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From War Game to War of Games

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Abstract

The concept of war of games has emerged as a critical component of modern military doctrine, encompassing a spectrum of activities from war game simulations to real-world operations. In this research, we focus on developing a conceptual model for promoting a nation's capabilities in this domain. Employing a qualitative grounded theory methodology, semi-structured interviews were conducted with 19 experts in the field of war games. Data analysis yielded a paradigm model comprising causal conditions, a central phenomenon, strategies and plans, contextual factors, intervening conditions, and consequences. Key causal conditions identified include domestic capacities, threats, the desire for superiority, conflicts and unrest, and inherent and strategic causes. The central phenomenon is the promotion of war of games capabilities. Strategies and plans encompass human resource development, investment and economic factors, emphasis on soft power, multifaceted strategies, unconventional warfare, scientific and technological advancements, and enhanced capabilities and capacities in the battlefield. Contextual factors include human resources, understanding, awareness, and a shared understanding of the war of games concept, infrastructure development, innovation and creativity, flexibility, and adaptability. Intervening conditions encompass technological, cooperation and partnership, legal and rights, military and security, media, cyber and cognitive factors, religious and ideological factors, cultural and social factors, economic factors, and political factors. The consequences of promoting war of games capabilities include enhanced national security, a more stable position in the global power structure, positive outcomes in the political, social, cultural, infrastructural, economic, and scientific spheres. This research provides a valuable framework for understanding the complex factors involved in promoting war of games capabilities and their potential implications.

Key words: War games, War of games, Hybrid warfare, Grounded theory.

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Introduction

Game theory as an analytical tool in various fields, including economics, politics, and international relations (Camerer, 2011). For instance, competition over limited resources such as nuclear energy, diplomatic interactions in resolving international conflicts, and stock market competitions can all be modeled as games.

Game theory is a branch of applied mathematics that has evolved within the field of economics, focusing on the study of strategic behaviour among "rational" agents. Strategic behavior occurs when an agent's payoff depends not only on their own chosen strategy but also on the strategies chosen by other players. Everyday life provides countless examples of such situations, including trade negotiations between two countries, advertising wars between competing companies, and voting decisions of two shareholders (Moradian, 2023). The types of problems that game theory addresses span a vast number of disciplines, particularly economics and social sciences. For instance, competitive or cooperative situations among companies in the market, as well as the foreign policies of nations, are among the issues that game theory analyzes. Its applications can even extend to technical and security fields. Information security in communication between a sender and a receiver can be modeled as a game where an eavesdropper has greater access to confidential information, while the communicating parties strive to keep this information confidential (Z. Han, 2012). Also, for more information on game theory and its features one can see (Osborne & Rubinstein, 1994).

Game theory has also been applied to the study of social dilemmas, where individuals face a trade-off between pursuing their own self-interest and cooperating with others. The prisoner's dilemma, a classic example of a social dilemma, illustrates how individuals may choose to defect even when cooperation would lead to a better outcome for both parties. Game theory can help to understand why cooperation can be difficult to achieve in certain situations and how it can be fostered (Axelrod, 1984).

The concept of employing wargames to visualize, present, and evaluate campaigns has consistently fascinated and intrigued military leaders and commanders. Historical evidence, such as the use of miniature soldiers and war chariots on specialized gaming boards, can be traced back to ancient China and the reign of Ramses II in Egypt (13th century BCE). Additionally, it is suggested that before the Common Era, during the time of the Pharaohs in Egypt and ancient Greece, philosophers like Plato and

Homer devised games resembling chess, which gained popularity in these civilizations. The extent to which these models and games were effective in military planning and training for commanders and leaders is difficult to definitively assess. Curry's research on professional wargames highlights their historical flaws while emphasizing their continued value. Understanding these limitations can help improve future game design and better prepare decision-makers. Lin-Greenberg et al. offered wargaming as a unique method for studying decision-making in IR research. They provided guidance on using wargames for scholarly inquiry, including considerations for design, recruitment, and evaluation.

Schechter et al. propose the experimental wargaming method as a way to integrate wargaming with social scientific research. Their International Crisis Wargame demonstrates the viability of this approach for studying decision-making and crisis behaviors. Moreover, Wargaming has been used to assess military strategies and tactics since ancient times. It involves creating simulated scenarios to experiment with different approaches. This practice provides valuable insights for military planners (Kyle et. al. 2021). However, the majority of research and scholars contend that wargaming evolved from chess, a game prevalent in certain regions of the ancient world, and subsequently underwent significant developments (Moradian, 2023).

The WCCAAM method, as presented by DeBerry et al., is a valuable tool for automating the analysis of courses of action in wargames. By semi-automating the MDMP, WCCAAM can save time and resources for commanders while ensuring optimal decision-making. The method has been demonstrated to effectively process military scenarios and produce recommended COAs.

Wargaming has played a pivotal role in shaping military strategy throughout history. By providing a controlled environment to simulate real-world conflicts, wargames have allowed military leaders to experiment with different tactics, assess vulnerabilities and risks, and develop contingency plans. From the Napoleonic Wars to the Cold War, wargames have been employed to test new technologies, evaluate the effectiveness of military doctrines, and explore potential future scenarios. For instance, during the Cold War, both the United States and the Soviet Union extensively used wargames to prepare their military leaders for the complexities of nuclear warfare (Paret,1985).

Despite its numerous benefits, wargaming is not without limitations. One of the primary challenges is the inherent difficulty of accurately modeling the complexities of real-world conflict. Wargames often simplify the variables involved, making it difficult to capture the nuances of human behavior, technological advancements, and unforeseen events. Additionally, wargames can be time-consuming and resource-intensive, requiring significant expertise and technical capabilities. To address these limitations, researchers and military practitioners have explored various methodologies, such as agent-based modeling and game theory, to enhance the realism and applicability of wargames which can be found in (Kievit, 2012).

While wargaming offers invaluable insights into strategic planning and decision-making, its effectiveness is significantly enhanced through the integration of game theory. Game theory provides a rigorous analytical framework for modeling strategic interactions, enabling wargames to capture the complexities of real-world conflicts with greater precision. By formalizing the decision-making processes of various actors, game theory allows wargamers to explore a wider range of scenarios, identify optimal strategies, and assess the potential outcomes of different courses of action. Indeed, wargaming without game theory would be akin to conducting a chess match without understanding the rules of the game. For instance, game theory can be employed to model the dynamics of deterrence, the escalation of conflicts, and the impact of asymmetric warfare, providing a more nuanced understanding of the challenges faced by military commanders.

The capabilities afforded by modern wargaming, underpinned by game theory, have profound implications for the conduct of warfare. By simulating a wide range of potential conflicts, wargaming can enable nations to develop more effective strategies, anticipate adversaries' moves, and respond more decisively to emerging threats. In essence, wargaming transforms from a mere tool for analysis to a means of shaping the battlefield. This evolution gives rise to the concept of war of games,' where nations can proactively influence the course of conflicts by manipulating the rules of engagement, exploiting vulnerabilities, and leveraging asymmetrical advantages. For example, a nation facing a cyber threat might employ a wargame to simulate various defensive and offensive cyber operations, allowing it to identify critical vulnerabilities and develop robust countermeasures. Similarly, a nation confronted with an economic blockade could use wargaming to explore different political and

diplomatic responses, assessing the potential costs and benefits of each option. Consequently, this study delves into the critical domain of wargaming, aiming to shed light on its theoretical foundations, practical applications, and future implications. In this work, we seek to answer two fundamental questions about this phenomenon:

1. **What is the paradigmatic model governing the war of games phenomenon?**
2. **What are the key elements and attributes that characterize war of games?**

This research delves into Grounded theory through a structured exploration of multiple facets. The study begins by examining the historical context, relevant literature, and underlying theoretical frameworks. Next, the research methodology is outlined, detailing the data collection and analysis processes. The central phenomenon is then scrutinized, followed by an in-depth analysis of associated strategies and plans. Contextual factors and intervening conditions are considered to understand the broader implications. Furthermore, the paper evaluates the consequences of successful strategy implementation, emphasizing the critical role of war games in assessing strategies and influencing factors. Finally, a comprehensive discussion and conclusion are presented, synthesizing the findings and contributing to the existing body of knowledge.

The future of wargaming is likely to be shaped by advances in technology, such as artificial intelligence, virtual reality, and big data. These technologies will enable more sophisticated simulations and provide new insights into the nature of conflict. Additionally, the increasing importance of cyber warfare and information operations is likely to lead to the development of specialized wargames to address these challenge (Bowes,2016).

The increasing importance of cyber warfare and information operations is likely to lead to the development of specialized wargames to address these challenges. These wargames will need to incorporate cyber capabilities, such as hacking, malware, and data breaches, into their simulations. By doing so, military leaders can better prepare for and respond to cyber threats (Krenn, 2018).

History

The origins of game theory can be traced back to James Waldegrave, who, in 1713, proposed a min-max solution for a two-player game (Nash, 1996). However, it was not until von Neumann and Morgenstern's seminal work, "Theory of Games and Economic Behavior" (1944), that game theory was formalized and established as a distinct field of study. Nash's subsequent contributions, particularly his concept of Nash equilibrium, further solidified game theory's position as a powerful tool for analyzing strategic interactions. Game theory, at its core, employs mathematical models to investigate the decision-making processes of rational agents in competitive or cooperative settings (Osborne & Rubinstein, 1994).

Game theory has evolved significantly since its inception, with contributions from numerous scholars. John Nash's work on bargaining theory and cooperative games has been particularly influential, as has Reinhard Selten's research on perfect information games and Thomas Schelling's analysis of coordination games. These developments have expanded the scope of game theory and its applications to a wide range of fields (Aumann, 1987).

The historical roots of wargaming can be traced back to ancient civilizations such as China and India. The Chinese game "Hai-wai" and the Indian game "Chaturanga," a precursor to modern chess, were used for military training and strategic planning (Afshordi et al., 2018). In Europe, the 17th century witnessed the development of games like "the game of kings," which, while designed for entertainment, also served as a means to explore military tactics and strategy (Moradian, 2023).

Although these early wargames offered cognitive benefits, they were limited by their reliance on complete information and centralized control. This led to a lack of flexibility and adaptability, reflecting the rigid tactics of their time. To address these limitations, wargamers began to experiment with different approaches, such as incorporating uncertainty and allowing for decentralized decision-making (Pavlovskaya & Trofimov, 2018).

The development of wargaming was further influenced by the work of mathematicians and theorists. F. W. Lanchester's theory of collective combat, which analyzed the dynamics of large-scale battles, provided a quantitative framework for understanding the effects of force ratios and firepower (Lanchester, 1916). Additionally, the pioneering work of John von Neumann and Oskar Morgenstern on game theory laid the foundation

for the mathematical analysis of strategic interactions, including those found in wargaming (Von Neumann & Morgenstern, 1944).

The 19th century witnessed a shift in wargaming practices, as military experts sought to move beyond the constraints of traditional methods. After Napoleon's defeat, there was a renewed interest in wargaming that emphasized flexibility and adaptability (Myerson, 2013).

Military conflicts have been a central theme in wargaming research. The Battle of Bismarck provides a case in point. Haywood (1954) employed zero-sum game theory to analyze the strategic decisions made during this engagement, highlighting the potential of game theory to improve military decision-making (Cantwell, 2012).

In the Middle East, the Israeli was among the first to employ wargaming to confront Arab adversaries. Subsequently, India and Pakistan engaged in a competitive adoption of wargaming models. Turkey has also developed a combat simulation system called JANUS at the Istanbul War College, which simulates maneuvers at the brigade, division, and corps levels. The secrecy surrounding this simulator is such that the Turkish military prohibits foreign students enrolled at the war college from using it (Karagöz, 2016).

The 1991 and 2003 Iraq Wars provided another significant example of wargaming in action. The U.S. military used these conflicts as a testing ground for new weaponry. Prior to these engagements, the Crisis Action Team (CAT) developed a comprehensive mathematical model to simulate various combat scenarios, considering factors such as flight ceilings, unit movement speeds, ammunition consumption, and fuel requirements. The results of these simulations informed the Pentagon's decision to deploy advanced weaponry, including Abrams tanks and F-117 stealth aircraft. The effectiveness of these weapons systems in both wars demonstrated the value of such modeling efforts. By employing these simulations, the U.S. military was able to optimize the use of its limited resources, achieving military objectives with fewer troops.

The 20th century witnessed a significant evolution of wargaming, characterized by increasing sophistication and realism. The development of computers and simulation technologies enabled the creation of more complex and immersive wargames. For instance, the RAND Corporation's INTERCOM system, developed in the 1960s, was a pioneering effort to simulate large-scale military campaigns using computer models (Taylor,

1967). As computer technology advanced, wargames became increasingly interactive and capable of simulating a wider range of scenarios, from tactical engagements to strategic decision-making. Moreover, the development of game theory provided a theoretical framework for analyzing wargame outcomes and evaluating the effectiveness of different strategies (Taylor, 1967).

While wargaming has traditionally been associated with military applications, it has also found utility in various civilian domains. For example, wargaming has been used to model complex social systems, such as urban planning, disaster response, and climate change. By simulating different scenarios and evaluating the potential outcomes, wargaming can help decision-makers identify risks, assess vulnerabilities, and develop more effective strategies. Additionally, wargaming has been employed in educational settings to teach students about critical thinking, problem-solving, and strategic decision-making (Albert, Garrelick, Setin, 2005).

Literature and theoretical foundations

This section establishes a fundamental understanding of wargaming and games of wars by defining key terms including *game*, *player*, *game board*, *game rules*, *game strategy*, *decision theory*, *game theory*, wargame, and *war of games*.

Optimal control problems focus on a single decision-maker optimizing an objective function within specific constraints. Conversely, game theory explores strategic situations where decisions are influenced by the actions of others. The goal of game theory is to determine optimal strategies for each player, even under adverse conditions.

Additionally, it's important to note that wargames and games of war often incorporate elements of both optimal control and game theory. While optimal control might be used to model individual decision-making within a game, game theory is essential for understanding the interactions between multiple players and their strategic choices.

Game theory offers a structured approach to analyze interactions among rational decision-makers. Games can be categorized based on the number of players, the nature of strategies, and predefined rules and constraints.

Key terms within game theory include:

Game: An interactive situation involving two or more players, each with a set of strategies, where the outcome for each player depends on the

strategies chosen by all players. In essence, a game is a decision-making process where individuals must consider the potential actions and reactions of others.

Player: An entity that makes choices within a game. A player can be an individual, a group, or even a nation-state. Each player seeks to maximize their own payoff, given the actions of the other players.

Strategy: A complete plan of action that a player adopts in a game. A strategy specifies the actions a player will take in every possible situation that may arise. A well-crafted strategy takes into account the potential moves of opponents and aims to optimize the player's outcome. For instance, in chess, a strategy involves anticipating opponents' moves and planning a sequence of moves to achieve a favorable position.

Game theory: A mathematical framework for analyzing strategic interactions. It provides tools for modeling and predicting the behavior of rational decision-makers in situations where the outcome for one player depends on the choices made by others. By studying game theory, researchers can gain insights into a wide range of phenomena, from economic markets to political negotiations.

Game theory differs from optimal control theory, which focuses on optimizing a single decision-maker's objective function. In contrast, game theory explicitly considers the interdependence of decisions and the potential for strategic behaviour. Game theorists often assume that players are rational and seek to maximize their expected payoff, given their beliefs about the other players' strategies.

Payoff Function: The payoff associated with a particular outcome in a game, representing the gains or losses incurred by a player. The payoff function quantifies the value or utility a player derives from different strategic choices.

Static and Dynamic Games: A static game is one in which players make decisions simultaneously and only once. In contrast, a dynamic game involves sequential decision-making, where players' actions can influence the actions of subsequent players.

Games of Complete and Incomplete Information: In games of complete information, all players have perfect knowledge of the rules, payoffs, and the actions of other players. In games of incomplete information, some players may have private information that is not known to others, leading to uncertainty about the game's structure.

Cooperative and Non-cooperative Games: Cooperative games involves players forming coalitions to achieve a common goal. Players may communicate and make binding agreements. Non-cooperative games, on the other hand, assume that players act independently and are primarily concerned with their own individual payoffs.

Deterministic and Stochastic Games: Deterministic games have a fixed set of outcomes for each combination of strategies. Stochastic games, in contrast, involve elements of chance, where random events can influence the outcome of the game.

Zero-sum and Non-zero-sum Games: In a zero-sum game, the gains of one player are exactly offset by the losses of the other players. In a non-zero-sum game, the sum of the payoffs to all players can be positive, negative, or zero, indicating that there may be opportunities for mutually beneficial outcomes.

Equilibrium: An equilibrium is a state in which no player has an incentive to deviate from their chosen strategy, given the strategies of the other players. Different types of equilibria, such as Nash equilibrium, Stackelberg equilibrium, and Pareto optimality, are used to analyze various game-theoretic situations.

In non-cooperative games, equilibrium concepts such as saddle points, Nash equilibrium, and Stackelberg equilibrium emerge. Saddle points are characteristic of zero-sum games, while Nash and Stackelberg equilibria are common in non-zero-sum games. Conversely, cooperative games are typically analyzed using the Pareto optimality criterion.

A wargame encompasses a multifaceted set of elements, none of which is sufficient on its own to constitute a complete wargame. For instance, a simulation may provide a mechanism for generating outcomes, but it does not, in itself, constitute a wargame. In other words, the tools used to construct a wargame are distinct from the wargame itself.

According to Staff (2017), the key components of a wargame are as follows:

Objectives: Clearly defined objectives are essential for a successful wargame. They provide a focal point for the exercise and ensure that the game is designed to address specific training or research goals. Well-articulated objectives guide the development of the scenario, the design of the simulation, and the evaluation of outcomes.

Setting and Scenario: The setting establishes the context within which the wargame takes place, providing a realistic or hypothetical environment for decision-making. The scenario, a narrative that drives the game, is carefully crafted to align with the objectives and to challenge the players. Both setting and scenario should be sufficiently detailed to immerse the players in the simulated environment.

Players and Decisions: The decisions made by the players are the heart of the wargame. These decisions shape the course of the game and determine the outcomes. To ensure a realistic and engaging experience, the players' decisions should have meaningful consequences and feedback mechanisms.

Simulation: A simulation is a fundamental component of most wargames. It provides a dynamic environment where players can test their strategies and observe the results of their actions. Simulations can range from simple rule-based systems to complex computer models that incorporate a wide range of variables. The choice of simulation methodology depends on the specific goals of the wargame and the available resources.

Rules, Procedures, and Adjudication: Wargames necessitate a defined set of rules, procedures, and an adjudication process. Adjudication involves the determination of the outcomes resulting from players' interactions.

Data and Resources: Wargames rely heavily on data and resources to construct the gaming environment and scenario. Moreover, all simulations depend on data to execute their models.

Expert Support: The design and execution of a wargame typically require the expertise of subject matter experts.

Analysis: A thorough analysis of the data generated during a wargame is essential to derive meaningful insights and lessons learned.

Strategic-level wargames can be highly complex due to the involvement of numerous actors making unpredictable strategic choices, often across multiple domains (e.g., cultural, economic, political, cyber, biological, military, cognitive). Strategic issues are multi-faceted, influencing various strategies and actors. For instance, decisions about expanding a military airfield involve considerations such as transportation, economics,

employment, urban planning, noise pollution, safety, civil defense, and security. Consequently, strategic decision-making is often characterized by a diffuse and "loosely coupled" nature (Koppenjan & Klijn, 2004). This diffusion can significantly hinder efforts to influence and guide decision-making processes. As illustrated in Figure 1, actors may encounter unexpected decisions in domains where they are not directly involved, leading to substantial and often unforeseen consequences over time.

Since complex wargames are not conducted in isolation but rather within a broader context of other games, their complexity is compounded. Given that actors may engage in multiple games within a single domain, these games can influence one another. Losses in one game might be offset by gains in another, or vice versa. Subcomponents of complex wargames interact, creating interdependencies that facilitate new exchanges between games. Consequently, it is conceivable that actions deemed undesirable in one game might be supported in another due to the potential for compensation. Furthermore, coupled games can have a mitigating effect on conflicts and the strategies employed by players. It is possible to design and plan such that strategic misbehavior in one game can be compensated for in another (Koppenjan & Klijn, 2004). Figure 2 illustrates such a scenario.

The complexity of hybrid warfare increases proportionally with the number of domains involved. Consequently, adversaries find it increasingly difficult to anticipate, analyze, and counter such multifaceted strategies. To effectively counter complex hybrid warfare, we must develop equally complex or even multiple parallel hybrid warfare strategies.

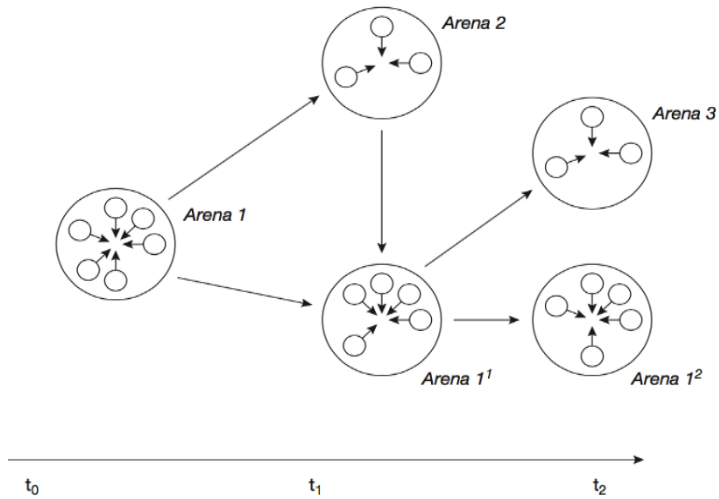

Figure 1. political games can be viewed as a series of decision-making processes across various domains.

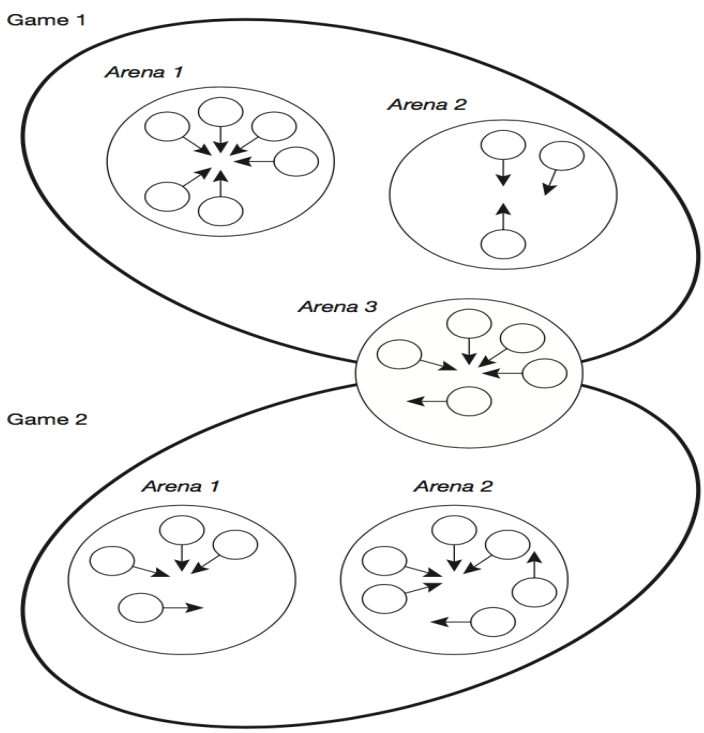

Figure 2. Interdependent games in hybrid warfare.

Methodology

This qualitative study employed a grounded theory approach, following the principles outlined by Strauss and Corbin (1990). Through an inductive process, the research aimed to address the research question by conducting in-depth interviews with experts in the field of war games and hybrid warfare. The research population consisted of professionals and experts with a deep understanding of the subject matter. Purposive sampling was utilized to select participants possessing sufficient knowledge, expertise, and experience. Semi-structured interviews were conducted to collect data, with theoretical saturation reached after interviewing 19 experts. To ensure the validity and reliability of the data, two methods of review were implemented: participant review and review by non-participating experts. Feedback from these reviews was incorporated into the research. The MAXQDA software was employed for data coding and analysis. The continuation of interviews until no new insights emerged ensured the depth and richness of the collected data. The involvement of experts in the review process enhanced the credibility and trustworthiness of the findings. The use of MAXQDA facilitated the organization, coding, and analysis of the interview data, ensuring a systematic and rigorous approach.

Analysis of findings

In this research and during semi-structured interviews, the participants answered questions such as: what is your opinion on the issue of war of games and why is it important to address this issue? What are the components and elements of war of games? In order for a country to emerge as a superior power in the field of war of games, what strategies and plans are necessary? What factors and conditions are effective in the implementation of these strategies and plans? and etc. With a detailed analysis of the typed files of the interviews line by line, conceptualization and open coding were done. In the next step, subcategories were extracted based on similarity, common features and conceptual relations of open codes. Then, subcategories were tried to be classified into larger conceptual categories. To do this, the method provided by Strauss and Corbin (1990) has been used. The coding process was repeated several times, and duplicate data and concepts were removed and similar concepts were merged. In the process of analyzing the interview data, 35 subcategories and 142 open codes were obtained. These categories and corresponding open codes are presented in Table 1.

Table 1. Open coding results.

No	Sub Categories	Open Codings
1	**Domestic capacities**	Superior military power, unified command, and specialized skills.
2	**Threats**	Perceived risk, cyber threats, and changing nature of terrorist threats and asymmetric conflict.
3	**Desire for superiority**	Staying ahead of rivals, escalating trends, and the pursuit of information dominance.
4	**Conflicts and unrest**	Geopolitical tensions, regional turmoil, and longstanding rivalries.
5	**Inherent causes of war of games**	The importance and impact of influence in modern warfare, large-scale influence, asymmetrical power dynamics, the possibility of war games becoming a central theme in future military literature, and the emphasis on the gray zone in the study of new warfare.
6	**Strategic causes**	Evolving military doctrine, changing the perspective from threat-based to capability-based, and public expectations.
7	**War of games**	Psychological warfare, political warfare, economic warfare, cyber warfare, information warfare, cognitive warfare, cultural warfare, media warfare, military warfare, diplomacy warfare, security warfare, science and technology warfare, environment warfare.
8	**Empowerment of human resources**	Specialized training programs, identification and attraction of talents, and continuous professional development.
9	**Investment and economic**	Investing in cutting-edge technologies, supporting investments and domestic sources of sustainable funding, and providing sufficient financing for projects and strategic initiatives.
10	**Emphasis on the soft components of power**	Building cyber capabilities, developing cognitive abilities, and prioritizing the intangible aspects of power.
11	**Having multifaceted strategies**	Deception strategy, adaptable strategy, innovative approach, countermeasures, and comprehensive deterrence.
12	**Unconventional war strategy**	Asymmetric conflicts, proxy conflicts, and unpredictability.
13	**Scientific and technological strategies**	Multidisciplinary research and development, the creation of scientific and research centers related to war of games, the expansion of scientific research in the field of war of games, effective strategies based on big data, futures research, Willingness to embrace the risks of new technology and enhanced technological capabilities.
14	**Increasing capability and capacity in the battle scene**	Intelligence in the battle scene, the ability to deal with information manipulation in the battle scene, and the ability to influence
15	**Human resources**	Experienced commanders, cohesion and coordination between different forces, and expert and committed human resources
16	**Understanding, awareness and the correct and common grounding**	Developing and establishing the war games concept at strategic levels, raising public awareness and involvement, and enhancing commanders' understanding and awareness of intangible factors, and developing the concept of war of games in other levels

No	Sub Categories	Open Codings
	for the war of games concept	
17	**Infrastructure development (from the contextual aspect)**	Development of communication infrastructure, and industrial and technological infrastructure.
18	**Innovation and creativity**	Creation and development of innovation centers, adaptation and continuous innovations in strategies, technological innovations, and creative approaches.
19	**Flexibility and adaptability**	Flexibility for countermeasures by competitors, the study of modern warfare, evaluation and monitoring systems (to track progress and evaluate the impact of strategic initiatives and the possibility of adjusting them), and adaptability.
20	**Technological field**	Development of information and communication technology, the limitation of access to technology, and the speed of technological progress.
21	**Cooperation and partnership**	Inter-agency cooperation (government and military), participation of public and private sectors, utilization of the capacity of universities and research centers, Involvement of experts in meetings, collaboration with experts, and working with leading global institutions.
22	**Legal and rights**	Changes in international laws and regulations, international obligations in the field of human rights, and the impact of the existence and implementation of laws and regulations on strategies.
23	**Military and security**	Military exercises, and security factors.
24	**Media, cyber and cognitive factors**	Cyber attacks, cognitive warfare, and the ability to control narratives through media and propaganda.
25	**Religious and ideological factors**	Strong religious national values, religious advice and guidance, and ideological beliefs.
26	**Cultural and social factors**	Public understanding and attitudes of society, cultural narratives, popular support and social support, cultural sensitivities, changes in social and demographic structure, and lifestyle changes.
27	**Economic factors**	Budget constraints, global economic changes, and resistance economy.
28	**Political factors**	Coalitions, international influence, global political environment, political will to implement strategic initiatives, political instability, promotion of international relations, and political support.
29	**National security**	Increasing national security, increasing deterrence power, increasing military power, deceiving the enemy, and changing the playing field according to superiority.
30	**Stabilization of the position**	Promotion of the country's position in the global and regional power geometry, the ability to change the rules of the game, and greater independence and flexibility in response to global challenges.
31	**Political sphere**	Political dominance, International influence (from the side of the consequences), political stability, improving the horizon of the sovereign vision, and correct governance.

No	Sub Categories	Open Codings
32	**Social and cultural sphere**	Strengthening the morale and self-confidence of the military forces and civilians, social dominance, increasing people's participation in defense programs, national cohesion, cognitive dominance, and cultural dominance
33	**Infrastructural consequences**	Increasing the capability in crisis management, strengthening critical and defense infrastructure, and improving cyber security
34	**Economic field**	Potential economic growth, economic dominance, economic stability, employment creation, obtaining economic benefits from the transfer of this knowledge, and creating a new environment by investing in new technologies and fields
35	**Scientific and professional field**	Improvement of scientific and professional standards, and a more capable human resource.

Paradigm Model
Causal Conditions

Causal conditions include factors that affect the central category and cause it to arise. In this research, domestic capacities, threats, desire for superiority, conflicts and unrest, inherent causes of war of games, and strategic causes are the causal conditions affecting the central category. In this regard, domestic capabilities include high military capabilities and capacities, unified commanding, and special capabilities and capacities. Regarding specific capabilities and capacities, the opinion of one of the interviewees is as follows: “Each country has unique capabilities and capacities that may not be used in traditional battlefields. By changing the battlefield, these capabilities can be used in a better way”. The next factor, threats, includes perceived threat, cyber attacks, and changes in the nature of terrorist threats and asymmetric warfare. Regarding the perceived threat, one of the interviewees states that “Perceived threat from another country can lead to proactive game design to reduce risks”. The desire for superiority, as another factor, includes not falling behind the competition, escalation patterns, and the desire for informational superiority. One of the interviewees said about the escalation patterns that “Each country's efforts to outdo the other can lead to more complex games”. The next factor, conflicts and unrest, includes geopolitical tensions, regional unrest, and historical enmities. In this context, one of the interviewees states that “regions that face regional instability or ongoing conflicts are more exposed to the emergence of strategic games”.

The inherent causes of war of games is another case among the causal conditions, which includes importance and influence as one of the concepts of modern war, influence with a large scope, asymmetry of power, the possibility of a high position of war of games in the future military literature, and attention to the gray environment in the topics of the new war. In this case, one of the interviewees states that “when there is a significant power imbalance, the more powerful country may design a game to exploit its advantages”. Following the words of this participant, it can be said that even a weaker country may design games based on its capabilities and lead the war in that direction. The last of the causal conditions are strategic causes, which includes changes in military doctrine, changing the paradigm from threat-oriented to capability-oriented, and people's expectations. In this context, one point of view is that “among the influential factors that create war of games are changes in

military doctrine and training to adapt to new threats and opportunities". Causal conditions and related open codings are shown in Table 2.

Table 2. Causal conditions and related open codings.

Causal conditions	Open Codings
Domestic capacities	Advanced military capabilities and capacities, unified commanding, and special capabilities and capacities.
Threats	Perceived threat, cyber attacks, and Evolving terrorist tactics and unconventional warfare.
Desire for superiority	Not falling behind the competition, escalation patterns, and the pursuit of information dominance.
Conflicts and unrest	Geopolitical tensions, regional unrest, and historical enmities.
Inherent causes of war of games	Importance and influence as one of the concepts of modern war, influence with a large scope, asymmetry of power, the possibility of a high position of war of games in the future military literature, and attention to the gray environment in the topics of the new war.
strategic causes	Changes in military doctrine, changing the paradigm from threat-oriented to capability-oriented, and people's expectations

Central Phenomenon

In this research, the central category is the issue of war of games, which according to the interviewees and experts, includes various dimensions of hybrid warfare such as psychological, political, economic, cyber, information, cognitive, cultural, media, military, diplomacy, security, science and technology, and environment. In other words, most of the participants in their talks and in response to the questions, mention the different dimensions of hybrid warfare in the war of games. For example, one of the interviewees states that "in general, any concept around which regional and global actors take action and exert power over each other in order to achieve benefits or gain superiority, is included in the framework of war of games. In other words, factors that cause competition or conflict can be considered among the elements mentioned in this concept. For example, the components of hybrid warfare include military, cultural, political, economic, science and technology, environmental warfare and etc, are among the elements of war of games". It is worth noting that when the interviewees talked about the dimensions of hybrid warfare, they mentioned some dimensions and used the phrase "and other dimensions", because due to the time limit in the interviews,

it was not possible to mention all dimensions and aspects of hybrid warfare, and this issue caused only some dimensions to be mentioned here. Central phenomenon and related open codings are presented in Table 3.

Table 3. Central phenomenon and related open codings.

Central phenomenon	Open codings
War of games	Psychological warfare, political warfare, economic warfare, cyber warfare, information warfare, cognitive warfare, cultural warfare, media warfare, military warfare, diplomacy warfare, security warfare, science and technology warfare, environment warfare

Strategies and Plans

Strategies in the grounded theory refer to solutions to achieve and face the axial phenomenon. In this research, based on the analysis of interview data, we have obtained seven strategies, which include empowerment of human resources, investment and economic, emphasis on the soft components of power, having multifaceted strategies, unconventional war strategy, scientific and technological strategies, and increasing capability and capacity in the battle scene. The first case, empowerment of human resources, includes specialized training programs, identification and attraction of talents, and continuous professional development. In this context, "Specialized training programs: Specialized training programs for military forces and civilians in various fields of war of games, such as cyber war, information war, and the use of advanced technologies" are the words of one of the interviewees. The second case, investment and economic strategies, includes investment in advanced technologies, support for investments and national sources of sustainable financing, and adequate financing of projects and strategic initiatives. In this regard, the opinion of one of the interviewees is that "countries may invest a lot in research and development in areas such as artificial intelligence (AI), quantum computing or advanced weapons to gain a technological advantage over their opponent". The next strategy is to emphasize the soft components of power, which here consists of the development of cyber capabilities, the development of cognitive capabilities, and to emphasize the soft components of power, as mentioned in various interviews. The next is to have multifaceted strategies that include deception strategy, development of flexible strategy, innovative strategy, countermeasure strategy, and comprehensive deterrence. In this context, one of the interviewees states that "it is necessary to develop flexible strategies that can quickly adapt to the changes of the battlefield". Next is unconventional war strategies, whose components include asymmetric conflicts, proxy conflicts, and unpredictability. In this regard, one of the interviewees states that "countries may indirectly enter the conflict and enter

the game by supporting opposition factions, rebel groups or other countries that are involved with their opponent". The next item is scientific and technological strategies, which here include multidisciplinary research and development, the creation of scientific and research institutes related to war of games, the expansion of scientific research in the field of war of games, effective strategies based on big data, futures research, readiness to accept the risk of using new technology, and increasing technological capabilities. In this context, one of the interviewees states the issue of "creating and supporting institutions dedicated to the study of war games, incorporating insights from various disciplines such as sociology, economics, technology, and media studies". The last strategy is to increase capability and capacity in the battle scene, whose components include intelligence in the battle scene, the ability to deal with information manipulation in the battle scene, and the ability to influence. Strategies and plans and related open codings are presented in Table 4.

Table 4. Strategies and plans and related open codings.

Strategies and plans	Open codings
Empowerment of human resources	Specialized training programs, identification and attraction of talents, and continuous professional development
Investment and economic	Investment in advanced technologies, support for investments and national sources of sustainable financing, and adequate financing of projects and strategic initiatives.
Emphasis on the soft components of power	Development of cyber capabilities, the development of cognitive capabilities, and The emphasis on the soft components of power.
Having multifaceted strategies	Deception strategy, Development of flexible strategy, innovative strategy, countermeasure strategy, and comprehensive deterrence.
Unconventional war strategy	Asymmetric conflicts, proxy conflicts, and unpredictability.
Scientific and technological strategies	Multidisciplinary research and development, the creation of scientific and research centers related to war of games, the expansion of scientific research in the field of war of games, effective strategies based on big data, futures research, readiness to accept the risk of using new technology, and increasing technological capabilities.
Increasing capability and capacity in the battle scene	Intelligence in the battle scene, the ability to deal with information manipulation in the battle scene, and the ability to influence.

Context

The strategies and plans presented in the previous section are influenced by various contextual factors, which based on data analysis include human resources, understanding, awareness and the correct and common grounding for the war of games concept, infrastructure development (from the contextual point of view), innovation and creativity, and flexibility and adaptability. Human resources includes experienced commanders, cohesion and coordination between different forces, and expert and committed human resources. In this context, one of the interviewees states that "experienced commanders bring a deep understanding of military strategy, historical context and enemy behaviour". The next contextual factor is the understanding, awareness and the correct and common grounding for the war of games concept, which includes the development and grounding for the war of games concept at strategic levels, increasing public awareness and participation, increasing commanders' understanding and awareness of soft components, and developing the concept of war of games in other levels. In this case, public awareness and participation can be an important support in the effective implementation of war of games strategies. That is, the more people of a country are aware in this field, the more carefully power there is, to change the playing field. The next factor is infrastructure development, which includes the development of communication infrastructure, and industrial and technological infrastructure. The opinion of one of the interviewees in this case is "creating and maintaining secure and high-speed communication infrastructure for effective coordination between forces". The next contextual factor is innovation and creativity, which includes the creation and development of innovation centres, adaptation and continuous innovations in strategies, technological innovations, and creative approaches. In this case, one of the interviewees states that "consistency and continuous innovation in strategies is necessary to surpass the competitor". The last of the contextual factors is flexibility and adaptability, which includes flexibility for countermeasures by competitors, the study of modern warfare, evaluation and monitoring systems (to track progress and evaluate the impact of strategic initiatives and the possibility of adjusting them), and adaptability. In this case, one of the interviewees states that "opponents in war games may change their strategies and learn new skills. This can somehow strain our strategies and require them to be improved and changed". Contextual factors and related open codings are presented in Table 5.

Table 5. Contextual Factors and Related open codings.

Context	Open Codings
Human resources	Experienced commanders, cohesion and coordination between different forces, and expert and committed human resources.
Understanding, awareness and the correct and common grounding for the war of games concept	Development and grounding for the war of games concept at strategic levels, increasing public awareness and participation, increasing commanders' understanding and awareness of soft components, and developing the concept of war of games in other levels.
Infrastructure development (from the contextual aspect)	Development of communication infrastructure, and industrial and technological infrastructure.
Innovation and creativity	Creation and development of innovation centers, adaptation and continuous innovations in strategies, technological innovations, and creative approaches.
Flexibility and adaptability	Flexibility for countermeasures by competitors, the study of modern warfare, evaluation and monitoring systems (to track progress and evaluate the impact of strategic initiatives and the possibility of adjusting them), and adaptability.

Intervening conditions

In this research, the intervening conditions include nine categories, which are technological, cooperation and partnership, legal and rights, military and security, media, cyber and cognitive factors, religious and ideological factors, cultural and social factors, economic factors, and political factors. The first one, the technological domain, consists of the development of information and communication technology, the limitation of access to technology, and the speed of technological progress. In this regard, one of the interviewees states that “the speed of technology development at the global level can have a direct impact on the effectiveness and up-to-dateness of strategies”. The next factor that can influence strategies is cooperation and participation, which includes inter-agency cooperation (government and military), participation of public and private sectors, utilization of the capacity of universities and research centres, participation of experts in meetings, cooperation with experts, and leading global institutions. In this context, one of the interviewees states that “effective coordination between different government agencies and departments is necessary for a coherent strategy”. The legal and rights field, as the next item, includes changes in international laws and regulations, international obligations in the field of human rights, and the impact of the existence and implementation of laws and regulations on strategies. In this regard, one of the participants states that “national and international legal frameworks, laws and regulations may impose restrictions on certain activities that this issue require precision and

compliance". Next, the military and security field, includes military exercises, and security factors. In this regard, one of the participants states that "countries, while not directly involved in armed conflicts, may use military exercises, arms races or threats of force to intimidate the opponent or prevent certain actions".

The next intervening factor, media, cyber, and cognitive factors, includes cyber attacks, cognitive warfare, and the ability to control narratives through media and propaganda. In relation to this case, the opinion of one of the interviewees is that "the most important intervening factor is cognitive warfare, the lack of attention to which, like a destructive virus, affects all power-generating factors and depletes national power from within". Another item is religious and ideological factors, including strong religious national values, religious advice and guidance, and ideological beliefs. In this context, one of the interviewees states that "primarily, paying attention to faith in God and piety is the most important factor in success in war of games". Among other intervening conditions are cultural and social factors, which include public understanding and attitudes of society, cultural narratives, popular support and social support, cultural sensitivities, changes in social and demographic structure, and lifestyle changes. In this regard, one of the participants states that "public understanding and society's attitudes towards the strategic goals of the country can affect the implementation of policies. Lack of public support may lead to resistance or reduced effectiveness". The next one is economic factors including budget constraints, global economic changes, and resistance economy. In this case, the opinion of one of the interviewees is that "economic recession or financial crises can limit the funds available for education, research and development of technology." The last one is political factors, which include coalitions, international influence, global political environment, political will to implement strategic initiatives, political instability, promotion of international relations, and political support. In this regard, one of the participants states that "the level of cooperation and relations with other countries can be effective". Intervening conditions and related open codings are presented in Table 6.

Table 6. Intervening conditions and related open codings.

Intervening Conditions	Open codings
Technological field	Development of information and communication technology, the limitation of access to technology, and the speed of technological progress
Cooperation and partnership	Inter-agency cooperation (government and military), Collaboration between public and private sectors, leveraging university and research center capabilities, expert involvement in meetings, expert cooperation, and engagement with leading global institutions.
Legal and rights	Changes in international laws and regulations, international obligations in the field of human rights, and the impact of the existence and implementation of laws and regulations on strategies.
Military and security	Military exercises, and security factors.
Media, cyber and cognitive factors	Cyber attacks, cognitive warfare, and the ability to control narratives through media and propaganda.
Religious and ideological factors	Strong religious national values, religious advice and guidance, and ideological beliefs.
Cultural and social factors	Public understanding and attitudes of society, cultural narratives, popular support and social support, cultural sensitivities, changes in social and demographic structure, and lifestyle changes.
Economic factors	Budget constraints, global economic changes, and resistance economy.
Political factors	Coalitions, international influence, global political environment, political will to implement strategic initiatives, political instability, promotion of international relations, and political support.

Consequences

The consequences of developing strategies and plans and their effective implementation are primarily related to national security (increasing national security, increasing deterrence power, increasing military power, deceiving the enemy, and changing the playing field according to superiority). Another consequence is the stabilization of the position, which includes the promotion of the country's position in the global and regional power geometry, the ability to change the rules of the game, and greater independence and flexibility in response to global challenges. In this regard, the opinion of one of the interviewees is that “improving the ability to design and deal with complex strategic scenarios will bring greater independence and flexibility in response to global challenges”. Among the other consequences are the consequences of the political sphere, which includes political dominance, International influence (from the side of the consequences), political stability, improving the horizon of the sovereign

vision, and correct governance. The noteworthy point here is that international influence has been proposed both as a consequence of strategies and as an intervening and influencing factor on strategies. Regarding international influence (as an outcome), one of the interviewees states, “increasing the country's influence and effectiveness in international organizations and institutions”, and regarding international influence (as an intervening factor), one of the interviewees mentions “A country's ability to influence international public opinion and gain diplomatic influence” as one of the factors that play a role in the war of games. Another consequence is related to the social and cultural sphere, which includes strengthening the morale and self-confidence of the military forces and civilians, social dominance, increasing people's participation in defense programs, national cohesion, cognitive dominance, and cultural dominance. In this regard, one of the interviewees states that “success in new battle arenas can help strengthen the morale and self-confidence of the military and civilian forces. This can play an important role in the country's resistance and stability against threats”. Next is the infrastructural consequences, which include increasing the capability in crisis management, strengthening critical and defense infrastructure, and improving cyber security. Another important consequences is the economic field, which includes potential economic growth, economic dominance, economic stability, employment creation, obtaining economic benefits from the transfer of this knowledge, and creating a new environment by investing in new technologies and fields. In this regard, one of the participants states that “Investment in research, development and technology creates innovation and potentially leads to economic growth and new industries”. Another consequence is related to the scientific and professional field, which includes the improvement of scientific and professional standards, and a more capable human resource. Consequences and related open codings are presented in Table 7.

Table 7. consequences and related open codings.

Consequences	Open codings
National security	Increasing national security, increasing deterrence power, increasing military power, deceiving the enemy, and changing the playing field according to superiority.
Stabilization of the position	Promotion of the country's position in the global and regional power geometry, the ability to change the rules of the game, and greater independence and flexibility in response to global challenges.
Political sphere	Political dominance, International influence (from the side of the consequences), political stability, improving the horizon of the sovereign vision, and correct governance.

Consequences	Open codings
Social and cultural sphere	Strengthening the morale and self-confidence of the military forces and civilians, social dominance, increasing people's participation in defense programs, national cohesion, cognitive dominance, and cultural dominance.
Infrastructural consequences	Increasing the capability in crisis management, strengthening critical and defense infrastructure, and improving cyber security.
Economic field	Potential economic growth, economic dominance, economic stability, employment creation, gaining economic advantages from knowledge transfer and creating a new environment through investments in emerging technologies and fields.
Scientific and professional field	Improvement of scientific and professional standards, and a more capable human resource.

In the continuation of this section, the resulting paradigm model is shown in Figure 1 as follows.

Selective Coding and Storyline

High military capabilities and capacities, unified commanding, special capabilities and capacities, perceived threat, cyber attacks, changes in the nature of terrorist threats and asymmetric warfare, not falling behind the competition, escalation patterns, the desire for informational superiority, geopolitical tensions, regional unrest, historical enmities, importance and influence as one of the concepts of modern war, influence with a large scope, asymmetry of power, the possibility of a high position of war of games in the future military literature, and attention to the gray environment in the topics of the new war, changes in military doctrine, changing the paradigm from threat-oriented to capability-oriented, and people's expectations are among the factors that make a country move towards the war of games and try to be raised in the field of war of games. Also, there is another point of view that with the presence of these factors, countries have no choice but to enter the war of games and it is necessary for them to enter this field. However, to emerge in the field of war of games, a country needs different strategies and plans. specialized training programs, identification and attraction of talents, continuous professional development, investment in advanced technologies, support for investments and national sources of sustainable financing, adequate financing of projects and strategic initiatives, development of cyber capabilities, development of cognitive capabilities, to emphasize the soft components of power, deception strategy, development of flexible strategy, innovative strategy, countermeasure strategy, comprehensive deterrence, asymmetric conflicts, proxy conflicts, unpredictability,

multidisciplinary research and development, the creation of scientific and research centres related to war of games, the expansion of scientific research in the field of war of games, effective strategies based on big data, futures research, readiness to accept the risk of using new technology, increasing technological capabilities, intelligence in the battle scene, the ability to deal with information manipulation in the battle scene, and the ability to influence, are the strategies and plans that a country should adopt and develop in this field. According to the participants in this research, experienced commanders, cohesion and coordination between different forces, expert and committed human resources, development and grounding for the war of games concept at strategic levels, increasing public awareness and participation, increasing commanders' understanding and awareness of soft components, developing the concept of war of games in other levels, development of communication infrastructure, industrial and technological infrastructure, creation and development of innovation centres, adaptation and continuous innovations in strategies, technological innovations, creative approaches, flexibility for countermeasures by competitors, the study of modern warfare, evaluation and monitoring systems (to track progress and evaluate the impact of strategic initiatives and the possibility of adjusting them), adaptability, technological domain (development of information and communication technology, limitation of access to technology, and the speed of technological progress), inter-agency cooperation (government and military), participation of public and private sectors, utilization of the capacity of universities and research centres, participation of experts in meetings, cooperation with experts and leading global institutions, changes in international laws and regulations, international obligations in the field of human rights, military exercises, security factors, cyber attacks, cognitive warfare, the ability to control narratives through media and propaganda, strong religious national values, religious advice and guidance, ideological beliefs, public understanding and attitudes of society, cultural narratives, popular support and social support, cultural sensitivities, changes in social and demographic structure, lifestyle changes, budget constraints, global economic changes, resistance economy, and also political factors (coalitions, international influence, global political environment, political will to implement strategic initiatives, political instability, promotion of international relations, political support), are the factors and conditions that affect the war of games strategies and plans. Every strategy and plan that is implemented will have consequences. national security (increasing national security,

increasing deterrence power, increasing military power, deceiving the enemy, changing the playing field according to superiority), stabilization of the position (promotion of the country's position in the global and regional power geometry, the ability to change the rules of the game, and greater independence and flexibility in response to global challenges), political sphere (political dominance, International influence, political stability, improving the horizon of the sovereign vision, and correct governance), social and cultural sphere (strengthening the morale and self-confidence of the military forces and civilians, social dominance, increasing people's participation in defense programs, national cohesion, cognitive dominance, and cultural dominance), infrastructural consequences (increasing the capability in crisis management, strengthening critical and defense infrastructure, and improving cyber security), economic field (potential economic growth, economic dominance, economic stability, employment creation, obtaining economic benefits from the transfer of this knowledge, creating a new environment by investing in new technologies and fields), and scientific and professional field (improvement of scientific and professional standards, and a more capable human resource), are the consequences of strategies and plans that raise a country in the field of war of games.

Discussion and Conclusion

The primary research question seeks to identify the paradigmatic model governing the phenomenon of war of games. To answer this, we employ a paradigmatic model that conceptualizes war of games as a complex system. This model comprises six core elements: causal conditions, central phenomenon, strategies and plans, context, intervening conditions, and consequences. Figure 3 presented visualizes the interconnections between these elements and their respective subcategories. By analyzing this model, we can gain a deeper understanding of the structure, dynamics, and influencing factors of the war of games phenomenon.

The key elements and distinctive attributes of war of games can be discerned through a meticulous examination of the six core elements of our paradigmatic model which can be found in Figure 3. The context of war of games encompasses factors such as historical period, available technology, and geographical environment, which influence game design and execution. Strategies and plans encompass a wide spectrum of tactics, objectives, and decision-making by various actors. Casual conditions are the primary drivers of in-game events, such as pivotal decisions, random

occurrences, or interactions between players. Consequences are the direct or indirect outcomes of these decisions and events, which can include victory or defeat, shifts in the balance of power, or transformations in the game environment. Intervening conditions are factors that can influence the course of the game, such as alterations in game rules, intervention by external actors, or unexpected crises. Finally, the central category of war of games, as the core of the model, encompasses distinctive features such as competition, conflict, simulation, and learning.

This research offers substantial implications for both scientific inquiry and practical applications in the domain of war of games. Scientifically, nations can leverage the findings to quantitatively investigate various aspects of war of games, customizing the model to suit specific national needs. By employing rigorous quantitative methods, researchers can delve deeper into the significance of the identified elements and their interrelationships. Practically, the insights gained from this study can be harnessed to enhance national capabilities in war of games. By developing advanced infrastructure, implementing tailored training programs, and fostering innovation, nations can gain a competitive edge in this critical field. Furthermore, the conceptual framework established in this research can serve as a foundation for transforming battlefields, enabling nations to exploit their advantages more effectively.

In the subsequent section, the concept of game confrontation is examined as an outcome of war of games. This research investigates how the concept of wargaming emerges from the notion of a war of games. One of the most significant outcomes of war of game is the concept of game confrontation. Figure 4 presents a simplified relationship between these three concepts.

Figure 4. The interconnections among the three concepts of wargaming, war of games, and game confrontation.

In explaining the concept of game confrontation, when a nation develops capabilities in wargaming and becomes prominent in this field, it can adopt two approaches in response to enemy aggression. The first approach involves designing and implementing defensive games to counteract

enemy attacks. The second approach involves designing and implementing offensive games to respond to enemy aggression with counterattacks. A combined approach, involving a response to the enemy's offensive game through a combination of defensive and offensive games and actions, also exists. Engaging in offensive, defensive, or combined games and actions necessitates a nation's proficiency in strategies, plans, contextual conditions, intervening conditions, and other factors discussed in wargaming. Figure 5 provides a schematic representation of game confrontation. As depicted in this figure, in response to an attack by an attacking nation or team, the defending nation or team can design a defensive game in the same arena of attack. Additionally, the defending nation has the capability to design an offensive game in the same defensive arena or in a different arena. In another approach, known as the combined approach, the defending nation can engage in a defensive game in one arena and an offensive game in another**.**

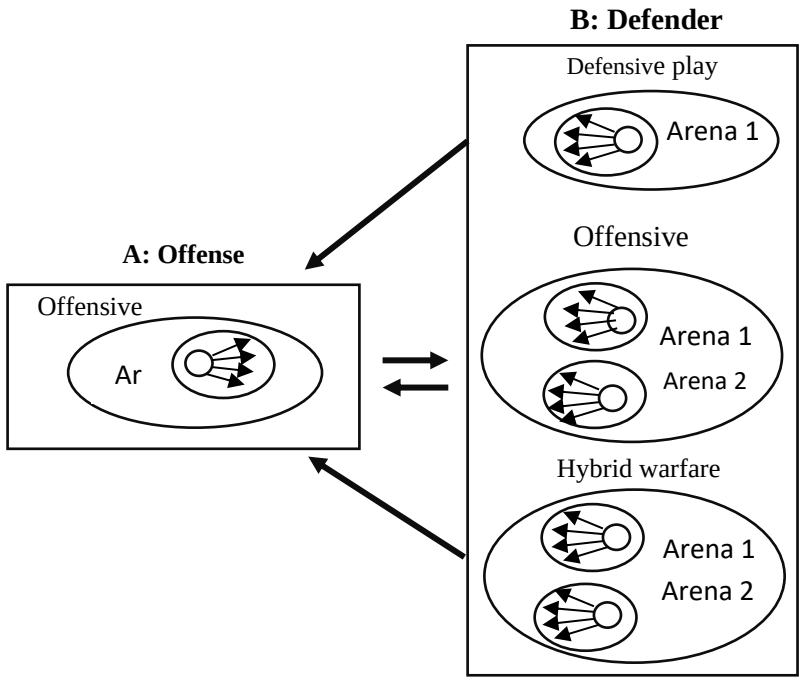

Figure 5. schematic representation of game confrontation

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