The Beacon Journal
Winter 2024

Applicability of Centre of Gravity 'Concept' in Modern Warfare

Sajjad Ahmed [*]

Abstract

This research critically evaluates the present relevance and application of the Centre of Gravity (COG) concept as originally conceived by Clausewitz, and later developed by contemporary theorists, within the realm of modern military operations amid the evolving character of war. It offers a comprehensive exploration of the COG's evolution, comparing its traditional interpretation against the backdrop of contemporary and emergent conflict scenarios. The study points out the intricate challenges and operational considerations in identifying and exploiting COGs, especially in the context of hybrid, grey-zone, and non-contact warfare. The research highlights the difficulty of applying a traditionally linear COG concept to the multifaceted and interconnected nature of modern conflicts. The paper advocates for a refined, systems-oriented approach to COG, underscoring its pivotal role in operational planning and decision-making. The findings propose a refined conceptual framework, emphasizing the imperative for military strategists to integrate a more dynamic, holistic perspective in navigating the complexities of modern warfare. The research aims to contribute to the ongoing discourse on the COG's utility, offering a perspective to the reader that aligns with the evolving character of global conflicts.

Keywords: *Centre of Gravity (COG), Modern Warfare, Clausewitz, Character of War, Systemic Theory.*

[*] Author is a serving officer in Pakistan Navy. He can be reached at sajjad7510@outlook.com.

Introduction

The Centre of Gravity (COG) concept, introduced by Carl von Clausewitz as "the concentration of mass" has long been a fundamental element of military strategy and doctrine. Sun Tzu did not cover COG in detail but instead offered general advice to "attack the enemy's plans." The US Department of Defence defines COG as "source of power that provides moral or physical strength, freedom of action, or will to act" Dr. Joseph Strange's assessment framework of Critical Capabilities (CC), Critical Requirements (CR), and Critical Vulnerabilities (CV) serves as the foundation of US doctrine and majority of contemporary literature on COG analysis (Strange, 1960).

Maritime Doctrine of Pakistan (MDP) defines COG as "an ideology, characteristic, capability or locality from which a nation, an alliance, a military force or other grouping derives its freedom of action, physical strength or will to fight, and whose serious degradation, dislocation, neutralization, or destruction would have the most decisive impact on the enemy's (or own) ability to accomplish given military objective(s)/ conflict" (Naval Headquarters, 2018). In the absence of a single definition of COG in warfare, clarity of thought with regards to its identification is questionable with complex modern systems at play. COG concept is being challenged for its relevance in modern, rapidly evolving technological era.

The centre of gravity, taken from Carl von Clausewitz's "On War" has become a point of theoretical contention among military theorists despite its doctrinal eminence. It is arguably controversial as a practical tool of operational planning. John Saxman, an American analyst, wrote in 1992 that "the term centre of gravity means something to everyone, but not the same to anyone" (Evans, 2014). The rise of operational design in Western military doctrine and resultant losses in conflict have made centre of gravity analysis more controversial than ever before. A question arises that a 19th century concept of war fighting of pre-industrial era can be applied to 21st century hybrid warfare and technological complexities?

This research has focused on the initial Clausewitzian COG concept and the contemporary theories of COG and their analysis including Dr. Strange, Dr. Vego, and

Col Eikmeier's COG concept. The objective of this research is to determine if the concept still rightly directs operational commanders in conventional and hybrid warfare complexities. The research has analysed what challenges and limitations arise when attempting to utilise the COG concept at the operational level in contemporary warfare. A critical assessment of the COG concept's applicability is necessary as military operations increasingly deal with unorthodox challenges.

This study sheds important light on whether the COG concept can continue to guide military judgement in the current security environment and future conflicts. The research aids in risk mitigation in conflicts by correctly pointing out operational COG(s), guiding the development of contemporary warfare education and policy, and adding to academic and policy discourse on the changing character of warfare. The applicability of the COG concept has come under scrutiny in today's dynamic and complex security environment, marked by a wide range of threats, evolving technologies, and changing geopolitical landscapes (Gilbert, 2024). The historical evolution of the COG concept, explored its contemporary relevance, and identified the challenges and limitations associated with its application in modern warfare. In the traditional sense, COG was often associated with tangible military assets, such as armies, navies, or industrial complexes (Handel, 1981).

The concept provided a framework for military planners to prioritize targets and allocate resources effectively. The research employed a qualitative methodology with a deductive approach to explore the COG concept in modern warfare. The qualitative approach facilitated an in-depth examination of the COG concept, enhancing understanding of its application in contemporary conflicts. Instead of starting with a predefined hypothesis, the study builds its theoretical insights grounded in the observed data using grounded theory. Moreover, non-probabilistic population has been taken to conduct purposive sampling based on international expertise available on the concept of COG.

Background of the Study

Wars have been fought since long-established. Victory and defeat, however,

have always relied on strength at decisive moments so as to attain a superior orientation from which to bring enemy's capitulation. This strength, or 'the hub of all power" became the basis of the concept of the Centre of Gravity (COG) in military strategy. Clausewitz's quest for objective knowledge brought forth principles of war due to his spirit of scientific inquiry as well as his inspiration from Immanuel Kant's works in philosophy (Krause, 2021). Europe was in midst of a 'Second Scientific Revolution' from 1780 till 1850, and therefore, inferring Newtonian physics to warfare theory is understandable.

Clausewitz's amalgamation of science and philosophy to warfare resulted in a work largely criticised less due to the substance of the ideas he expressed, than to the form in which they were expressed. Clausewitz used the terms 'centra gravitates' as direct analogy to Newtonian science to describe a scientific concept to warfare whose literal interpretation can be "heavy point" or "focal point." It can be argued that applying the COG concept requires choosing between various theories, classical or contemporary, with each one having differing qualities attached to them and open to subjective interpretation. Experience has also evolved COGs interpretation as seen in US doctrine after failures of post-Vietnam war and on debates on identification of COG during Operation Desert Storm.

Contemporary Perspectives on COG

The opinions of various contemporary theorists on the concept of COG all hold fast to the classical notional appeal it holds. However, much debate has been made over the concept's applicability for complex wars, not just of the future, but of the past. Dr. Ben Zweibelson is not the only one to state that COG concept is 'misapplied and outdated', and a complex force structure cannot be simplified for interpretation using Newtonian mechanical laws (Keegan, 2024). Christopher C. Paparone of the US Army was even more explicit when he criticised the modern militaries for interpreting wars through "pseudo-scientific" logic wherein scientific discourse is inferred to complex warfare which is always essentially a simple "duel between two opposing wills" (MCU,

2023).

The Norwegian Army War College has analysed contemporary theories due to distinct interpretations of COG's identification, utility and application (Meyer, 2022). Six contemporary theorists were shortlisted which have made an impact on US Joint Doctrine over the years whereas two have been interviewed during the course of this research:

a. Colonel John A. Warden proposed the 'Five-Ring' Model during planning phase for the air campaign of Operation Desert Storm. Warden conceptualized COGs as key points for targeting to induce "strategic paralysis" and he posited that his model is universally applicable across all types of conflicts (except when a whole population is engaged) (Chun, 2010).

b. Dr. Joe Strange and Col Richard Iron devised a theory which integrated a structured approach to analysing and identifying COGs. The theory was derived from Clausewitzian concept to suit modern conflicts and its interconnectedness. It defines COGs as entities crucial to friend and adversary's strength, power, and resistance. The CG-CC-CR-CV construct, distinguishes between physical and moral COGs, focusing on Critical Capabilities (CC), Critical Requirements (CR) and Critical Vulnerabilities (CV) to determine strategic and operational targets through an indirect approach. The utility of COG at the operational level is through identifying decisive points and exploiting vulnerabilities to degrade or neutralize COG's effectiveness. Strange and Iron described COG to be dynamic, and based its identification upon own and enemy's objectives (Strange, 1960).

c. Dr. Antulio J. Echevarria points out how contemporary interpretations deviate from original Clausewitzian scientific and philosophical conceptual basis of COG, how the COG is only applicable at the strategic level as a focal point where all forces converge, and how the concept is crucial for achieving total collapse of the enemy only in wars aimed at outright victory. However, he acknowledges that COG's applicability can vary depending on the nature and character of the conflict, and that these focal points create balance and unity,

essential for an entity to act as a single body. He further describes that the concept may be ideological, psychological, or physical (Meyer, 2022). Dr. Echevarria has proposed a 3-step methodology for identification:

1. Determine whether identifying and attacking a COG is appropriate for the type of war that will be waged.
2. Determine whether the enemy's force structure as a system is sufficiently connected to be treated as a single body.
3. Identify the key element that provide the necessary cohesive/ centripetal force to maintain the integrity of the system.

Echevarria emphasised that any prescriptive formulae to identification must be avoided and this identification must be done at the highest strategic level only for enemy's defeat in a decisive war due COG's increasingly dynamic nature at operational and tactical levels.

d. Vego' s theory aims to optimise the use of power sources for achieving specific military/political objectives. He aligned his theory with key principles of war such as objective, mass, and economy of effort primarily at the operational level. He has defined the COG as a source of massed strength or leverage, crucial for accomplishing a given objective, which can be physical or moral and is identified through its potential impact on the ability to achieve objectives. Vego calls COG as 'dynamic' which can exist at all levels of warfare. Vego stresses the irreplaceable value of human judgment and understanding in determining COGs.

e. Dale Eikmeier, a retired US Army Colonel offers a distinct perspective on the COG while applying systems theory in operational design. His definition of the COG as the primary entity with CCs to achieve an objective provides a level of clarity, logic, precision, and testability (Eikmeier, 2010). His method involves a six-step process:

1. Identify the organisation's desired ends.

2. Identify "ways" (Critical Capabilities) or actions that can achieve the desired ends.
3. List the organisation's means or resources available.
4. Select the entity from the list of means that inherently possesses the critical capability. This is the COG.
5. From the remaining means, select those that are critical for the execution of the critical capability. These are the critical requirements.
6. Identify critical requirements that are vulnerable to adversary actions, known as critical vulnerabilities.

Eikmeier's approach contributed to redefining of COGs in US doctrine and restructuring overall operational design construct. His proposed and simplified definition of COG as "the primary entity that inherently possesses the critical capabilities to achieve the objective." This is considered as a practical approach bringing clarity to application of the concept. However, he highlighted that COG can be dynamic in a complex environment (Eikmeier, 2010). He proposed his theory at the start of the century, however, at present, he is a proponent of ' divorcing' Clausewitzian ways of defining COGs and ushering in a new understanding of it.

Upon comparison of aforementioned contemporary theories using a range of aspects, Dr. Eystein Meyer has determined 14 differences at various levels of granularity. Theories have been largely termed as non-linear making it difficult for any AI based system to arrive at a correct COG identification. This entails a human intervention at each step of the operational design, and therefore, it may be argued that the concept is not entirely scientific (Meyer, 2022). Contemporary theorists have therefore argued that the COG's utility is more at the strategic, then at the operational, and very less so at the tactical level making it a hierarchical concept that links interconnected systems to a singular hub.

Problems with the Clausewitzian COG Model

The original Clausewitzian concept emphasised crucial understanding of the enemy's core strengths and vulnerabilities, whether tangible, such as an army or capital.

Notwithstanding, present approach to the COG has not only considerably enhanced the understanding of operations and strategy for military practitioners, but has also provided a basic framework for addressing the complexities of warfare where the lines between conventional and unconventional tactics are increasingly blurred. It goes without saying that any flaw in the interpretation of the concept, and the resultant erroneous identification of the COG, can adversely impact the outcome of any conflict.

Dr. Antulio J. Echevarria has described in similar terms how Clausewitz stressed that the meaning be understood behind his principles rather than treating them as rigid rules. For instance, "a centre of gravity is always found where the mass is concentrated most densely…" (Echevarria, 2011). The principle of 'concentration of mass' within modern militaries is no longer relevant. With long range vectors in play, modern militaries employ complex interconnected systems to employ a 'concentration of effort.'

So, a prescriptive approach to Clausewitzian concept would yield no dividends. Another excerpt describes why 19th century warfare, of brute force against brute force, essentially differs from the 21st century warfare concept – "a major battle in a theatre of operations is a collision between two…" (J.J. Schneider, 1988). Long range vectors, grey-hybrid protracted conflicts and non-contact warfare concepts do not conform to 19th century warfighting. Notwithstanding, this research is of the view that there will be circumstances where concentration can yield desired results. Twin Carrier Operations with a battle group concept is one such example. Keeping such assertions aside, the overall character of war has evolved, and therefore, a modern major battle is not likely to:

a. Concentrate Mass.

b. Result in clash between two concentrated masses or focal points.

Thus, challenges and limitations will arise when attempting to use the Clausewitzian COG concept in contemporary conventional wars. This in no way entails that Clausewitzian concept no longer holds worth. It would if a battle waged is as simple as employment of simple brute force against another adversary. However, for

complexities of today, the concept requires tailoring and consideration of a few other propositions as highlighted by contemporary warfare theorists. Without concentrations of mass, the overused metaphor 'COG' may exist where an enemy's force structure is inter-connected so as to form a cohesive whole – a single entity.

It would exist when these forces possess 'centripetal' pull to have integrated force structure as part of a system, and within this system, striking or neutralising 'schwerpunkt' or 'focal points' would cause the collapse of the entire force structure. Using a 'Systems of Systems' (SyoSy) approach, focal points may be termed as critical factors in the Dr. Strange's CG-CC-CV-CR concept which has been made part of US Doctrine (Strange, 1960). The concept allows for following an indirect approach leading to collapse of adversary and advocates for avoiding the enemy's main strengths and instead targeting their weaknesses or less defended positions – the vulnerabilities.

Application of COG in Modern Warfare: Limitations and Challenges

COG was first made part of US doctrine in 1980s post-Vietnam War, and the doctrinal application by US was what made other countries derive their own respective doctrines. MDP follows the definition similar to that conceived by US in 1986 and that in use by NATO, with the addition that COG can be 'ideological' as well. Same has been contested by theorists like Dale C. Eikmeier, Dr. Strange and Iron, etc., due to lack of 'clarity, logic, precision and testability'. The current definition adopted by JP 5-0 as 'source of power that provides moral or physical strength, freedom of action, or will to act' is deemed more simple, clear and unambiguous yet, the concept is still largely misunderstood.

Deductions from Application

During the Gulf War of 1990-91, the US employed the COG concept in combat for the first time since its doctrinal inception in 1986. John Saxman wrote in 1992, "the term centre of gravity means something to everyone, but not the same to anyone." The COG concept has shown limited value in conflicts like the Gulf War, the invasion of Afghanistan, Iraq, and the Libyan conflict. Its applicability is deemed less effective in

subsequent stabilisation and security operations as well, where civil-military collaboration is vital for success. This suggests that while the concept may be effective for warfighting, its utility in peacebuilding efforts appears limited. The original Clausewitzian concept, as discussed earlier, was conceptualized for a linear design, employing brute force, with inadequacies for addressing the complexities of contemporary conflicts. Therefore, a system's approach to the identification of COG is essential. Following key takeaways are pertinent:

a. The COG as a linear thinking concept, is not suitable for dealing with the dynamic, sensing, and adapting systems present in modern warfare. For this purpose, operational commander will always remain reactive, and thus, lose the initiative once operations begin.

b. Liddell Hart stressed that an operational commander must have adaptable plans, and if focused on a single objective through a linear approach, it simplifies the enemy's task and complicates own.

c. As per US doctrine, identifying a COG entails determination of CG-CC-CR-CV. This often leads to a simplified understanding of the COG as the entity that accomplishes the mission, objectives or end state. However, the critique is that this linear process might oversimplify the complexities of modern warfare, where multiple variables and unpredictable dynamics influence outcomes. Same will be discussed in later case study.

d. As per Clausewitz, 'effects in war seldom result from a single cause; there are usually several concurrent causes.' War's outcomes are rarely attributable to straightforward, singular factors, and are complex such that a reductionist COG analysis might not fully apprehend. Own objectives desired in war may be numerous and similar and would be the case with adversary. By focusing on isolating a singular COG for entire operational, planners might overlook the broader context wherein multiple factors and dynamic interactions shape outcomes.

e. With regards to the identification of COG at the operational level, game theorist Roger Myerson's concept of incomplete information in games serves as a relevant parallel. Just as Myerson highlighted the challenges of making strategic decisions with incomplete information in competitive scenarios, military planners face similar difficulties when identifying COG based on uncertain assumptions about the opponent. For example, in the early stages of the conflict in Afghanistan, US identified the Taliban leadership in Kandahar and cave complexes in Tora Bora as COG. However, this assessment was based on incomplete information and an insufficient understanding of the political and ideological dynamics of the Taliban. Basing own operational design on targeting the enemy's envisaged COG may not lead to victory when such incomplete information is used.

COGs Dynamic Nature in Time, Space, Phase & Objectives

In light of contemporary theories, COGs are dynamic focal points in temporal and spatial domain. Whether they are derived from analysis of enemy's strengths and weaknesses or using critical factor analysis (Strange, 2005). Operationally, they are dynamic with respect to hypothesised objectives to be accomplished by the enemy and own mission to be achieved. Even whilst considering Clausewitz's saying "out of the dominant characteristics of operation, a certain COG evolves" (Clausewitz et al., 1984), with the evolving character of war, considering war's nature inherently violent, the means of violence are adaptive and innovative.

Thus, dominant characteristics are likely to shift in time as the war progresses due to attempts to outdo through escalation; in space, as means of violence employed in one geographical area would differ from the other; and due to multiple initial objectives and consequent shift in them due to war's friction. Shift in objectives may result owing to the two types of Clausewitzian 'friction' (Echevarria. 2007), the 'general friction' (due to a war's atmosphere, unpredictability of weather, miscommunication and misinterpretation) and the 'incidental friction' (due to unique unexpected challenges that may arrive and are not planned for earlier like sudden

logistical hurdles, and false intelligence) which can lead to outcomes and scenarios that are not always foreseeable or align with the initial policy expectations (Zweibelson, 2023). Dr. Vego puts it aptly as to how objectives of a naval operation may change upon the outcomes of tactical actions. It has been repeatedly stressed that errors made in operational planning and design at the strategic and operational level of war can only be overcome with great difficulty, if at all (Vego, 2008).

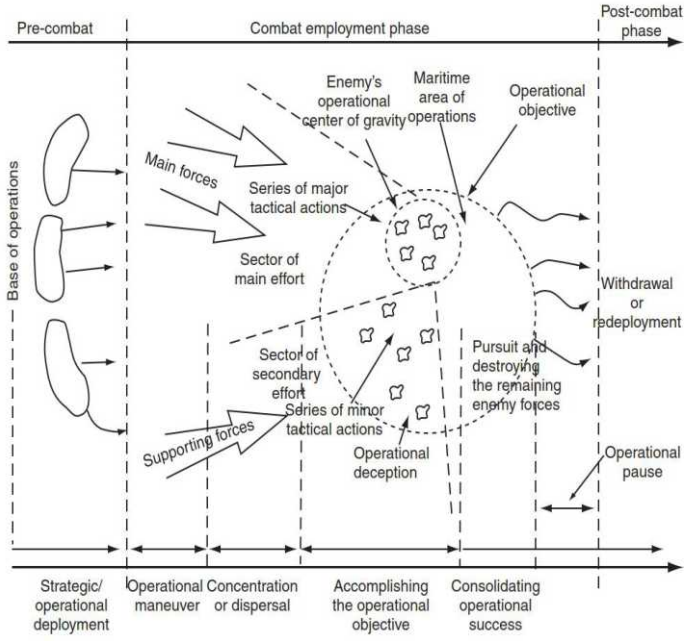

Figure 1*: Elements of a Naval Operation* (Vego, 2008).

An example of COGs dynamic nature, as pointed by Vego, is when the adversary's COG can change as a naval operation progresses, particularly during a large-scale amphibious assault. Initially, when the amphibious task force is at sea, the primary objective is safeguarding the amphibious task force, making cover and support force the operational COG. However, when the amphibious force commences landing, priority shifts towards overcoming enemy units and securing the beachhead. Consequently, the COG for the attacking force transitions to the elements with the

greatest combat capability within the landing force, often the armour or mechanized units. Typically, in the early stages of such operations, a carrier group or a substantial surface task force represents the operational COG. Thus, the COG shifts in various phases of operation. For any particular operation, a mission would consist of multiple core tasks and each task, as an objective to be achieved, would require varying capabilities. Conversely, same would be true for the adversary. Moreover, if own mission, or operational objective, is to deny adversary achieving his objective, different strengths would be necessary. Thus, for each operational objective would entail varying means, and the COGs would, thus, vary in between employment of those means.

Multiple Dynamic COGs: An Example

Identifying multiple COGs is, doctrinally, also an option available in operational planning; however, several theorists argue against this approach (Rueschhoff & Dunne, 2011). In a systemic method, a critical factor analysis would require targeting various nodes and elements vulnerable to attack in the enemy's system. This coupled with multiple COGs would essentially quadruple the decisive points to be attacked, thus, further complicating the operational planning process.

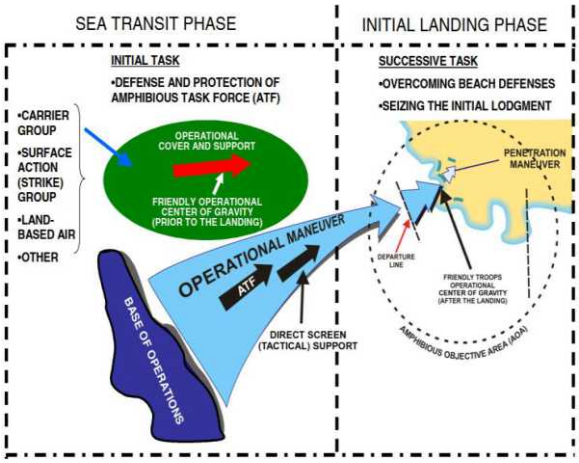

Figure 2: *Shift in COGs in Amphibious Ops* (Vego, 2008).

Whilst varying definitions of COG exist, as highlighted in Chapter 1, this research does not aim to redefine COG but rather explores its applicability in contemporary warfare, focusing on its practical application and the implications of the overall concept. Considering others aside, even if we consider the simplified Eikmeier's definition of COG, which brings clarity to the concept and its application at the operational level, a case study in a complex and dynamic contemporary warfare environment would further elucidate why COGs introduce added complexities. Planners need to adapt their courses of action based on dynamic COGs in terms of time, space, and the objectives desired.

COG's Dynamic Nature – Misapplied in Modern Warfare

Ekmeier has argued over having multiple COGs. He points out how multiple objectives are not accounted for singularly during operational planning process as planners would not want to 'over-complicate' the planning process and that planners avoid such complexities for 'simplification' However, such simplification may result in costly repercussion when a wrong COG is identified for different objectives. US doctrine's adaptation of Dr. Strange's method of CG-CC-CR-CV paved way for simplicity with which planners can reduce complexity to a simple methodology of finding either moral or physical sources of strength.

However, as earlier pointed out, errors made in identification of COG at higher levels are too costly. It is here that Ben Zweibelson quotes Col (Retd) Robert (Bob) Johnson of the US Army who commented very recently "that the whole notion of 'centre of gravity' is something that makes us feel good about it, but it has absolutely paid no dividend in terms of what we have been able to achieve within any of our operational efforts" (Zweibelson, 2023).

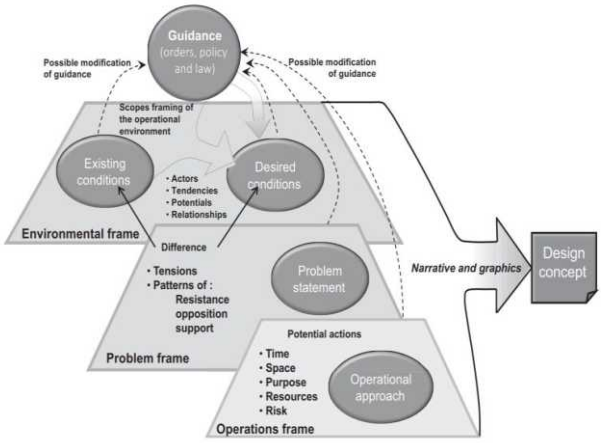

Figure 3: *Americanized Operational Design Concept* (Zweibelson, 2023).

Ben Zweibelson has suggested Systemic Operational Design (SOD) concept adopted by Israeli Defence Forces (IDF) and how US needs to adapt to same since it provides more leverage to adaptive and innovative ways to win conflicts.

COG's: From Simple to Complex

Dr. Ben Zweibelson, goes on to say how, despite the objections, the doctrine writers at the USJFC continued to integrate traditional COG models into design frameworks, which is indicative of a persistent institutional preference for established models in evolving character of warfare (Zweibelson, 2023). He is critical of the tendency of military institutions to insert traditional planning models like the COG in operational design which should be more adaptive and innovative. In essence, a deeper institutional belief system that prioritises existing paradigms always has been criticised over the need for disruptive, critical and creative thinking in complex warfare situations. He points out how COG is not just misapplied and outdated (except in the simplest conflict), but generally of no use.

The debate over a metaphorical concept has consumed enough resources, time and intellectual capital only to continue 'to be misinterpret and misunderstand a real world that has never been simple enough' to obey the COG principle to anything other

than physics. Col Amos Fox has repeatedly highlighted the same based upon his experiences during Operation Iraqi Freedom (Fox, 2024). The complex and dynamic environments we encounter in modern warfare do not conform to the COG construct, and it highlights nothing but our own preferences for a singular world view (paradigm) that prevents us from recognising a misapplied concept.

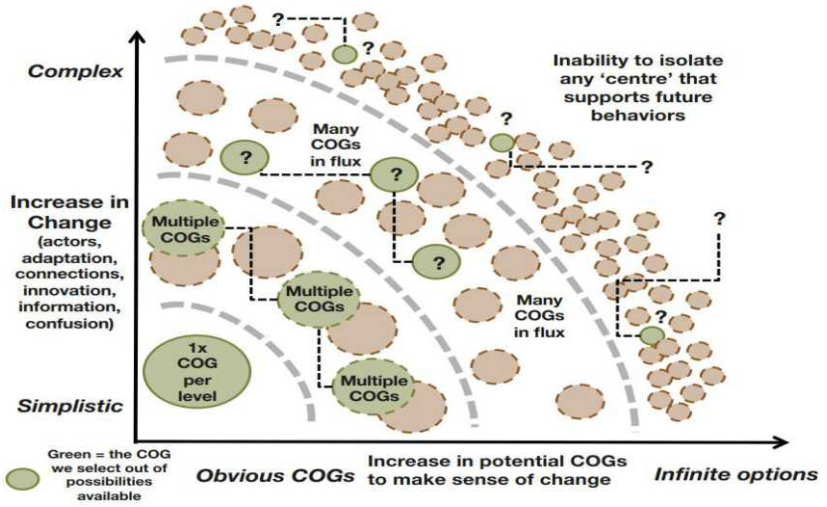

Figure 4: *COG feasibility in simple and complex environments* (Zweibelson, 2023).

Potential for an Alternative Concept

Modern conflicts, characterized by interacting, adaptive systems, require systems approach rather than a focus on relative power and strength. The aim is to sustain the system while pursuing political objectives, moving beyond the traditional COG-focused planning paradigm. Standardising a consistent theory (out of the contemporary theories mentioned in this research) or renaming the 'COG' term to avoid terminological confusion can be a way forward, but such changes face resistance due to the term's deep-rooted presence in military doctrines the world over. A way forward can be a partial removal of COG, focusing instead on critical factor analysis only, without the identification of a COG, is another pragmatic alternative.

For example, President Ghani in the Afghanistan context could be viewed not

as a COG but as a CR or CV. Identifying and protecting CV is essential, whether labelled as COG or not. The US failure in Afghanistan may not be termed as the COG concept's failure, but rather its application failure due inherent challenges involved that have been discussed. Notwithstanding, it may be argued that the COG concept has helped prioritize efforts in operational design and may continue albeit in more systemic fashion. As a counter argument, a solely critical factor analysis might offer flexibility but could lack clear direction. However, something as complex as modern-day warfighting, with an interplay of complex systems, cannot be expected to offer an essentially simple solution like the age old, and linear, Clausewitzian, brute force on force attack.

Operational Reach as COG

Col Amos Fox of US Army, holds another variant view. He suggests that degrading adversary's operational reach is crucial as it may induce culmination (Fox, 2024). This would thereby lead to neutralization and destruction of the enemy's system components. Persistent attacks on the links and nodes would disrupt or deny its ability to maintain stability. He points out how operational reach is critical for undertaking any offensive actions and, therefore, is a critical vulnerability for achievement of objectives. Historically, victors have managed their operational reach and disrupted adversary's system, in particular, Napoleon's defeat in 1812 campaign and Ukraine's defeat in the battle of Debaltseve, demonstrated the frailty the COG concept.

The contemporary Russo-Ukraine conflict is another example where strikes on adversary's operational reach, protection, sustainment and mobility, would illuminate the primacy of operational reach and importance of culmination in systems warfare (Inam & Rauf, 2024). The traditional COG concept should be reconsidered since it is too simplistic for contemporary warfare's complex and rapidly adapting systems. Amos Fox, like others, advocates for a systems-centric approach in planning and execution. It needs no further emphasis that while Clausewitz' 'On War' remains relevant, it needs to be tailored to adapt to the realities of modern warfare. The essence of operational reach: balancing endurance, protection, and momentum is crucial for a force's success

and must remain a prime consideration in operational planning. This includes the capabilities that support and sustain the operations, such as logistical resources, technology, and infrastructure. It is therefore imperative that operational sustainment and operational reach remains at the heart of operational planning and its design (Fox, 2024).

Future Warfare Dynamics with AI: US Concerns on China's Inevitable Rise

US is adapting its naval strategy towards Distributed Maritime Operations (DMO) or 'Distributed Lethality' as a response to evolving threats from China (SGP, 2024). There has been an increasing debate in US policy circles on how to fight 'near-peer' adversaries. This shift involves increasing the offensive and defensive capacity of individual warships, deploying them in dispersed formations across a wide geographic area, and enabling them to generate powerful, distributed missile salvos that are hard to counteract due to their dispersed nature.

The Distributed Lethality concept, therefore, could be seen as a proactive approach to avoid the Thucydides Trap. Robert Work describes the Chinese concept of warfare as a 'Systems Destruction Warfare', without the notion of targeting one COG, and therefore, there is a growing perception that China will attack the weaker nodes (or CVs), the communications and the components of US forces which are essential to maintain Operational Reach (Burke, Gunness, Cooper III, & Cozad, 2020).

The increasing debate on applicability of COG concept , the suggestions to shift to Systemic Operational Design (SOD), the imminent implementation of Distributed Lethality through DMOs, and how the US Defence Innovation Unit (DIU) is vying to procure as many Unmanned Systems as possible within next 2-3 years with lethal capabilities , are all seemingly indicative of present US threat perception of the overall Chinese strategy in general, and its Anti-Access and Area Denial (A2AD) in particular (Bondar , 2024). In such terms when Clausewitzian model of COG is hard to determine, it paves way for a systemic approach wherein disruption of enemy's system of forces while degrading its operational reach necessitates that it becomes the dominant

operational design.

Conclusion

The study underscores the need for a pragmatic shift in terms of understanding and applying the concept of COGs in times of modern warfare. The traditional Clausewitzian model, although effective in conflicts of smaller scale and with clear objectives, however, falls short in addressing the real complexities of contemporary challenges of hybrid and non-conventional warfare. In this way, it is pertinent to understand the fact that as the character of war evolves, so too must our analytical tools. The research advocates for a more multi-dimensional approach, moving beyond the aspects of conventional methodologies in order to better capture the real dynamic nature of COGs.

By proposing Critical Factor Analysis as an alternative tool and introducing the concept of operational reach, particularly in the context of the US's strategy toward China, the study lays the groundwork for a re-evaluation of operational design. The adoption of a 'Systems of Systems' (SyoSy) approach is recommended, emphasizing adaptability and flexibility in military strategy. Ultimately, the continuous reassessment and evolution of the COG concept will be crucial in ensuring the effectiveness of future operations, providing a clearer path forward in the increasingly complex landscape of modern conflict.

Disclosure Statement

No potential conflict of interest was reported by the author.

References

Bondar , K. (2024). Closing the Loop: Enhancing U.S. Drone Capabilities through Real-World Testing. *CSIS*. Retrieved from https://www.csis.org/analysis/closing-loop-enhancing-us-drone-capabilities-through-real-world-testing

Burke, E. J., Gunness, K., Cooper III, C. A., & Cozad, M. (2020). *People's Liberation Army Operational Concepts.* RAND COOPERATION. Retrieved from https://www.rand.org/content/dam/rand/pubs/research_reports/RRA300/RRA394-1/RAND_RRA394-1.pdf

Chun, C. K. (2010). JOHN WARDEN'S FIVE RING MODEL AND THE INDIRECT APPROACH TO WAR. *Theory of War and Strategy*. Retrieved from https://www.jstor.org/stable/10.2307/resrep12025.30?searchText=&searchUri=&ab_segments=&searchKey=&refreqid=fastly-default%3Ae0820a38113c6ccf75e3ef9dcd889981

Echevarria, A. J. (2011). Reconsidering War's Logic and Grammar. *Infinity Journal*. Retrieved from https://www.clausewitz.com/readings/Echevarria/LogicAndGrammar.htm

Eikmeier, D. (2010). Modernizing the Center of Gravity Concept-So It Works. *Academia*.

Evans, M. (2014). *Centre of Gravity Analysis in Joint Military Planning and Design*. Retrieved from Yumpu: https://www.yumpu.com/en/document/read/24271196/centre-of-gravity-analysis-in-joint-military-planning-and-design

Fox, A. C. (2024). Precision Paradox and Myths of Precision Strike in Modern Armed Conflict. *The RUSI Journal*.

Gilbert, C. (2024, April 16). *Clausewitz's Centre of Gravity in a Modern Battlespace* . Retrieved from theforge: https://theforge.defence.gov.au/article/clausewitzs-centre-gravity-modern-battlespace

Inam, Z. b., & Rauf, S. (2024). Understanding Urban Warfare and its Manifestation in Russia-Ukraine War. *ISSI*.

J.J. Schneider, L. I. (1988). *Clausewitz's Elusive Center of Gravity* . Retrieved from Militaire Spectator: https://www.militairespectator.nl/sites/default/files/bestanden/uitgaven/1988/1988-0326-01-0089.PDF

Keegan, M. J. (2024, July 18). *Navigating Complexity: Insights from Dr. Ben Zweibelson on Evolving Military Strategy*. Retrieved from businessofgovernment: https://www.businessofgovernment.org/blog/navigating-complexity-insights-dr-ben-zweibelson-evolving-military-strategy

Krause, M. (2021, August 11). *Clausewitz & Centres of Gravity Open to Interpretation*. Retrieved from Theforge: https://theforge.defence.gov.au/article/clausewitz-centres-gravity-open-interpretation

MCU. (2023). Next Generation of Warfare. *Journal of Advanced Military Studies, 14*. Retrieved from https://www.usmcu.edu/Portals/218/JAMS_Spring%202023_14_1_web3.pdf

Meyer, E. L. (2022). The centre of gravity concept: contemporary theories, comparison, and implications. *Defence Studies*, 327-332.

Naval Headquarters. (2018). *Maritime Doctrine of Pakistan: Preserving Freedom of Seas.* Islamabad: Naval Headquarters.

Rueschhoff, J. L., & Dunne, J. P. (2011). Centers of Gravity from the "Inside Out". *JFQ*(60). Retrieved from https://theforge.defence.gov.au/sites/default/files/adfwtc05_-_rueschhoff_dunne_centres_of_gravity_inside_out.pdf

SGP. (2024). *Defense Primer: Navy Distributed Maritime Operations (DMO).* Congressional Research Service. Retrieved from https://sgp.fas.org/crs/natsec/IF12599.pdf

Strange, D. J. (1960). *Centers of Gravity and Critical Vulnerabilities* . Retrieved from Jfsc: https://jfsc.ndu.edu/Portals/72/Documents/JC2IOS/Additional_Reading/3B_COG_and_Critical_Vulnerabilities.pdf

Vego, M. (2008). Operational Warfare at Sea: Theory and Practice. *War-Science*.

Zweibelson, B. (2023). *Understanding the Military Design Movement (War, Change, and Innovation).* Routledge.