

DECIPHERING THE PHYSIOGNOMY OF THE MILITARY OPERATIONAL ENVIRONMENT – FACTORS AND CHARACTERISTICS

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Abstract: *The purpose of this paper is to provide a systematic and detailed analysis of the key components that characterise the military operational environments and that should be considered to improve the effectiveness of the operations process. Also, it focuses on understanding how these salient characteristics might influence capabilities and tactics with particular emphasis on the adaptability of military forces in the face of rapid and unforeseen changes in the operational environment. The research objectives include identifying and assessing the impact of operational environment’s factors, and analysing how military forces adapt to these conditions to maximise their effectiveness. The results highlight the need for continuous adaptability and flexibility of the military forces to respond performantly to the ever-changing operational requirements. Furthermore, the paper demonstrates that military operational effectiveness is closely connected to the ability to anticipate, understand and integrate new technologies, as well as to adjust continuously designated strategies and tactics in the face of the challenges specific to the operational environment.*

Keywords: operational environment, physiognomy, PMESII-PT, VUCA, technology

1. Introduction

The operational environment refers to the context and conditions in which military forces conduct operations. It includes not only physical and geographical elements, but also political, social, economic and informational factors that influence the way operations are planned and executed. The operational environment can range from open and rural to dense urban areas, from cyber to space environments, and involves a wide range of challenges and threats. Understanding the operational environment is essential for effective planning and adaptation of strategies in line with the dynamic changes in this environment. Factors such as terrain, weather conditions, local population, infrastructure and available technology can decisively

influence the success or failure of a military operation. Recognising and understanding asymmetric threats, such as insurgent groups or hybrid warfare operations, are also critical components of operational environment analysis. In order to cope with this complex and often uncertain environment, commanders and military personnel must have a broad knowledge and be able to apply principles of critical thinking and adaptability. This requires close collaboration between different branches of the military forces and sometimes with allied forces, government agencies (GO) and non-governmental organisations (NGO) to ensure a holistic and coordinated approach to the planning and execution of operations. Based on these initial aspects, the purpose of this paper is

to provide a clarifying analysis on the elements of the operational environment that influence the effectiveness of the operations process with an emphasis on planning and execution. The research objectives (RObj) that will be pursued consist of:

- RObj₁ - Identification and analysis of the factors and characteristics influencing the operational environment. This objective focuses on assessing the dynamics and complexity of the environment in which military forces must operate, as well as analyzing factors that may affect mission effectiveness and success;

- RObj₂ - Assessing the technological impact on the evolution of the military operational environment. This objective focuses on understanding how technological innovations, from the development of new weapons systems to artificial intelligence (AI), are changing operational paradigms. It also includes anticipating future directions of evolution in military technology and their impact on military doctrine and strategy.

Achieving these objectives requires identifying the answer to the following research questions (RQ):

- RQ₁ - What are the main factors and characteristics influencing the military operational environment?;

- RQ₂ - How do recent technological developments influence the strategies, capabilities and operational effectiveness of military forces?

2. Research Methodology

The research methods (RM) used are diverse and adapted to the specifics and objectives of the study. Literature review and analysis of relevant resources are the starting points of this study, providing a solid theoretical basis. As shown in Table 1, each research method has made an important contribution to the responses of the RQs, being applied in an interconnected manner.

Table 1 Research Design & Methodology

RObj _s	RQ _s	RM _s
RObj ₁	RQ ₁	- literature review; - analysis of relevant resources;
RObj ₂	RQ ₂	- content analysis; - descriptive method.

Also, in order to carry out this paper, it will be used both the content analysis and the descriptive method.

3. Results

The application of the methodology highlighted in Table 1 favoured obtaining the results with reference to RQ₁ and RQ₂.

3.1. Factors and Characteristics Influencing the Operational Environment

Commanders and their staff employ operational variables to conduct in-depth analyses and engage comprehensively with all pertinent aspects of an operational environment. These variables are essentially the subsystems within an operational environment, serving as focal points for analysis. The focus is on identifying key and critical connections both within and among these subsystems. To organize this analysis, operational variables are divided into eight main categories: political, military, economic, social, information, infrastructure, physical environment, and time (PMESII-PT). This categorization aids in systematically examining the operational environment to inform military planning and decision-making [1]. These operational variables are intricately connected and, when coherently applied, aid in forming the commander's common operational picture (COP). This comprehensive view assists commanders in making informed decisions by providing a detailed and integrated understanding of the operational environment [2]. The eight variables are described as follows [3]:

- Political – details the allocation of power and responsibility across all formally established levels of governance, alongside both informal and hidden political forces.

(Who holds the position of tribal leader in the village?);

- Military – in a given operational environment, this examines the military/paramilitary strengths of all key actors: adversarial, allied, and neutral (Do regional forces in the designated area possess anti-tank missiles?);

- Economic – covers the actions and interactions of individuals and groups regarding the creation, distribution, and consumption of goods and services, including the unemployment rate from designated operational environment;

- Social – primarily focuses on the aspects related to culture, religion, and ethnicity which are present in an operational environment; secondarily are analysed specific beliefs, values, traditions, and practices of the subject population. It also focuses on religious leaders, tribal leaders, crime organizations, influential families, etc.;

- Information – involves detailing the nature, extent, attributes, and impacts of systems, organizations or individuals engaged in gathering, handling, altering, sharing, or responding to information. It questions the level of access the local population in operational environments has to news media or the Internet;

- Infrastructure – encompasses essential utilities, services, and infrastructures required for a community or society to operate, such as querying the operational status of the electrical generator, water supply system, etc.;

- Physical environment – covers the topography, human-made features, climate, and meteorological conditions within an operational area, questioning which landforms or climatic circumstances might advantage adversary activities;

- Time – details the scheduling and length of actions, occurrences, or circumstances in an operational setting, along with the varying perceptions of these timings and durations by different participants within the operational environment. This includes

identifying when individuals are most likely to crowd roads or engage in activities that could conceal hostile operations.

All these factors are analyzed and correlated to achieve a comprehensive picture of the operational environment and the area of operations in which the military forces operate.

On the other hand, the military operational environment is volatile, uncertain, complex and ambiguous (VUCA) in fashion and reflects the challenges faced by commanders and their troops, from operations on the continually changing battlefield, to adapting to unexpected adversary strategies or managing unclear information. Responding effectively in such operational environment requires a combination of rigorous training, ability to think critically and creatively, adaptability, and openness to collaboration and innovation. The brief description of these characteristics refers to:

- Volatility is marked by sudden and significant changes within a very short timeframe, potentially with global repercussions. The 2022 conflict between Russia and Ukraine exemplifies such volatility. Military leadership must recognize and prepare for the extent of these unpredictable changes to manage them effectively;

- Uncertainty denotes the unpredictability of future events. With the growing interconnection of the world, values, and ideologies are no longer confined to specific regions. This global mixing blurs the lines between opposing values and ideologies, making adversaries difficult to clearly identify. Globalization further enhances this interconnectedness, increasing the unpredictability inherent in our world today;

- Complexity is driven by globalization, digitalization, and the escalating interdependencies among various systems. These interconnected systems introduce a multitude of factors that can directly and immediately affect everyday life,

contributing to the VUCA world's multifaceted nature;

- Ambiguity stems from the lack of clarity in situations, information, or events, challenging individuals' ability to navigate their surroundings. Addressing the growing questions of "why" and "how" involves fostering a culture that emphasizes orientation, encourages experimentation, and accepts mistakes to mitigate ambiguity and disorientation [4].

Thus, answering to the RQ₁, the RObj₁ was achieved by identifying and analysing in details the factors and characteristics that influence any operational environment. A deep understanding of operational variables such as PMESII-PT facilitates the development of a clear and effective COP necessary for commanders to trigger adjustment decisions.

3.2. Technological Impact on the Operational Environment

The 21st century wars are distinctively shaped by transformative technologies including AI, autonomy, robotics, quantum computing, cyber warfare, etc. The current conflict in Ukraine exemplifies the pivotal influence of these innovations in augmenting traditional combat tactics. For instance, Russian Federation employs KUB-BLA drones with AI capabilities for target identification, signifying a push towards more autonomous combat systems. In contrast, Ukraine leverages drones equipped with anti-tank weaponry, utilizing satellite reconnaissance to extend their operational awareness and precision. Additionally, the conflict showcases the strategic deployment of cyberattacks and disinformation by Russia to generate a digital "fog of war," aiming to disrupt and demoralize through the manipulation of information and direct attacks on infrastructure. This fusion of advanced technologies with conventional warfare tactics underscores a new era of combat, where digital prowess is as crucial as physical might [5]. The intense combat operations in Ukraine have highlighted a

pivotal shift in both symmetric and asymmetric warfare, illustrating a transitional phase away from Soviet-era weaponry towards more modern, conventional arms. This change has been markedly underscored by the effectiveness of high mobility artillery rocket systems (HIMARS) and mobile, portable anti-tank and air defense systems like Javelin and NLAW. These advancements demonstrate the growing importance of flexibility, precision, and technological superiority on the battlefield, fundamentally altering traditional combat dynamics and emphasizing a move towards more agile and responsive military capabilities [6]. Also, significant advancements in robotics have primarily impacted the Unmanned Aerial Vehicles (UAV), having the United States (US) leading nation, closely followed by Israel. During different international operations (Iraq, Afghanistan), the US forces had used six main UAVs such as: Predator, Global Hawk, Hunter, Shadow, and Dragon Eye. These UAVs varied significantly, from the 27,000-pound Global Hawk, which resembled a Lear jet, to the five-pound Dragon Eye, which resembled a model airplane. Initially designed for surveillance, these UAVs shared a common purpose. However, much like the historical progression of manned aircraft, UAVs such as the Predator quickly transitioned to offensive roles, engaging in attacks on enemy targets [7]. Robotic systems are evolving into crucial tactical assets for military leaders, radically transforming the way they plan and execute actions. These advanced technologies enable commanders to achieve novel effects against adversaries, navigate and alter terrains, occupy spaces more effectively, and significantly influence the tempo of operations. The inherent advantages of these machines lie in their efficiency, precision, and speed for particular tasks, surpassing human capabilities. This paradigm shift is already observable in the realm of industrial manufacturing and

assembly plants, where robotics have revolutionized production processes, demonstrating a glimpse of their potential impact on military strategy and tactics [8]. These were just a few elements that have contributed to answer to the RQ₂ and to fulfil the RObj₂. Indeed, the technological impact on the military operational environment highlights how technology innovations can transform military strategies and tactics, increasing efficiency and accuracy in the fulfilment of missions. Thus, it is vital that military leaders integrate operational variable analysis and anticipate technological developments to remain relevant and effective in dynamically changing operational environments.

4. Conclusions

The physiognomy of the military operational environment underlines the importance of a comprehensive and adaptive approach to the operations process. The diverse factors that define this environment, from geographic and meteorological conditions, to technology, cultural and political dynamics, and the complexities of information warfare, require careful assessment and continuous adaptability. The ability to understand and cope with these factors is crucial to the success of military operations. Training and strategic development efforts must therefore prioritise improving operational agility and tactical flexibility, thereby ensuring that military forces can respond effectively to the challenges and opportunities presented by the changing operational environment. Broad analysis of the military operational environment reveals a complex mix of dynamic and interconnected factors that require a multidimensional and in-depth

approach to the effective planning and execution of military operations. This environment, influenced by physical variables such as geography and weather conditions, is also shaped by human and technological factors, including social change, technological developments and international politics. Elements such as culture, troop morale, and adversary psychology add another layer of complexity, showing that success in war depends not only on physical strength, but also on a deep understanding of these nuances. In addition to these factors, the digital age has introduced a new battlespace into information warfare, where information supremacy and the ability to influence perception become key weapons. Thus, the operational environment of the 21st century transcends physical boundaries, involving information warfare where the ability to manage and counter misinformation can be decisive. Therefore, adaptability and flexibility are becoming indispensable qualities for military forces, which must be prepared to evolve with the operational environment. This requires not only continuous technological innovation and the development of tactical capabilities, but also deep cultural and political understanding and sophisticated information management strategies. In this regard, military force training needs to pay greater attention to simulating these complex and changing conditions in the operational environment. Advanced simulations and war games, along with continuing education in areas such as cyber, psychology, and international relations, can provide military personnel with the tools to navigate and excel in this complex environment.

References List

- [1] Spilý P. Insight into contemporary operational environment. *Security Dimensions International & National Studies*. 2014. No. 1(11): p. 135. Cited at April 6, 2024. Available from: [Security_Dimensions_International_National_Studies-r2014-t-n1_\(11\)-s132-140.pdf \(muzhp.pl\)](#).
- [2] Terziu J. U.S. political and warfare strategy effects on democratization efforts. Baltimore, Maryland. April 2019; p. 50. Cited at April 8, 2024. Available from: <https://jscholarship.library.jhu.edu/server/api/core/bitstreams/e4a0d9f0-094e-413f-81b3-7c40f9db1411/content>.
- [3] ATP 3-21.8. Infantry platoon and squad. Headquarters, Department of the Army. 2016; p. 1-2. Cited at April 11, 2024. Available from: ATP 3-21.8 Working Edit.pdf (lethalgrunt.com).
- [4] Pott R. Future generations and new challenges: leadership in times of the VUCA world. *The defence horizon journal*. January 2023. Cited at April 15, 2024 Available from: <https://tdhj.org/blog/post/future-generations-challenges-leadership-vuca/>.
- [5] Patil S. The Future of War in the Age of Disruptive Technologies. *Raisina Debates*. April 2022. Cited at April 16, 2024. Available from: <https://www.orfonline.org/expert-speak/the-future-of-war-in-the-age-of-disruptive-technologies/>.
- [6] Nardelli A., Wickham A., Jacobs J. Russia Orders Forces to Strike Ukraine's Long-Range Weapons. August 2022. Cited at April 17, 2024. Available from: <https://www.bloomberg.com/news/articles/2022-07-18/russia-orders-forces-to-strike-ukraine-s-long-range-weapons>.
- [7] Boot M. The Paradox of Military Technology. *A journal of technology & society: The New Atlantis*. 2006. No. 14: p. 23. Cited at April 18, 2024. Available from: <https://www.thenewatlantis.com/wp-content/uploads/legacy-pdfs/TNA14-Boot.pdf>.
- [8] Boisboissel G. New Technologies and Decision-Making for the Military. *Advances in Decision Making*. July 2021; p. 4. Cited at April 19, 2024, Available from: (PDF) New Technologies and Decision-Making for the Military (researchgate.net).