the storylines and national flavor of the gaming platform.

Thus, the main unresolved issues in the field of research are the lack of effective methods for assessing and correcting the psychophysiological state of players. Substantiation of the neuropsychological aspects of computer games allows to reveal new prospects for the application of technologies in the development of cognitive and emotional characteristics of a person (target audience). This makes the research aimed at developing a method of psychological influence on the target audience – gamers – relevant.

3. The aim and objectives of the study

The aim of the study is to develop a method of psychological influence on the target audience of gamers using information technologies. The practical use of the method will allow to substantiate a complex of information technologies for carrying out psychological influence on the enemy through the target audience of gamers.

To achieve the aim of the study, it is necessary to solve the following objectives:

- to develop a stochastic model based on the theory of random graphs of psychological influence on the target audience of gamers;
- to formulate the stages of the method of psychological influence on the target audience of gamers;
- to evaluate the effectiveness of the method of psychological influence.

4. Materials and methods

The object of the study is the process of psychological influence on the target audience of gamers using information technologies.

The main hypothesis of the study is the assumption that modeling the adaptive behavior of players provides the development of measures to promote the effectiveness of psychological influence on specific target audiences of the enemy.

A simplification was made regarding the sufficiency of using available data on gaming communities that communicate in open information systems. These data are sufficient for an adequate analysis of the psychological state of the target audience and for substantiating methods of influencing a change in this state.

The following methods are used to solve the research problems:

- to develop a model of psychological impact on target audiences of gamers, methods of random graph theory are used. Random graph theory studies the properties of graphs that appear randomly, according to a certain probability distribution. This theory studies what properties are usually found in random graphs and how their probabilities change with changing model parameters. Therefore, the application of random graph theory will allow to adequately describe the stochastic nature of random processes of the model of psychological impact on target audiences of gamers;

- to develop a method of psychological influence on the target audience of gamers, methods of the theory of statistical analysis. Statistical analysis allows to draw conclusions and predict patterns in mass phenomena. Statistical analysis includes probability theory, statistical study, and other mathematical models based on the analysis of statistical data. The results of statistical analysis of the behavior of gamers (target audience) depending on the information content allow to develop a method of psychological influence on the target audience of gamers;

- to assess the effectiveness of the developed method of psychological influence, methods of the theory of effectiveness. The theory of effectiveness allows to assess the degree of achievement of the desired result, that is, the result of influencing gamers (the target audience) in order to change their psychological state.

Analytical generalization of the research results and scientific and methodological literature in the field of studying the psychological impact on the target audience allowed to form the following elements of the taxonomy of method development. For this purpose, the following methods of separating the elements of the taxonomy were used:

- comparison method to find common features of target audiences;

- hierarchy methods for classifying gamers and target audiences by degree of affinity and membership in gaming groups (environments, communities);

- multivariate analysis to use statistical methods to identify dependencies between features and classify information according to these dependencies;

- a method of classifying information about gaming groups (environments, communities), for example, articles (websites) by keywords, tags, categories, etc.

The listed separation methods allowed to form the elements of the taxonomy used in the development.

Social integration of gamers. Online communities, such as Discord, are an important communication channel (CC) for gamers to interact with, which can be used to distribute PsI materials, highlighting the potential of CG as a means of mass CC.

Psychological aspects. Gamers often turn to CG for stress relief and socialization. Influence through games allows for the integration of manipulative elements into content that affect a person's emotional state and decision-making process.

Regional features. It is important for Ukraine to use gaming platforms to form a favorable international image and conduct counter-propaganda activities against the Russian Federation.

Financial opportunities: Using games with monetization features (e.g., embedded advertising) provides financial support for PsO.

Immersion effect and interactivity. The popularity of the game, which is designed for a large (in terms of number) target audience, ensures a high level of engagement, and VR tech-

nologies add a presence effect to gamers, which helps create specialized scenarios with PsI on the enemy's target audience.

Thus, the significant potential of using information technologies and interactive content in conducting psychological operations is based on the integration of patriotic and ideological narratives into information technologies. And also, through popular computer games, it contributes to changing the attitude of players to certain events, strengthening critical thinking and forming new behavioral patterns.

5. Results of developing a method of psychological influence on target audiences of gamers using modern information technologies

5.1. Development of a stochastic model based on random graph theory of psychological impact on target audiences of gamers

Modern conflicts are accompanied by the use of PsO as a tool that supports the achievement of political and military goals [20]. In the context of large-scale armed aggression of the Russian Federation against Ukraine, the search and use of new tools to increase the effectiveness of PsO against a specific target group of the enemy is particularly relevant. Thus, CG is a promising communication channel through which PsO is implemented in a new, interactive format. Let's consider this on the basis of the widespread CG – STALKER [21], which was developed by the Ukrainian studio GSC Game World and, thanks to its interesting storyline, can be used to implement PsO when conducting psychological actions and psychological operations. The leadership of the Defense Forces of Ukraine is also considering the possibility of using interactive platforms to counter the spread of disinformation and Russian information influences, for example, to prevent mobilization activities in Ukraine [7, 22].

At the same time, gamification is actively researched in the field of education, where CGs are used to develop professional skills, but their effectiveness compared to traditional teaching methods requires further research. Another interesting direction is the therapeutic use of CGs to correct cognitive and psychological disorders of a person, such as dementia, attention deficit hyperactivity disorder, or emotional disorders, which opens up new opportunities for integrating games into clinical practice. In the context of PsI, CGs are considered as a PsO tool, where they can be used to change behavior, form stereotypes, spread certain ideas, or create empathy. Such games are able to implement the influence of narratives on the target audience or teach strategic thinking, influencing the cognitive and emotional sphere of players.

The results of the analysis of factors influencing the effect of PsI using CG are presented in Table 1.

The use of information technologies, for example, the modern STALKER CG, as a PsO tool, opens up new opportunities in the conditions of modern conflicts. This study emphasizes the need for further development of innovative approaches in the use of interactive platforms to achieve the goals of PsO. The use of interactive content for PsO has wide practical implementation. Thus, PsO is aimed at shaping public opinion, supporting political and military actions, as well as countering enemy propaganda. The Russian special services are active in this area, which actively use the media and social platforms to form a distorted view of events. At the same time, the Defense Forces of Ukraine, with the support of partners from NATO member states, are actively fighting

against information campaigns and campaigns by the enemy (the Russian Federation and its allies).

Table 1
Results of the analysis of factors influencing the effect of PsI using CG

Factors	Target audience engagement	Significance for psychological impact
Target audience scale	3.2 billion gamers; 1.17 billion online players	High accessibility to target audience, especially among young people (Gen Z 81%, Millennials 77%)
	60% of the market – mobile games	
Social integration	84% find like-minded people. 77% maintain connections with friends	Potential for mass communication impact through online communities
Psychological factors	Using games for: Stress relief; socialization	Integrating manipulative elements into content
Geographical location	Largest markets: Asia	Formation of Ukraine's international image
	Europe	
	USA	
Financial	Mobile gaming revenue	Monetization of information campaigns
Technical features	Multiplayer games, VR technologies	High level of engagement and presence effect

Through CG, players are immersed in a virtual world where, through emotional impact, desired cognitive changes can be achieved in a specific target audience. The STALKER game, which is based on the events in the Chernobyl Exclusion Zone, already has strong elements of national identity and culture, language, and musical content of Ukraine, which allows it to be effectively used for PSV on the enemy target audience.

To simulate the process of influencing the target audience, it is possible to develop a stochastic model based on random graph theory, which formalizes gamers' chat in the form of a weighted undirected graph as follows

$$G=(V,E,W), \quad (1)$$

where V – set of vertices (gamers), E – set of edges (connections between gamers in the chat), W – set of edge weights that reflect the strength of connections between gamers (chat presence).

The graph of the state transition of gamers in the CG chat is shown in Fig. 1.

The objective function is the maximum effect of PsI

$$\max_{C(t)} E(t; \theta), \quad (2)$$

where $C(t)$ – the volume of PsI information materials in game content at a given time t ;

$E(t; \theta)$ – an indicator that characterizes the change in target audience behavior as a parameterized characteristic θ .

To take into account the dynamics of changes in the behavior of the TA under the influence of the PsI, let's describe the discrete PsI model with a step by a recurrent equation Δt , where the change in the PsI effect is equal to

$$E(t + \Delta t) = E(t) + \alpha \cdot f(C(t), R(t), \theta), \quad (3)$$

where $\alpha \in [0, 1]$ – TA to PsI sensitivity coefficient;

$R(t)$ – the PsI effect function, which depends on the quality of information materials integrated into the computer game.

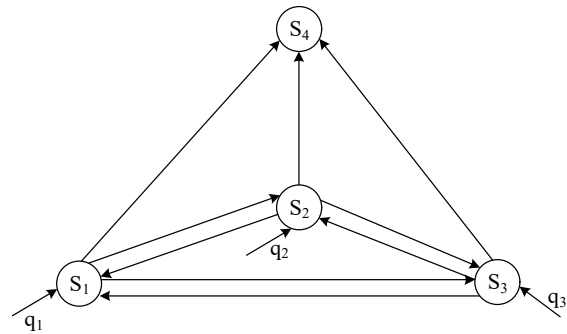


Fig. 1. The scheme of gamers' transitions from one state to another: S_1 – state of gamers who support Ukraine; S_2 – state of gamers who do not support Ukraine (opponent); S_3 – state of gamers who are neutral about the Russian war against Ukraine; S_4 – state of gamers who have left the chat; q_1 – the intensity with which gamers joined the chat and supported Ukraine; q_2 – intensity with which gamers joined the chat and do not support Ukraine; q_3 – intensity with which gamers joined the chat and are neutral about the Russian war against Ukraine. At the same time, the state S_4 is absorbing, due to gamers exiting the game, i.e. from states: S_1 , S_2 , S_3

The PsI effect function can be described based on the analysis of responses. The TA can be described by a weighted response index

$$R(t) = \omega_1 \times \text{Sentiment}(t) + \omega_2 \times \text{Engagement}(t) + \omega_3 \times \text{Dissemination}(t), \quad (4)$$

where *Sentiment* – average rating of emotional reactions of target audience in comments;

Engagement – frequency of active interactions (comments, streams, etc.);

Dissemination – number of reposts, mentions.

The value of the average score of the target audience's emotional reactions in the comments, the frequency of active interactions (comments, streams, etc.), and the number of reposts (mentions) is calculated from data on gaming communities that communicate in open information systems.

Thus, the proposed model is based on a stochastic model based on the theory of random graphs of the psychological impact on the target audience of gamers in dynamics.

5.2. Formulation of the stages of the method of psychological influence on the gamers target audience

Based on the PsI model for the enemy's target audience (for example, gamers), the following stages of the method being developed have been formulated:

Stage 1. Target audience analysis.

According to the results of the research, the target audience of the STALKER game is diverse and includes young people, fans of the survival horror genre, active players and members of the fan community. During the analysis of this target audience, the psychological characteristics, interests and motivations of this group are determined for the subsequent adaptation of PsI materials to the game content. Special attention is paid to the age category of 18–35 years, which is most receptive to new narratives through interactive content.

This stage is critical for understanding the influence of Russian intelligence services, which also aim to attract and manipulate similar audiences. Table 2 provides a description of the target audience of gamers.

Table 2

Characteristics of the target audience of gamers

Target audience	Purpose of influence	Characteristics	Methods of influence	Possibility of information exchange
Ukrainians	Supporting patriotism, strengthening national identity, motivation to actively counter aggression	Young people (18–35 years old), active social media users, gamers, survival horror fans, members of fan communities, patriotic citizens, people interested in national history and culture	Integration of Ukrainian culture, military heroism, language content and music. Use of stories of the struggle for independence and truth	Creating chat rooms for communication, organizing online events and communities
Russians	Decreasing support for the war, forming a critical attitude towards propaganda, demotivation to participate in the war	Young people (18–35 years old), members of online gaming communities, critical-thinking citizens, opponents of mobilization, citizens with poor access to alternative information	Using stories that demonstrate the negative consequences of aggression, revealing discrepancies between reality and propaganda narratives	Chats for discussing stories that encourage critical thinking and sharing alternative sources of information
Representatives (gamers) of NATO countries	Strengthening support for Ukraine, emphasizing the global threat of aggression	Young people who are fond of computer games, citizens of Ukraine's partner countries, active participants in online communities, politically aware people interested in geopolitics and conflicts	Including stories about international solidarity, the heroism of the Ukrainian military, and the importance of common values	Creating cross-national chat rooms to discuss the realities of war, exchange experiences, and support information warfare
Other gamers	Dissemination of truthful information, formation of a neutral or positive attitude towards Ukraine	Gamers from neutral countries, the global gaming community, people interested in new gaming trends, consumers of interactive content, participants of international gaming forums	The use of universal themes of the struggle between good and evil, the depiction of the tragedies of war, and the emphasis on universal human values	Ability to create global chats to discuss universal values, topics of peace and the fight against evil

Stage 2. Development of PsI materials or special information (SI) taking into account the results of the TA analysis. The development of PsI materials includes the formation of new storylines, tasks, characters and locations that reflect the realities of modern warfare, the heroism of the Ukrainian military and the importance of patriotic values. It is important that this content (SI) is organically integrated into the game, without looking like overt or covert propaganda. For example, characters may have real prototypes from war heroes, and tasks may demonstrate examples of information manipulation and ways to counteract them. In this context, Ukrainian special services can cooperate with developers to ensure an accurate and realistic presentation of events.

After the game was officially released on the relevant resources, Russians began to hack it and upload it to torrent platforms. Thus, the game became more accessible, and a significant part of the Russian audience began to download it en masse for free. Subsequently, many users not only played the game, but also “streamed” (distributed online broadcasts of the game) it. During this, it turned out that a large number of Russian bloggers were outraged by the Ukrainian soundtracks, especially the track “Ukrainian Fury” by Khrystyna Soloviy, which sounds in the game, which caused PsI in the TA of the rf.

Stage 3. Modification, expansion and adaptation of PsI materials. Installing game updates allows to adapt existing content by adding new scenarios and locations that reflect current events in Ukraine. The game's fan community actively participates in creating such modifications that help maintain interest and expand narratives. Partners play an important role in this process, supporting Ukraine's information security and ensuring coordination of efforts between partner countries.

Stage 4. Obtaining the final results of the PsI on the enemy's TA. For this, can use the developed stochastic model based on the theory of random graphs, which formalizes

the gamers' chat in the form of a weighted undirected graph.

Stage 5. Monitoring and evaluating the effectiveness of the measures taken. Monitoring the effectiveness of the PsI is implemented by analyzing feedback in communication channels (internet platforms, forums, etc.), as well as through online chats of players, which makes it possible to determine changes in the attitude of players to the war, the level of support for Ukraine, and resistance to hostile disinformation (likes, comments, etc.). Psychological operations units of the Defense Forces of Ukraine can participate in monitoring using specialized tools for analyzing internet platforms and forums.

Stage 6. After Action Review (AAR). The AAR is a key capability assessment tool for U.S. and NATO military units, helping to improve training, develop personnel, retain lessons learned, and foster a culture of continuous improvement. Thanks to the successful application of AAR, it is successfully used to learn from experience, improve processes, and positively impact mission performance.

Table 3 presents the results of the analysis of communication channels of the target audience of gamers.

To visualize the sequence of stages of the method, it is possible to display it in the form of an algorithm, which is shown in Fig. 2.

Thus, empirical verification is an important component of the process of assessing the effectiveness of using the STALKER CG. To ensure objectivity and accuracy of verification, it is necessary to apply a monitoring and evaluation system that will include quantitative indicators to clearly reflect changes in the perception of the target audience of the game narratives. Such an indicator can be a complex indicator of the PsI effect, which has a value in the range: from 0 to 1. If this indicator has a value from 0 to 0.5 ($0 \leq y_{ef} \leq 0,5$), it is necessary to repeat the PsI cycle and return to the first stage to upload information to information networks (INs).

Table 3

Results of analysis of communication channels of gamers' target audience

CC category	Information platform	Description of the information platform (IP)	Information Network (IN) capabilities
1. Streaming platforms	Twitch, YouTube Gaming, Facebook Gaming	One of the most popular platforms for game streaming	Live broadcast with interactive communication via chat. Using the influence of popular streamers to spread ideas or content. Advertising integrations (banners, mentions, influencer marketing)
2. Social networks	Discord, Reddit, Twitter, Instagram and TikTok	Social media is a primary channel for engaging gamers, communities, and distributing content	Creating servers with interesting interactive content. Holding thematic events, surveys, distributing promotional codes. Involving key participants to organize discussions or gaming tournaments
3. Gaming platforms	Battle.net, Origin, PlayStation Network, Xbox Live	Closed ecosystems for players on specific platforms (Blizzard, EA, PlayStation, Xbox)	Promotion of special gaming events. Targeted advertising within the platform
4. Cloud gaming services	GeForce Now, Google Stadia, Amazon Luna	Cloud gaming platforms allow to play without downloading game clients	Impact through access to games and advertising in integrated services
5. Cyber-sports tournaments	(Faceit, ESL, BLAST)	Cybersports tournaments attract millions of viewers	Event sponsorship. Placing branded or thematic materials during broadcasts

5.3. Evaluating the effectiveness of the psychological influence method

To assess the effectiveness of the PsI CG on the TA, it is proposed to use the following indicators.

Content emotional coloring indicator. This indicator includes an assessment of the change in the emotional response of players to real-life events and conflicts depicted in the game. The indicator is assessed by analyzing feedback (comments), surveys and interviews before and after the game, as well as by monitoring activity in online communities. The level of change is expressed in percentages, which indicates the emotional response and awareness of the players of the realities of war.

Level of patriotic motivation. The assessment of this

indicator is based on measuring the level of patriotism among Ukrainian players after completing the game. The indicator is assessed through specialized questionnaires that examine attitudes towards national values, heroism, and support for government actions in wartime. The increase in motivation is assessed as a percentage of positive media coverage.

A partial indicator of the level of influence of hostile propaganda. The reduction of the impact of disinformation and propaganda from the enemy is assessed by comparing indicators of awareness and attitude towards propaganda materials before and after interaction with the CG. The indicator is assessed by monitoring the impact on the target audience through surveys, analysis of messages in information sources, and specialized studies based on media analytics.

The obtained ranges of influence of the proposed efficiency indicators on the objective function (2) (complex indicator of the PsI effect), calculated by the relation (4), are given in Table 4.

Table 4

Ranges of influence of the proposed performance indicators on the complex indicator of the effect of psychological influence

Indicators of the effectiveness of the method of psychological influence	Range of increase in the complex indicator of the PsI effect, %
Content emotional coloring indicator	15...20
Level of patriotic motivation	10...12
Partial indicator of the level of influence of hostile propaganda	25...30

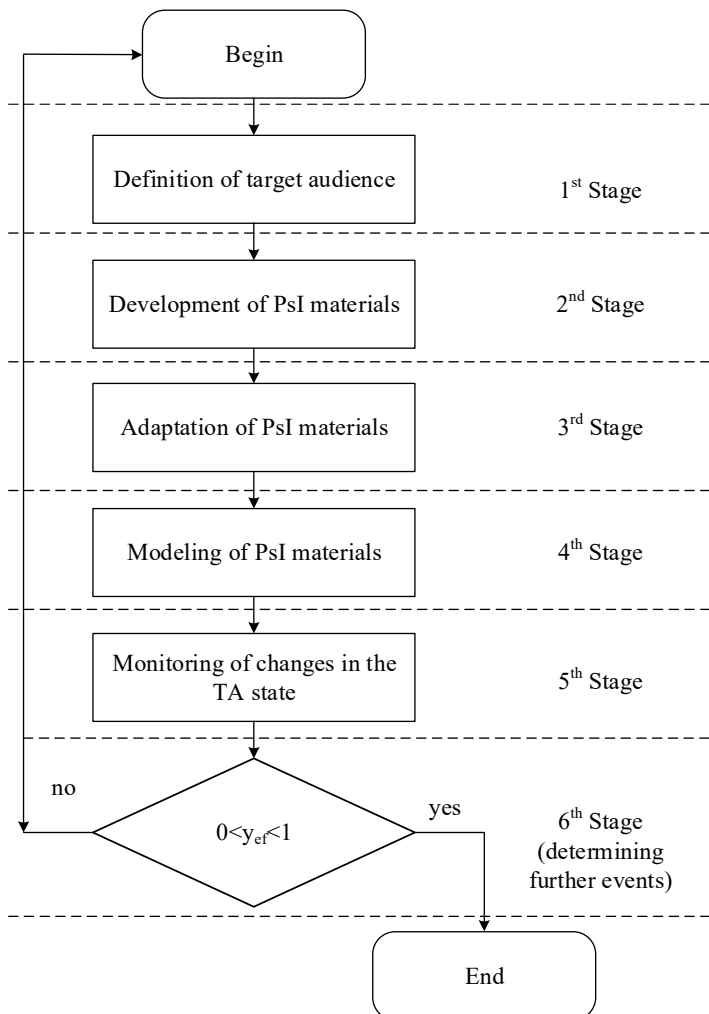


Fig. 2. Algorithm of the stages of the method of psychological influence on the target audience of gamers when conducting psychological operations

The proposed quantitative indicators reflect the real impact of CG on the change in perception,

patriotic motivation and ability to resist enemy propaganda. To influence gamers, it is important to use the platforms that they actively use for playing, communicating and viewing content [20]. The main platforms (CCs) that provide various opportunities for interaction with the target audience are described below.

The predicted psychological effects of using CG are as follows:

- emotional impact: the interactive format of CG creates strong emotional experiences that can enhance the connection with the narrative and influence players' attitudes towards war and national values;

- increased motivation: Players can identify with the heroes fighting for survival and truth. This increases the sense of belonging to the struggle and supports patriotic sentiments.;

- formation of critical thinking: using game plots to demonstrate manipulation and deception of critical thinking, which reduces the impact of hostile propaganda. This is part of the strategy of the European community and NATO member states to increase the media literacy of the population [17, 18];

- technical recommendations: within the framework of the project to create an interactive information platform based on the STALKER CG, it is necessary to take into account a number of technical aspects that will ensure the adaptability and effectiveness of this tool [23, 24]. One of the key elements is the development of technology for automatically adapting the CG content to a specific information context. This will ensure the constant relevance of the content and increase its effectiveness in the PsI.

6. Discussion of the results of developing a method of psychological influence on target audiences of gamers

The results of the study show that for the effective use of information technologies to increase the effect of PsI, it is necessary to adapt the information content to the peculiarities of perception of different types of gamers' target audience. Using the example of the STALKER CG, it is important for Ukrainians to emphasize national identity and culture; for Russians, it is important to demonstrate the negative consequences of war and manipulation; for representatives of the European community and NATO member states, it is important to emphasize the global threat of aggression and the importance of international solidarity. The integration of universal human values into the plot also contributes to the dissemination of truthful information among neutral groups. The proposed method provides the dynamics of creating the prerequisites for the formation of a method of psychological influence on target audiences of gamers using modern information technologies.

The proposed method of psychological influence on the target audience of gamers provides for the study of aspects of the use of interactive platforms in psychological operations and educational platforms based on gaming technologies. In order to increase the level of information literacy among the population, not only an in-depth understanding of the possibilities of interactive technologies in information warfare is used, but also the sustainable development of innovative methods for strengthening the information security of the state.

The proposed method of psychological influence is presented by an algorithm (Fig. 2). The method is based on the

developed model, the graph of which is shown in Fig. 1 and is described by the relations (1)–(4). The relevance of the introduction of information technologies in the field of psychological operations is proven by the results of evaluating the effectiveness of the developed method of psychological influence on the target audience (gamers) using the example of the STALKER CG (Table 4).

The features of the proposed method and the results obtained are in taking into account the target audience and influencing this audience by appropriate methods through the information content of a computer game. In addition, the method, which is based on the developed stochastic model, allows predicting the behavior of users of information technology – a computer game. The results obtained in the work are a continuation of the research of other authors [5–12], and the basis of the initial data for modeling does not contradict the works [17, 18]. For example, the taxonomy used in the development of the method was compiled on the basis of an analysis of the results of works [5, 8, 10, 11]. The results of the analysis of factors affecting the effect of psychological impact (Table 1) are compiled according to the data of works [18, 19]. The choice of the computer game STALKER for modeling the developed method does not contradict the conclusions of the work [17] about a significant segment of the global gaming community that is involved in this game. The considered indicators of effectiveness assessment proved an increase in the complex indicator of the effect of psychological impact on the target audience by 10–30% depending on the information content of the game (Table 4).

The developed method should be implemented in the following conditions of using information technologies:

- organizational (orientation to the desired audience);
- technical (requirements for computer equipment, software, etc.). For example, to attract a wider range of players – lower requirements for technical characteristics; for narrowly focused groups of players – specific requirements);
- social (introducing into game scenarios the distribution of the game environment and game characters into different categories of social groups).

This study is limited to using available data on gaming communities that communicate in open information systems (CCs such as the Internet, Facebook, YouTube, etc.). At the same time, the scope of the study left behind the discussion of gaming platforms in CCs of gaming chats and gaming communities of gaming groups (clans, communities, etc.), closed channels of gaming platform developers. However, the results of open data on gaming communities allow to obtain adequate information both about the target audience (gamers) and about their attitude to gaming content, depending on the information content of the gaming platform.

The disadvantage of this study is the targeted focus of the study on determining the effect of psychological influence on the target audience in the conditions of resolving the “hot phase” of the war. In the future, it is necessary to consider the features of developing methods of psychological influence on a neutral target audience in order to transfer it to partners.

The development of this research in the field of information warfare has several key directions. First, it is necessary to investigate the features of PsI of interactive content on different target audiences and social groups, in particular using neuropsychological methods of influence. Second, it is promising to create mathematical models using neural networks to predict behavioral changes of players under the influence of PSV. Third, it is necessary to study the possibil-

ities of automating the adaptation of game content using artificial intelligence, which will allow to promptly respond to new challenges and changes in the information environment. Special attention deserves an interdisciplinary approach that combines sociological, psychological and technological research to create complex tools of influence.

7. Conclusions

1. A stochastic model based on the theory of random graphs of psychological impact on target audiences of gamers has been developed. The model formalizes gamers' chat in the form of a weighted undirected graph for studying the emotional and psychological state of players. To take into account the dynamics of changes in the behavior of the target audience under the influence of a psychological operation, a model in the form of a recurrent equation has been proposed. The model allows to estimate the change in the effect of psychological impact depending on the method used in the gaming platform.

2. The stages of the method of psychological influence on the target audience of gamers are formulated. Six stages of the method are proposed:

- target audience analysis;
- development of psychological impact materials or special information taking into account the results of target audience analysis;
- modifications, expansions and adaptations of psychological impact materials;
- obtaining the final results of psychological impact on the enemy's target audience;
- monitoring and evaluating the effectiveness of the activities carried out;
- analysis of actions taken.

An algorithm for performing the stages of the method of psychological influence on the target audience of gamers when conducting psychological operations has been developed.

3. The effectiveness of the method of psychological influence was assessed. To assess the effectiveness of psychological influence through a computer game on the target audience, it is proposed to use three indicators:

- indicator of the emotional coloring of the content;
- level of patriotic motivation;

- partial indicator of the level of influence of hostile propaganda.

The proposed quantitative indicators reflect the real impact of computer games on the change in perception, patriotic motivation and the ability to resist enemy propaganda. The range of influence of efficiency indicators on the complex indicator of the effect of psychological impact according to the results of the evaluation of the computer game STALKER is 10–30%.

Based on the results of the effectiveness assessment, predicted psychological effects were formed when using a computer game:

- emotional impact;
- increasing motivation;
- developing critical thinking;
- technical recommendations.

To ensure the relevance of content and increase its effectiveness in terms of psychological impact, it is necessary to develop technologies for automatically adapting the content of computer games to specific information content.

Conflict of interest

The authors declare that they have no conflict of interest regarding this study, including financial, personal, authorship, or other, that could influence the study and its results presented in this article.

Financing

The study was conducted without financial support.

Data availability

The manuscript has no associated data.

Using artificial intelligence tools

The authors confirm that they did not use artificial intelligence technologies when creating the presented work.

References

1. Shmatko, O., Herasymov, S., Lysetskyi, Y., Yevseiev, S., Sievierinov, O., Voitko, T. et al. (2023). Development of the automated decision-making system synthesis method in the management of information security channels. *Eastern-European Journal of Enterprise Technologies*, 6 (9 (126)), 39–49. <https://doi.org/10.15587/1729-4061.2023.293511>

2. Yevseiev, S., Hryshchuk, R., Molodetska, K., Nazarkevych, M., Hrytsyk, V., Milov, O. et al.; Yevseiev, S., Hryshchuk, R., Molodetska, K., Nazarkevych, M. (Eds.) (2022). *Modeling of security systems for critical infrastructure facilities*. Kharkiv: PC TECHNOLOGY CENTER, 196. <https://doi.org/10.15587/978-617-7319-57-2>

3. Herasymov, S., Tkachov, A., Bazarnyi, S. (2024). Complex method of determining the location of social network agents in the interests of information operations. *Advanced Information Systems*, 8 (1), 31–36. <https://doi.org/10.20998/2522-9052.2024.1.04>

4. Sokulska, N., Huzyk, N., Kmin, V. (2023). Interactive educational content of a relevant educational environment in andragogy. *Academic Notes Series Pedagogical Science*, 1 (209). <https://doi.org/10.36550/2415-7988-2022-1-209-383-389>

5. Seong, W., Hong, J. S., Kim, S., Kim, S. M., Han, D. H. (2019). Personality and Psychological Factors of Problematic Internet Gamers Seeking Hospital Treatment. *Frontiers in Psychiatry*, 10. <https://doi.org/10.3389/fpsy.2019.00583>

6. Herasymov, S., Yevseiev, S., Milevskyi, S., Balitskyi, N., Zaika, V., Povaliaiev, S. et al. (2024). Development of a method for automatic control of monitoring means for information protection objects. *Eastern-European Journal of Enterprise Technologies*, 6 (9 (132)), 25–38. <https://doi.org/10.15587/1729-4061.2024.319058>

7. Li, J. (2023). Research on the effects of gaming on the brain. *Theoretical and Natural Science*, 6 (1), 247–251. <https://doi.org/10.54254/2753-8818/6/20230242>
8. Zinovieva, T. (2024). Video Games As Deep Media: Challenges During The Russian-Ukrainian War. *Obraz*, 44 (1), 45–57. [https://doi.org/10.21272/obraz.2024.1\(44\)-45-57](https://doi.org/10.21272/obraz.2024.1(44)-45-57)
9. Zamani, E., Chashmi, M., Hedayati, N. (2010). Effect of Addiction to Computer Games on Physical and Mental Health of Female and Male Students of Guidance School in City of Isfahan. *Addiction & Health*, 1 (2). Available at: https://ahj.kmu.ac.ir/article_84523.html
10. Oscarido, J., Siswanto, Z. A., Maleke, D. A., Gunawan, A. A. S. (2023). The impact of competitive FPS video games on human's decision-making skills. *Procedia Computer Science*, 216, 539–546. <https://doi.org/10.1016/j.procs.2022.12.167>
11. Gackenbach, J. I. (2009). Video Game Play and Consciousness Development: A Replication and Extension. *International Journal of Dream Research*, 2 (1), 3–11. <https://doi.org/10.11588/ijodr.2009.1.115>
12. Gaming Statistics. Academy of Animated Art. Available at: <https://academyofanimatedart.com/gaming-statistics/>
13. De Rosa, O., D'Onofrio, P., Conte, F., De Luca, P., Schiavone, C., Lustro, A. et al. (2025). The impact of an action commercial video game on adult non-gamers psychological well-being, cognitive functioning, and sleep. *Sleep Medicine*, 129, 274–282. <https://doi.org/10.1016/j.sleep.2025.03.002>
14. Monley, C. M., Liese, B. S., Oberleitner, L. M. (2023). Gamers' and non-gamers' perspectives on the development of problematic video game play. *Current Psychology*, 43 (1), 552–561. <https://doi.org/10.1007/s12144-023-04278-w>
15. Bowditch, L., Chapman, J., Signal, T., Naweed, A. (2025). Gamers in Real Life: Internet Gamer Typologies and Their Association With Problematic Gaming and Health Outcomes. *Human Behavior and Emerging Technologies*, 2025 (1). <https://doi.org/10.1155/hbe2/2368683>
16. Ngah, S., Rahi, S., Long, F., Gabarre, C., Rashid, A., Ngah, A. H. (2024). Future behavioural of console gamers and mobile gamers: are they differ? *Quality & Quantity*, 58 (6), 5531–5557. <https://doi.org/10.1007/s11135-024-01895-w>
17. Videnovik, M., Vold, T., Kjøning, L., Madevska Bogdanova, A., Trajkovik, V. (2023). Game-based learning in computer science education: a scoping literature review. *International Journal of STEM Education*, 10 (1). <https://doi.org/10.1186/s40594-023-00447-2>
18. Million copies, zero Russian: S.T.A.L.K.E.R. 2's Ukrainian victory. Available at: <https://euromaidanpress.com/2024/11/25/s-t-a-l-k-e-r-2-inside-the-making-of-ukraines-most-ambitious-video-game/>
19. Voitko, O., Solonnikov, V., Polyakova, E. (2022). SIR-model of distribution and taking into account of the results of the negative influence of information channels on public opinion. *Modern Information Technologies in the Sphere of Security and Defence*, 43 (1), 115–120. <https://doi.org/10.33099/2311-7249/2022-43-1-115-120>
20. STALKER 2. GSC Game World. Available at: <https://www.stalker2.com/uk>
21. Pro vnesennia zmin do Kryminalnoho kodeksu Ukrainy. Zakon Ukrainy No. 1183-VII. Verkhovna Rada Ukrainy. Available at: <https://zakon.rada.gov.ua/laws/show/1183-18#Text>
22. Allied Joint Doctrine for Information Operations (AJP-10.1) (2023). NATO. Available at: <https://www.gov.uk/government/publications/allied-joint-doctrine-for-information-operations-ajp-101>
23. Shmatko, O., Herasymov, S., Milevskyi, S., Balitskyi, N., Pohasii, S., Aleksieiev, M. et al. (2025). Development of a method for assessing the efficiency of technical systems' computer dynamic simulators. *Eastern-European Journal of Enterprise Technologies*, 2 (9 (134)), 50–61. <https://doi.org/10.15587/1729-4061.2025.327558>
24. Kyrychok, R., Laptiev, O., Lisnevskyi, R., Kozlovskyi, V., Klobukov, V. (2022). Development of a method for checking vulnerabilities of a corporate network using Bernstein transformations. *Eastern-European Journal of Enterprise Technologies*, 1 (9 (115)), 93–101. <https://doi.org/10.15587/1729-4061.2022.253530>