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# Dynamic modeling of military variables based on structured reconfiguration: an optimal analysis of the relationship between strength, resources and morale in a complex battlefield environment (Literature review)

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**ABSTRACT**: This work, therefore, is dedicated to developing optimal modelling in military variables by following the approach of structured reconstruction to investigative dynamic relationships among forces, resources, and morale in complex combat fields. Most traditional models rely on static coefficients, which cannot catch the dynamic changes of battlefield environments effectively. This paper presents a systematic reconstruction and analysis framework that reconstructs strength, resources, and morale relationship equations using genetic algorithms and calculus methods in order to enhance dynamic adaptability and interconnectivity of the model. The reconstructed model uses resource consumption, morale fluctuation, and battle intensity as dynamic variables, realizing real-time simulation of the relation between variables through multi-level causal analysis. It follows that the reconstructed model improves both prediction accuracy and the optimal allocation of resources, especially for a higher consumption rate of resources or larger morale fluctuation to make the development of battle progress more realistic. Based on this, the structured reconfiguration method effectively improves the predictive performance of military models and enhances the actual application value. This will be more analytically scientific for the establishment of future military strategy.

**KEYWORDS:** Structured reconstruction; Military variable model; Dynamic relationship optimization

## I. INTRODUCTION

Traditional military variable models usually adopt a static coefficient method to describe the main variable relationships, such as forces, resources, and morale, when describing modern and complex battlefield environments. The dynamic fluctuations in tactical demands and complexity of conditions within the battlefield make it really hard to effectively respond under these circumstances. Therefore, an increasing number of studies in recent years aimed at enhancement of the military models predictive capability and resource management effectiveness through dynamic modelling and optimization algorithms. However, most of them only focus on single variable optimization, without taking into full consideration the overall impact of interactions between variables on the battlefield process. Most existing models cannot do well in variable correlation and situational adaptability, and thus it is impossible for them to give good strategic support to protracted wars or high-intensity wars of attrition. It was further emphasized during the war decision-making that the nonlinear relationship between resource depletion and morale fluctuation has been a focussed area of study but still related

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model design and application are at the stage of initial exploration.

The methodology adopted in the paper to address these issues is a structured reconstruction approach: reconstructing dynamic relationship models of military variables-such as troop strength, resources, and morale-by means of genetic algorithms and multilevel causal analysis. Unlike most of the previous research, this work will take into consideration the role not only of each variable individually but also focus on their interaction effects, targeting very optimal resource allocation and morale in multiple contexts. Therefore, the work in this paper tries to provide a more accurate and flexible decision tool for military strategy in the complex battlefield atmosphere, which enhances adaptability for protracted warfare and resource-strapped scenarios.

**Purpose of the Study**

The aim of this work is to determine the optimum of the dynamic model of military variables using a structured reconstruction approach in order to enhance the dynamic adaptability and interlinking of forces, resources, and morale in a 'complex battlefield environment'. The goal of this study is to construct a model that could maximize the use of resources and morale in different contexts so as to provide more accurate support for decision-making during protracted warfare and high-intensity wars of wearing down, thus offering a scientific basis for working out military strategies in complicated battlefield environments.

**Research Significance**

This research is significantly important both on a theoretical and practical level. Theoretically, this paper develops the Dynamic Model of Military Variables by the Structured Reconstruction approach, enriches the analysis of dynamic dependencies concerning such complex battlefield environmental variables as power, resources, and morale, and opens new horizons for research regarding enhancements to optimize military models. It fills in the variable interaction and dynamic adaptability for deficiencies of the existing models, verifies the effectiveness of multilevel causal analysis and genetic algorithm in military models, and promotes the theoretical development of military dynamic modelling.

Such a research result has huge practical use value for military strategy compilation in complex battlefields. Based on the reconstructed model, the effect of optimizing resource allocation during protracted and intense wars of attrition can increase morale management to a higher degree, providing more practical decision support for commanders. Besides, the research model is highly adaptable, flexible, and even effective in rapid responses to various situations for urgent tactical needs, fully improving the success rate of military operations.

This paper combines the method of structured reconstruction and dynamic optimization. The developed dynamic military model has broad applicability, with increased accuracy of prediction and reliability of decision-making. In the future, based on the obtained outcome, generalization, as well as applicability to other resource allocation and dynamic management issues, will strongly support strategy formulation in complicated environments.

**Research Questions**

Research Question 1: How can the structured reconstruction methods further enhance the predictive accuracy and dynamic responsiveness of military models? Predictive accuracy of traditional military models is normally restricted by the static coefficients and single-variable optimization, while the battlefields require high dynamic responsiveness. Can the predictive accuracy and responsiveness of models to rapidly changing situations be significantly improved when introducing structured reconfiguration methods? What is the enhancement mechanism behind?

Research Question 2: How would structure reconfiguration optimize resource allocation to support military decisions within a protracted war and high-intensity war of attrition? With the setting of protracted warfare and restricted resources, how can multiple scenarios achieve optimal allocation through dynamic management of the reconfigured resource variables in order to contribute to enhanced continuity of operation and efficiency of decision-making?

## II. LITERATURE REVIEW

**2.1Literature overview: knowledge mapping**

This is the knowledge graph developed on the strategy and resource dynamics of Israel and Iran in the war, alongside the impact that international factors and theoretical models will have on the war. The nodes and relationships color-coded distinguish them from each other in different types of elements:

Blue: major Israeli and Iranian strategies –egrapid strike and guerrilla war

Green: core military variables, strength, resources, morale

Purple: External factors include political pressure and international aid.

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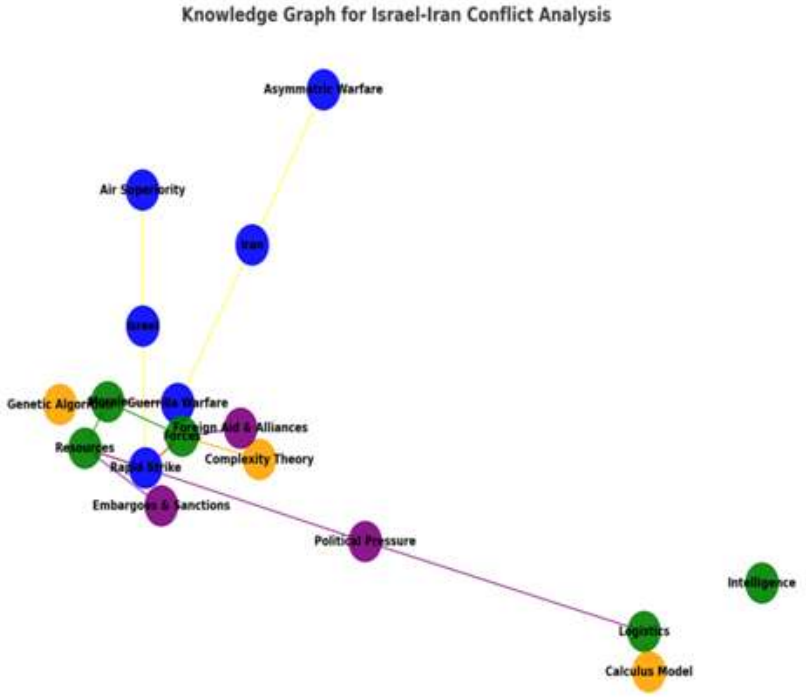
Orange: theoretical models, e.g., complexity theory, genetic algorithms
Red and yellow: relationship of variables, for instance how tactics will affect resource consumption or morale

The map systematically represents war dynamics interaction, from considerations of military tactics, resource management, influences of international politics, to complexity theory. This visualization will build on comprehending how different factors can interact in a conflict.




The following will be a critical overview of the knowledge graph components, which, taking into consideration nodes, relationships, and their effects, depicts the role of various factors within the conflict between Israel and Iran.

**2.1.1. Military Strategy of Israel and Iran**

Full-scale Attack and Air Supremacy: Israel mainly follows the strategy of air superiority and rapid-strike weapons in order to get short-term military advantage at the beginning of the war. This will rapidly raise the military power within a very short period but then rapidly lower resources because of continuous consumption, which will lower resource and moral points in a long wartime. Therefore, this strategy fits for a short-term war, but it will get its advantage lost in the long-term attrition war.

Guerrilla Warfare and Asymmetric Warfare: Iran attempts to paralyse its opponents through guerrilla warfare and asymmetric tactics, such as cyber warfare and proxy arming. Due to the fact that guerrilla warfare is so flexible and durable, this kind of warfare has been continuously draining Israel's morale and resources and is especially advantageous in long, protracted wars.

**2.1.2. Key Military Variables**

For this purpose, forces operate differently in rapid strikes in Israel as compared to the concept of sustained war in Iran. The former increases the benefit of power when it comes to rapid strikes, but only for a very short period of time as forces deplete over time. In contrast, Iran increases its relative war advantage in the long war through asymmetric tactics.

Involvement of Resources: Resource management is decisive in war durability. At this rate, involving major airstrikes and rapid strike tactics, Israel strikes in a highly consumptive rate, placing it in the short term, respectively in supply, especially if the war prolongs further. On the other side, Iranian countermeasures depend much upon decentralized supply lines and other forms of external support that may help it in resource sustainability for a protracted war engagement, such as proxy warfare and blackmarket resources.

Morale: Morale is the central variable reflecting the Will to Fight. In asymmetric wars, Israel is with high morale in short-term victories, and resource depletion and pressure from international public opinion will take some time to

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play a role in morale during a protracted war. The Iranian side increases morale in the middle of the war by propaganda warfare, religious mobilization, and changes in morale are more likely to be favourable, especially in the long war.

**2.1.3. External Influences**

International Political Pressure: The intervention of other countries or the international community through vast resources, forces and morale, imposition of sanctions, and the provision of aid could sanction the UN or other countries that would not only impede Israel's replenishing its resource supplies but external military aid may raise both Israel's power and morale.

**2.1.4. Application of Theoretical Models**

CT or Complexity Theory: this complexity theory explains a number of interactions between various military, political as well as logistic variables. This theory allows us to understand nonlinear changes that take place within war systems and shows dynamic equilibrium and adaptability in protracted wars. For example, the complexity theory applies to Iran's guerrilla warfare strategy in order to prove randomness and adaptability in its protracted war against Israel depletes Israel's resources and morale.

Genetic Algorithm: applied to optimize tactical combinations and resource allocation in order to achieve the optimal war scenario. Thus, Israel might employ genetic algorithms to optimize quick-strike tactics that would enhance short-term resilience, while Iran could utilize algorithmic analysis to make adjustments in guerrilla-warfare tactics that would mute Israel's advantage in the short term.

Calculus Model-explains with quantification how dynamic processes, such as forces, resources, and morale evolve over time. It helps us consider the rate at which resources and morale are depleted during a course of war and enables us to predict a change in the depletion of both sides moving into a long-term war.

**2.1.5 Conclusions of the systematic analysis**

Short-term advantage: The air superiority and quick-strike strategy by Israel at the commencement of war did indeed augment its strength, but in the long term, this is quite difficult to achieve with fast dwindling resources and morale.

Long-term equilibrium: Under the guerrilla warfare strategy, Iran expressed their advantage in the long-term war by gradually weakening Israel both in its resources and morale. Events of external interventions, such as sanctions and pressure of international public opinion, further affect Israel's ability for sustainable fight ability in the long run.

Overall, the forecast would be that if the conflict in the region were to grow into a protracted war, then Iranian protracted warfare and asymmetric tactics could continue to apply sustained pressure on Israel. Thereby unfolding the deterioration of Israel's resources and morale if the nation is not able to win decisively in the short term. Otherwise, the optimal approach is likely to pursue victory in the short run, or more skilfully use diplomacy in peacetime to prevent the long-term difference of a war of attrition.

**2.2 Content Review**

A special review of the content based on the article entitled "Application of 'military campaign success' theory based on 'Sun Tzu's Art of War - The Book of Combat' genetic algorithm in the field of prediction and decision making in wars between Israel and Iran".

**2.2.1.Limitations of Traditional Military Models and Introduction of Emerging Dynamic Modelling Approaches**

Traditional military models are usually based on static coefficients and cannot catch up with or preferably reflect the real-time dynamic change of the battlefield environment. Such models, in fact, lack so much in dealing with modern battlefield complexity and rapid changes. Facing the challenge, on one hand, representatives of modern modelling techniques such as complexity theory and genetic algorithm give more flexible and dynamic ways of analysing this very concern. Especially for battlefield environments characterized by multivariate interactions and nonlinear dynamic relationships, forces, resources, and morale are all changing dynamically in an unthinking static model.

**2.2.2. The role of the complexity theory in military modelling**

In particular, it provides theoretical support for more flexible battlefield decision-making by showing nonlinear interactions among factors within a military system. Turner and Baker, in their 2019 work, mention that the complexity theory is quite effective when it comes to coping with uncertain environments and can help gain a proper understanding of systems with multivariate interactions. Battlefield environments in Israel and Iran within the context of the Middle East conflict provide an appropriate backdrop for the practical applicability of complexity theory, and enhance a

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case for studying the interaction and dynamics of multiple forces on the battlefield.

**2.2.3.Genetic Algorithm Optimisation: Advantages in Military Prediction**

Genetic algorithms can filter and optimize the most adapted strategies to the battlefield environment through iteration, wholly mimicking the process of natural selection and genetic mutation, especially in cases with resource constraints. The use of algorithms of this type in military optimization offers significant advantages that may help commanders cope with complexity and uncertainty and choose the best tactics and courses of action. It has been pointed out in the literature that genetic algorithms can overcome traditional optimization methods possibly falling into a local optimum, and the global search properties are particularly critical in dynamic battlefields.

**2.2.4. Modern use of strategic ideas taken from The Art of War**

The Art of War's strategic principles pride themselves on their flexibility, efficient use of available resources, and adaptiveness-characteristics whose guideline value in modern war is still immense. Combining complexity theory with genetic algorithms can turn these strategic principles into dynamic military models underlying decision-making adapted to the modern battlefield. For example, genetic algorithms can generate and screen optimum tactical combinations from the core ideas in Sun Tzu's The Art of War, thus enabling the commanders to respond with their actions against enemy uncertainty in a quick manner so that advantage can be retained in tactics.

**2.2.5. Application of Calculus Dynamic Modelling in Military Variables Prediction**

Calculus models equate the change of military variables, such as troop strength, resources, morale, to achieve the dynamic modelling of battlefield processes. The reviewed literature designs calculus equations that model changes regarding such variables as time decay of troop strength, the rate of depletion of resources, fluctuations of morale. In this case, it is the quantitative approach that allows control of the long-term effects of different tactical choices about combat power and resource allocation in a dynamic perspective.

**2.2.6.Application Case: Dynamic Simulation of Israel-Iran War**

Following the theory of "Application of Genetic Algorithm 'Military Battle Success' Theory Based on Sun Tzu's Art of War-The Book of Warfare in the Field of Prediction and DecisionMaking in the Israel-Iran War, it has applied the genetic algorithm military model to the conflict between Israel and Iran in 2024, thus proving the practicality of the theory. Moreover, besides showing simulations of different tactics, the study has been able to show how power, resource, and morale-like variables interact with one another in a complex battlefield environment. The results, while showing that quick strike advantages exist in the short term, reveal that in a protracted war, the guerrilla and asymmetric warfare tactics do start to exhibit superior points of view and yield significant insight into the strategic optimization in a complex war environment.

In other words, the integration of only complexity theory, genetic algorithms, and structured reconstruction of calculus can modernize military wisdom in light of "Application of the theory of 'Military Campaign Success' based on the Genetic Algorithm of Sun Tzu's The Art of War-The Book of Combat" for predictive analysis and decision-making in the wars between Israel and Iran in the complex war environments. Comprehensive warfare environment complicated decision-making: this dynamic adaptive model shows especially high practicality under battlefield changes and resource optimizations and demonstrates the scientific basis and effective tool for military decisions in related conflicts in the future.

**2.3 Literature review of research results**

In the paper, "The Art of War: A Study of the Application of Genetic Algorithm 'Military Battle Success' Theory to the Israel-Iran War", a total of thirteen research findings have been identified covering large areas from tactical selection, psychological warfare, logistics support to international pressure. The following review discusses the details of this finding:

**2.3.1. Predictive analysis of shifts in forces, resources, and morale**

While the results of the current research demonstrate that, under diversified tactical strategies, the shifting trajectories of power, resources, and morale in the war between Israel and Iran are vastly different-srael relies on an air attack to maintain supremacy during the early period, whereas Iran gradually recovers its morale in the course of a long, protracted war and adopts a flexible resupply strategy regarding resources. The

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results of the research suggest a really limited nature of short-term advantage; the harm to morale and resources in protracted warfare is crucial in the dynamic environment.

**2.3.2. A systematic comparison of Israeli and Iranian tactical effectiveness and probability of battlefield victory**

At the beginning of the war, Israel, with its powerful air force, was successful in fast-attack actions. Iran responded with a form of asymmetric warfare using guerrilla tactics, which over time drew the war out into an extended process of attrition. The result in this case illustrates the strengths of asymmetric tactics, especially when facing off against a resource-strong opponent, of which the utilization of tactics such as guerrilla warfare effectively depletes the resources of the enemy and enhances the pre-determined possibility of victory.

**2.3.3. Analysing the pressure systems in logistical and supply line warfare by Israelis and Iranians**

The study also establishes that, by depending on air and sea transportation for logistical resupply, Israel increases its burden in resupply during prolonged battles, while Iran has eased its reliance on conventional resupply by decentralizing lines of supply and using proxy tactics. This would thus indicate that stability within the logistical supply system is one of the significant factors in maintaining prolonged warfare and that flexible asymmetric logistical strategies enable the feasibility of protracted wars.

**2.3.4. Morale and Psychological Warfare Analysis**

Proud of its strong combat capability, the morale of the Israeli side is high in the initial stage but in danger of sagging in a protracted war, while moral-psychological warfare and religious mobilization ensure that Iran has the advantage in a protracted war. In this regard, the result indicated the importance of psychological warfare and morale management, which reflected the strategic function of psychological warfare in the process of the protracted conflict.

**2.3.5. Dynamics of Israeli and Iranian morale over time**

Analysis of the dynamics of morale during wartime shows that Israel is very successful in having high morale in a short period of time, but with time, it surges down, and when its resources are scant, morale is low. At the same time, cumulative morale gains in Iran's case come with time due to protracted warfare and a psychological war. From the above, we can conclude that morale is one of the central variables in any kind of war, and good morale management can definitely increase the chances of winning a protracted war.

**2.3.6. Balance analysis of war duration and depletion**

The findings prove that the longer the war continues, the more resources and morale will be depleted. Israel's fast-attack method is suitable for a short-term strategy, whereas Iran's guerrilla war is suitable for a long-term strategy. The results reflect the secret of the "time-consumption" balance: Israel has to end the war as soon as possible in order to preserve its advantage, while Iran can depend on a war of attrition to achieve strategic aims.

**2.3.7. Trends in Military Strength, Resources, and Morale over Time**

The study presents graphically the dynamics of Israeli and Iranian forces, resources, and morale over time in a protracted war. The results from here show that at the beginning of the war, the strength and resources of Israel stood at a high level, which were rapidly depleted, and at the same time, Iran gradually closed the gap in the protracted war due to the nature of guerrilla warfare. The following strategic recommendations on resource and morale management in the case of long wars are addressed.

**2.3.8. Analysis of Diplomatic Intervention and International Pressure**

It systemically analyses the impact that diplomacy and international pressure have on the situation in war, and suggests that the impact of international intervention on the course of war can be nonlinear in character. These results show that well-timed international interventions, such as economic sanctions or diplomatic mediation, can affect the course of war by demoralizing and weakening one of the parties to the conflict. This result points to the strategic value of international power in conflict.

**2.3.9. The impact of foreign intervention-an overview of developments in the war**

This outcome analyses what impact different forms of international intervention-diplomatic, military, and economic-can have at different stages of war. In substance, military interventions were effective in the first instance, but with time, the role of diplomatic and economic interventions impinged on the economy and the ability for long-term sustainability of the war. This

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result shows well the potential of joint use of diversified approaches to interventions for the promotion of lasting peace.

**2.3.10 Effectiveness of the Rapid Strike Strategy in Israel**

By applying genetic algorithm optimization, the study simulates the most influential short-run effects of the Israeli rapid strike strategy and how its air superiority can easily demolish Iranian defences in the initial parts of the war. However, if the war keeps going on, the effectiveness of the strategy decreases very rapidly. This suggests that quick strikes are only suitable for quick localized victories and are hard to maintain long-term strategic advantage.

**2.3.11The Persisting Guerrilla Warfare/ Asymmetric Warfare Strategy of Iran**

The Iranian guerrilla war showed having an flexibility advantage in protracted war. Thus, "despite the early defeats of Iran in this war, protracted war managed to weaken its opponents." It bases its military doctrine on asymmetric means with the gradual development of effectiveness. This result has legitimized the application and efficiency of asymmetric methods when the resources are poor while the strategy is effective in delaying the war and increasing the possibilities of winning.

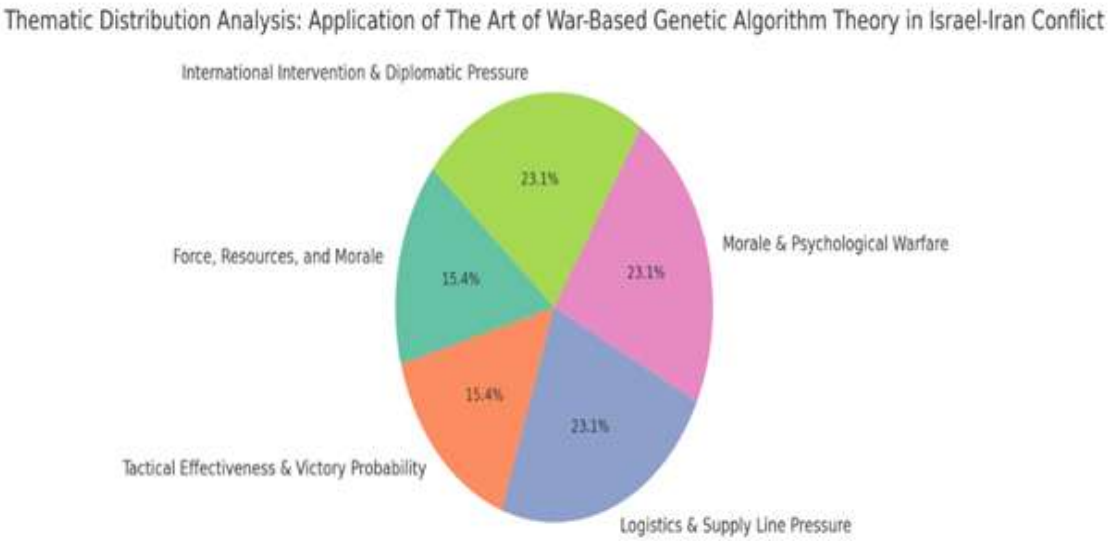
**2.3.12 The effect of logline pressure on combat persistence**

The model simulations for performance of forces of Israel and Iran, under logistical stress, show that the war continuation results in steep increase in the logistical stress. In the prolonged war, the theatres of Israel have more logistical lines stress than Iran, whose flexible logistical strategy assured better performance. That would suggest logistical support is particularly critical in the case of a protracted war and that a sound logistical strategy is fundamental to ensuring combat effectiveness.

**2.3.13 The Role of Diplomacy and Psychological Warfare in the Conduct of War**

Studies have shown that Iran, in this protracted war, made active use of psychological and propaganda warfare to win the support of popular opinion, boosting morale to mitigate pressure both from international public opinion and internal divisions. Conversely, Israel tried to stabilize the situation through diplomacy in the early stages. This result is a manifestation of the strategic value of diplomacy and psychological warfare in wars, especially in protracted wars, precisely where psychological and diplomatic means can be strategic advantages.

Above, the analysis of 13 research results indicates that the genetic algorithm military model based on Sun Tzu's Art of War provides a rich strategic perspective to modern warfare. The variable of power, resources, morale, logistics, and diplomacy tangles with each other in war and has great influence on the development of the battlefield. Different advantages and disadvantages in different war stages of the two armies of dynamic adaptation and multivariate strategies will bring valuable insight into future military strategy developments.



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**2.4 Bibliometrics applied to a single literature review**

**2.4.1Analysis with thematic distribution:**

Thirteen studies were categorized in themes, such as tactics, logistics, morals, international interventions, among others. Afterwards, a thematic distribution chart was developed. A pie chart or bar chart can be done to show the distribution of each theme proportional to the research.

The pie chart above is analytical; it develops a distribution of the themes themselves to show how the findings are distributed across the themes proportionately. Major themes identified are:

Shifting of power, resources, and morale: examining the dynamic relationship between power, resources, and morale.

Tactical Effectiveness coupled with Battlefield Probability of Victory: The different possible tactical strategies to be pursued on the battlefield are analysed for probability of victory.

Logistical and Supply Line Stress: This paper examines battlefield consequences due to the impact of the logistics systems.

Psychological Warfare and Morale: It deals with morale and psychological warfare in regard to war.

International Intervention and Diplomatic Pressure: to what extent does international intervention and diplomatic pressure affect the course ofwar?

This chart clearly shows the research focus of each theme and helps in understanding the role and importance of different themes in modelling military decision-making.

**2.4.2Correlation analysis between variables:**

Qualitative analysis of the interaction among variables, for instance, such variables as strength, resources, morale, and others, is done through graphical representation of the variables and their relationship. Force, resources, morale, logistics, etc. may be represented in their paths of influence through some interrelated variables on a network diagram.

This is the network diagram of relationships among variables in a military conflict model. It is used to show how and along what pathways main variables interact, for instance, force, resources, morale, logistics, international pressure.

FORCE: depends on resources and morale, and it directly influences the probability of victory.

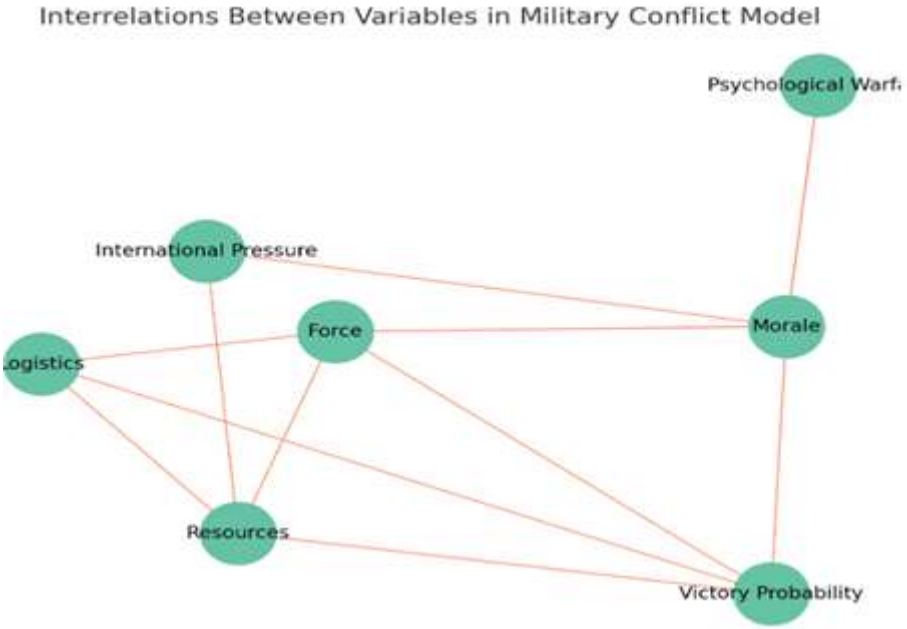
Resources: pressured by the international community, supply logistics, and eventually determine the probability of victory.

The psychological war and international pressure would affect morale; morale sometimes affects strength and, in some cases, affects the likelihood of victory.

Logistics: Determined by resources support, directly relating to strength and ultimate victory.

Psychological warfare: it essentially impacts morale and serves as the main indicator of its shifts.

International Pressure: The international pressures indirectly change the texture of the battlefields in terms of resources and morale.



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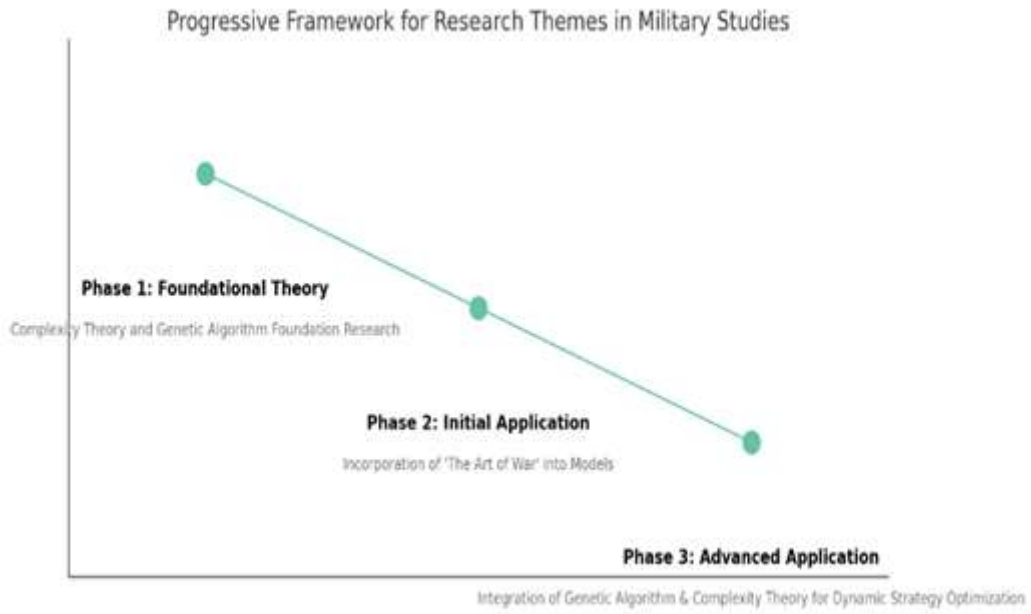
This chart reflects the interaction of all the mentioned variables with a view to identifying those that might play decisive roles in gaining victory within a dynamic military milieu.

**2.4.3 Diagram of the progressive analytics framework based on research themes**

Hence, an incremental framework is provided that can be used to illustrate the research focus over unequal time periods.




Phase1:Fundamentalstheory of complexity, genetic algorithm basic research

Phase2: Embedded application introducing the idea of "The Art of War" into the model.

Phase III: Actual detail implementation with Genetic Algorithms integrated approaches in complexity theory for Dynamic Tactical Optimisation.

The following is the "Progressive Analysis Framework of Research Themes" diagram reflecting the focus of research in varied time periods:

Phase 1: Foundational Theory

Phase 1: Theoretic Basics. Basic research regarding complexity theory and genetic algorithms constitutes the theoretical basis for the application in further steps.

Phase 2: Initial Application

Introduce ideas from Sun Tzu's Art of War into military modelling, giving new strategic dimensions to traditional models.

Phase 3: Advanced Application

Dynamic tactic optimization tries to cope with the complexity of modern warfare by combining genetic algorithms with complexity theory. This diagram will also help to comprehend the course of development at each stage in an elaborative manner in the research themes in military research and provide a structured framework for future research directions.

**2.4.4Causal analysis diagram of research results:**

Schematics of a casual model based on the complexity theory genetic algorithm with arrows indicating how one factor interacts with another in the process of forming one dynamic system of factors in decision-making on war.

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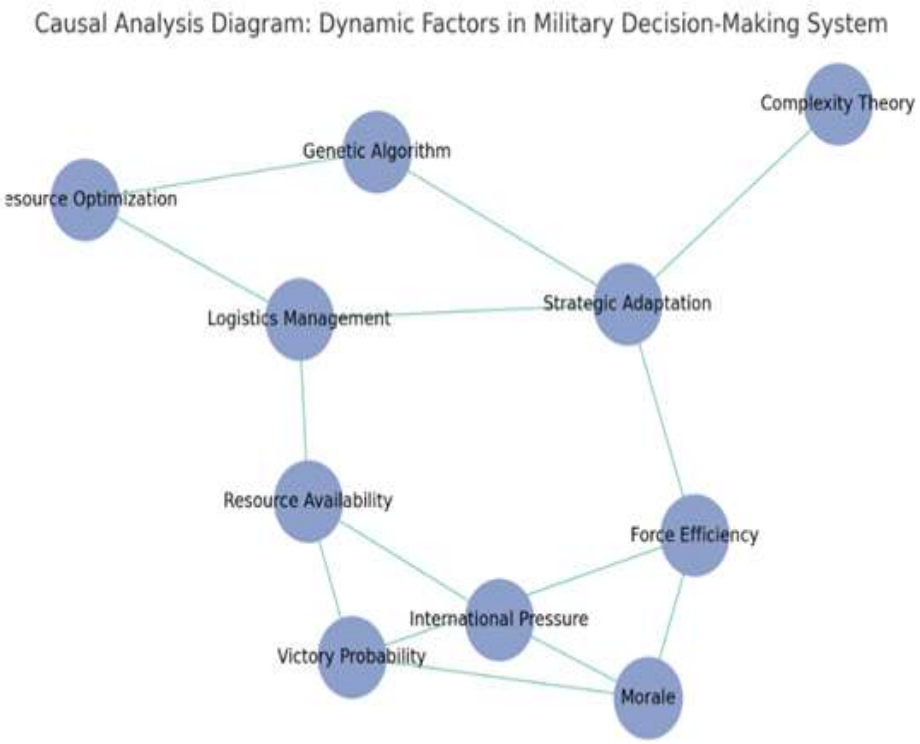


This is the causal analysis diagram of the dynamic factors of the military decision-making system and their interrelations, based on the complexity theory with application of genetic algorithm.

Genetic Algorithm: pressures strategic adaptation and resource optimization.

Complexity Theory: influences Strategic Adaptation.

Strategic Adaptation: Further consequences to force efficiency and logistics management.

Force Efficiency: Boosts Morale, Probability of Victory.

Resource optimization and logistics management: More resources available may lead to Victory.

International Pressure: The influence of international pressure on victory is indirect, through resources and morale. The following is the diagram that represents how different factors interlink through cause and effect in war decision-making.

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