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THE TRILOGY OF MAN, MACHINE AND METHOD IN HOLISTICALLY ENHANCING THE FUTURE OF MALAYSIAN ARMY

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KETERANGAN

Sorotan Darat ialah Jurnal Tentera Darat (TD) yang diterbitkan sejak 1 Mac 1983 bagi mempertingkatkan budaya ilmu di kalangan warga TD. Jangka masa pengeluaran ialah setiap 6 bulan iaitu pada bulan Jun dan Disember. Segala isi kandungannya termasuk sebarang ilustrasi, gambar, jadual dan rajah tidak dibenarkan dicetak semula dalam apa corak sekalipun tanpa mendapat kebenaran Kementerian Pertahanan melalui MK PLDTD terlebih dahulu.

Sebagai sebuah jurnal eksklusif TD, Sorotan Darat berperanan sebagai sebuah platform perbincangan berkenaan isu-isu kontemporari yang boleh menimbulkan minat profesional ketenteraan. Bermula tahun 2020, penerbitan bagi setiap siri Sorotan Darat adalah berdasarkan kepada tema-tema penulisan yang tertentu hasil cadangan dan persetujuan daripada MK TD – Cwg OPLAT serta MK TD – Cwg P&P.

Isu-isu kontroversi biasanya menjadi nadi penggerak bagi sesebuah jurnal profesional yang mana ia dapat menjadi asas pemikiran dan perbincangan yang sihat. Artikel-artikel seperti ini akan lebih diberikan keutamaan, manakala artikel-artikel mengenai operasi, idea-idea latihan atau kegunaan peralatan adalah antara topik-topik yang sangat dialu-alukan untuk diterbitkan.

Semua pertanyaan mengenai Sorotan Darat hendaklah dikemukakan kepada Ketua Editor iaitu Kol Doktrin, MK PLDTD.

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FOREWORD

السلام عليكم ورحمة الله وبركاته

In the name of Allah, the Most Compassionate and Merciful, we express our gratitude to Allah SWT for His guidance and blessings, which have allowed us to continue the publication of *SOROTAN DARAT*, the Malaysian Army's journal. This publication aligns with the intent of the Higher Commanders to facilitate the sharing of military knowledge and promote the professionalism of Army Officers.

On behalf of the Editorial Board, I would like to extend my deepest gratitude to everyone who has contributed to the successful publication of this 85th edition. We encourage continued interest and participation in submitting articles for future publications. I also wish to acknowledge the Editorial Board's efforts in ensuring the regular publication of this journal. As an exclusive platform for the Malaysian Army, *SOROTAN DARAT* serves as a forum to discuss a wide range of issues which significance to the military affairs.

This edition is discussing on **The Trilogy of Man, Machine and Method in Holistically Enhancing the Future of Malaysian Army**. As highlighted, 3M is the holistic framework that integrates personnel development, technological innovation, and strategic methodologies in ensuring the future advancement of the Malaysian Army. A better understanding on this aspect will cultivate knowledge and perspectives on the said matter. Hopefully that the ideas and information highlighted by all writers would enhance the readers' knowledge, thus supporting the objective to develop the Army as a knowledge-based organization.

Last but not least, let us pray to Allah SWT for the well-being of all Army personnel. May the Almighty Allah continue to give us the guidance and strength to bring this organization excel in every aspect. Thank you.

"*Latihan Teras Keyakinan*"

MEJ JEN DATUK MARZUKI BIN HJ MOKHTAR
GOC TRADOC

FROM CHIEF EDITOR'S DESK

السلام عليكم ورحمة الله وبركاته

In the name of Allah, the Most Gracious and the Most Merciful, we extend our gratitude for His blessings that have enabled the successful publication of this second journal of 2024. This edition stands as a testament to the dedication of the contributors in enriching readers' knowledge through articles that are informative, beneficial, and insightful. The Editorial Council sincerely appreciates the efforts of all writers whose contributions have made this journal possible. Their commitment and passion reflect the invaluable talent required for producing a high quality journal.

Wisdom, both in thought and action, emerges from diverse perspectives and experiences. *SOROTAN DARAT* serves as a vital platform for readers to engage with and derive knowledge from the ideas shared by the contributors. By facilitating the exchange of insights, this journal aims to enhance professional development and situational awareness among readers. This edition of *SOROTAN DARAT* will be discussing on **The Trilogy of Man, Machine and Method in Holistically Enhancing the Future of Malaysian Army**. The effective integration of Man, Machine, and Method is essential for creating a capable, resilient, and adaptive force. By embracing innovation, fostering continuous improvement, and addressing potential risks, the Malaysian Army can ensure the readiness to face future challenges and uphold the mission to protect and defend the nation.

The Editorial Council warmly invites and encourages aspiring writers to contribute articles for future editions of the journal. Constructive opinions, dynamic discussions, innovative ideas, and feedback from readers are highly valued, as they play a crucial role in improving the quality of future publications. Thank you for your continued support and engagement.

"Knowledge is the Core of Confidence"

KOL MOHD RASHID BIN ANANG
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THE TRILOGY OF MAN, MACHINE AND METHOD IN HOLISTICALLY ENHANCING THE FUTURE OF MALAYSIAN ARMY

By BRIG JEN Sr RATENAH BINTI ISMAIL
ROYAL ENGINEER REGIMENT

INTRODUCTION

The interaction among man, machine, and method is becoming more crucial in improving military abilities as a whole. As global security dynamics evolve, Malaysia recognises the necessity to modernise its defence strategies through a multifaceted approach that integrates advanced technologies with human-centric methodologies. The evolution of military technology in Malaysia underscores a commitment to developing systems that not only augment operational effectiveness but also address the complexities of contemporary warfare. This modernisation involves more than just getting advanced equipment but it requires recognizing the different aspects of a soldier's humanity such as moral, cognitive, and physical as these traits greatly impact performance in difficult situations.

Moreover, the incorporation of artificial intelligence in military activities poses various opportunities and challenges, requiring thorough examination of ethical consequences and operational preparedness. Flexible training methods are necessary to adequately train personnel for contemporary war scenarios and to foster resilience and adaptability in soldiers. By exploring technology integration, considering human factors in defence strategy formulation, and adapting to new training paradigms, the Malaysian Army can successfully address upcoming obstacles and take advantage of potential growth and progress. Hence, a collaborative strategy can reshape future military readiness characterised by fast technological advancements and changing geopolitical environments.

The future of the Malaysian Army depends on improving the synergy between man, machine, and method. The combination of these three elements is vital for operational efficiency in more complex combat settings. The factor of human dimension continues to play a crucial role in determining military success. Though technological progress is unquestionably impactful, it cannot replace the mental and physical readiness of soldiers. It is important to provide training that focuses on cognitive, moral, and physical skills to ensure that military personnel can adjust to changing battlefield

conditions. Additionally, it is vital to comprehend how human factors align with conventional indicators of military preparedness. An effective evaluation strategy must consider emotional and mental factors like morale and cognitive skills, in addition to traditional assessments such as equipment condition. This comprehensive view helps military leaders effectively prepare their troops for tasks by ensuring that both human abilities and mechanical resources work harmoniously together.

Creating measurable indicators for these aspects of human performance will make it easier to design training programs that are customised to address specific operational requirements. Moreover, human-machine teaming signifies a fundamental change in contemporary military tactics. The combination of robotics, artificial intelligence (AI), and augmentation technologies results in improved awareness of situations and decision-making abilities on the battlefield. Nonetheless, this change requires thorough evaluation of the ethical consequences linked to independent systems. Military commanders need to find a way to incorporate new technologies while also emphasising the importance of human supervision in order to use them responsibly.

MAN, MACHINE AND METHOD

In the Malaysian Army, the interactions among human abilities, technological progress, and operational tactics are complex when considering man, machine, and method. Recognising the importance of the "human dimension" of soldiers is vital as military operations become more advanced. It was highlighted that a deep understanding of soldiers' physical and mental capabilities is necessary to support technological innovations in modern warfare. Soldiers need to be mentally ready and have the required skills to successfully maneuverer through changing environments. This emphasises the importance of training programs that not only concentrate on technical skills but also promote psychological strength in staff. Additionally, morale and motivation from human factors are essential for maintaining operational effectiveness in military units. Ensuring that human factors align with physical elements such as equipment is needed for creating a positive command atmosphere. Before deployment, the Malaysian Army should incorporate evaluations that assess combat readiness and psychological preparedness. This thorough assessment guarantees that soldiers are not just provided with state-of-the-art technology, but also mentally prepared to effectively utilise these tools in intense situations.

The integration of machines in military operations is another important aspect of this triangle. Moreover, human-machine teaming signifies a fundamental change in contemporary military tactics to establish cohesive teams in which soldiers collaborate with advanced technologies like artificial intelligence and robotics. In Malaysia, this might mean creating robot systems that are customised for local requirements and ensuring smooth communication between humans and machines. These improvements can increase the likelihood of mission success by enabling soldiers to complete tasks in less risky conditions with the help of robots for dangerous operations. Thus, to improve the future efficiency of the Malaysian Army, it is important to focus on a well-rounded strategy that places importance on military personnel, equipment, and tactics. By prioritising both soldier's growth and technological progress in a way that takes ethics into account, Malaysia can lead in modern military strategies. The Malaysian Army's strategy combines personnel, equipment, and tactics, requiring equal attention to both human and technological aspects. By promoting a setting that appreciates mental preparedness as well as skill development, and by effectively incorporating machinery, the military can improve its overall operational abilities in modern-day warfare.

Therefore, enhancing the Malaysian Army's future effectiveness requires a balanced approach that prioritises man, machine, and method. By fostering soldier development alongside technological advancements while considering ethical implications, Malaysia can position its armed forces at the forefront of modern military operations. The Malaysian Army's structure involves balancing humans, machines, and methods to prioritise human aspects along with technological advancements. Through promoting a culture that prioritises mental preparedness as well as skills training while also effectively incorporating technology, the military can improve its overall performance in modern conflicts.

❖ Evolution of Military Technology in Malaysia

There has been a focused attempt to modernise Malaysia's armed forces in response to changing warfare and security threats, leading to advancements in military technology. At the core of this change is the Army 4nextG, a holistic effort to improve critical operational abilities like sustainability, mobility, survivability, lethality, and command, control, communications, computers, and intelligence. This program recognises that modern battlefields require more than just advanced weapons but they also need integrated systems

to improve situational awareness and protect troops. In the past, Malaysia's advancement in military technology has evolved from simply buying traditional weapons to adopting a comprehensive strategy that includes drones, surveillance, and cyber technologies. Incorporating these technologies into military operations is crucial to ensure strategic balance with neighbouring rivals and while addressing internal security challenges.

However, the successful implementation of these advancements depends on how to overcome significant obstacles including budget constraints and the need for skilled personnel capable of operating sophisticated systems. Moreover, the human dimension remains critical in this technological evolution and also understanding soldiers' moral and cognitive capacities is vital for maximizing operational effectiveness. The interplay between technology and human factors necessitates robust training programs that prepare personnel not just to operate new technologies but also to adapt their tactics in rapidly changing scenarios. The duos are essential for maintaining the agility and effectiveness of the Malaysian forces. Malaysia's journey towards modernising its military demonstrates a dedication to merging state-of-the-art technology with a deep respect for the soldier's function in this structure. With ongoing challenges related to distributing resources and developing personnel, it is important for the Malaysian Army to implement a flexible approach that encompasses both technological advancements and thorough soldier preparedness.

❖ Human-Centric Approaches in Defence Strategy

In the modernisation efforts of the Malaysian Army, there is a need to consider Human-centric approaches in defence strategy to ensure effective military operations. These approaches focus on understanding and improving the moral, cognitive, and physical capabilities of individual soldier within complex operational environments. With military conflict evolving towards asymmetric warfare, especially emphasizing small-unit tactics, it is essential to develop strategies that consider the distinct psychological and cognitive characteristics of personnel. By integrating human dimension assessments into readiness evaluations, a more holistic grasp of soldier performance can be attained, surpassing mere proficiency in equipment.

Furthermore, it is vital to create an atmosphere that emphasises the importance of leadership growth and effective training methods. Effective leadership not just boosts soldiers' moral strength but also guarantees they possess the essential critical thinking abilities in making decision in stressful circumstances. Acknowledging that skilled and adaptable personnel are still necessary, defence strategies can be developed to utilise both human abilities and technological advancements, understanding that technology alone is not a complete solution. By incorporating feedback loops from frontline soldiers into strategic planning processes further enriches this human-centric approach by ensuring policies remain relevant to actual operational experiences. Such inclusivity fosters a culture of continuous improvement within military ranks, ultimately leading to enhanced effectiveness in executing missions. As Malaysia navigates its path toward modernising its armed forces amidst budgetary constraints and evolving security challenges, prioritising human-centric methodologies will prove indispensable in cultivating a resilient and capable military force prepared for future uncertainties. Thus, integrating these principles into defence strategies not only prepares soldiers physically but also equips them mentally and morally to face diverse threats effectively.

❖ Integration of Advanced Methods in Military Operations

The integration of advanced methods into military operations represents a transformative shift in the operational capabilities of the Malaysian Army, aligning with global trends towards increasingly sophisticated warfare. AI technologies can enhance decision-making processes, optimise resource allocation, and improve situational awareness through advanced data analytics and predictive modelling. By leveraging advanced technologies, military planners can process vast amounts of information rapidly, enabling them to anticipate threats and respond more effectively in dynamic environments. Moreover, AI-driven systems can facilitate autonomous operations, from unmanned aerial vehicles conducting reconnaissance missions to automated logistics support, thus allowing human personnel to focus on higher-level strategic tasks.

However, the incorporation of advanced technologies like AI into military frameworks is not without its challenges. The reliance on algorithms raises critical questions regarding accountability and transparency in decision-making processes. As machines increasingly take on roles traditionally held by humans, it becomes imperative to establish robust ethical guidelines that govern their deployment. This ethical dimension is particularly salient in combat scenarios where decisions may have life-or-death consequences; thus, ensuring that human oversight remains integral to AI applications is essential for maintaining moral responsibility within military operations. Furthermore, the successful integration of AI necessitates a comprehensive approach to training methods for personnel. Soldiers must be equipped not only with technical skills to operate advanced systems but also with cognitive competencies that allow them to interpret data outputs critically and make informed decisions under pressure. This dual focus on technological proficiency and human judgment underscores the need for ongoing education that adapts alongside evolving technologies. Although the incorporation of AI presents great potential for improving operational efficiency in the Malaysian Army, it also requires careful focus on ethical issues and training approaches. Ensuring a balance of these components will be crucial in fully leveraging the capabilities of AI while maintaining the critical human elements necessary for successful military operations.

❖ Training Methods for Modern Warfare Preparedness

Training techniques for readiness in modern warfare need to progress along with the rising intricacy of current combat settings and technological progress. The Malaysian Army must implement new training methods that combine human and machine abilities to improve operational effectiveness. At the core of this development is the requirement for a holistic strategy that not only introduces soldiers to new technologies but also nurtures their cognitive and moral aspects, preparing them to handle complex operational situations. An effective tactic is simulation-based training, enabling personnel to participate in realistic combat scenarios without the hazards of live exercises. These simulations have the ability to include AI systems that adjust in real-time, offering soldiers evolving challenges mirroring possible battlefield situations. Immersive experiences help develop critical thinking and decision-making skills, which are

becoming more essential as military engagements move towards asymmetrical warfare tactics.

Incorporating evaluations of the human aspect into training programs is important in pinpointing soldiers' individual strengths and areas needing improvement. Military leaders can customize training programs for optimal performance results by considering metrics that assess both psychological resilience and physical readiness. This comprehensive method recognizes the significance of mental toughness in stressful situations where quick decisions can impact the outcome of a mission. Moreover, promoting a culture of ongoing learning by incorporating input from frontline experiences increases adaptability among military personnel. Motivating soldiers to communicate knowledge acquired during operational deployments enhances overall understanding and guides the development of future training approaches. This inclusivity guarantees that training stays pertinent and adaptable to changing threats. Effective readiness for modern warfare requires a comprehensive approach that combines cutting-edge technological expertise with strong human-focused training techniques. By emphasizing technical expertise and cognitive development in their training initiatives, the Malaysian Army has the potential to cultivate a resilient and flexible unit capable of effectively managing future obstacles and leveraging advancements in technology.

❖ Ethical Considerations in Military Advancements

The ethical considerations surrounding military advancements are increasingly critical as the Malaysian Army seeks to integrate sophisticated technologies into its operational framework. The deployment of cutting-edge systems, particularly those involving artificial intelligence and autonomous weaponry, raises profound moral questions regarding accountability, decision-making, and the potential for unintended consequences in combat scenarios. As military technology advances, ethical guidelines regulating its usage must also progress while; neglecting to do so may result in serious consequences for both soldiers and civilians impacted by military operations.

The core of these ethical discussions is the question of human supervision in AI-operated activities. Although AI can improve productivity and understanding of the situation,

depending on algorithms for important choices, especially those related to the use of deadly force, can lead to the dehumanisation of warfare and have potential risks. Strict guidelines must prioritise ethical accountability within military protocols due to the risk of machines making life-and-death decisions without sufficient human intervention. Additionally, it is crucial to create distinct chains of responsibility and clearly identifying who is morally responsible when autonomous systems participate in combat is needed. Furthermore, the impact on soldier well-being and morale must be considered when integrating advanced technologies. As military personnel adjust to more automated surroundings, there is a danger of reducing their importance and duties in tactical structures. This change may result in psychological effects due to decreased control in decision-making in combat scenarios. Therefore, the implementation of training programs do not just provide military personnel with technical skills but also enhance their cognitive and ethical abilities to effectively interact with technology. Dealing with these moral factors necessitates a varied strategy incorporating strong policy creation as well as extensive training programs to enhance soldiers' technological skills and ethical judgment. When the Malaysian Army focuses on these aspects during its modernization process, it can effectively address the challenges of modern warfare and maintain important ethical principles required for proper military behaviour.

❖ Future Challenges and Opportunities

The Malaysian Army faces a myriad of future challenges and opportunities as it seeks to navigate the complexities of modern warfare while enhancing its operational capabilities through the integration of advanced technologies, human-centric strategies, and innovative training methodologies. One significant challenge lies in balancing the rapid pace of technological advancement with the need for adequate human capital development. As military operations increasingly rely on sophisticated systems, there is an urgent requirement for skilled personnel who can effectively operate these technologies while maintaining situational awareness and decision-making capabilities. This necessitates a comprehensive approach to recruitment, retention, and training that not only prioritises technical proficiency but also fosters critical thinking and adaptability among soldiers.

Ethical considerations surrounding military advancements present another layer of complexity. The introduction of AI in combat situations raises essential inquiries about responsibility and ethics in decision-making processes. With the increasing use of AI-powered systems, it is crucial to uphold human supervision to ensure ethical standards are met in military operations. The task goes beyond just integrating technology; it involves creating strong systems to govern how these systems are implemented while also protecting moral obligations. However, amidst these challenges lie substantial opportunities for growth and transformation within the Malaysian Army. Embracing a holistic approach that synergises man, machine, and method can lead to enhance operational effectiveness and resilience in facing diverse threats. By investing in simulation-based training programs that leverage AI technologies to create realistic combat environments, soldiers can develop critical skills necessary for navigating asymmetrical warfare landscapes. Furthermore, fostering an inclusive culture that values feedback from frontline experiences will enrich strategic planning processes while ensuring continuous improvement in training methodologies. Addressing future challenges requires a proactive stance towards integrating advanced technologies with comprehensive soldier readiness initiatives. The Malaysian Army's commitment to ethical considerations alongside its modernisation efforts will ultimately define its capacity to adapt successfully within an evolving security landscape characterised by rapid technological change and complex geopolitical dynamics.

❖ Integration of Man, Machine and Method in Building Information Modelling

According to Defence White Paper, Science and Technology Research Institute for Defence (STRIDE) and the Defence Industry Division (DID) are the main influencers of Defence Science, Technology and Industry, but this paper will also examine how Defence Engineering Service Division (BPKP) will help improve the readiness of future army by using Building Information Modelling (BIM). In today’s complex construction environment, efficient cost management is crucial and BIM offers a transformative solution. By integrating real-time costing with design and planning, BIM enables smarter, more cost-effective decision-making, ensuring every project stays within budget while maximizing value. This approach

allows project teams to make informed decisions that enhance overall project value. The power of BIM streamlines collaboration among all stakeholders throughout the entire project lifecycle, ensuring smooth implementation and delivery of BIM projects. By boosting productivity, reducing project timelines, and cutting costs, BIM significantly enhances overall project value, making it an indispensable tool for achieving sustainable and economically viable construction projects in the Malaysian Army.

BIM has revolutionised the architecture, engineering, and construction industries by providing a comprehensive framework for managing the physical and functional characteristics of infrastructure projects. As BIM continues to gain traction, it becomes increasingly important to understand how various frameworks can enhance its implementation. One such framework is the military trilogy of man, machine, and method and this article explores how this trilogy is applicable to BIM. BIM has emerged as a transformative force within the global construction industry, heralding new paradigms in project delivery and management. The construction industry in Malaysia is undergoing a transformative shift, largely driven by the adoption of BIM. This innovative approach integrates digital technology into the design, construction, and management processes of buildings, fostering enhanced collaboration among stakeholders.

The benefits of BIM are profound. It ranges from improved financial management and communication to enhanced visual representation and coordination throughout project lifecycles. As Malaysia strives to elevate its construction practices to meet global standards, understanding both the advantages and challenges associated with BIM becomes paramount. Furthermore, it will delve into future trends that may shape BIM's trajectory within Malaysia's construction landscape alongside necessary training initiatives aimed at equipping professionals with requisite skills. By undertaking a comprehensive analysis of these dimensions, this discourse seeks to illuminate pathways for overcoming existing barriers while maximizing the potential benefits that BIM can offer to the Malaysian Army construction and development.

BIM is also pertinent as to enhance Facility Management (FM) by improving efficiency, accuracy, and collaboration. BIM’s integration with FM processes supports

lifestyle management, accurate data handling, and strategic decision-making. In the military context, BIM offers substantial benefits in maintenance, asset tracking, compliance, and emergency response. Overcoming implementation challenges and embracing emerging technologies will further refine BIM's role in sustainable and smart facility management. BIM represents a paradigm shift in the construction industry, characterized by the integration of digital tools and processes that enhance the design, construction, and operational phases of building projects. At its core, BIM facilitates the creation of a comprehensive digital representation of the physical and functional characteristics of facilities. This multidimensional approach enables stakeholders to collaborate more effectively throughout a project's lifecycle by providing access to real-time data and visualizations that improve decision-making.

Skilled professionals (man) rely on software (machine) to implement effective process (method). Each element enhances the others. Insights gained from human analysis can lead to software improvements while technology advancements can influence new methodology needs. Therefore, the synergy of these three elements in BPKP's BIM will offer substantial benefits that encompass financial oversight, facilitate accurate cost estimation and budget tracking throughout a project's lifecycle, enabling stakeholders to identify potential financial discrepancies early on, enhanced communication channels and collaboration among stakeholders, superior visual representation techniques, efficient scheduling practices, and effective long-term facility management solutions.

CONCLUSION

The future of military technologies and strategies is rapidly evolving, with advancements in man, machine, and method playing a critical role in enhancing the capabilities of the modern army. The intricate interplay of man, machine, and method is essential for the holistic enhancement of the Malaysian Army's capabilities in an era defined by rapid technological advancement and evolving security challenges. The evolution of military technology in Malaysia illustrates a strategic commitment to not only modernise operational frameworks but also to prioritise human-centric approaches that recognise the soldier's multifaceted role in contemporary warfare. By integrating artificial intelligence into military operations, the Malaysian Army can leverage advanced data analytics and autonomous systems to

enhance decision-making processes while simultaneously grappling with ethical considerations surrounding accountability and moral responsibility.

Furthermore, innovative training methodologies must evolve to ensure that personnel are adept at operating sophisticated technologies while cultivating critical thinking and resilience necessary for modern combat scenarios. The importance of ethical norms in military progress is crucial; it is essential to have strong guidelines for implementing new technologies to maintain basic moral principles. As the Malaysian Army faces upcoming obstacles such as limited resources and need to stay ready for operations, it finds itself at a crucial moment where adopting a collaborative strategy could lead to significant advancements in growth and change. In the end, by continuously investing in both incorporating technology and implementing soldier development programs, Malaysia can enhance its military readiness, establishing itself as a strong force able to handle various threats in a complex geopolitical environment.

The integration of BIM in the Malaysian construction industry presents a compelling opportunity for transformative change, yet it is accompanied by significant challenges that must be addressed. The in-depth examination presented in this paper shows that BIM provides significant advantages, such as better financial management, enhanced communication among stakeholders, advanced visualization abilities, and effective project scheduling. In the future, it appears that BIM will increasingly merge with new technologies like artificial intelligence and cloud-based solutions, which will improve efficiency and collaboration in the industry. Nevertheless, these developments require a strong foundation for training and education to develop a proficient workforce capable of using BIM tools efficiently. By utilising the military trilogy of man, machine, and method offers useful perspectives on enhancing Building Information Modelling adoption among designers and planners. Prioritising human elements in education will enhances stakeholder engagement in selecting appropriate technologies increases operational efficiency while adopting structured strategies that enhances adaptability in changing circumstances. It is essential for organisations to thoroughly consider these foundational elements when integrating innovative practices such as BIM into their operations to enhance information flow and decrease rework. In the end, combining these factors will not just lead to effective outcomes but also significantly boost productivity in general. In general, the collaboration among people, technology, and procedures in BIM leads to a holistic approach that enhances project efficiency, collaboration, and outcomes.

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THE TRILOGY OF MAN, MACHINE, AND METHOD IN HOLISTICALLY ENHANCING THE FUTURE OF THE MALAYSIAN ARMY

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INTRODUCTION

The military forces have been evolving for decades through a modernization process in line with regional and global changes. As the military landscape continues to evolve, particularly with the advent of the Revolution in Military Affairs and its focus on technological edges, there has been a growing recognition of the need to understand the impact of emerging technologies on the human element of conflict (Billing et al., 2021). This is particularly relevant for developing nations like Malaysia, where the military has had to grapple with the challenges posed by the emergence of diverse tactical threats and unique operational environments, even among superpowers, which have directly affected military organizations and increased the challenges faced by military leaders in preserving soldiers' commitment to their roles (Jung, 2009). The emergence of diverse challenges and unique environments in the military tactical threat, even among superpowers, has significantly impacted military organizations in developing nations like Malaysia. Like many developing nations, Malaysia has grappled with the diverse challenges and unique environments in the military tactical threat, even among superpowers, which have directly impacted military organizations.

The Malaysian Army must address the leadership setbacks identified during their annual unit commanders conference, which raised concerns about maintaining soldier commitment in the evolving military landscape (Sulaiman et al., 2020). The trilogy of man, machine, and method offers a comprehensive approach to address the evolving challenges faced by the Malaysian Army. Recognizing that the nature of warfare is rapidly changing, with the emergence of diverse challenges and unique environments in the military tactical threat, even among superpowers, the Malaysian Army must adapt and modernize its strategies and tactics to maintain a competitive edge (Yahaya, 2019). Leveraging the strategic integration of the trilogy of man, machine, and method can serve as a comprehensive framework for the Malaysian Army to enhance its future preparedness and operational effectiveness in the face of evolving military threats and challenges. Accordingly, this paper delves into how the Malaysian Army can

leverage the synergies between its human capital, technological capabilities, and innovative methodologies to develop a holistic framework for enhancing its future preparedness and operational effectiveness.

MAN: THE HUMAN ELEMENT

The military has long recognized the human soldier's central role in warfare. However, as modernization accelerates, the role of the human combatant undergoes significant transformation. This highlights the crucial need for the Malaysian Army to prioritize the development and well-being of its human capital as a key aspect of its modernization efforts. There are several key considerations in this regard, like the importance of skilled personnel, leadership, morale, and cognitive capabilities.

❖ The Importance of Skilled Personnel in Adapting to a New Era of Warfare

Lee et al. (2022) noticed that human capital in the Malaysian context has underscored the significance of personnel with specialized skills and advanced qualifications as crucial factors in achieving organizational sustainability and performance. Beyond the need for skilled personnel, the Malaysian Army must also recognize that soldier well-being and morale are integral to maintaining a highly committed and effective force. In his studies, Jayasingam (2019) stated that, in order to effectively address the diverse challenges and unique environments in the military tactical threat, even among superpowers, the Malaysian Army must invest in developing a multifaceted and highly skilled workforce capable of adapting to the rapidly evolving nature of modern warfare. The Malaysian Army confronts a rapidly evolving security environment, as do military organizations globally. While conventional threats persist, they now intersect with intricate challenges posed by technological advancements and non-state entities. This emergent paradigm of warfare necessitates a fundamental shift in strategic thinking and a concerted emphasis on cultivating specialized expertise within the Malaysian military forces.

In the rapidly evolving landscape of modern warfare, the Malaysian Armed Forces face the pressing challenge of adapting to the changing dynamics and technological advancements that characterize the new era of conflict. For decades, the forces have been modernizing in response to

regional and global changes, necessitating a diverse range of new skills and competencies from the nation's youth (Kamarck, 2017). The multidimensional threats Malaysia faces necessitate a strong and capable military. Traditional threats, such as the growing military capability and increased aggression of neighboring countries, as well as non-traditional threats like terrorism, necessitate a comprehensive and adaptable response (Triantama & Pangestu, 2020). To address these challenges, the Malaysian Army must focus on developing a highly skilled and versatile personnel force.

Aspects of training such as discipline, weapon skills, morale-building, and adherence to instructions are crucial in shaping a competent and efficient army (Othman et al., 2020). While physical power and technological superiority are undoubtedly important, the psychological resilience and overall well-being of the troops are equally vital in ensuring their effectiveness and commitment in the face of these emerging threats. The Malaysian Army has undertaken the Revolution in Military Affairs, marked by the acquisition of advanced weaponry and technological capabilities, as a key strategic initiative to transform itself into a more powerful and capable regional military force, better equipped to address the diverse challenges it faces (Triantama & Pangestu, 2020).

Malaysia's digital landscape has become increasingly vulnerable to cyber threats, posing a significant challenge to the country's digital sovereignty. The rise of sophisticated cyber-attacks, such as data breaches, ransomware, and digital disruptions, has underscored the critical importance of a robust and skilled cybersecurity workforce within the Malaysian armed forces. Recent studies have highlighted the growing shortage of qualified cybersecurity professionals in Malaysia, with a particular emphasis on the need for specialized skillsets to combat the rapidly evolving cyber threat landscape (Sohime et al., 2020). Furthermore, the COVID-19 pandemic has exacerbated the issue, with a surge in cyberattacks targeting individuals and organizations due to the increased reliance on digital technologies (Singh et al., 2021). To effectively safeguard Malaysia's digital sovereignty, the Malaysian Army must prioritize the recruitment, training, and retention of skilled cybersecurity personnel. This will enable the country to proactively defend against cyber threats, mitigate the impact of attacks, and maintain the integrity of its critical digital infrastructure (Shammugam et al., 2021).

As Malaysia strives to become a developed nation by 2020, the Malaysian Army faces the imperative of keeping pace with the rapid technological advancements that define modern warfare (Yaakob et al., 2020). The emergence of the Revolution in Military Affairs, characterized by an increasing reliance on sophisticated technologies, has directly impacted military operations around the globe, including in developing nations such as Malaysia (Futter & Collins, 2015). In response to these pressing challenges, the Malaysian government has recognized the critical need to invest in the continuous education and training of its military personnel, intending to cultivate a highly skilled and adaptable workforce capable of navigating the evolving technological landscape. As the cornerstone of the nation's security and defense, the Malaysian Army must be well-equipped and prepared to confront the ever-changing threats that emerge in the contemporary geopolitical landscape, necessitating a steadfast commitment to ongoing skill development and knowledge acquisition (Othman et al., 2020; Sulaiman et al., 2020).

❖ The Critical Role of Adaptable Leadership

Strong leadership is crucial in motivating soldiers and fostering a cohesive and effective fighting force, particularly in the rapidly evolving modern military landscape. The Malaysian Army has been undergoing a process of modernization to adapt to regional and global changes, with a focus on incorporating technological advancements and addressing emerging challenges. As the military environment becomes increasingly complex and unpredictable, with the emergence of diverse tactical threats and unique operational environments even among superpowers, military leaders in developing nations like Malaysia are facing heightened challenges in preserving the commitment and resilience of the personnel under their command.

Effective leaders must possess the adaptive capacity to understand the situational context, demonstrate a high level of hardiness, and emerge stronger and more committed from adversity (Tucker et al., 2010). The dynamic and uncertain realities of modern warfare often confront commanders with unanticipated problems and limited or inaccurate information, making the ability to adapt and improvise solutions an indispensable skill for leaders to navigate the complexities of the

contemporary battlefield and ensure the readiness and effectiveness of their forces.

The Malaysian Army's participation in the ongoing "Revolution in Military Affairs," a global trend that prioritizes the development and integration of advanced technologies to maintain a strategic edge over potential adversaries and adapt to the evolving nature of warfare, has further amplified this imperative for adaptability. Commanders in modern military leadership face well-documented paradoxical challenges, balancing competing demands like encouraging autonomy and control, supporting individuality and teamwork, ensuring flexibility and efficiency, and enabling soldiers to reach their full potential while attending to their well-being and social responsibility (Kark et al., 2016). The successful navigation of these tensions requires a leadership approach that is both responsive and proactive, one that can foster a culture of innovation, adaptability, and cohesion within the ranks.

The annual unit commanders conference of the Malaysian Army has underscored the necessity of addressing these leadership setbacks and developing a cadre of military leaders capable of effectively leading their units amidst the evolving challenges and complexities of the modern battlespace (Jayasingam, 2019). Such leaders must possess the creativity, problem-solving abilities, and strategic foresight to rapidly transform the military's capabilities in response to evolving operational requirements, ensuring the Malaysian Army maintains its operational readiness and strategic relevance in the years to come.

❖ Cognitive Enhancement and Human Augmentation

The rapid advancement of technologies, such as cognitive enhancement drugs and human augmentation, has brought forth a myriad of ethical and practical considerations that the Malaysian Army must thoughtfully navigate. These emerging technologies hold the potential to enhance the physical and cognitive capabilities of soldiers, potentially improving their performance and efficiency on the battlefield (Hossain & Ahmed, 2021). However, the implementation of such technologies also presents complex ethical dilemmas that require careful examination. One of the primary ethical concerns is authenticity and the notion of the "good life." The use of cognitive enhancement drugs or neural implants may call into

question the distinction between natural and artificial human abilities, potentially challenging the concept of personal identity and the inherent value of one's accomplishments. Another significant concern is the potential for unequal access to these technologies, which could create a stratified force where certain individuals or groups possess enhanced capabilities while others do not, potentially leading to issues of fairness and discrimination.

Furthermore, we cannot ignore the regulatory and policy challenges these technologies present. Policymakers must grapple with questions of safety, efficacy, and the appropriate use of such technologies within the military context (Bostrom & Sandberg, 2009). Despite these ethical concerns, the Malaysian Army cannot ignore the potential benefits of these emerging technologies. Improved cognitive function and physical abilities could enhance the overall readiness and effectiveness of the military, potentially leading to better outcomes in combat situations and improved soldier welfare (Edison, 2021; Ward & Hackett, 2004). Ultimately, the Malaysian Army must strike a delicate balance, carefully weighing the potential benefits against the ethical implications of implementing cognitive enhancement and human augmentation technologies. Rigorous discussion, interdisciplinary collaboration, and the development of robust regulatory frameworks will be essential in ensuring that the adoption of these technologies aligns with the Army's ethical principles and the broader societal good.

MACHINE: TECHNOLOGICAL ADVANCEMENTS

The Malaysian Army's ability to harness emerging technologies will be a critical determinant of its future preparedness and operational effectiveness. As the pace of military modernization accelerates, the proliferation of new technological capabilities, including robotics, artificial intelligence, and information systems, is reshaping the character of warfare. Across the global military landscape, organizations are grappling with the rapid advancements in robotics and autonomous systems, and the Malaysian Army must proactively address the implications of these emerging technologies for its future force structure, strategic planning, and operational doctrine. As the Malaysian Army confronts an increasingly complex security environment shaped by technological innovations, it must prioritize the strategic integration of machine-based capabilities to enhance the effectiveness and adaptability of its forces.

However, a concerted effort to understand and mitigate the potential risks and ethical challenges posed by these advancements must accompany the integration of new technologies. The emergence of technologies like unmanned vehicles and cognitive neuroscience research carries the potential to redefine the human role in military operations, creating new conceptions of the soldier and the nature of human-machine interaction on the battlefield. The Malaysian Army must therefore carefully navigate the interplay between technological progress and its implications for the human element of conflict, ensuring that its modernization efforts holistically address the evolving relationship between man, machine, and method.

❖ Modern Weapon Systems and Equipment

The Malaysian Army faces significant challenges in maintaining its strategic advantage amidst the rapidly evolving military landscape. The growing military capabilities of neighboring countries, particularly China's assertiveness in the South China Sea, coupled with the persistent threat of terrorism, underscores the urgency for Malaysia to enhance its defense capabilities (Triantama & Pangestu, 2020). In this context, the revolution in military affairs has become a crucial aspect of modern warfare, characterized by the integration of advanced weapons systems that leverage cutting-edge technologies.

The Malaysian Army must prioritize the acquisition and integration of precision-guided munitions, unmanned aerial vehicles, and cyber warfare capabilities to strengthen their operational effectiveness and ensure the country's security and sovereignty (Yahaya, 2019). Currently, Malaysia's defense industry is classified as a 'third-tier' arms producer capable of producing relatively low-tech weapons (Sulaiman et al., 2020). The Malaysian government must comprehensively review and revise its defense strategy, engage all relevant stakeholders, and ensure it aligns with the necessary capability development initiatives for the Malaysian Army to address this limitation. The government's efforts to produce a defense white paper are lauded as a positive step towards overcoming the challenges faced by the Malaysian defense industry.

Furthermore, the evolving nature of military threats, even among superpowers, has directly impacted military organizations in developing nations like Malaysia. This has increased the challenges faced by military leaders in preserving soldiers' commitment and morale, underscoring the importance

of effective leadership and organizational adaptation within the Malaysian Army. The Malaysian Army must prioritize the acquisition and effective integration of advanced weapon systems and capabilities, including precision-guided munitions, unmanned aerial vehicles, and cyber warfare technologies, to safeguard the country's sovereignty, integrity, and resilience during major power conflicts.

❖ Information Technology and Network-Centric Warfare

As the global military landscape has evolved, the Malaysian Armed Forces, including the Malaysian Army, have found themselves at the forefront of adapting to the emerging paradigm of network-centric warfare, which has fundamentally reshaped the conduct of modern military operations. At the heart of this transformation lies the strategic embrace of information and communication technologies, which have enabled the Malaysian Army to enhance its situational awareness, improve coordination and information sharing, and ultimately sharpen its operational edge (Von Lubitz et al., 2008; Ward & Hackett, 2004).

The concept of network-centric warfare, which has gained traction across various military organizations worldwide, emphasizes the importance of leveraging information and communication technologies to achieve a "knowledge edge" over potential adversaries (Goztepe, 2015). This approach has been particularly crucial for the Malaysian Army as it navigates the rapidly evolving regional security environment, marked by the modernization of other Southeast Asian militaries and the emergence of new challenges (Jayasingam, 2019). Hendy and Troester (2000) found that by harnessing the power of information technology, the Armed Forces has sought to strengthen its military capabilities, adapt to changing operational environments, and maintain its position as a formidable force in the region.

The progress made by the Malaysian Army in developing robust communication and information-sharing systems underscores its commitment to embracing the principles of network-centric warfare. This endeavor has involved the integration of mobile technologies, such as mobile instant messaging, into the Army's operational framework (Azuwar & Bahri, 2020). However, the adoption of these new technologies

has not been without its challenges, as the Malaysian Army has had to navigate the complexities of adapting its deeply rooted military culture and organizational structures to accommodate these transformative advancements. As the Malaysian Army continues to evolve and adapt to the demands of the modern battlefield, the successful implementation of network-centric warfare principles will be crucial in ensuring its continued relevance and effectiveness. By leveraging the power of information technology, the Malaysian Army can enhance its situational awareness, improve coordination and information sharing, and ultimately sharpen its operational edge, positioning itself as a formidable force in the ever-changing regional security landscape.

❖ The Ethical and Strategic Implications of Artificial Intelligence

Artificial intelligence (AI) has become a topic of growing interest and concern in the realm of national security and defense, with its potential applications ranging from intelligence gathering to autonomous weapons systems. The integration of AI-driven technologies presents both opportunities and challenges that the Malaysian Army must carefully navigate as it seeks to modernize and enhance its capabilities. The primary areas where the Malaysian Army can leverage AI are in intelligence gathering and decision-making processes. The ability of AI systems to rapidly process and analyze vast amounts of data can enhance the military's situational awareness, enabling more informed and timely decision-making. However, addressing the potential for bias, errors, and unintended consequences is crucial when using AI in these sensitive domains (Wong et al., 2020).

Another area that AI is exploring is the development of autonomous weapons systems capable of independent targeting and engagement. While these systems may offer tactical advantages, such as the potential to reduce the risk to human operators, they also raise profound ethical concerns regarding the delegation of lethal decision-making to machines. As the Malaysian government contemplates the strategic value of such technologies, it must carefully weigh the ethical implications and ensure that the deployment of autonomous weapons aligns with international laws and norms.

Furthermore, the integration of AI into military operations also raises strategic considerations. The potential for AI-driven systems to enhance the Malaysian armed forces' capabilities, such as through improved intelligence analysis or more precise targeting, must be balanced against the risk of adversaries developing similar technologies, potentially leading to an "AI arms race" and destabilizing the regional security landscape (Mikhailov, 2023). The responsible development and deployment of AI in the Malaysian Army will require a multifaceted approach involving collaboration between government, industry, and academia. This may include the establishment of ethical frameworks, rigorous testing and validation procedures, and a robust system of governance and oversight to ensure the safe and accountable use of these technologies. As the Malaysian government navigates the complex terrain of AI integration in its armed forces, it must strive to strike a careful balance between the strategic advantages offered by these technologies and the ethical and societal implications that come with their use.

METHOD: OPERATIONAL DOCTRINES AND STRATEGIES FOR ASYMMETRIC THREATS

In the face of evolving security challenges, the Malaysian Army has recognized the need for flexible and adaptable operational doctrines to address the growing threat of non-state actors. As modern warfare increasingly involves asymmetrical conflicts, the Malaysian Army has developed counter-insurgency and counter-terrorism strategies that emphasize the importance of seamless coordination and cooperation between different branches of the military.

As the world continues to witness the evolution of warfare, the Malaysian Army has demonstrated its commitment to adapting to these changes and developing operational doctrines and strategies that are flexible, adaptable, and technologically advanced. The Malaysian Army's ability to effectively leverage emerging technologies and harness human-machine synergy will depend on its capacity to develop innovative operational doctrines and strategic frameworks. In a rapidly evolving security landscape, the Malaysian Army must cultivate a culture of agility, adaptability, and responsiveness, enabling its forces to swiftly pivot and deploy in response to emerging threats and ever-changing operational environments. Prioritizing the development of modular, reconfigurable force structures will enable the Malaysian Army to rapidly adapt to changing circumstances on the battlefield.

The Malaysian Army should also prioritize enhancing its special operations capabilities, enabling it to undertake highly specialized and targeted missions that leverage the unique advantages offered by advanced technologies and human-machine collaboration (Billing et al., 2021; Futter & Collins, 2015; Kirkpatrick, 2001). Ultimately, the Malaysian Army's success in holistically enhancing its future operational effectiveness will hinge on its ability to seamlessly integrate the trilogy of man, machine, and method, creating a cohesive and resilient force capable of decisive action in the face of complex and rapidly evolving challenges.

❖ Adapting to Asymmetric Threats

The principal purpose of armed forces is to deter and win a nation's wars, and the Malaysian Army has adapted its operational lenses to address the challenges posed by non-state actors. Lecuyer (1993) suggests that the concept of an operational continuum offers a more pragmatic approach to addressing operational challenges to national security, highlighting the need to address several threats affecting national security and prosperity before dispatching combat forces into a conflict situation. The Malaysian Army's counter-insurgency and counter-terrorism strategies have been instrumental in addressing the threats posed by non-state actors. The adaptive nature of these strategies allows the military to effectively respond to the evolving nature of hybrid threats, including cyber threats, terrorism, and other unconventional threats (Asmoro et al., 2021).

The Malaysian Army's ability to effectively integrate new technologies and train personnel is crucial for the force to maintain its operational edge in the face of a rapidly evolving security landscape. Liaropoulos (2006) mentioned in his study that the growing emphasis on technological superiority, a trend often described as the "Revolution in Military Affairs," has posed significant hurdles for military organizations in developing countries like Malaysia as they strive to ensure their forces can adapt and capitalize on these advancements. The Malaysian Army must adopt a flexible and responsive strategic approach to swiftly adapt to changing battlefield conditions in order to address these challenges. This "Adaptive Warfare" doctrine empowers the force to rapidly pivot and adapt to emerging threats (Jayasingam, 2019).

❖ Joint Operations and Interoperability

The Malaysian Army has recognized the importance of seamless coordination and cooperation between different branches of the military in achieving successful joint operations. The emergence of diverse challenges and unique environments in the military tactical threat has increased the need for military leaders to foster a high level of commitment and hardiness among soldiers. The role of technology in enhancing joint operations has also been a key focus for the Malaysian Army (Abu Hassan, 2014). The implementation of the *Revolution in Military Affairs*, marked by the acquisition of advanced weaponry technology and followed by changes in military doctrine and organizational adaptation, has transformed the Malaysian Army into a powerful military force in the region (Triantama & Pangestu, 2020).

Enhancing joint operations and interoperability with other branches of the Army, as well as international allies, is another key pillar of the Malaysian Army's strategic development. By fostering greater coordination and information-sharing, the Malaysian Army can leverage the complementary capabilities of its sister services and partner nations to achieve more comprehensive and effective outcomes on the battlefield (Caton, 2018). This is particularly important as the military faces an increasingly complex and diverse set of threats, from conventional conflicts to asymmetric challenges.

The inclusion of scenario-based planning and simulation exercises is instrumental in guiding the Malaysian Army's doctrinal and strategic progression. Extensively testing a diverse range of potential scenarios and situations through war games and other training simulations allows the force to anticipate and prepare for a variety of operational environments. The Malaysian Army's strategic development must be a continuous process, constantly adapting to the shifting geopolitical landscape, technological advancements, and emerging threats. The Malaysian Army can ensure the continued efficacy and relevance of its doctrinal and strategic frameworks in an ever-changing security landscape by adopting a dynamic, cooperative, and prospective approach.

❖ Cyber Warfare and Information Operations

The Malaysian Army has also been cognizant of the growing importance of cyber warfare and information operations in modern conflicts (Lecuyer, 1993). The emergence of diverse challenges and unique environments in the military tactical threat, even among superpowers, has directly affected military organizations in developing nations like Malaysia and increased the challenges military leaders face in maintaining soldiers' commitment to their jobs.

CONCLUSION

The ability of the Malaysian Army to holistically integrate the trio of man, machine, and method will shape its future. The Malaysian Army can position itself to effectively navigate the complex and rapidly evolving 21st century security landscape by prioritizing the development of a technologically advanced and operationally agile force. Through the strategic integration of modern weapon systems, information technology, and autonomous capabilities, the Malaysian Army can enhance its overall operational effectiveness and strategic posture. At the same time, the Malaysian Army must address the ethical and strategic implications of these advancements, ensuring that its modernization efforts strike a careful balance between technological progress and the enduring human element of warfare. As the Malaysian Army continues to adapt and evolve, it must remain vigilant and proactive in its approach, constantly seeking to identify and address emerging threats and opportunities. By embracing the trilogy of man, machine, and method, the Malaysian Army can build a force that is resilient, responsive, and capable of safeguarding the nation's security and prosperity in the years to come.

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THE APPLICATION OF QUALITY MANAGEMENT IN THE RELATIONSHIP BETWEEN MAN AND MACHINE IN THE FORCE MODERNISATION OF THE MALAYSIAN ARMY

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INTRODUCTION

Currently, the different roles and missions of the military organisation and emphasis placed on people over the machine will affect how quality is utilized. Some have integrated quality management (QM) into their organisation and often believe that most quality improvements are equally beneficial for all units regardless of the type. However, not all units are the same because technology capabilities and the amount of human involvement will be different in each organisation. In addition, military roles and missions have changed in response to operations other than war and urban warfare (Fielder, 2011). This has caused a revolutionary focus on time versus mission and the proper mix of quality among the operational and support functions of the military organisation.

Military commanders cannot always expect subordinates to perform without direction and it is important to communicate the process toward a vision. As part of the mission-building process, some tools of quality management can be tailored within some areas of a military organisation (Kasimlioglu, 2001). Within the organisation, however, not all areas are alike, thus quality will not be applied equally across all fields. Due to this, the future of force modernisation in the Malaysian Army (MA) will shape a new dimension of quality implementation in the organisation. Applying quality to command and control (C2), operations and logistics covers the majority of key military warfighting capabilities in the MA (Goure, 2018). Each is mutually supporting, thus quality is mutually inclusive but often in varying degrees and methods depending on the situation.

IMPLEMENTING QUALITY MANAGEMENT IN THE FORCE MODERNISATION OF THE MALAYSIAN ARMY

❖ Command and Control

In the current challenging military of the future, management without good leadership will not get the mission accomplished in the most efficient way possible. A good team

leader will lead the team along in the required direction. Therefore, QM would better be phrased using leadership versus management principles. Quality can be matched with the leader's responsibility for timely decisions on the modern battlefield. Historically, QM was based on the concept that those closest to the man must be empowered to act on the problems and opportunities they face (Omar, 2017). This management principle takes responsibility from the leader of today's fast-paced world, where there simply is not enough time to pass an issue up the chain of command for approval.

Frontline leaders must be able to correct problems on the spot and although technology can assist in making the flow faster it cannot make the decision for us nor accept the responsibility. Force modernisation empowerment of its leaders in MA must be supported by new skills and knowledge (Tan, 2004). Through training, frontline leaders must have access to critical strategic information so that they can make good decisions. In using technology, an accurate overview of the issue can quickly assimilate many sources of input in a short time. Modern management methods can serve as good leadership tools. Thus, commanders can independently make quick accurate decisions (Vitto, 2016). These decisions are the key to how missions will be executed. The operations of the unit require more daily personal interaction and although quality is important for a smooth operation, it is employed differently than under the command and control requirements.

❖ Operations

At the root of operations is planning, training and execution. Also, within the operations field, the emphasis is on actual performance versus expectations. Thus, the quality process that meets mission requirements is at the core of the organisation around which it is built (Kasimlioglu, 2001). The technological capability of force modernisation in MA is the key to operations for most corps because of their emphasis on equipment. For the MA, quality is focused on personal interaction because there is still a great deal of emphasis placed on the knowledge of the people (ICRC, 2013). Therefore, the application of quantitative methods used to assess and improve the processes within an MA must be strengthened with the knowledge of the people. This will alleviate the tendency to confuse efficiency which is a key concept of QM with effectiveness which is to accomplish the mission in the military.

As for force modernisation in MA, the quality management system element involves problem-solving made up of subordinates as well as commanders who give the group authority to implement changes (Tan, 2004). But this often meant statistics became a substitute for strategy. Moreover, military personnel did not feel they had ownership of the process because commander involvement at every step of the process meant the military culture was threatened by micro-management, zero defects and management by objective. Then, when the facts are gathered and the options are developed, the commander can decide without the cumbersome task of managing a problem-solving team along with the day-to-day responsibilities of the organisation. This distinction between management and leadership in the operations field is similar to how the military currently operates its Standard Operating Procedure (Davide Orsi, 2018). To maximize an unbiased decision that is best for the entire MA, the search is performed by those who know the problem best and the decision is made by the commander given the authority to enforce it. With an appropriate plan in place, the MA can now train according to the given task.

Training within MA can benefit from QM. The most important factor is to measure the success of the man performing the task as well as the process used by the man (Gallagher, 2016). The quality management system in place today is primarily an evaluation of how to improve a process based solely on the performance of that process. This process is known in the military management philosophy as the continuous improvement cycle and is derived from the Kaizen philosophy in QM. Since men are the key to the MA, it is more important that MA emphasize capability as a result of training, rather than determining key parameters and metrics selection. As a result, the task-condition standards manuals upon which the MA is measured can incorporate the skill of the user as well as the performance of the asset. This concept can be described in modern QM as ‘System Thinking’, where it is important in a matured quality environment that leadership views the organisational system as interrelationships (Young, 2005).

Therefore, modern-day training should be geared to include as many personnel as possible. This does not mean everyone should be responsible for decision-making, but everyone should be involved in the process to ensure there are no gaps of knowledge among the personnel of the unit that make

the mission happen. Before commanders make decisions that affect operations, an intelligence base is built. If the quality concepts are not congruent between operations and intelligence, commanders will not get adequate and timely information. Unlike operations, intelligence relies more on technology and quality is applied as a system.

❖ Logistics

The logistics field was the first to embrace QM and will be the one most likely to exploit its successes to force modernisation in MA. The key element of QM to emphasize is that quality refers to the extent to which units satisfy their mission requirements (John & Ao, 2014). The logistics community regularly uses the term customer. But in the MA, who is the customer? In most cases, it is not the soldier, but other services and the civilian population. Since mission accomplishment is the gauge we are measured upon, the improvement process should put each soldier in the position to systematically analyze and change process factors so that they work together to better improve quality.

The logistics field adopted many business efficiency practices and those not adopted have gone out to the civilian community in the form of outsourcing or privatization (Schutz & Stanley-Lockman, 2017). Unlike other areas in the military, logistics is one area where QM is the most appropriate. The civilian community and MA concepts of QM focus on product and process. Leadership and training are driven more by technology's infrastructure and money, than human interface, when it comes to logistics missions. Therefore, digitization can effectively be incorporated into the QM process.

As a part of force modernisation, the MA logistics systems must be functional such as converting from a supply-based system to a distribution-based system (Yoho & Tatham, 2013). In this manner, the MA as part of the joint system evaluates how, for instance, a part failed, and does not just stock up more parts to compensate for the increased rate of failure. Logistically, the MA is on track with systems like Outcome Based Budgeting (OBB) and competing for productivity excellence awards. But in logistics, as well as in C2 and operations, performance should be measured by mission accomplishment supported by a standard (John & Ao, 2014).

According to the original QM model proposed by Dr. Deming and adopted by the military, standards have been substituted for a time-consuming process of evaluation, reengineering, and further study. The military has begun to make decisions through consensus. In the battlefields of the future, where time and assets are at a premium, consensus must be limited to the planning stage, measured according to the mission standard in the training phase, but left to the commanders to execute in the decision phase (ICRC, 2013).

Although C2, operations and logistics require some QM, each uses it differently. That requires a proper understanding of QM to ensure that each situation is handled differently and that one generic standard is not haphazardly applied across the board. Generally, the functional areas in the MA are more people-oriented and will continue to be in the next century as part of force modernisation (Davide Orsi, 2018). That requires a different quality balance between man and technology than generally found in other military services or the civilian community.

THE IMPACT OF QUALITY MANAGEMENT TOWARDS FORCE MODERNISATION IN THE MALAYSIAN ARMY

The military is unique from other organisation and the civilian sector because it has different roles and missions, and the importance placed on man over technology. Therefore, the employment of quality will vary differently in the MA than in other settings. This characteristic represents an obstacle to bottom-up organisational communication necessary for QM efforts to generate a free flow of ideas in all directions (Goure, 2018). The breakthroughs in technology that are the officially stated driving factor for force modernisation in MA are largely a result of the drawdown and limited budgets. Most military organisations have been ordered to decrease their organisational structure, it is looking to compensate for the reduced human endeavors through advances in technology (John & Ao, 2014).

Now that force modernisation in MA has arrived and technology is at the forefront, QM has regained some of the pre-1980 emphasis on product and mixed it with the process. The role of a unit's leadership should be to ensure that quality is being employed congruently throughout the MA to enhance rather than destroy unit effectiveness (Kasimlioglu, 2001). It is also important to review how to make the most of existing quality principles while avoiding the traps that usually cause

MA to employ quality generically rather than tailor it to their specific needs such as command and control, operations and logistics.

EXPLORING THE ADVANTAGES OF QUALITY MANAGEMENT FOR FORCE MODERNISATION IN THE MALAYSIAN ARMY

The specific requirements for military QM are to increase its effectiveness, plan, train and motivate its personnel to produce a product unequalled in the world. Through the correct balance of people versus technology, leadership provides the MA with the opportunity to shape its future (Bungay, 2011). To exploit the advantages of QM, the selection of initial processes for improvement requires decision-making at the highest level to ensure buy-in and success. One way to get the leadership on board with quality is to give the responsibility that comes with decisions back to the commanders and call this process improvement quality in leadership. An aspect often forgotten in the QM process is motivation. Motivation is an important element in the success of QM for both the military and the public sector (Ortner, 2000).

For the MA, motivation is driven by leadership, but for civilians, profit incentives and market share often mean motivation. Where the civilian sector can offer a greater variety of tools to build motivation, the MA is constrained due to regulations, chain of command and reduced budgets. Extrinsic rewards such as profit sharing, employee stock options, sabbaticals, incentive vacations, bonuses and others, combined with intrinsic rewards such as feedback, two-way communication, and extensive employee input are available to the public sector. However, the MA has only promotions as an extrinsic option, hence it must rely on more creative intrinsic rewards. A possible approach to combat the motivation challenge for the MA is standardisation (Gallagher, 2016). Since force modernisation is almost technically oriented, the MA will likely have a tendency to evaluate a soldier's performance based on the output of the asset. This, however, relies heavily on the performance of the asset which may not adequately reflect the soldier's skill. Therefore, skill-based rewards should emphasize performance-based rewards to ensure greater motivation by placing responsibility for the soldier's performance back to the soldier instead of on technology (Goure, 2018).

Standardisation of skill levels incorporated into standard operating procedures in addition to performance output standards already in existence will help to give MA commanders the advantage the corporate managers already have over maximizing the involvement of their workers. This concept ensures the MA is still on track with process-oriented quality and has not slipped back into product-oriented

quality. Empowerment always exists in the military, but its emphasis should be on the leader, not the follower. In past QM doctrine, followers were empowered to represent their leadership and the organisation. The leaner units of force modernisation in MA require leaders to be more efficient in their decision making to accomplish the mission while balancing the needs of the soldier. Leaders should be empowered to represent the best interests of the unit requiring soldiers to provide input to the decision making process during the planning stages not the decision stage (Young, 2005). Lessons from the MA doctrine support the notion that commanders make military decisions, therefore, leadership should take the lead in QM. Taking the lead does not mean directing and planning every problem-solving team, because that has been perceived as micro-management or a zero-defect mentality in the past. The members of the unit should plan and analyse, and let the commanders make the decisions based on the team efforts. Leaders should be empowered to represent the interest of the unit, not the other way around as previously practiced (Vitto, 2016).

There will be little or no time for the typical QM group huddle for a consensus decision in the modern fast-paced battlefield. Therefore, decision planning needs to be conducted well in advance and rehearsed, tested, and rehearsed again. These practices should be measured against a set of standards. Unlike normal QM techniques, these standards need to include not just the evaluation of the process outcome, but also the step-by-step skills of the people performing the process. Each skill is different in the command and control, operations and logistics fields and each should be treated differently (Vitto, 2016). Proper use of modern quality techniques can be useful if employed to account for every member of the team, not just the leadership. Then, it is up to the leadership to implement an innovative way to reward its successes. Normally, cash bonuses and other incentives would work in the private sector, but in the MA, if these options do not exist, it is important to give its soldiers part ownership in the goals of the organisation. This incentive is also known as motivation and is often forgotten when QM drives group decisions and neglects individual accomplishments. Constant change will be a part of force modernisation and managing it will require the leader's vision that QM can provide through early planning often associated with personnel interaction (Davide Orsi, 2018). Although the MA can benefit from the correct balance of quality throughout its functional areas of command and control; operations and logistics, the ultimate unit product is still to maintain a warrior focus.

CONCLUSION

The MA roles in the 21st century require further refinement of the quality management system. Ultimately, the unique functional aspects of command and control, operations and logistics require a tailored fit relationship between man and machine (Young, 2005). The force modernisation process has sought to leverage the power of information age technology to the advantage of the military's quality people. Therefore, through a review of merging quality management and military, this study has focused on the issue that leadership needs to become a greater theme in the implementation of quality management. In preparation for force modernisation, quality management programs should emphasize effectiveness as well as traditional efficiency.

The mission comes first and the soldier is part of a team but not the customer (ICRC, 2013). Moreover, the role of the soldier in the quality process should be one of the contributors to planning. Once the planning has its solution to improve a process, it is up to the commander to make the decision. The military has tried to instill leadership into the management process, but it still places too much emphasis on management. People are the key to success, not the machinery. Leaders are responsible for making decisions, and quality management should not be a process to replace decision-making, but rather augment it. For the military and its unique roles in the 21st Century, quality management can play an important role, but it should be stated clearly in military doctrine and weighted heavily with technology giving ground to soldiers.

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THE TRILOGY OF MAN, MACHINE AND METHOD IN HOLISTICALLY ENHANCING THE FUTURE OF THE MALAYSIAN ARMY

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INTRODUCTION

The complex and evolving security landscape of the 21st century drives the imperative modernisation of the Malaysian Army. As the nature of warfare transforms with rapid technological advancements, the Malaysian Army must adapt to maintain strategic superiority and operational readiness. The Trilogy of Man, Machine and Method, a holistic framework that integrates human capital development, technological innovation, and strategic methodologies, is central to this transformation.

Likewise, the insight given by Malaysian Armed Forces (MAF) Chief of Defence Force (CDF) presently in his Command Philosophy, “The future force is designed by the present armed forces; what we decide today will dictate our tomorrow” (Jen Tan Sri Dato’ Seri Mohammad bin Ab Rahman 2023), To make the future Malaysian Army work as a whole, we need to figure out its vision, mission, and ultimate goals. This will help us build credible land forces that can do their jobs and protect both the MAF and the country's strategic goals. This trilogy is not merely a theoretical construct but a practical approach that underpins the Malaysian Armed Forces Towards Future Forces 2030 initiative, aiming to create a more agile, effective, and resilient military force.

The “Man, Machine and Method” trilogy is pivotal in shaping the future of the Malaysian Army. To define the application of this trilogy in developing a more effective army, consider the following concepts of **Man** - Soldiers are the core asset. Continuous training, leadership development, and psychological well-being are essential. Soldiers must adapt to advanced technologies and diverse forms of warfare. **Machine** - will refers to Cutting-edge technology, such as robotics, cyber capabilities, and advanced weaponry, serves as a force multiplier. To mitigate risks, we must manage integration carefully. Despite all the above, the **method** - plays a crucial role in deriving the strategic and operational methodologies outlined in initiatives such as *Strategi Domain Daratan* (SD2), National Military Strategy 2.0 (NMS), Army 4nextG and Defence White Paper (DWP) will be ensuring agility.

Those elements are crucial in developing future forces, which would prepare the army for current and future security challenges. This writing explores the intricate interactions among these elements and their combined influence on shaping the future of the Malaysian Army, specifically focusing on the Army's development to align with MAF Future Forces 30.

FUTURE FORCES 30

The Future Forces 30 outlook outlines a comprehensive strategy for the transformation of the MAF, aiming to become a joint, agile, and future-focused fourth-dimensional force. This transformation aligns with the nation's Defence White Paper, National Military Strategy 2.0, and National Defence Policy (NDP) by reinforcing the MAF's capabilities and safeguarding sovereignty to meet future challenges (Jen Tan Sri Dato' Seri Mohammad Abdul Rahman 2023). Through the eyesight of the CDF Command Philosophy, in order to prepare MAF in achieving Force 30, it needs a holistic approach to transform armed forces in objective strategy that encompasses the following four key pillars.

The Command Philosophy emphasizes four key pillars to advance the MAF towards its 2030 aspirations. The first pillar focuses on empowering capabilities and readiness for the future force. This includes establishing the Future Force Development Committee, advancing through the fourth dimension, and reforming the MAF under the Force 30 initiative using the PAODKAL acronym. The second pillar centres on transforming operations, training, and doctrine. It emphasizes joint training and exercises, applying the Raise, Train and Maintain principle, enhancing the Operate and Sustain concept, and synchronizing the 3M synergy approach of Man, Machine and Method.

The third pillar aims to holistically develop positive and progressive human capital within the force. It focuses on enhancing technical capabilities, fostering emotional stability and rationality, upholding heroism and chivalry, and embodying true citizenship values related to divinity and human relationships. The fourth pillar seeks to integrate the military with the broader society, emphasizing Military Operations Other Than War (MOOTW) and promoting total defense through Whole of Government and Whole of Society (WoGoS) integration. This approach ensures that the MAF and the public work cohesively to defend the nation and maintain its sovereignty.

In summary, the Future Forces 2030 plan aims to create a forward-looking, capable, and adaptable military force that meets the challenges of the 21st century while upholding national interests.

TRILOGY MAN, MACHINE AND METHOD IN HOLISTICALLY ENHANCE FUTURE ARMY

In the holistic pursuit of enhancing the future of the Malaysian Army to obtain Future Force 30, the convergence of “Man, Machine and Method” plays a pivotal role. This trilogy – comprising human capabilities, cutting-edge technology and efficient processes – forms the bedrock for a resilient and forward-looking defence force.

MAN

Human capital is the cornerstone of any effective military force. The skills, dedication and resilience of personnel directly influence operational readiness and strategic capabilities. The Malaysian Army, recognizing the critical role of its soldiers, has emphasized human capital development as a key pillar in its modernisation efforts. The following six significant aspects will be discuss on human capital development in holistically enhance Army’s future development for 2030.

- **Current Training and Education Programs**

The education and continuous professional development are critical to ensuring that the Malaysian Army remains at the cutting edge of military science and technology. In the meantime, the National Defence University of Malaysia (UPNM) offers higher education opportunities, allowing personnel to pursue degrees in defence studies and related fields. Meanwhile, The Army Training and Doctrine Command (TRADOC) plays an essential role in designing and implementing these programs. Basic training provides recruits with the essential skills and knowledge needed for military service, including physical conditioning, weapons handling, and survival skills.

Beyond basic training, specialized courses offer advanced instruction in areas such as engineering, communications, and intelligence. Over the course of a year, the Malaysian Army offered 310 career and functional courses, and 32,061 personnel completed various types of skilled and academic requirements at Army schools and institutions. Other

than that, the Malaysian Army also sent 88 officers and other ranks annually to attend international courses and seminars in 18 countries to extend their knowledge and skills appropriately. The Malaysian Army has established comprehensive training programs to ensure that its personnel are well-prepared for a range of operational scenarios. Therefore, training and education are foundational to building a skilled and proficient military.

❖ Leadership Development

Effective leadership is vital for the operational success and morale of military units. The Malaysian Army invests significantly in developing leaders at all levels, from junior officers to senior commanders. Leadership development programs focus on enhancing decision-making skills, strategic thinking, and ethical leadership. The Malaysian Armed Forces Staff College (MAFSC), Malaysian Armed Forces Defence College (MAFDC) and the National Resilience College (NRC) provide rigorous training for future leaders.

These institutions offer courses that cover a broad spectrum of military and strategic studies, emphasizing the importance of adaptive leadership in complex environments. To support this stance, present Chief Defence Force has emphasised on effective leadership and accountability at all levels. He notes that, leaders are expected to be role models, demonstrating accountability and fostering a culture of excellence and innovation within their units (CDF Command Philosophy 2023). A study published in the Journal of Military Leadership also highlights that, leadership development programmes in the Malaysian Army are designed to cultivate leaders who can think critically, act decisively, and inspire their subordinates (Col Ridzwan 2022).

❖ Initiatives to Enhance Skills and Capabilities

To remain effective in an ever-changing security landscape, the Malaysian Army continually seeks to enhance the skills and capabilities of its personnel. The Future Forces 2030 plan outlines several initiatives aimed at achieving this goal. Key among these is the integration of new technologies into training programs. A report by the Ministry of Defence UK (2024) states, international military exchanges and joint exercises are invaluable for enhancing the skills and operational

readiness of our personnel. The new approaches to training, like simulations and virtual reality (VR) systems, are being used to create realistic training environments that enhance combat readiness and operational effectiveness. Moreover, workshops, seminars and international exchanges encourage continuous professional development. Collaborations with allied nations provide opportunities for Malaysian soldiers to learn from global best practices and incorporate them into their own operations.

❖ Psychological and Physical Well-being

Soldiers' well-being is critical to maintaining a resilient and effective force. The Malaysian Army recognises that psychological and physical health are integral to overall performance. Comprehensive wellness programmes are in place to support soldiers' mental and physical health. Psychological support services, including counselling and stress management programmes, are available to help soldiers cope with the demands of military life. Those statements above are supported by Carolyn Heward et. al (2024), where the importance of mental health is underscored by research published in the Journal of Military Medicine, which notes that proactively addressing mental health issues can significantly enhance the overall well-being and operational effectiveness of military personnel.

❖ Physical Fitness

Regular fitness assessments, physical training programmes and access to sports and recreational facilities ensure that soldiers maintain optimal physical condition. The Army Fitness Centre, which is located at various camps, swimming pools and sports facilities, would provide tailored fitness programmes designed to meet the unique demands of military service. Daily physical exercise in a unit’s training schedule can also maintain the army’s endurance and stamina performance at all times. However, a variation of physical training exercises should be embedded in the system to gain better impact and rebuild a healthy strength to attain desire military endurance. A systematic review found that nontraditional military physical training positively affected muscular endurance, power, strength, and occupationally specific performance compared to traditional training (Smith et. al 2022).

❖ **Integration of Diversity**

Diversity within the army enhances its strength and operational effectiveness. The Malaysian Army is committed to integrating individuals from diverse backgrounds, including women and ethnic minorities, into its ranks. The principles of inclusivity and equal opportunity align with this commitment to diversity. Women play an increasingly prominent role in the Malaysian Army, serving in various capacities, including combat roles. The Malaysian Army implements policies that foster gender equality and facilitate the progression and integration of women. According to a statement by the former Deputy Defence Minister, the inclusion of women in the military not only reflects our commitment to gender equality but also enhances our operational capabilities by leveraging diverse perspectives and skills (Liew Chin Tong 2019).

Therefore, human capital is paramount to the future success of the Malaysian Army, with comprehensive training, leadership development, and continuous skill enhancement at its core. The emphasis on education through UPNM and specialized training by TRADOC ensures personnel remain adept in modern military science and technology. Leadership programs cultivate decision-making and strategic thinking, vital for operational success and morale. The Future Forces 2030 plan integrates cutting-edge technologies, enhancing operational readiness. Additionally, the Army prioritizes psychological and physical well-being, recognizing their importance to resilience and effectiveness. Embracing diversity strengthens the army by integrating varied perspectives and skills. Overall, investing in human capital is crucial for a modern, capable and adaptive Malaysian Army.

MACHINE

The rapid evolution of technology has profoundly impacted the nature of warfare and military operations. For the Malaysian Army, staying ahead of technological advancements is crucial for maintaining national security and operational superiority. The Army 4NextG and SD2 plan, a cornerstone of the Future Forces 2030 initiative, aims to integrate cutting-edge technologies into the Malaysian Army, enhancing its capabilities across various domains. This point delves into the current technological assets and future advancements under this plan, focusing on robotics, cyber warfare, advanced weaponry, and

communication systems. The scopes that need to be emphasised are as follows:

❖ Current Technological Assets

The Malaysian Army has made significant strides in incorporating technology into its operations. Current assets include a range of advanced equipment and systems that provide a solid foundation for further transformation. The Malaysian Army has significantly advanced its technological capabilities with assets like the AV8 Gempita Armoured Vehicle, UAVs such as the ScanEagle, the Tactical Communications Network (TacNet), VR training simulators and electronic warfare systems.

These innovations enhance operational readiness, intelligence gathering, communication, training and battlefield advantages. The Malaysian Ministry of Defence (MINDEF) has recently signed contracts worth RM7.3 billion (approximately $1.5 billion) to strengthen the nation's defence capabilities. These contracts include considerations for Hanwha Aerospace's technology, particularly for the Malaysian Army's rocket launcher programme. Additionally, the Malaysian Army is prioritizing advancements in defence science, technology, and industry to remain at the cutting edge of military capabilities. The integration of advanced technology across our forces ensures that the Malaysian Army remains capable and prepared for modern military challenges (Harry McNeil 2024). These technological assets demonstrate the Malaysian Army's commitment to modernizing its forces and enhancing its operational capabilities through the integration of advanced technology.

❖ Unmanned Aerial Vehicles (UAVs)

The Malaysian Army's use of UAVs, such as the ScanEagle, Fulmar, and ALUDRA MK1, has significantly improved its reconnaissance and surveillance capabilities. These UAVs provide real-time intelligence, enhance maritime and border security, and integrate seamlessly with ground units, enabling rapid decision-making and better operational effectiveness. According to Asia Pacific Defence Journal (2022), UAVs have revolutionized our surveillance and reconnaissance operations, providing us with the real-time intelligence necessary to maintain situational awareness and operational

superiority. In other hand, a study by the Centre for Strategic and International Studies highlights that UGVs offer significant advantages in terms of reducing risks to personnel and increasing operational efficiency (Zachary Kallenborn 2023).

❖ **Armoured Fighting Vehicles (AFVs)**

The ACV-300 Adnan offers enhanced protection, mobility, firepower, and modern communication systems. It features advanced armour, with options for explosive reactive armour, ensuring crew safety. The ACV-300 Adnan is fitted with applique armour which can be further upgraded with explosive reactive armour (ERA) to provide enhanced protection against projectiles and explosive devices. The vehicle's ability to manoeuvre through various terrains enhances its operational flexibility. Its armament includes a 25mm Bushmaster cannon and a 7.62mm machine gun for effective target to engage both armoured and soft targets effectively. Meanwhile, modern communication systems ensure seamless battlefield coordination equipment, including radios and data links, ensuring seamless communication between units and higher command.

❖ **Advanced Artillery Systems and Air Defence Capabilities**

The Astros II MLRS significantly enhances the Malaysian Army's Future Force 2030 by delivering devastating firepower over long distances. It can launch multiple rockets up to 90 kilometres, providing critical support and disrupting enemy formations. Global Security states (2022), the Astros II MLRS is capable of launching multiple rockets in rapid succession, delivering devastating firepower across a wide area. Its versatility, as noted by Jane's Defence Weekly (2021), allows it to perform various battlefield roles with different types of munitions. Complementing the Astros II MLRS, the G5 Mk III 155mm howitzer and FH-70 155mm howitzer provide precise and powerful indirect fire support.

The G5 Mk III offers superior range and accuracy, making it essential for long-range artillery support. Artillery Systems Review highlights, the G5 Mk III 155mm howitzer offers superior range and accuracy. The FH-70's mobility allows for rapid deployment and repositioning, enhancing tactical flexibility. Jane's International Defence Review (2023) states, the FH-70's

mobility allows for rapid deployment and repositioning. Additionally, the Starstreak High-Velocity Missile system bolsters air defence by providing short-range protection against helicopters, low-flying aircraft, and UAVs, ensuring comprehensive aerial threat coverage. These systems together significantly enhance the operational effectiveness and tactical flexibility of the Malaysian Army's Future Force 2030.

❖ Robotics

Robotics represents a transformative technology with the potential to revolutionize military operations. The Malaysian Army is actively exploring the integration of robotic systems to enhance various aspects of its capabilities. For example, unmanned ground vehicles (UGVs) and autonomous drones are being tested for their ability to perform reconnaissance, surveillance, and logistics support, reducing the risk to human personnel and increasing operational efficiency. According to a report by the Centre for Strategic and International Studies, "The deployment of UGVs can significantly reduce the risks faced by soldiers in combat zones, while also enhancing the army's operational capabilities" (Zachary Kallenborn, 2023).

❖ Cyber Warfare

Cyber warfare has emerged as a critical domain in modern military strategy. The Malaysian Army recognizes the importance of developing robust cyber capabilities to protect its information infrastructure and conduct offensive operations.

- **Cyber Defence Units**

  The establishment of dedicated cyber defence units is a key component of the Army 4NextG plan. These units are tasked with defending against cyber-attacks, conducting vulnerability assessments, and ensuring the integrity of military networks. A report by the International Institute for Strategic Studies notes that cyber defence is essential for protecting critical military and national infrastructure from increasingly sophisticated cyber threats (IISS Report 2021).

- **Offensive Cyber Capabilities**

In addition to defensive measures, the army is also developing offensive cyber capabilities to disrupt adversaries' operations. These capabilities include the ability to conduct cyber espionage, sabotage, and information warfare.

❖ **Advanced Weaponry**

The integration of advanced weaponry is pivotal for enhancing the army's combat effectiveness. The Army 4NextG plan emphasizes the acquisition and development of cutting-edge weapon systems.

- **Precision-Guided Munitions (PGMs)**

PGMs, such as smart bombs and guided missiles, provide the ability to strike targets with high accuracy, minimizing collateral damage. The deployment of PGMs enhances the army's capability to conduct precision strikes in complex environments.

- **Directed Energy Weapons (DEWs)**

DEWs, including lasers and microwave weapons, represent a new frontier in military technology. These systems can disable or destroy targets with focused energy, offering advantages in terms of speed and cost-effectiveness. According to a study by the RAND Corporation, DEWs have the potential to significantly alter the battlefield by providing rapid, precise, and scalable effects (Stuart Dee and James Black 2024).

❖ **Communication Systems**

Effective communication is the backbone of military operations, ensuring coordination and real-time information sharing. The Army 4NextG plan prioritizes the modernization of communication systems to enhance connectivity and interoperability.

- **Secure Tactical Communication Networks**

The development of secure and resilient communication networks is essential for maintaining command and control in contested environments. These networks utilize encryption and anti-jamming technologies to protect against electronic warfare threats.

- **Battlefield Management Systems (BMS)**

BMS integrate various sources of information to provide a comprehensive operational picture. These systems enable commanders to make informed decisions and coordinate actions across different units. A report by the European Defence Agency highlights that BMS enhance situational awareness and improve decision-making processes, contributing to more effective and efficient operations.

❖ **The integration of advanced technologies**

Under the Army 4nextG plan is instrumental in modernizing the Malaysian Army. These technological advancements enhance operational capabilities, increase efficiency, and provide a strategic advantage in a rapidly evolving security landscape.

- **Enhanced Situational Awareness**

Technologies such as UAVs, BMS, and advanced sensors provide real-time data and intelligence, improving situational awareness and enabling proactive decision-making.

- **Increased Operational Efficiency**

Automation and robotics reduce the physical and cognitive burden on soldiers, allowing them to focus on critical tasks. This increases overall operational efficiency and effectiveness.

- **Improved Combat Effectiveness**

Advanced weaponry and precision-guided munitions enhance the army's ability to conduct precise and effective strikes, reducing the risk to personnel and minimizing collateral damage.

❖ **Resilience Against Emerging Threats**

Cyber warfare capabilities and secure communication systems protect the army's information infrastructure from cyber-attacks and electronic warfare, ensuring operational continuity.

In a nutshell, the integration of advanced technologies under the Army 4NextG and Future Forces 2030 plans is revolutionizing the Malaysian Army. By incorporating cutting-edge assets such as UAVs, AFVs, advanced artillery, cyber warfare capabilities, robotics, and modern communication systems, the Malaysian Army significantly enhances its operational readiness, efficiency, and combat effectiveness. These advancements ensure that the Malaysian Army remains resilient against emerging threats and maintains a strategic advantage in a rapidly evolving security landscape. The commitment to technological modernization underscores the Malaysian Army's readiness to face current and future military challenges with unparalleled precision and effectiveness.

METHOD

SD2 2023 been produced in associate with Army 4nextG, National Military Strategy 2.0 (NMS 2.0), and the Defence White Paper 2020 (DWP) collectively contribute to achieving the Malaysian Armed Forces' (MAF) Future 2030 aspirations by aligning their strategic goals and operational plans. To determine the link of SD2 with strategic documents are as follows:

❖ **SD2 to the Army 4nextG**

It is a modernization plan focused on advancing the Malaysian Army's capabilities through technological innovation. SD2 works with Army 4nextG by:

- **Technology Integration**

SD2 ensures that the technological advancements outlined in Army 4nextG are effectively applied to land operations. This includes integrating cutting-edge technologies such as unmanned systems, advanced communication networks, and precision weaponry into ground forces.

- **Operational Enhancement**

By focusing specifically on land-based operations, SD2 adapts and applies Army 4nextG's technological advancements to improve the Malaysian Army's combat effectiveness, mobility, and operational flexibility on the ground.

- **Capability Alignment**

Both strategies aim to enhance the army's overall capabilities. SD2 ensures that the land domain improvements are in harmony with the broader technological upgrades promoted by Army 4nextG, thereby supporting MAF's Future 2030 goals.

❖ **SD 2 to the NMS 2.0**

NMS 2.0 sets the strategic direction and priorities for Malaysia's defence. SD2 contributes by:

- **Supporting Strategic Objectives**

SD2 aligns with the strategic objectives of NMS 2.0, focusing on enhancing the army's land capabilities to meet national defence goals.

- **Operational Focus**

NMS 2.0 provides broad strategic priorities, while SD2 translates these into specific land-based operational improvements, ensuring that the army's land operations are well-aligned with national defence objectives.

- **Capability Development**

SD2 supports the development of land-based capabilities that contribute to the overall strategic goals outlined in NMS 2.0, such as increased operational readiness and enhanced force effectiveness.

❖ **SD2 to the Defence White Paper**

The Defence White Paper outlines Malaysia's long-term defence strategy and policy direction. SD2 integrates with this document by:

- **Implementing Policy Directions**

SD2 operationalizes the strategic and policy directions provided in the Defence White Paper, focusing on land operations as a key component of the broader defence strategy.

- **Enhancing Strategic Readiness**

The White Paper emphasizes modernization and capability enhancement. SD2 provides a detailed approach for improving land-based military capabilities, aligning with the White Paper's objectives for a future-ready armed force.

- **Ensuring Coherence**

By aligning its initiatives with the Defence White Paper's vision, SD2 ensures that land operations are effectively integrated into the overall defence strategy, contributing to MAF's Future 2030 aspirations.

❖ **Achieving MAF Future Force 2030 Aspirations**

MAF Future Force 2030 aims to transform the Malaysian Armed Forces into a modern, capable, and technologically advanced military force. SD2 supports this vision by:

- **Modernizing Land Capabilities**

By focusing on upgrading land-based operations, SD2 ensures that the Malaysian Army can effectively

respond to modern threats and challenges, contributing to MAF's Future 2030 goal of operational superiority.

- **Leveraging Technological Advancements**

Integration with Army 4nextG ensures that land forces benefit from the latest technological innovations, enhancing their capabilities and effectiveness.

- **Supporting Strategic Goals**

Alignment with NMS 2.0 and the Defence White Paper ensures that SD2's initiatives are consistent with broader national defence goals, contributing to a cohesive strategy for achieving MAF's Future 2030 vision.

In summary, SD2 works in concert with Army 4nextG, NMS 2.0, and the Defence White Paper by aligning its land-focused strategies with broader technological, strategic, and policy objectives. This integrated approach ensures that the Malaysian Army is well-positioned to achieve its Future 2030 aspirations and maintain a modern and capable defence force.

CASE STUDIES

Examining case studies provides valuable insights into the practical application of strategic and operational frameworks. Two notable examples highlight the effectiveness of the Malaysian Army's methodologies and demonstrate how the trilogy of Man, Machine and Method can enhance army capabilities in the future.

❖ Operation Daulat (2013)

Operation Daulat was conducted in response to the intrusion by armed militants in Lahad Datu, Sabah. The successful execution of this operation demonstrated the importance of joint operations and coordinated efforts between the Malaysian Army, Navy, Air Force, and Police. According to a report by the Royal Malaysian Police, the success of Operation Daulat was a testament to the effectiveness of joint operations doctrine and the ability of Malaysian forces to collaborate in responding to security threats (Wikiwand 2013). This case study illustrates the critical role of human capital (Man) in ensuring effective coordination and leadership across different branches

of the armed forces. The operation also highlighted the significance of utilizing advanced technologies (Machine) for communication and intelligence gathering. Furthermore, it underscored the importance of having well-defined strategic and operational frameworks (Method) to guide complex, multi-agency missions.

❖ **United Nations Peacekeeping Missions**

The Malaysian Army has been actively involved in United Nations (UN) peacekeeping missions, including those in Lebanon (UNIFIL) and South Sudan (UNMISS). These missions have provided valuable experience in multinational operations and contributed to the development of robust operational frameworks. According to the United Nations, Malaysia's commitment to peacekeeping operations underscores its dedication to international peace and security (Roy Anthony 2023). Participation in these missions has enhanced the Malaysian Army's capabilities in several ways. Firstly, it has fostered the development of a highly trained and adaptable workforce (Man) capable of operating in diverse and challenging environments. Secondly, the missions have facilitated the integration and application of advanced technologies (Machine), such as surveillance and communication systems, in real-world scenarios. Lastly, the experience gained from these operations has refined the strategic and operational methodologies (Method) employed by the Malaysian Army, ensuring they are equipped to handle both national and international security challenges effectively.

These case studies provide compelling evidence of how the trilogy of Man, Machine, and Method can enhance the Malaysian Army's capabilities in the future. Operation Daulat and the UN peacekeeping missions both underscore the critical importance of human capital, technological integration, and strategic frameworks in achieving operational success.

FUTURE PROSPECTS

The Trilogy of Man, Machine, and Method represents a holistic approach to modernizing the Malaysian Army, encompassing human capital development, technological integration, and strategic frameworks. This part analyses the implications of this trilogy on the overall effectiveness of the Malaysian Army, discussing long-term benefits, potential risks, and providing recommendations for

policymakers and military leaders. It also highlights future research areas and opportunities for further enhancement.

❖ Long-Term Benefits

The comprehensive integration of man, machine, and method offers several long-term benefits for the Malaysian Army, enhancing its operational capabilities and strategic effectiveness.

❖ Enhanced Operational Efficiency

The integration of advanced technologies and strategic methodologies significantly improves the efficiency of military operations. Automated systems, enhanced communication networks, and precision-guided weaponry reduce the operational burden on personnel, allowing for more streamlined and effective missions. According to the Malaysian Ministry of Defence (2023), the modernization efforts under Future Forces 2030 are expected to enhance operational efficiency, allowing for faster and more decisive actions.

❖ Improved Decision-Making

Advanced data analytics and real-time intelligence capabilities enable better-informed decision-making processes. Enhanced situational awareness and predictive analysis tools provide commanders with critical insights, improving strategic planning and execution. A study by the RAND Corporation (2024) emphasizes that integrating data-driven decision-making tools enhances the accuracy and timeliness of military decisions, leading to more effective outcomes.

❖ Increased Resilience

The integration of robust cybersecurity measures and advanced defence technologies increases the resilience of the Malaysian Army against emerging threats. This includes protection against cyber-attacks, electronic warfare, and hybrid threats. The International Institute for Strategic Studies (2021) notes that building resilience against diverse and evolving threats is crucial for maintaining national security and operational continuity.

❖ **Enhanced Force Multiplication**

The use of robotics, unmanned systems, and AI enhances the capabilities of individual soldiers, acting as force multipliers. These technologies augment human capabilities, allowing for more effective operations with fewer personnel. According to a report by the Centre for Strategic and International Studies (2022), the deployment of unmanned systems and AI technologies acts as a force multiplier, increasing the effectiveness of military operations.

The Trilogy of Man, Machine, and Method offers a comprehensive approach to modernizing the Malaysian Army, aiming to enhance its operational capabilities and strategic effectiveness in the long term. By integrating human capital development, advanced technologies, and strategic frameworks, the Malaysian Army is better prepared to face contemporary and future security challenges under the Future Forces 2030 initiative.

CHALLENGGES

The security environment is continually evolving, with new threats emerging that require adaptive and forward-looking strategies. The Malaysian Army faces significant challenges in preparing for hybrid warfare, enhancing cyber defences, and integrating advanced technologies.

Hybrid warfare, which combines conventional and irregular tactics, poses a significant threat as adversaries increasingly use a mix of traditional military operations with cyber-attacks, misinformation and other unconventional tactics. To effectively counter hybrid threats, the Malaysian Army needs to enhance its intelligence capabilities, improve its cyber defences, and conduct more specialized training programs. While comprehensive strategies are being developed to integrate conventional and unconventional capabilities, these areas still represent crucial capability gaps.

Cyber threats are another growing concern as they become increasingly sophisticated, capable of disrupting military operations and critical infrastructure. Nation-states and non-state actors can launch cyber-attacks that cripple defence systems and communications. To address these threats, the Malaysian Army must establish dedicated cyber defence units, invest in advanced cybersecurity technologies, and increase the frequency and scope of

cyber defence exercises. The prioritization of robust cyber defence capabilities is essential for protecting national security.

The rapid pace of technological advancement further necessitates continuous adaptation to maintain a strategic advantage. Adversaries are employing advanced technologies such as artificial intelligence (AI), unmanned systems, and directed energy weapons, which the Malaysian Army must also adopt and integrate into its operational frameworks. There are gaps in the domestic research and development of these advanced military technologies, and personnel require ongoing training to effectively utilize new technologies. The Defence White Paper emphasizes that embracing new technologies is crucial for maintaining a strategic advantage and improving operational capabilities.

In summary, addressing these capability gaps is essential for maintaining the Malaysian Army's operational readiness and achieving strategic objectives. Through comprehensive strategies, specialized training, investment in advanced technologies, and the establishment of dedicated cyber units, the Malaysian Army is working towards overcoming these challenges and ensuring national security in an evolving threat landscape.

CONCLUSION

The Trilogy of Man, Machine and Method provides a comprehensive framework for enhancing the capabilities and effectiveness of the Malaysian Army. This essay has explored each component in detail, emphasizing their importance in modernizing the armed forces under the Future Forces 2030 initiative. Human capital is the cornerstone of the Malaysian Army's modernization efforts. Emphasizing training, education, and leadership development ensures that personnel are well-prepared to meet contemporary security challenges. Initiatives to enhance psychological and physical well-being, promote diversity, and develop a resilient and adaptive workforce are crucial for maintaining a capable and motivated military force.

The integration of advanced technologies, including robotics, cyber warfare capabilities, advanced weaponry, and sophisticated communication systems, is vital for modernizing the Malaysian Army. The Army 4nextG plan focuses on leveraging these technologies to enhance operational efficiency, improve decision-making, and provide a strategic advantage. However, this technological integration must be carefully managed to address potential risks such as cybersecurity

threats and technological dependency. Effective strategic and operational methodologies are essential for guiding military operations. The SD2, SKN 2.0 initiative and the Defence White Paper provide comprehensive frameworks for addressing security challenges and ensuring cohesive and adaptive military strategies. Joint operational frameworks, dynamic strategic planning, and continuous evaluation and feedback mechanisms are critical for maintaining operational readiness and achieving strategic objectives.

The sustained commitment and investment from policymakers and military leaders, coupled with ongoing research and development, will be crucial for realizing the full potential of this trilogy. As the Malaysian Army navigates the complexities of the modern security environment, the principles and strategies outlined in this essay will serve as a guiding framework for achieving long-term success and maintaining national security. In conclusion, the effective integration of man, machine, and method is essential for creating a capable, resilient, and adaptive Malaysian Army. By embracing innovation, fostering continuous improvement, and addressing potential risks, the Malaysian Armed Forces can ensure their readiness to face future challenges and uphold their mission to protect and defend the nation.

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THE TRILOGY OF MAN, MACHINE, AND METHOD IN HOLISTICALLY ENHANCE THE FUTURE OF MALAYSIA ARMY

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"The credible aspirations of the Army will be implemented comprehensively and systematically based on three main objectives, namely readiness, organizational sustainability, and a strengthened warrior ethos through a focused, planned, and holistic combination under the concept of Synergy 3M."
Jen Tan Sri Dato' Wira Muhammad Hafizuddeain bin Jantan

INTRODUCTION

The Napoleonic Wars (1803-1815) were a well-known history at world level. It was a series of conflicts between the French Empire, led by Napoleon Bonaparte, and various European coalitions. These wars reshaped European politics, borders, military strategies, and societies, having a massive impact on the modern world. The Napoleonic Wars are often seen as a continuation of the French Revolutionary Wars (1792 - 1802), which began after the French Revolution in 1789. Revolutionary France was challenged by European monarchies fearful of revolutionary ideas spreading. After years of conflict, France became a powerful republic. The wars are typically divided into several phases, including War of the Third Coalition in 1803 to 1806. After Napoleon became Emperor, Britain, Austria, Russia, and others formed a coalition against France. Napoleon achieved a decisive victory at the Battle of Austerlitz (1805), defeating Austrian and Russian forces. He also crushed Prussian forces at Jena-Auerstedt in 1806. The War of the Fourth Coalition (1806 - 1807) where Napoleon defeated Prussia and Russia, leading to the Treaty of Tilsit, which allowed Napoleon to dominate much of Europe. There is a lot more phase continuing to Peninsular War (1808 - 1814), Invasion of Russia (1812), War of the Sixth Coalition (1813 - 1814) and lastly Hundred Days and the Battle of Waterloo (1815). In these 15 years of war series, we can see a big success and victory happened even there were also disaster defeated along the journey.

The victory was based on some factors such as the strategic brilliance, military genius, superior tactics, flexibility, offensive doctrine, logistical efficiency, use of artillery, superior organisation and good leadership will help a lot in breaking the enemy line. Definitely from the

history, we can see the components of man, machine and method were strongly benefited from the arm forces which finally leads to victory. The Defence White Paper (DWP) outlines how the 3M framework - Man, Machine, and Method will enhance the effectiveness of the armed forces, specifically for *Angkatan Tentera Malaysia* (ATM). The factors that affect these three components in the military are significant because they directly impact an army's ability to defend, fight, and achieve operational success.

MAN DEFINITION

In the armed forces, the "Man" factor refers to the soldiers, officers, and support personnel that make up the military. The effectiveness of personnel is crucial to achieve operational success. For any organization to succeed, the people behind its operations are the most fundamental. The success of any operation relies on clear, open communication between the man at all levels, from top management to frontline forces. This factor emphasizes the importance of training and leadership to improve personnel competency, ensuring soldiers are skilled and ready for modern warfare challenges.

MACHINE DEFINITION

The "Machine" represents the tools, technology, weapons systems, vehicles, communications systems, and technologies that soldiers use in combat and logistics and machinery used to facilitate work. It can be referred to non-physical machinery in industries, as well as software, systems and automation in modern digital contexts. Utilizing the right machines or technology helps in improving efficiency, reducing errors, and speeding up tasking processes. The effectiveness of machines and tools directly impacts productivity and quality. In modern organizational contexts, "Machine" increasingly includes artificial intelligence (AI), data analytics, and automation, which enhance decision-making and operational efficiency.

METHOD DEFINITION

The "Method" refers to the doctrines, operational procedures, strategies, tactics, processes, and frameworks that guide how tasks and operations are carried out. Clear and well-defined methods ensure consistency, quality, and productivity. In a fast-changing environment, methods and processes need to be agile, allowing the organization to adapt to new challenges and opportunities quickly. This factor focuses on developing effective strategies and tactics to improve organizational efficiency, readiness, and interoperability with international forces.

5 SYNERGY SIAGA

The 5 Synergy SIAGA also outlined in the *Perintah Ulung Panglima Tentera Darat* (Chief of Army's Directive) provides a framework to enhance the preparedness and professionalism of the Malaysian Army. These five pillars are meant to guide the operational effectiveness of the army and promote overall defense readiness:

S for *Sumber Manusia Cakna* (Human Resource Focused on Warrior Ethos). This point emphasizes the strength morale, professionalism, and competency of military personnel. It promotes leadership that is attentive to the welfare and development of its people, ensuring a robust and motivated force.

I for *Inovasi Peperangan Bersama* (Joint Warfare Innovation) where this focuses on advancing strategies and military innovation, particularly in joint operations. This encourages inter-branch cooperation between the army, navy, and air force to ensure seamless collaboration in complex military scenarios.

A for *Agenda Pengukuhan Keupayaan* (Capability Enhancement Agenda). This pillar emphasizes upgrading military capabilities, including weapons, technology, and infrastructure. It ensures the armed forces can maintain and improve their operational readiness and firepower.

G for *Gagasan Tentera dan Rakyat* (Military and People Integration). It enhances the relationship between the military and the public, ensuring national security is a shared responsibility. It promotes civil-military cooperation (CIMIC) for humanitarian aid and disaster relief.

A for *Anjakan Diplomasi Pertahanan* (Defense Diplomacy Shift). This synergy will encourage in strengthening defense diplomacy with international allies through joint exercises, intelligence sharing, and capacity-building initiatives to enhance Malaysia’s role on the global stage.

Together, these five elements aim to develop a credible, modern, and professional military force capable of defending the nation's sovereignty and effectively engaging in both national and international operations. These five pillars are very crucial together with the 3M component – Man, Machine and Method.

THE 3M CONTEXT

First and foremost is the Man which refers to people. The context can be seen as human resources that refers to the individuals involved in an organization or a project, encompassing their skills, motivation, expertise, and teamwork. For any organization to succeed, the people behind its operations are the main power to succeed. That is why this factor should come first and their warfare should be taken care without fail. Next, leadership and management from the man in the organisation. The man who got effective leadership in guiding, motivating, and aligning people is very critical towards common goals. Leaders need to ensure the team is well-trained, well-managed, and motivated to perform at their best. Communication is one of the most important key towards success of any operation relies on clear, open communication between people at all levels, from top management to frontline workers. Lastly, empowerment and motivation also important to empower individuals, giving them the autonomy and confidence to take initiative, be creative, and find solutions in work.

In *Angkatan Tentera Malaysia* (ATM) organisation, human resources included all personnel across three services of the military which are Malaysian Army, Royal Malaysian Navy (RMN), and Royal Malaysian Air Force (RMAF). This encompasses soldiers, officers, non-commissioned officers (NCOs), and civilian defense staff. The "Man" element also involves a strong emphasis on continuous training, discipline, leadership development, and ensuring physical and mental readiness. As part of the *Pertahanan Menyeluruh* (HANRUH) concept, civilian participation and public involvement are significant, expanding the definition of "Man" to include the public people in national defense. The key elements regular forces who are core military personnel responsible for operational readiness and defense missions, volunteer forces who are servicing at reserve units, including volunteer forces who support the army when required, veterans who are retired military personnel whose experience and role in defense can still contribute to national security and civil servants and civilians who are non-military personnel within ATM, as well as broader civilian engagement under HANRUH (DWP, 2020).

Second is for the Machine which refers to technology, assets and tools. The "Machine" represents the tools, technology, weapon, equipment and machinery used to support and enhance military operations. For example, weapons system that improving from rifles to advanced missile systems, vehicles and platforms such as armoured vehicles, naval vessels, aircraft, and drones for surveillance and combat, systems for cyber defence, communication to help in cyber

and electronic warfare and the drones and robotics platform that can be used for logistics and surveillance. Efficiency and optimization really needed for utilizing the right machines or technology helps in improving efficiency, reducing errors, and speeding up processes. The effectiveness of machines and tools directly impacts productivity and quality. Upkeep and innovation where regular maintenance and upgrading of machines and technology are necessary to stay competitive and innovative in the ever-evolving world. Integration of AI and automation where modern organizational contexts, "Machine" increasingly includes artificial intelligence (AI), data analytics, and automation, which enhance decision-making and operational efficiency.

The last one is for Method which refers to strategic frameworks, doctrines, and processes that guide how ATM operates and executes its missions. This includes military strategies, operational doctrines, and the command-and-control processes that structure ATM's activities. In ATM, the "Method" component is centered around creating a coherent, adaptable military strategy that aligns with national defense priorities. This includes adhering to strategic blueprints like the Army 4nextG Plan and implementing the National Defence Strategy outlined in the Defence White Paper. These documents emphasize joint operations, interoperability, and technology-driven capabilities to ensure that the military can respond effectively to both conventional and non-conventional threats.

Method is mostly including processes and procedures. Standard Operating Procedures (SOPs) is the "Method" refers to the processes, systems, and frameworks that guide how tasks and operations are carried out. Clear, well-defined methods ensure consistency, quality, and productivity. Continuous improvement for organizations must continuously refine and improve their methods and processes through feedback loops, innovation, and adapting best practices. Quality control might be a strong focus on the method ensures that every part of the process adheres to high standards of quality, reducing waste and increasing efficiency. Finally, agility and flexibility. In a fast-changing environment, methods and processes need to be agile, allowing the organization to adapt to new challenges and opportunities quickly.

INTERNAL AND EXTERNAL FACTORS CONTRIBUTING TO THE 3M

The factor that can affect Man context factor is recruitment and training. The quality of recruitment processes, training programs, and leadership development affects the skill, discipline, and readiness of

military personnel. Training must cover both technical skills such as weapons handling, tactics and soft skills like leadership, decision-making under pressure. For example, elite forces such as special forces *Gerak Khas* or as known as *Komando* in *Angkatan Tentera Malaysia* undergo hardcore training contributes to their superior capabilities. Next is morale and motivation. High morale and motivation are essential for maintaining combat effectiveness. Factors such as leadership, unit cohesion, sense of purpose, and welfare including access to healthcare, pay, and support services will impact man morale. For example, troops with strong leadership and a sense of mission are more likely to perform well under stress or during extended deployments. Besides, strong and competent leadership influences the overall performance of soldiers. Leaders who can make quick, sound decisions and inspire their troops often have a profound impact on the effectiveness of military operations. For example, historically military leaders like Napoleon or modern commanders who excel in decision-making and strategy play critical roles in the success of their forces.

In addition, health and physical fitness in the armed forces, physical and mental fitness is critical for operational success. Factors like nutrition, medical support, and physical training programs influence the health and endurance of soldiers. If the soldiers have poor physical fitness standards or inadequate health level, it can result in a less effective fighting force. Lastly, experience and adaptability level of the man. Experienced soldiers and officers often perform better in combat because they have honed their decision-making skills, can remain calm under pressure, and can adapt to evolving battlefield conditions. For example, veterans or soldiers with real-world combat experience tend to be more resilient and perform better in complex operations than those without experience.

Next, factor affecting the "Machine" component is technological advancements. The quality and modernity of military hardware like weapons, vehicles, drones, and communications systems play a major role in the effectiveness of armed forces. Modern armies depend on cutting-edge technology to maintain superiority. For example, The Malaysian Army stands to benefit from 18 units of anti-tank guided weapon - medium range (ATGW-MR) from Turkey, enhancing infantry battalion capabilities. Meanwhile, the Royal Malaysian Air Force (RMAF) is gearing up for a technological overhaul, replacing its air surveillance radar (ASR) and air traffic management system in an effort to ensure airspace sovereignty and modernised air traffic services. All the machines, whether they are tanks, aircraft, or rifles, need to be well-maintained to remain effective. Poor maintenance reduces reliability and increases the risk of failure in critical moments. If the military

neglects equipment maintenance, it may cause prone to experiencing breakdowns during critical missions, impacting operational effectiveness.

Besides that, logistic and supply chain also important in keeping the machine operation well. The ability to supply and sustain military operations with adequate resources such as ammunition, fuel, spare parts and many more is vital. An efficient logistics system ensures that forces can be rapidly resupplied. We can see the failures in logistics, such as inadequate fuel supplies for armoured units, can lead to operational paralysis, as seen during Napoleon's invasion of Russia in 1812. In this modernisation era, cybersecurity and digital warfare is one of the critical factors that modern military must pay attention to. Modern armed forces rely heavily on communication, data sharing, and intelligence systems. Vulnerabilities in these systems due to cyber-attacks can cripple an army's ability to respond and function effectively. For example, disruptions in communication networks or GPS systems due to cyberattacks can severely impact the coordination of military operations.

Finally, integration of new technologies. The rapid pace of technological development means that military forces must continuously integrate new systems such as artificial intelligence, cyber warfare capabilities and unmanned aerial vehicles. However, there can be challenges in adopting new technologies if personnel are not adequately trained or if legacy systems are not compatible. The integration of advanced AI-based surveillance systems can enhance battlefield intelligence, but it requires that personnel be skilled in using such technologies effectively.

The Method component refers to the doctrines, operational procedures, strategies, and tactics used in military operations. The Military Doctrine and Strategy is one of the factors that will affect the Method component. Military doctrine provides the theoretical foundation for how an armed force should conduct war and operations. Clear, flexible, and up-to-date strategies are essential for success. Outdated or rigid doctrines can hinder military performance. Napoleon's emphasis on offensive warfare and rapid troop movements was innovative and gave him a significant advantage over more defensive-minded opponents. Next, training and drills. Operational methods are shaped by the training and drills soldiers undergo. The regular practice of complex manoeuvres, joint exercises with other branches of the military, and realistic simulations ensure that forces are prepared for a wide range of scenarios. The U.S. military frequently conducts joint exercises with allies to simulate real-world combat

situations, ensuring preparedness and interoperability. Besides, intelligence and information warfare. Military success increasingly depends on the ability to gather, interpret, and act on intelligence data. Methods of intelligence gathering, including satellite surveillance, signal intelligence, and human intelligence, significantly affect decision-making in operations. Superior intelligence allowed United States forces to track and eliminate high-value targets during counterterrorism operations. Plus, adaptability and flexibility of tactics should be a high concern of future arm forces.

Modern warfare requires adaptive strategies due to the complexity and changing nature of threats. Forces must be able to shift between conventional warfare, counter insurgency, and peacekeeping operations. For example, United States and NATO forces had to adapt quickly to guerrilla tactics in Iraq and Afghanistan, shifting their methods to focus more on counter insurgency and local partnerships. In order to enhance the arm forces, joint operation and interoperability must be practised by the organisation. Modern military operations often involve joint efforts between different services between Army, Navy and Air Force with allied nations. The ability to synchronize operations across these units is crucial to achieving strategic goals. For example, in joint operations like Operation Desert Storm, the effective integration of air, land, and sea forces, alongside allied countries, played a decisive role in the quick defeat of Iraqi forces. Last but not least, the doctrine evolution will help in enhancing the Method component. Methods must evolve in response to new types of warfare, such as cyber warfare, asymmetrical threats, terrorism, and space-based conflict. A military force that is slow to adapt may be outmanoeuvred by adversaries using unconventional or novel tactics.

INTEGRATION OF 3M

The strength of the 3M framework lies in its integration. A successful organization ensures that all three components Man, Machine and Method work in harmony like how it is related to each other in the **Figure 1.0**, integration between components:

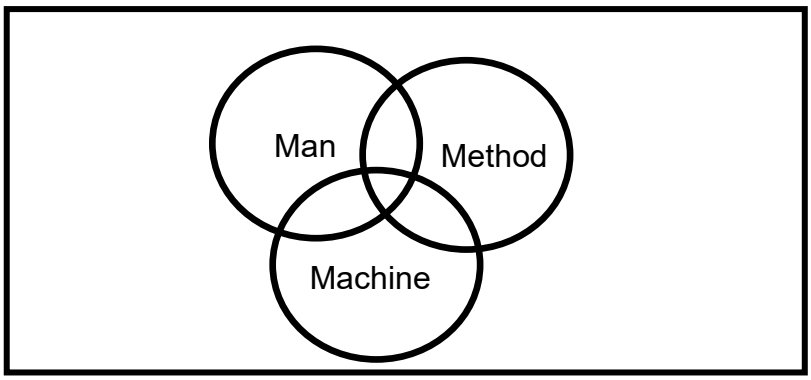

Figure 1.0: Integration of 3M

- **Man - Machine**: People must be adequately trained and skilled to use technology effectively. Leadership should ensure that machines and tools empower people, not hinder them.

- **Man - Method**: People should be involved in shaping and refining processes to ensure they are practical, relevant, and easy to implement. Human input helps adapt methods to real-world conditions.

- **Machine - Method**: Technology should support and optimize established methods, making processes more efficient, automated, and accurate.

THE ARMY FUTURE SOLDIER DEVELOPMENT IN MALAYSIAN ARMY

The Defence White Paper (DWP) outlines how the 3M framework Man, Machine, and Method will enhance the effectiveness of the armed forces, specifically the *Angkatan Tentera Malaysia* (ATM). This is how each component contributes to strengthening the military:

❖ MAN (Personnel and Human Resources)

The Defence Personnel section highlights those military personnel are central to achieving operational readiness and defence goals. The DWP emphasizes:

Comprehensive Training and Development. Ensuring soldiers, officers, and civilian defense workers are well-trained, disciplined, and equipped with the

necessary skills for modern warfare. The DWP stresses the importance of patriotism and security culture within the ranks and among the public, to create a well-rounded defense force.

Veteran Support. The DWP recognizes veterans as a crucial part of the defense ecosystem and includes provisions for their welfare to maintain morale and ensure experience remains within the defense structure.

Involvement of Civilians and Reserve. The concept of Total Defence involves not only regular forces but also reserves and civilians, emphasizing a national defense approach that includes all layers of society.

❖ **Machine (Technology and Equipment)**

The DWP outlines a focus on modernizing military technology:

Technology-Driven Military. The document calls for a technology-based defense posture, emphasizing the need for advanced military tools and systems that leverage new technologies. This includes cybersecurity, surveillance systems, and communication technologies essential for modern warfare.

Investment in Defense Industries. The DWP promotes local defense industries through research and development (R&D) in military technology, aiming to enhance self-reliance and reduce dependency on foreign suppliers. This includes promoting defense innovation that could serve as an economic catalyst.

Joint Military Equipment. Ensuring interoperability of equipment between different military services (Army, Navy, Air Force) and with allies. This enhances operational cohesion during joint missions.

❖ **Method (Strategies and Procedures)**

Strategic Defense Planning. The DWP defines clear defense strategies like *Cegah Rintang Berpadu* (Integrated Deterrence), a defensive posture that prioritizes deterrence over conflict, emphasizing defensive and preventive measures. It

also stresses Comprehensive Defense involving multiple stakeholders.

Operational Interoperability. The document stresses the need for forces to be interoperable across different services and international partners, ensuring they can operate simultaneously in multiple theatres and respond to diverse threats effectively.

Continual Improvement. The DWP promotes a transformation plan for the ATM, focusing on agility, mission-focus, and the ability to respond to evolving threats through flexible and updated procedures.

CHALLENGES

The 3M framework (Man, Machine, and Method), while advantageous for enhancing the future army, also presents several challenges in each of its components. These challenges need to be addressed to ensure successful integration and effectiveness.

❖ **Man (Human Resources) Challenges**:

Training and Skill Development. As military technology advances, soldiers require constant upskilling to operate complex systems, such as drones, cyber tools, and AI systems. This creates a burden of continuous training. Without sufficient resources, training programs may become outdated, leaving soldiers ill-equipped for modern warfare.

Psychological and Physical Stress. The increasing complexity of modern warfare, such as asymmetric threats, cyber warfare, and urban combat, could lead to higher psychological stress among soldiers. The risk of burnout or PTSD (Post-Traumatic Stress Disorder) could rise, requiring greater attention to mental health.

Human-Machine Integration. The challenge of integrating soldiers with advanced systems like unmanned vehicles and AI decision aids are not just technical but also cultural. Soldiers may struggle to trust and collaborate effectively with machines, leading to potential miscommunication or operational inefficiencies.

Retention and Recruitment: Keeping highly trained personnel within the military, especially in specialized fields like cyber operations, could be difficult as the private sector offers more lucrative opportunities. This could lead to talent retention issues.

❖ **Machine (Technology and Equipment) Challenges**:

High Costs and Maintenance. Advanced technologies such as autonomous systems, cyber defense mechanisms, and AI-driven equipment are expensive to acquire and maintain. This poses a challenge for defense budgets, especially in countries with limited financial resources. Additionally, maintenance costs for these machines can be high, and equipment obsolescence may occur quickly.

Cybersecurity Risks. As more military operations become dependent on technology, the risk of cyberattacks increases. Critical systems can be hacked, disrupted, or manipulated by adversaries. The challenge is to ensure that cyber defenses are always one step ahead of the attackers, which requires constant upgrades and vigilance.

Interoperability Issues. In multi-domain operations, integrating technologies across land, sea, air, and cyber domains can be challenging. Systems may not always be compatible, leading to communication breakdowns between different units or branches of the military. Ensuring seamless interoperability between technologies developed by different vendors or countries is also a significant challenge.

Ethical and Legal Concerns. The use of AI and autonomous systems, especially in combat, raises ethical questions about decision-making, accountability, and civilian safety. The deployment of autonomous lethal weapons, for example, brings up debates about human control and the risks of accidental harm.

❖ **Method (Processes and Strategy) Challenges:**

Adapting to Rapid Change. Modern warfare is evolving rapidly, with new threats such as hybrid warfare, cyberattacks, and information warfare. Traditional military strategies and doctrines may not be agile enough to address these emerging challenges, creating a need for constant updating of methods

and strategies. Adapting the entire military structure to a dynamic environment is a major challenge.

Coordination and Integration. Implementing new methods and strategies requires seamless coordination across various branches of the military, government agencies, and international allies. Ensuring that all parts of the military are aligned with the new methods, while also maintaining interoperability with allies, can be a logistical and operational challenge.

Bureaucratic Resistance. The introduction of new methods, particularly those involving technology, can meet with institutional resistance within the military. Changes to long-standing traditions, processes, and hierarchies can face pushback from personnel accustomed to older systems.

Balancing Innovation with Stability. While innovation is critical, the military also requires stability in its operations. The constant push to innovate can sometimes clash with the need for reliable, tested methods, leading to potential operational disruptions during the transition phase.

3M IN THE CONTEXT OF GENERAL SERVICE CORP (PAY)

General Service Corp (Pay) which handles the pay and allowances, auditing, accounting and salary deduction of the Malaysian Armed Forces (MAF). The Pay Corp also handle the managements of service account and regimental funds account. The 3M framework (Man, Machine, and Method) can be applied to enhance its processes and support the future army.

- **Man (Human Resources)**:

Skilled Personnel in Financial Management. By enhancing the skills and expertise of Pay Corp personnel in financial management, accounting, and payroll systems, the accuracy and efficiency of processing payments and allowances can improve. This ensures that soldiers and officers receive correct and timely pay, boosting morale and operational readiness. All Young Officers in Pay Corp will attend a course which is Paymaster Basic Course that will help the new officers in their skill and knowledge.

Training and Upskilling. Providing Pay Corp personnel with ongoing training in the latest financial tools, software, and regulatory changes will improve their capacity to handle increasingly complex pay structures. This prepares Pay Corp to handle future changes in the compensation system effectively, ensuring they can meet the needs of a modern, technologically advanced military. The working nature of the Pay Corp itself which always dealing with numbers would affect the government finance if the huge fault happened. The tools and software will definitely help to minimise the human fault among workers during the work process.

❖ **Machine (Technology and Equipment)**:

Automation and Digital Tools. Implementing advanced financial management systems and automation tools can streamline the payroll process. Automating repetitive tasks such as data entry, pay calculations, and allowance adjustments can reduce human errors, improve processing speed, and ensure accuracy. All of this information can be accessed through website SPGATM which every soldier will have to log in and enter their own password to view their payslip and allowance. This new system was evolving from the cash pay system (1968 - 1979) to Listing System (1980 - 1985) which there was no automation from system and everything was manually generated. Starting from 1996 to 2012, the system was modernised to Host Based System and from 2013 until nowadays Pay Corp already have online system which is a web based. From year to year, we can see clearly the automation that happened is really important in helping Pay Corp to achieve their objective in settling soldiers' payment.

Data Security and Cyber Defense. In the era of cyber threats, it is essential to protect sensitive payroll data. Integrating cybersecurity measures into Pay Corp's financial systems ensures that confidential information related to pay and allowances remains secure. This helps prevent data breaches and ensures financial integrity. Pay Corp Data System unit have a fine data security that works 24 hours in maintaining the security of data from UGATNet where the data already has backup if the system is down. Pay Corp has internet websites which are *Sistem Penyata Gaji Angkatan Tentera Malaysia* (SPGATM) and *Portal Urusan Gaji Angkatan Tentera* (UGAT) while the intranet websites are UGATNet and *Sistem Gaji*

Angkatan Tentera Malaysia (SGATM) that keep all the payroll data of the organisation.

Integration with Military Systems. Ensuring that payroll systems are interoperable with other military administrative systems, such as personnel management and deployment tracking, can help provide a comprehensive view of each soldier's status and ensure that allowances are adjusted according to their operational activities.

❖ **Method (Processes and Strategy)**:

Efficient Pay Processing Methods. By developing more efficient, streamlined methods for processing payroll, Pay Corp can reduce administrative burdens and improve the timeliness of salary disbursements. Modernizing payroll methods can also include creating transparent, easy-to-use digital platforms for soldiers to access pay information, submit claims, or resolve contradiction.

Strategic Financial Planning. Pay Corp can adopt strategic planning methods that anticipate future changes in the military pay structure, such as adjustments for inflation, cost of living, or hazard pay for overseas deployments. By planning for these contingencies, Pay Corp can ensure the army's financial systems remain adaptable to future requirements.

Data-Driven Decisions. Leveraging data analytics to assess patterns in pay, overtime, and allowances can help Pay Corp make data-driven decisions on budget allocations and resource management. This will enhance the army's financial sustainability and ensure funds are efficiently used to support personnel.

CONCLUSION

The 3M framework (Man, Machine, and Method) in the armed forces is affected by a variety of internal and external factors. The success of military operations depends on the quality of personnel (Man), the state and effectiveness of technology and equipment (Machine), and the robustness and adaptability of tactics, strategies, and operational procedures (Method). In practice, these three elements must work together in harmony. An armed force with well-trained and motivated personnel, cutting-edge technology, and adaptive, well-rehearsed tactics can achieve significant operational success.

Conversely, weaknesses in any one of these areas can jeopardize mission outcomes and overall military effectiveness. As a leader, focusing on Man, Machine, and Method allows you to create an environment where resources are used efficiently and goals are achieved systematically. The key role of leadership in this concept is to empower and develop people, leverage the best tools and technology and ensure efficient and affective possess. Together, these components of 3M will enable the future army to become a more resilient, responsive, and capable force, ensuring national security in the face of modern and future challenges.

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MAN, MACHINE AND METHOD: CHALLENGES AND WAY FORWARD UNDERTAKEN FOR A BETTER ARMY

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INTRODUCTION

In the rapidly evolving landscape of modern warfare, militaries worldwide are integrating new strategies, technologies, and methodologies to remain competitive. The Malaysian Army is no exception, striving to enhance its capabilities holistically through what has been termed the "Trilogy of Man, Machine, and Method." This concept emphasizes the critical balance between human resources, technological advancements, and the processes that bind them together to create a robust and future-ready military force. As the Malaysian Armed Forces undergo significant restructuring, the role of this trilogy has never been more pertinent. This essay explores how these three elements Man, Machine, and Method work in harmony to enhance the future of the Malaysian Army, ensuring its relevance, effectiveness, and resilience in the face of new and emerging challenges.

CHALLENGES AND THE ROAD AHEAD

While the potential for the Malaysian Army to enhance its capabilities through the trilogy of man, machine, and method is significant, several challenges remain. Budgetary constraints, for example, may limit the ability to fully modernize equipment and integrate cutting-edge technologies. Additionally, the rapid pace of technological advancement necessitates continuous training and adaptation, which can strain resources (United States Army, 2024).

There is also the question of ethical considerations, particularly in the use of AI and autonomous systems in warfare. As machines become more advanced, ensuring that human oversight remains central to decision-making processes is crucial to preventing unintended consequences. Furthermore, the reliance on digital systems introduces new vulnerabilities, with cyber warfare emerging as a significant threat to national security. So, this write-up will discuss the problems and challenges and the ideas to solve the upcoming issues.

MAN: THE HUMAN ELEMENT

At the core of any military force is its human component. The soldiers, officers, and supporting personnel who operate within the Malaysian Army are its most valuable assets. The “Man” element of the trilogy focuses on recruitment, training, and the overall well-being of military personnel, ensuring they are physically and mentally prepared for the challenges of modern warfare. The Army's emphasis on human resource development can be seen in initiatives to improve training facilities, such as the modernization of the Army's training programs under the "Army 4nextG Strategy" (Selangor Journal, 2023).

The evolving nature of conflict requires personnel to be adaptable, not only to traditional combat scenarios but also to operations that involve technology, cyber warfare, and peacekeeping. The Whole of Government, Whole of Society (WOGOS) approach adopted by the Malaysian Army emphasizes comprehensive training that integrates the military with broader societal efforts, allowing for more holistic defence strategies (Selangor Journal, 2023). The human element also involves leadership and decision-making processes, which are essential in ensuring the successful deployment of both machine and method.

Malaysia, like many other countries, is experiencing an aging population, which reduces the pool of young individuals available for military service. Once personnel are trained, retaining them becomes a challenge due to higher-paying opportunities or better work-life balance in civilian jobs. Military service may not be as attractive as careers in the civilian sector, especially in industries like technology, business, or healthcare. This leads to difficulties in recruiting and retaining talent within the armed forces. Modern warfare increasingly requires personnel with technical skills in areas such as cyber security, drone operations, and data analysis. Malaysia’s military may not have enough personnel with these specialized skills, making it harder to compete with more technologically advanced forces. While there are efforts to train soldiers in modern warfare techniques, the Malaysian Army may lack sufficient funding or resources to train and continuously upskill its manpower to meet modern defence needs.

As experienced military leaders retire or move into the private sector, it becomes challenging to maintain a strong leadership pipeline. This affects both operational efficiency and the mentoring of younger soldiers. Many skilled military personnel are often drawn to lucrative private-sector jobs, especially in fields like security or engineering, which offer higher salaries and better conditions than military service.

If veterans or retiring personnel do not feel adequately supported (e.g., in terms of pensions, healthcare, or career opportunities), it can create a negative perception that discourages new recruits from joining the military.

In some societies, the appeal of serving in the military has diminished over time. If the Malaysian public perceives military service as less prestigious or rewarding compared to civilian professions, this may result in lower interest among young people. Unlike some countries that implement mandatory national service, Malaysia relies on voluntary recruitment, which can limit the available manpower. Malaysia has historically adopted a defensive and neutral stance in its geopolitical strategy. As a result, there may not be a strong push to significantly expand military manpower compared to nations that view themselves as regional military powers. While more women are being integrated into the armed forces, there may still be cultural or institutional barriers that prevent many women from joining or progressing in military careers. Expanding the role of women in the armed forces could address manpower shortages.

In summary, the Malaysian Army faces challenges in recruitment, retention, and upskilling its personnel, particularly in specialized fields that are essential for modern warfare. Addressing these challenges would require a combination of better recruitment strategies, improved career incentives, and modernization of training programs.

MACHINE: TECHNOLOGICAL INNOVATION

The second component of the trilogy is the "Machine" element, which focuses on the role of technology in enhancing military capabilities. With the rise of Artificial Intelligence (AI), robotics, and unmanned systems, the Malaysian Army is investing heavily in modernizing its equipment and technological infrastructure. The introduction of advanced weaponry, communication systems, and surveillance technologies ensures that the Army remains at the forefront of military innovation (Wikipedia, 2024).

One significant area where technology plays a critical role is in logistics and supply chain management. AI-driven predictive analytics can optimize resource allocation, ensuring that supplies reach the frontlines in a timely manner and reducing the chances of equipment failure (United States Army, 2024). Additionally, autonomous systems and drones offer unprecedented advantages in intelligence gathering

and surveillance, providing real-time data to commanders, allowing for quicker and more informed decision-making.

However, the adoption of such technologies also brings challenges, such as cybersecurity threats and the need for continual technological upgrades. As adversaries develop new methods to disrupt digital systems, the Malaysian Army must also invest in robust defence mechanisms to protect its technological assets. Moreover, while machines can significantly enhance operational capabilities, they must work in tandem with human personnel and methods for their full potential to be realized.

Malaysia's defence budget is relatively modest compared to other countries in the region. Limited defence spending can restrict investments in cutting-edge technology, modernization programs, and expansion of military personnel. Historically, Malaysia's military focus has been more on internal security, particularly counter-insurgency efforts and maintaining national stability. This might have delayed investments in high-tech weaponry or advanced military methods compared to nations that prioritize external defence and power projection.

Many of Malaysia's military platforms, like tanks, aircraft, and naval vessels, are considered outdated when compared to regional powers such as Singapore, Indonesia, or Thailand. While modernization efforts are underway, progress can be slow due to the cost and complexity of upgrading. Although the Malaysian Armed Forces have well-trained personnel, the army’s manpower is not as large as some neighbouring countries. This could create a perception of being understaffed, especially in more technologically intensive fields like cyber warfare, drone operations, or specialized units.

Malaysia’s strategic priorities differ from more aggressive regional powers like China or even its neighbour Singapore. Malaysia traditionally maintains a more neutral or defensive stance in geopolitics, which could lead to less urgency in acquiring cutting-edge military equipment or strategies. Malaysia's military procurement process has faced issues such as delays, inefficiencies, and corruption scandals. This has slowed the acquisition of new technologies and modern equipment, causing the military to lag some of its regional peers. In recent years, however, there have been efforts to modernize the military, but overcoming these systemic challenges will take time.

METHOD: THE OPERATIONAL FRAMEWORK

The third component of the trilogy, "Method," refers to the strategies, doctrines, and operational frameworks that guide the use of both man and machine. In the Malaysian Army's context, the method involves integrating new technologies and personnel into cohesive and effective military strategies. This is achieved through comprehensive operational planning, which includes simulations, wargaming, and joint exercises with other branches of the Malaysian Armed Forces and international partners (Selangor Journal, 2023).

The restructuring of the Army under the National Military Strategy Plan aims to ensure that methods of warfare are not only reactive but also proactive. This involves redefining the Army's combat strategies to include elements such as cyber warfare, anti-terrorism operations, and humanitarian missions (Selangor Journal, 2023). The adoption of new doctrines ensures that the Army can respond swiftly to various conflict scenarios, from traditional warfare to non-combatant evacuation operations and disaster relief.

Furthermore, methods also include the Army's approach to sustainability. The Army is placing increased emphasis on maintaining operational readiness through efficient logistics, adaptive tactics, and a well-maintained infrastructure (United States Army, 2024). The development of new military doctrines also considers the integration of advanced technologies like AI and drones, ensuring that human resources are effectively supported by machines.

The Malaysian Army’s military doctrine, which guides its strategic and operational approach, may not be keeping up with the rapid changes in modern warfare. With the advent of cyber warfare, asymmetric threats, and advanced technology, there is a need for continuous revision and modernization of military strategies and doctrines. Traditionally, the Malaysian Army has focused on conventional warfare and internal security, such as counter-insurgency operations. However, modern conflicts increasingly involve hybrid warfare (combining traditional military actions with cyberattacks, information warfare, and irregular tactics), and the army may not be fully prepared for these new forms of warfare.

Modern militaries rely heavily on high-tech simulation and training centres to prepare their soldiers for a wide range of scenarios. The Malaysian Army may lack access to cutting-edge simulation technologies, which are essential for training in complex and fast-evolving battlefields. While the Malaysian Army does participate in joint

exercises with other countries, it may not have the same frequency or depth of involvement in large-scale multinational military exercises that promote modern tactical thinking and interoperability with other forces.

Modern warfare requires highly specialized units such as cyber defence teams, drone operators, electronic warfare specialists, and special forces capable of handling unconventional threats. The Malaysian Army may not have developed these specialized units to the same extent as other militaries in the region. Skills like urban warfare, counterterrorism, and cyber warfare require new tactics and training methodologies. If the army is slow to adopt these modern warfare techniques, it could fall behind in terms of strategic and operational effectiveness.

Militaries around the world are increasingly integrating technologies like artificial intelligence (AI), big data analytics, autonomous vehicles, and drones into their warfare strategies. The Malaysian Army may be slower in adopting these technologies, limiting its ability to execute modern warfare strategies efficiently. Effective modern militaries rely on integrated systems for communication, command, and control. If the Malaysian Army has difficulty integrating its older systems with newer technologies, or lacks interoperable systems with allied forces, it may struggle to coordinate and execute complex operations effectively.

The rise of non-state actors, terrorism, cyberattacks, and irregular warfare requires new methods and tactics. The Malaysian Army may be more focused on traditional defence roles and less equipped to deal with asymmetric threats that don't fit conventional warfare paradigms. Modern conflicts often involve significant cyber elements, such as attacks on military networks or critical infrastructure. The army may lack the capacity or expertise to effectively deal with cyber warfare, leaving it vulnerable to digital attacks that undermine its military operations.

Malaysia has historically adopted a more defensive and neutral stance in its military strategy, focusing on internal security and regional stability. This has resulted in less emphasis on power projection, aggressive tactical development, or rapid modernization, compared to countries with more assertive military strategies. A significant portion of the army's training and methods is designed around internal security operations, such as managing ethnic tensions, dealing with border security, and maintaining domestic stability. This focus may limit the development of methods for external defence or complex, multi-theatre operations.

The military institution may be slow to embrace reform, especially when it comes to adopting new methods of warfare. Bureaucratic inertia can hinder efforts to change training programs, restructure command hierarchies, or implement new strategies. The development of new military methods often requires substantial investment in research and development. If the Malaysian Army is not heavily investing in R&D or collaborating with universities and think tanks, it may lag in developing innovative methods for modern warfare.

Countries that regularly collaborate with larger or more advanced military forces often benefit from exposure to cutting-edge methods and strategies. While Malaysia engages in joint exercises, it may not have as much exposure to advanced military tactics as regional powers like Singapore, which has strong ties with the U.S. and other advanced militaries. Building a strong network of intelligence-sharing alliances is critical for modern warfare, particularly in dealing with threats like terrorism and cyber warfare. If Malaysia's defence relationships are not as deep or well-developed as those of other countries, it may be left out of key intelligence-sharing networks, limiting its strategic options.

Innovation in military methods requires significant investment, not only in equipment but also in training, simulation, and research. With a limited defence budget, the Malaysian Army may prioritize immediate needs over long-term innovation, which slows the adoption of new methods. Implementing new methods of warfare often requires a complete overhaul of training, equipment, and organizational structures. The financial and logistical burden of transitioning to modern military methods can be prohibitive without sufficient funding.

Senior military leadership plays a critical role in shaping the army's methods and strategies. If the leadership is resistant to change or conservative in their thinking, it could slow down the army's adaptation to modern warfare methods. As new threats such as cyberattacks, drones, and disinformation campaigns emerge, military doctrine must evolve. The Malaysian Army may lack a robust doctrine on these emerging threats, leaving it behind other militaries that are more agile in adapting to changing warfare landscapes.

The Malaysian Army's challenges in adopting modern methods stem from outdated doctrines, inadequate training infrastructure, slow technological integration, and a focus on internal security over external, advanced warfare strategies. Addressing these issues would require institutional reform, increased investment in modern warfare training,

better integration of technology, and a shift in military doctrine toward preparing for 21st century threats like cyber and asymmetric warfare.

WAYFORWARD FOR A BETTER ARMY

To effectively overcome the challenges faced by the Malaysian Army in integrating man, machine, and method, a multifaceted approach is required. Incremental budgetary allocation, where modernization occurs in phases, can help alleviate financial constraints while prioritizing critical upgrades and training. Continuous training and adaptation are essential, and partnerships with international defence organizations can enhance knowledge exchange and readiness for technological advancements (United States Army, 2024). Addressing ethical concerns surrounding the use of AI and autonomous systems in warfare requires the development of clear guidelines that emphasize human oversight in decision-making processes. Additionally, strengthening cybersecurity measures is crucial to protect against emerging digital threats. By fostering a balanced synergy between human soldiers and advanced technologies, the Malaysian Army can enhance its operational capabilities and maintain its credibility as a respected force in the region.

The next thing that we can do is to invest in continuous education programs for military leaders to keep them updated on global trends, ensuring they adopt agile and responsive strategies for evolving warfare scenarios. Build joint simulation centres with allied nations to increase the army's exposure to modern training techniques. These centres should focus on future warfare scenarios involving cyber warfare, counterterrorism, and urban combat. Develop fast-track programs for creating elite cyber defence teams and UAV (unmanned aerial vehicle) operators. These teams should engage in specialized training and international joint exercises to stay sharp and updated on modern warfare techniques. Establish a defence technology innovation hub to collaborate with tech companies, universities, and startups. This hub should focus on bringing disruptive innovations like AI and robotics to military use in the shortest possible time frame.

Next is increase investment in cybersecurity infrastructure and training. Develop an asymmetric warfare doctrine that focuses on countering non-state actors, cyber-attacks, and irregular warfare, ensuring troops are prepared for unconventional threats. Gradually shift towards a balanced posture by developing strategies that not only maintain internal security but also project force in regional and international arenas when necessary. We also need to establish stronger defence ties with global powers to reinforce external defence

capabilities. Implement institutional reforms that promote flexibility and quicker adaptation to changing warfare methods. This could include flattening the military command structure to enable more rapid decision-making and encouraging innovation at all levels of command. Create internal platforms where new ideas, strategies, and technologies can be tested rapidly and with minimal bureaucracy.

We can also practise a leadership rotation system that brings in younger, more progressive officers into decision-making roles. Initiate more bilateral defence programs focused on intelligence sharing and tactical interoperability. This will provide greater exposure to cutting-edge techniques and ensure that Malaysian forces can operate seamlessly in joint operations with allied forces. Lobby for increased defence funding by demonstrating how these investments directly contribute to national security. Focus on upgrading the most critical areas first, such as cybersecurity and drone warfare, while delaying fewer essential projects. Establish doctrine development committees that are continuously updated on emerging threats and modern warfare techniques. These committees should review and revise military doctrine on a regular basis, particularly in areas related to cyber warfare, drones, and disinformation.

In a nutshell, with careful planning and a commitment to continual improvement, the Malaysian Army is well-positioned to overcome these challenges. By focusing on the holistic integration of man, machine, and method, the Army can not only enhance its operational capabilities but also ensure that it remains a credible and respected force in the region.

THE INTEGRATION OF MAN, MACHINE, AND METHOD

The true strength of the Malaysian Army's future lies in the seamless integration of man, machine, and method. This integration ensures that soldiers are well-trained, machines are effectively deployed, and methods are continuously updated to meet evolving threats. The Army's holistic approach allows it to remain agile and capable of responding to a variety of challenges, from traditional military engagements to modern threats such as cyberattacks and asymmetric warfare (Selangor Journal, 2023; United States Army, 2024).

Key to this integration is the development of joint operations frameworks, which ensure that all branches of the Armed Forces, land, air, and naval can work together effectively. The introduction of joint training exercises and shared technologies fosters a sense of unity

within the military, ensuring that the man, machine, and method work in concert rather than in isolation. Moreover, through collaborative partnerships with international allies, the Malaysian Army can adopt best practices and technological innovations that further strengthen this integration.

The Malaysian Army should establish a dedicated doctrine modernization team that continually assesses global military trends, focusing on cyber warfare, hybrid warfare, and irregular threats. The team should work closely with international think tanks, defence experts, and other modern militaries to ensure that the doctrine is revised regularly to reflect new forms of conflict. The army must invest in state-of-the-art training facilities with virtual reality (VR) and AI-driven simulation programs that offer a broad range of combat scenarios. Partnering with technologically advanced militaries for knowledge transfer and equipment upgrades would provide immediate improvements.

Establish specialized units dedicated to cyber warfare, drone operations, electronic warfare, and counterterrorism. This requires recruiting talent from sectors like IT, engineering, and robotics to complement traditional soldiers with modern technical skills. Speed up the adoption of cutting-edge technologies such as AI, drones, and big data analytics by allocating more funds for R&D and collaborating with private-sector technology firms. The integration of real-time data systems into command-and-control networks will enhance decision-making on the battlefield. The army needs a dedicated task force focused on asymmetric threats like terrorism, cyberattacks, and unconventional warfare. These units must be provided with the tools and authority to act quickly, such as better intelligence sharing and rapid response teams.

To counter the effects of a non-aggressive posture, the Malaysian Army can emphasize defence diplomacy by participating more actively in regional security forums and multinational joint exercises. These initiatives will broaden the army's experience and readiness for both regional and global conflicts. Implement institutional reforms that promote flexibility and quicker adaptation to changing warfare methods. This could include flattening the military command structure to enable more rapid decision-making and encouraging innovation at all levels of command.

CONCLUSION

The trilogy of man, machine, and method offers a comprehensive framework for enhancing the future of the Malaysian Army. By focusing on human resource development, technological innovation, and the evolution of military doctrines, the Army can adapt to the demands of modern warfare. While challenges remain, the Army's commitment to holistic improvement ensures that it is prepared to face the future with confidence. This approach positions the Malaysian Army as a forward-thinking, agile force capable of defending the nation and contributing to regional stability.

Today's global landscape is characterized by unconventional threats, including cyber warfare, terrorism, and hybrid conflicts. A better army must be agile and adaptable, capable of responding to a diverse range of scenarios. This involves developing flexible strategies that encompass not just conventional military operations but also counterinsurgency, peacekeeping, and humanitarian assistance. Training programs should emphasize resilience and adaptability, preparing personnel to operate effectively in uncertain and rapidly changing environments.

In conclusion, addressing these challenges will require a comprehensive overhaul of the Malaysian Army's methods, involving significant investment in technology, R&D, training, and international collaboration. Leadership reform and a more aggressive strategic posture will also help bring the military in line with modern warfare standards, enhancing both regional and global defence capabilities. By addressing these key areas, armed forces can enhance their readiness, effectiveness, and resilience in an increasingly complex world. As they navigate the challenges of contemporary warfare, a commitment to transformation will be essential for securing a safer future.

Developing a better army in today's complex landscape requires a multifaceted approach. Prioritizing modernization through advanced technologies and innovative practices is essential for maintaining operational superiority. Enhancing recruitment and retention strategies will ensure a skilled and motivated workforce ready to tackle diverse challenges. Emphasizing cybersecurity and fostering international partnerships will strengthen defence capabilities and resilience. By committing to continuous improvement and adaptability, armed forces can effectively navigate the evolving nature of warfare and safeguard national security in an uncertain world. A forward-thinking, well-

resourced army is crucial not just for defence, but for ensuring peace and stability globally.

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TRILOGY OF MAN, MACHINE AND METHOD IN HOLISTICALLY ENHANCING THE FUTURE OF THE MALAYSIAN ARMY

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INTRODUCTION

The Indo-Pacific region (refer Figure 1) is currently undergoing a period of rapid and profound transformation, characterised by a complex interplay of factors that have significant implications for regional security. The shifting balance of power, most notably the rise of China and its assertive posture in the South China Sea, has created a more volatile and uncertain environment. Territorial disputes, long-standing flashpoints in the region, continue to simmer and have the potential to escalate into open conflict. Moreover, the rise of non-traditional security threats, such as terrorism, cyber warfare, and climate change-related disasters, further complicates the security landscape and demands a multifaceted response.

Figure 1: Asia Pasific and Indo-Pasific Regions

In light of these challenges, the Malaysian Army faces a pressing need to modernise and adapt its capabilities to effectively safeguard national interests and contribute to regional stability (The Cove, 2021). It can be argued that McNeil's (2023) opinions of a purely reactive or incremental approach will not suffice in this dynamic environment. Instead, the Malaysian Army must embark on a holistic modernisation journey that addresses not only the acquisition of advanced military hardware but also the development of its human capital and the adaptation of its doctrines and organisational structures to meet the demands of 21st-century warfare.

This essay proposes that the key to achieving this comprehensive transformation lies in a 'trilogy' approach that prioritises the synergistic enhancement of three core elements: the human element ('Man'), the technological dimension ('Machine'), and the strategic and operational framework ('Method') that aligns with Zhang et al. (2018). Each of these pillars is essential for the Malaysian Army to reach its full potential and remain a capable and relevant force in the 21st century. By synergistically enhancing these three interconnected elements, the Malaysian Army can position itself to effectively navigate the complexities of the Indo-Pacific security landscape and achieve its full potential in the years to come.

MAN: DEVELOPING HUMAN CAPITAL THROUGH ADDRESSING CHALLENGES AND INVESTING IN THE FUTURE

The cornerstone of any effective military force, as Reeves and Barsuhn (2023) aptly assert, lies not solely in the sophistication of its weaponry but fundamentally in the calibre of its personnel. The Malaysian Army, to navigate the complexities of contemporary warfare, needs to cultivate a cadre of 'thinking soldiers,' equipped with cognitive skills and intellectual agility to excel in an increasingly technology-driven battlespace (Alim, 2023). This emphasis on human capital development is crucial in the shift towards knowledge-based warfare, where the ability to process information, make sound judgments, and adapt swiftly is paramount. Thus, continuous enhancement of its human capital is indispensable for the Malaysian Army to ensure its future readiness and effectiveness.

However, the pursuit of this objective is fraught with significant challenges. Attracting and retaining top talent within the Malaysian Armed Forces is an ongoing struggle. The allure of the private sector, with its potentially higher salaries and diverse career opportunities, often outshines the prospects of a military career, leading to a concerning brain drain (Azizan et al., 2021). This attrition is further

compounded by the rapid pace of technological advancement, which necessitates a constant evolution of training and education programs to ensure soldiers remain abreast of the latest developments. Without these updated skills, soldiers may find it challenging to operate effectively in a technologically sophisticated environment (Ridzwan, A. M., 2018).

If left unaddressed, these challenges pose a serious threat to the Malaysian Army's ability to field a force capable of meeting the complex demands of the 21st century. The Malaysian government's recent announcement of a salary increase for military personnel in 2024 is a positive step towards addressing the challenge of attracting and retaining talent. This follows a similar increase in 2013, demonstrating a recognition of the need to keep military pay competitive with the private sector. However, it's crucial to acknowledge that financial incentives alone may not be sufficient. The current manpower attrition rate, which reportedly surpasses the recruitment rate, underscores the need for a more comprehensive approach. This includes not only competitive remuneration but also clear career development pathways, improved quality of life for military personnel, and robust training and education programs.

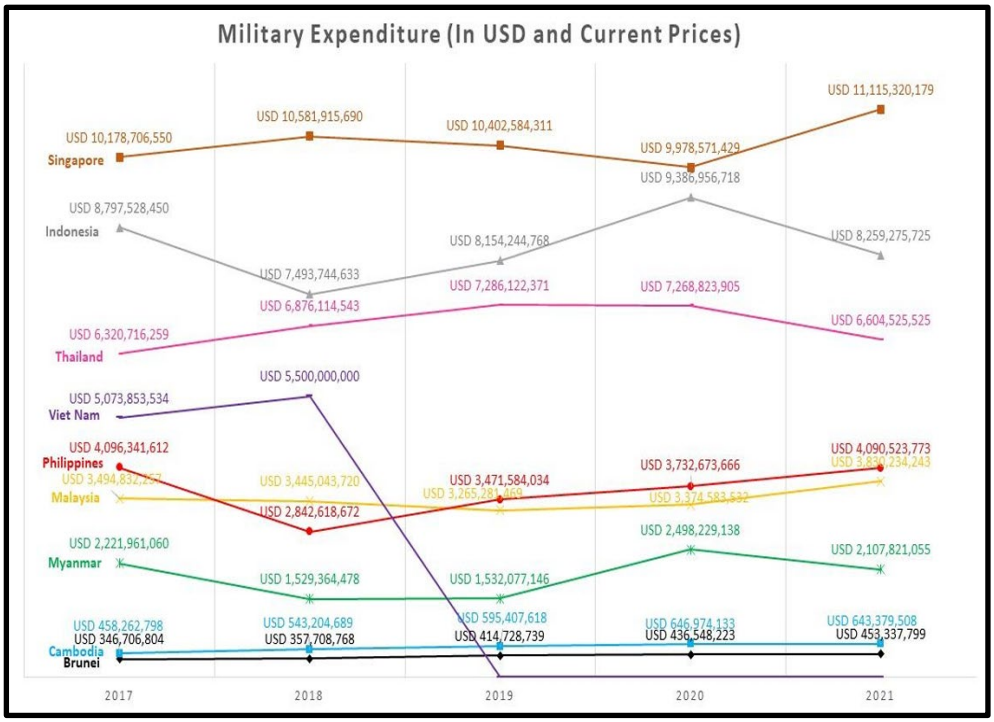

Figure 2: Military Spending Among ASEAN Member States (2017 – 2021)

The challenges of attracting and retaining talent are not unique to Malaysia. Globally, militaries are grappling with the 'brain drain' phenomenon, as highly skilled individuals are lured away by the private sector's competitive salaries and perceived better work-life balance. The rise of remote work and the globalisation of the job market have further intensified this competition. In the ASEAN region, the situation is further complicated by disparities in economic development and military spending among member states (see Figure 2). While some countries, like Singapore, can offer attractive remuneration packages and career prospects, others, including Malaysia, face greater challenges in competing for talent. The allure of serving in more technologically advanced and well-funded militaries can lead to a regional brain drain, with skilled personnel seeking opportunities elsewhere. The rapid pace of technological advancement also necessitates continuous upskilling and adaptation, particularly for an ageing workforce. The increasing complexity of military technology demands a higher level of cognitive ability and adaptability from soldiers, further highlighting the need for 'thinking soldiers'.

CULTURAL AND SOCIAL FACTORS INFLUENCING RECRUITMENT

Beyond financial considerations, the cultural and social fabric of Malaysia plays a pivotal role in shaping the recruitment landscape for the Malaysian Army. Deep-seated cultural values and societal perceptions of military service can significantly influence enlistment rates and the overall attractiveness of a military career. In Malaysian society, where respect for elders and communal harmony are highly valued, the hierarchical structure and disciplined lifestyle of the military may resonate with certain segments of the population (Total Military Insight, 2024). However, the perception of military service as a career primarily for those with limited opportunities or academic prospects can deter talented individuals from considering it. This perception can be further reinforced if the education system does not adequately promote STEM fields or critical thinking skills, limiting the pool of potential recruits who possess the aptitude for modern, technology-driven warfare.

Furthermore, the multi-ethnic and multi-religious nature of Malaysian society can also present challenges and opportunities for recruitment as implied by Noor (2024). While the Army's diverse composition can be a strength, ensuring inclusivity and addressing potential cultural sensitivities during recruitment and training is crucial. Promoting the idea of military service as a unifying force that transcends ethnic and religious lines can be a powerful motivator for

potential recruits. Additionally, understanding and leveraging the unique cultural strengths and perspectives of different communities within the Army can enhance its overall effectiveness and adaptability.

Addressing these cultural and social factors requires a multi-faceted approach. Public awareness campaigns that highlight the diverse roles and opportunities within the military, as well as the skills and experiences it can offer, can help reshape societal perceptions. Collaborations with educational institutions to promote Science, Technology, Engineering, and Mathematics (STEM) education and critical thinking skills can also expand the pool of potential recruits with the aptitude for modern warfare. The Army can also actively engage with community leaders and organisations to foster understanding and support for military service. By addressing these cultural and social dimensions, the Malaysian Army can create a more conducive environment for attracting and retaining the best and brightest, ensuring a strong foundation for its future human capital as suggested by Rogers (2020) and Tirado (2023).

LEARNING FROM GLOBAL BEST PRACTICES

The Malaysian Army can significantly benefit from studying and adapting successful human capital development strategies implemented by other militaries worldwide. The U.S. Military's focus on developing "warrior-scholars," individuals who possess both combat prowess and intellectual acumen, exemplifies a model that emphasises the importance of cognitive skills alongside traditional military training. This approach recognises that modern warfare demands not only physical strength and tactical proficiency but also the ability to analyse complex situations, make sound judgments, and adapt to rapidly changing circumstances. By fostering a culture of lifelong learning and intellectual growth within its ranks, the U.S. Military ensures that its soldiers are equipped to meet the challenges of the 21st-century battlefield (Keller et al., 2013; Aloi, 2020). The Malaysian Army can adopt a similar approach by integrating intellectual development programs into its training and education curriculum, encouraging soldiers to pursue higher education, and recognising and rewarding intellectual achievements alongside combat accomplishments.

Similarly, the Republic of Korea's mandatory service model, which fosters a sense of national duty and shared responsibility for defence, could offer valuable insights into cultivating a culture of service and commitment within the Malaysian Armed Forces. The mandatory service model, while not directly applicable to Malaysia's context, highlights the importance of instilling a strong sense of

patriotism and dedication to national defence among its citizens. The Malaysian Army can adapt this principle by emphasising the values of service, sacrifice, and national unity in its recruitment and training programs. By fostering a sense of shared purpose and commitment to the nation's security, the Army can enhance morale, esprit de corps, and overall effectiveness.

In addition to these examples, the Malaysian Army can also explore other successful models of human capital development from around the world. The Israeli Defence Forces' emphasis on innovation and adaptability, the British Army's focus on leadership development, and the Australian Army's commitment to diversity and inclusion all offer valuable lessons that can be adapted to the Malaysian context. By studying and adapting these best practices, the Malaysian Army can develop a more comprehensive and effective approach to human capital development, ensuring that it possesses the skilled, motivated, and adaptable personnel necessary to succeed in the complex and dynamic security environment of the 21st century.

SPECIFIC PROGRAMS AND INITIATIVES

In addition to addressing broader cultural and social factors, the Malaysian Army should also invest in specific programs and initiatives aimed at improving the quality of its personnel. This could include:

- **Leadership Development Programs**: Cultivating strategic thinking, decision-making, and communication skills among officers and non-commissioned officers is paramount. The Malaysian Army can establish dedicated leadership academies or partner with civilian institutions to offer advanced courses in military strategy, operational planning, and leadership ethics. These programs should not only focus on theoretical knowledge but also provide opportunities for practical application through simulations, war games, and real-world exercises. By nurturing a cadre of capable and visionary leaders, the Army can ensure that it is well-prepared to navigate the complexities of the modern battlefield.

- **Partnerships with Educational Institutions**: Collaborations with universities and technical colleges can provide avenues for soldiers to pursue higher education and acquire specialised skills relevant to the modern battlefield. This could involve offering scholarships or study leave for soldiers to pursue degrees in fields such as engineering, computer science, cybersecurity, or international relations. The Army can also work

with educational institutions to develop customised training programs that address specific skill gaps within its ranks. By fostering a culture of lifelong learning and providing opportunities for professional development, the Army can enhance the intellectual capital of its personnel and prepare them for the challenges of the future.

- **Foreign Exchange Programs:** Participating in exchange programs with allied militaries can offer invaluable opportunities for knowledge exchange, exposure to new technologies and tactics, and the development of strong interpersonal relationships that can enhance interoperability in future joint operations. These programs can also foster a broader understanding of different military cultures and approaches to warfare, enriching the perspectives of Malaysian soldiers and enabling them to adapt to diverse operational environments. By actively engaging in such exchanges, the Malaysian Army can tap into a global network of military expertise and build lasting partnerships that contribute to regional and global security.

By implementing these targeted initiatives, the Malaysian Army can create a more capable, adaptable, and motivated force. These programs, in conjunction with efforts to address broader cultural and social factors, can significantly enhance the Army's human capital and ensure that it possesses the skilled, dedicated, and forward-thinking personnel necessary to meet the challenges of the 21st century.

MACHINE: LEVERAGING TECHNOLOGICAL ADVANCEMENTS

The rapid pace of technological change in the military domain is undeniable, creating both opportunities and challenges for armed forces worldwide. The Malaysian Army must proactively adopt and integrate emerging technologies to maintain a competitive edge in the evolving security landscape. As Rashid et al. (2023) highlight, technologies such as artificial intelligence, robotics, and unmanned systems can significantly enhance capabilities in surveillance, reconnaissance, and precision strikes. These advancements also offer force multipliers, enabling the Malaysian Army to achieve more with fewer personnel, a crucial consideration given the ongoing challenges with recruitment and retention. Embracing technological innovation is not merely an option but a strategic necessity for the Malaysian Army to remain relevant and effective in the 21st century.

However, the pursuit of technological advancement is not without its hurdles. The Malaysian Army faces financial constraints and resource limitations that can hinder acquiring and maintaining cutting-edge military technologies, a challenge shared by many other nations in the region and globally. The integration of new technologies into existing force structures and doctrines presents a complex challenge, requiring adaptation of operational procedures, potential restructuring of units, and retraining personnel, particularly those from an ageing workforce who may be less familiar with new technologies (Editorial Team, 2024). The COVID-19 pandemic has further exacerbated these challenges, causing disruptions in supply chains and delays in procurement, as experienced even by more developed militaries like Singapore's (East Asia Forum, 2021).

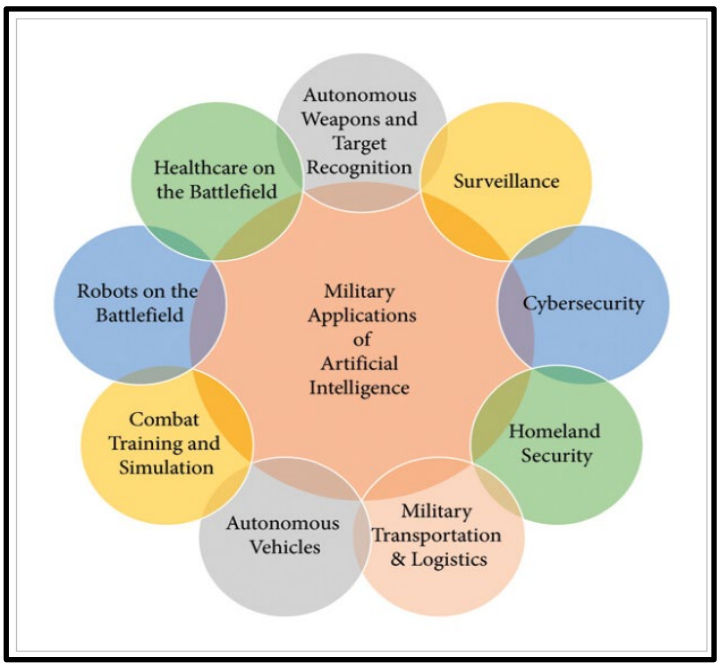

Figure 3: Applications of Artificial Intelligence in the Defense Sector

To navigate these challenges, a balanced and strategic approach to technology acquisition is essential. The Malaysian Army should prioritise capabilities that align with the strategic objectives outlined in the Defence White Paper (DWP) and current policies, ensuring investments in technologies that directly contribute to the nation's defence needs. Specific technologies that warrant prioritisation include:

- **Artificial Intelligence (AI)**: AI can revolutionise various aspects of military operations, from enhancing decision-making

and situational awareness to enabling autonomous systems and improving logistics and maintenance (see Figure 3).

- **Cybersecurity Measures**: In an era of increasing cyber threats, robust cybersecurity measures are essential to protect critical military infrastructure and information from malicious attacks (Iftikhar, 2024).

- **Unmanned Systems (Drones)**: Drones offer a versatile and cost-effective platform for various missions, including surveillance, reconnaissance, target acquisition, and even combat operations. They can enhance the Army's situational awareness, extend its reach, and reduce risks to human personnel.

Increased collaboration with the private sector and international partners can provide access to expertise, resources, and technology transfer opportunities, facilitating the Army's modernisation efforts (Editorial Team, 2024). For instance, partnerships with local tech firms can foster innovation and the development of customised solutions tailored to the Malaysian Army's specific needs. International collaborations, such as the U.S.-India defence technology cooperation agreements highlighted by Vergun (2023), can provide access to cutting-edge technologies and facilitate joint research and development initiatives.

Furthermore, fostering the development of indigenous defence industries, like the Sovereign Defence Industries, is crucial. This reduces reliance on foreign suppliers, enhances national self-sufficiency, and potentially creates economic opportunities. The role of Sovereign Defence Industries is pivotal in this regard, as they can contribute to research and development, manufacturing, and maintenance of military equipment, tailored to the specific needs of the Malaysian Army. Other stakeholders, such as universities and research institutions, also have a role to play in fostering innovation and developing the technological talent pool necessary for a modern military.

In parallel, it is crucial to address the challenge of an aging workforce adapting to new technologies. This could involve tailored training programs, mentorship initiatives, and clear communication about the benefits and necessity of technological adoption. By taking a proactive and multifaceted approach to technological advancement, the Malaysian Army can harness the power of innovation to enhance

its capabilities, optimise its force structure, and ensure its preparedness for the challenges of the future battlespace.

In addition, incorporating technological aptitude into the entry qualifications for new recruits can ensure that the future generation of soldiers is equipped with the foundational skills necessary to operate in a technology-driven environment. This would not only streamline the integration of new technologies but also contribute to a more agile and adaptable force. It is also important to recognise that technological advancements bring with them ethical considerations, particularly in areas like artificial intelligence and autonomous weapons systems. The Malaysian Army must develop clear guidelines and policies to ensure that the use of technology adheres to international humanitarian law and ethical standards.

METHOD: ADAPTING DOCTRINES AND ORGANISATIONS

In an era marked by rapid change and unpredictable security challenges, the ability to adapt is paramount for any military organisation. The Malaysian Army must embrace agility and adaptability, not only in its technological capabilities but also in its doctrines and organisational structures. This entails a shift away from rigid, traditional approaches towards more flexible and responsive frameworks that can effectively address the diverse spectrum of threats faced in the 21st century. Moreover, as Niessl (2021) emphasises, fostering interoperability with other branches of the armed forces and international partners is crucial. This enables seamless coordination and collaboration, maximising the effectiveness of joint operations and enhancing the Malaysian Army's ability to contribute to regional and global security initiatives. The adoption of flexible doctrines and structures, coupled with a commitment to interoperability, is thus essential for the Malaysian Army to remain a capable and relevant force in the face of evolving security challenges.

However, the path to doctrinal and organisational adaptation is often met with resistance. Military bureaucracies, by their nature, can be resistant to change, and overcoming institutional inertia can be a significant challenge. The inherent hierarchical structure, emphasis on tradition, and established procedures can create a culture that is averse to innovation and adaptation. The perceived risks associated with change, coupled with the potential disruption to existing power structures and career paths, can further fuel resistance. Additionally, striking the right balance between maintaining traditional warfare capabilities and developing the capacity to address non-traditional security operations, such as counter-terrorism and disaster relief,

presents a complex dilemma (Nik Mohamed Rashid Nik Zurin & Kwek, 2020). The allocation of resources, training priorities, and force structure can become contentious issues as the Army seeks to adapt to the evolving security landscape. These challenges necessitate strong leadership, a clear vision for the future, and a willingness to embrace change at all levels of the organisation. The DWP, while providing a strategic direction, must be accompanied by effective implementation strategies and a commitment to overcoming institutional barriers to change.

To navigate these complexities, the Malaysian Army must adopt a proactive and forward-looking approach. This involves a commitment to continuous review and adaptation of doctrines and organisational structures based on lessons learned from operations, emerging threats, and technological advancements. The establishment of dedicated units or task forces specialising in non-traditional security operations can enhance the Army's ability to respond effectively to these challenges. The 10 Paratrooper Brigade, for instance, has evolved from a conventional airborne unit to one capable of conducting a wide range of special operations, demonstrating the potential for such specialised units. Furthermore, increased participation in joint exercises and training programs with regional and international partners, such as the Five Power Defence Arrangements and the ASEAN Defence Ministers' Meeting-Plus exercises, can foster interoperability, promote knowledge exchange, and build trust and confidence. By embracing change, investing in specialised capabilities, and strengthening partnerships, the Malaysian Army can ensure that its methods of operation remain aligned with the demands of the 21st-century security environment.

DOCTRINE EVOLUTION AND FLEXIBILITY

The nature of warfare is in constant flux, and the Malaysian Army's doctrines must evolve in tandem to remain effective. The rise of hybrid warfare, characterised by the blending of conventional and unconventional tactics, demands a doctrinal shift that emphasises adaptability and the ability to operate across multiple domains. This necessitates a move away from traditional, linear battlefields and towards a more fluid and multi-dimensional approach that encompasses not only kinetic operations but also information warfare, psychological operations, and cyber warfare. The Malaysian Army must develop the capacity to identify and counter hybrid threats, which often exploit vulnerabilities in the seams between conventional and unconventional warfare.

Cyber threats, another growing concern in the contemporary security landscape, necessitate the development of doctrines that address both defensive and offensive cyber capabilities. The increasing reliance on digital technologies and networks in military operations makes the Malaysian Army vulnerable to cyberattacks that can disrupt communications, compromise sensitive information, and even disable critical systems. Therefore, the Army must develop robust cyber defence mechanisms to protect its networks and data, while also cultivating offensive cyber capabilities to deter and respond to potential adversaries. This requires not only investing in technology and infrastructure but also developing the human capital and doctrinal frameworks necessary to operate effectively in the cyber domain.

Moreover, the persistent threat of terrorism and the increasing frequency of natural disasters require doctrines that enable the Army to effectively conduct counterinsurgency and humanitarian assistance and disaster relief (HADR) operations. The Malaysian Army has a long history of contributing to peacekeeping and humanitarian missions, both domestically and internationally. However, the evolving nature of these operations, often characterised by complex environments, non-state actors, and the need for civilian-military cooperation, demands a continuous refinement of doctrines and tactics. The Malaysian Army can draw lessons from historical precedents, such as the U.S. Army's experiences in Iraq and Afghanistan, which highlight the importance of cultural understanding, community engagement, and adaptable tactics in counterinsurgency operations. Similarly, the increasing frequency and intensity of natural disasters, exacerbated by climate change, necessitate the development of robust HADR doctrines that enable the Army to respond rapidly and effectively to crises, providing essential aid and support to affected populations.

By embracing flexibility and proactively adapting its doctrines, the Malaysian Army can ensure its preparedness for the full spectrum of contemporary security challenges. This requires a willingness to challenge traditional assumptions, learn from past experiences, and anticipate future trends. It also necessitates a culture of innovation and experimentation within the Army, where new ideas and approaches are encouraged and tested. Ahmad Ghazali Abu-Hassan (n.d.) outlines the strategic priorities and challenges facing the Malaysian Armed Forces and advocates that the DWP must be the basis of future development. The DWP will be a key artefact that provides a valuable framework for guiding doctrinal evolution. However, it is essential that the Army remains agile and responsive to emerging threats and opportunities, continuously refining its doctrines to ensure its continued effectiveness in an ever-changing security environment.

ORGANISATIONAL STRUCTURE CHANGES TOWARDS AGILITY AND RESPONSIVENESS

The Malaysian Army's organisational structure, like its doctrines, must evolve to meet the dynamic challenges of the 21st century. The traditional hierarchical command structure, while effective in conventional warfare scenarios, may prove less agile in the face of rapidly evolving threats and decentralised operations. A more decentralised command structure, as suggested in the prompt, could empower lower-level commanders to make decisions more quickly and effectively in dynamic situations, fostering initiative and adaptability on the battlefield. The increasing complexity and fluidity of modern warfare, characterised by hybrid tactics and non-linear battlefields, necessitate a command structure that can respond swiftly and decisively to emerging opportunities and threats. The Malaysian Army can draw inspiration from the experiences of other militaries, such as the U.S. Army's ongoing efforts to flatten its command structure and empower junior leaders, to inform its own organisational transformation.

The creation of specialised units dedicated to specific threats and challenges is another crucial aspect of organisational adaptation. The establishment of a dedicated cyber warfare unit, for instance, can enable the Army to develop and deploy offensive and defensive cyber capabilities, safeguarding critical infrastructure and information systems from malicious attacks. Similarly, the formation of an information operations unit can enhance the Army's ability to shape the narrative, counter disinformation, and influence public opinion in support of its operations. The 10 Paratrooper Brigade, which has evolved from a conventional airborne unit to one capable of conducting a wide range of special operations, serves as a successful example of how specialised units can enhance the Army's capabilities and responsiveness. The creation of such units, however, must be accompanied by adequate resources, training, and clear mandates to ensure their effectiveness.

The implementation of these structural changes should be guided by a comprehensive analysis of the Army's current capabilities, future needs, and the evolving security environment. The DWP, which outlines the strategic priorities and challenges facing the Malaysian Armed Forces, can serve as a valuable reference point for identifying areas where organisational adaptation is needed. It is also crucial to ensure that any changes are implemented gradually and with clear communication to all stakeholders. This will help to minimise disruption, maintain morale, and ensure that the Army remains a cohesive and

effective fighting force throughout the transformation process. The leadership of the Malaysian Army plays a critical role in this regard, as they must articulate a clear vision for the future, build consensus for change, and manage the transition effectively.

By embracing organisational adaptation and fostering a culture of innovation and agility, the Malaysian Army can position itself to effectively navigate the complexities of the 21st-century security landscape and fulfil its mandate to safeguard national interests and contribute to regional stability.

INTEROPERABILITY IN PRACTICE

The concept of interoperability, the ability of different military units or forces to operate together seamlessly, has become increasingly vital in today's interconnected world. The Malaysian Army's active participation in various joint exercises and operations underscores its recognition of this reality. The Five Power Defence Arrangements (FPDA) exercises, involving Malaysia, Singapore, Australia, New Zealand, and the United Kingdom, serve as a prime example of the Army's commitment to interoperability. These exercises provide a platform for enhancing cooperation and coordination among the participating nations' armed forces, enabling them to develop shared tactics, techniques, and procedures (TTPs) and build trust and confidence. The FPDA exercises also demonstrate the Malaysian Army's ability to integrate seamlessly into a multinational force, a crucial capability in an era of coalition warfare and peacekeeping operations.

Similarly, the ASEAN Defence Ministers' Meeting-Plus (ADMM-Plus) exercises foster regional cooperation and capacity-building to address shared security challenges. These exercises, which involve ASEAN member states and their dialogue partners, including major powers like China, the United States, and India, provide a valuable opportunity for the Malaysian Army to interact and train with a diverse range of militaries. The ADMM-Plus exercises also contribute to regional stability by promoting transparency, confidence-building, and practical cooperation in areas such as maritime security, counter-terrorism, and humanitarian assistance and disaster relief. The Malaysian Army's active participation in these exercises demonstrates its commitment to regional security and its willingness to work collaboratively with its neighbours and partners.

Beyond these formal exercises, the Malaysian Army has also demonstrated interoperability in real-world operations. Its contributions to United Nations peacekeeping missions, such as those in Lebanon and the Democratic Republic of the Congo, showcase its ability to operate effectively alongside other militaries in complex and challenging environments. Salleh and Idris (2016) affirm that the Army's participation in these missions not only enhances its operational capabilities but also contributes to international peace and security, further solidifying its role as a responsible and capable regional actor.

The benefits of interoperability extend beyond the tactical and operational levels. By fostering closer ties and understanding among militaries, interoperability can also contribute to strategic stability and conflict prevention. The ability to operate seamlessly with partners can deter potential adversaries, enhance collective defence capabilities, and facilitate coordinated responses to regional crises. The Malaysian Army's commitment to interoperability, as demonstrated through its participation in various exercises and operations, is thus not only a testament to its professionalism and adaptability but also a crucial contribution to regional and global security.

CONCLUSION

In conclusion, the complexities of the 21st century security landscape necessitate a holistic and multifaceted approach to modernising the Malaysian Army. The 'trilogy' of Man, Machine, and Method, as explored in this essay, represents an interconnected and interdependent framework for enhancing the Malaysian Army's capabilities and ensuring its continued relevance in the face of evolving challenges.

The development of human capital is paramount, necessitating a focus on attracting, retaining, and training 'thinking soldiers' equipped with the cognitive skills and technological aptitude to navigate the complexities of modern warfare. This requires addressing the challenges of talent acquisition and retention, as well as investing in comprehensive training and education programs that foster critical thinking, problem-solving, and technological proficiency. Simultaneously, the Malaysian Army must embrace technological advancements, prioritising the acquisition and integration of emerging technologies that align with its strategic objectives and resource constraints. Collaboration with the private sector and international partners, alongside the development of indigenous defence industries, can facilitate this process and enhance the Army's technological edge.

Finally, adapting doctrines and organisational structures to embrace agility and interoperability is crucial. This involves overcoming resistance to change, balancing traditional and non-traditional security capabilities, and continuously reviewing and adapting operational frameworks in response to emerging threats and lessons learned.

The successful implementation of this 'trilogy' approach hinges on sustained commitment and investment from all stakeholders. It requires a long-term vision, strategic planning, and a willingness to adapt and evolve in the face of change. By prioritising the synergistic enhancement of Man, Machine, and Method, the Malaysian Army can position itself as a capable, adaptable, and relevant force, ready to safeguard national interests and contribute to regional stability in the dynamic and challenging Indo-Pacific security environment of the 21st century.

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THE TRILOGY OF MAN, MACHINE AND METHOD IN HOLISTICALLY ENHANCING THE FUTURE OF MALAYSIAN ARMY

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INTRODUCTION

The idea of integrating man, machine and method has always been a framework that frequently emerges in system thinking. This is because system thinking is a broad field. There are many different branches of the military that make frequent use of these three ideas and they frequently play an incredible role in terms of efficiency and effectiveness. Every component has the potential to play an important part. It is possible to dramatically improve military strategy and operations by the optimization of these variables. Therefore, the Malaysian Armed Forces always place a significant emphasis on these three aspects.

MAN, MACHINE & METHOD (3M)

As a first step, **man/human** resources. In armed forces, it is the most important and it is required. There are senior officers, officers, sergeants (senior rank soldiers), and soldiers who are present in a structure. Not only that, but there are also members of their family who are there to assist them behind the scenes. Because of this, the ability, training, morale, skills, psychological quality, physical health and leadership of individuals at various levels of the army frequently result in differing degrees of management and combat efficiency. As a result, the army continues to provide training in order to guarantee that people at all levels within the army are proficient in the use of equipment are able to adapt to the fast changing battle environment, and improve the training requirements for actual combat scenarios. In light of the National Defence Policy and the Fourth Dimension Malaysian Armed Forces (4D MAF), this is something that is readily apparent.

The next component to consider is the **machine**. The major components that are essential to victory in modern combat are frequently created by the combination of all of the hardware, software and numerous systems that are utilized by the military. Regardless of the type of machine, whether it be new weapons, drones, robots or other automated systems, they have the potential to guarantee a considerable boost in the capabilities of the military. They have the

ability to guarantee that the military will continue to have an advantage over its competitors either in the air, at sea or on land. Tools for communication, vehicles for transportation, and routine maintenance for logistics are all included in systems. It is possible for the military to improve its combat capabilities by standardizing its systems and integrating them more effectively. This applies to all sorts of weaponry, whether they are small-range, medium-range or long-range weapons.

Naturally, the military is also responsible for ensuring the dependability of all machines and developing routine maintenance programs in order to limit the number of equipment failures. In order to improve the competitive advantages, ensure that all machines are properly maintained in equipment life cycle management. The ability to initiate cyber warfare and employ artificial intelligence for surveillance, strategic calculation and automation has become increasingly significant in current wars. This is an irrefutable fact that cannot be refuted. The constant escalation of cyber warfare and artificial intelligence has made this skill increasingly important. There has been a substantial amount of assistance supplied by artificial intelligence, which is an essential technology that cannot be disregarded in the military. Because of this, it is clear that the combat method that does not involve artificial intelligence is no longer capable of satisfying the fundamental needs of modern warfare. On the other hand, artificial intelligence is capable of performing flawless coordination of a significant amount of manpower.

Lastly, the so-called **methods** are in reality nothing more than strategies and procedures. In this element, the procedures, theories, doctrine, strategies and organizational methods that are typically utilized in the military are discussed. In the context of contemporary combat, data-driven decision making is unavoidable. Collecting, analysing and processing a substantial amount of data in real time can provide soldiers with the ability to make judgments that are more intelligent. It is possible to get a greater degree of analysis and an increase in the percentage of successful operations through the use of any data gathering method, including satellites, sensors or reconnaissance drones. The planning of strategic moves and the creation of theoretical frameworks will not be static. The utilization of efficient real-time intelligence, the consistent revision of military doctrines and the comprehensive research and development of a variety of techniques for asymmetric warfare, network defence and hybrid warfare situations are all elements that contribute to this.

It is essential to establish a variety of military doctrines that are both successful and diversified. That are aware of both ourselves and the adversary. As a result, the army will be able to improve its operational adaptability on the spot, as well as its efficiency and agility on a battlefield that is always changing. The next step is to conduct regular reviews of the army's advantages and disadvantages using the feedback loop. The army should make use of the numerous flaws in the feedback loop in order to enhance the system as a whole. This will help the army to comprehend the distinction between simulation and real exercises, give more proper training for war and enable the troops to coordinate the gaps. Through the training of soldiers, the enhancement of the performance of equipment, and the update of doctrine and procedures. Therefore, by considerably enhancing the interaction between man, machines and method, the entire military system becomes more efficient, more adaptive and more prepared for the complexity of modern combat. This is because all of these factors are interconnected. Developing the Malaysian Future Army is the appropriate plan for the nation's defence.

MAN-MACHINE

Throughout the course of human history, there have been two primary perspectives regarding the relationship between man and machine. The first hypothesis is known as the slavery theory, which holds the belief that robots are enslaved by humans. Aside from that, it holds the belief that machines are the ones that enslave humans, but the more profound viewpoint is that humans are enslave by another human who used those machines. The tool hypothesis also known as the component theory, is another argument that contends that machines are nothing more than tools, which are merely another method that has been invented to increase the activity of human organs. (Peng Cheng, 2017) In the lives of the 21st century, the link between man and machine has become intertwined as a result of these criticisms, regardless of which particular viewpoint one may hold.

The tendency of computationalism has also reached an irreplaceable point, which coincides with the growth of artificial intelligence to a new height. It does not matter whether we are talking about the global environment, the preparation or battle environment of the military, or any other environment; the link between man and machine has totally engulfed all activities. This is not merely a numeric engagement rather it is a comprehensive coordination of the psychological and bodily levels. (Mgbemena et al.,2020) This is due to the fact that the relationship between man and machine brings about an abundance of benefits, not only in terms of the reduction of time, but

also in terms of the engagement of manpower, which significantly contributes to the provision of significantly more effective, real-time and high-quality decision-making.

When it comes to boosting combat efficiency, decision-making ability and overall military effectiveness, the link between man and machine is a crucial factor. People use the terms officers, soldiers and support personnel when they are referring to members of the military. The equipment, technologies and systems that soldiers carry with them are referred to as machines. When employed on the battlefield or in military administration, the two components have the ability to build a mutually beneficial connection. This kind of partnership allows soldiers to fully harness the potential of technology to carry out the most effective task with the least amount of labour. At the same time, machines are additionally regulated and utilized in an efficient manner in order to accomplish strategic objectives. As a result, human-cantered technology design is of utmost significance in order to properly connect the relationship between man and machine in the military workstation and to play a more significant role.

The user should be the primary focus of the design process for all machine systems and software, with an emphasis on usability, intuitiveness and simplicity of interfaces. Because of this, members of the military will be able to engage with technology efficiently without subjecting themselves to significant training. At the same time, this will empower senior decision makers to make speedy decisions in high-pressure situations by utilizing command and control systems that are straightforward to operate and have user-friendly interfaces. In the most basic terms, for instance when it comes to the utilization of robots for the purpose of mine clearance operations, the simpler the operation, the simpler it will be for demanders to control the system, which will ultimately result in the demining process being more convenient and safer. However, if the system needs to be supported by a number of people and the interface is quite complicated, then even the most expensive and secure computer will not be able to effectively meet tactical goals when it is employed in a combat scenario. Consequently, a user-friendly interface has the potential to effectively strengthen the human-machine relationship, completely prevent interference and cross-connection, guarantee that combat people are able to utilize it effectively and significantly improve flexibility. There is no such thing as the best machine rather there is simply the machine that is the most appropriate for our needs.

In the context of the link between man and machine, Human-Machine Teaming (also known as HMT) is an additional important way that really must be stressed. This is an assisted interaction between man and machine that is far more effective and efficient than each side can do on their own to execute complicated tasks. As a result, artificial intelligence, robotics and autonomous systems are becoming increasingly crucial. High-end machines, such as drones, self-driving military vehicles and robotic systems are able to collaborate with military operators in the context of the interaction between autonomous systems and operators. (Richard Berkebile, 2018) In order to have a better understanding of one another and to have more trust in one another, operators and the systems that they operate need to have effective transparency and human-machine trust.

Taking into account the functioning of artificial intelligence or autonomous systems, it is recommended that certain decisions be made by the system itself but at the same time guaranteeing that military operators are able to intervene when it is required. Confidence can be built while lowering concerns in high-risk scenarios, hence reducing behaviours such as accidental injuries to civilians or damage to public facilities. This can be accomplished through the efficient transparency of the system. It goes without saying that the utilization of aid from artificial intelligence is likewise unavoidable. The algorithms that make up artificial intelligence are capable of processing vast volumes of data more quickly than humans. In the instantaneous environment of the battlefield, soldiers are prone to making recognition errors or delaying judgments.

Systems that utilize artificial intelligence make it possible to conduct real-time analysis of the situations on the battlefield, allowing for the provision of effective fighting commands or judgments. Take for instance the recent conflict between Russia and Ukraine. A comprehensive demonstration of the enormous benefits brought about by human-machine collaboration was carried out by the Ukrainian military. In order to accomplish their goals, soldiers can use drones to manage or supervise a group of drones for the purpose of conducting reconnaissance or providing logistical support. They can even use drones to produce self-destruct bombing. Additionally, in the Nagorno-Karabakh War that took place in 2020, Azerbaijan utilized drones to cause significant damage to Armenia. It is clear that the utilization of artificial intelligence aid in conjunction with autonomous systems and innovative combat ways, along with minimum operator supervision, has the potential to bring about a variety of combat theories, as well as results that are of an extremely cheap cost and high efficiency.

A further area in which the interaction between man and machine can be seen is in the field of logistics. On the battlefield, logistics is frequently a significant component that can have a significant impact on the outcome. It is possible to accomplish automated transportation and supply efficiency through the use of a systematic logistics function. This will make sure to send medical help and ammunitions to the front line in a timely manner. At this crucial juncture, the mechanical device has the potential to perform the function of automated logistics. In order to reduce the risk of combat personnel and to ensure the safety of logistics personnel, the logistics staff are able to arrange the materials in the rear and automatically distribute the essential items that are required by the front line to the appropriate locations. This is done in accordance with the requirements of each unit. At the same time, the autonomous system is able to connect the machine itself as well as the equipment to the utilization of big data.

Using robots to repair equipment, vehicles, armoured vehicles and fighters minimizing downtime ensuring that military activities are under control, reducing the uncertainty created by maintenance or damage and allowing the machine to keep its reliability in combat are all ways to detect and predict the need for maintenance. The only thing that the operator needs to do in order to have the automated maintenance system ready is to supervise and distribute the burden through the autonomous system. This is not a dream rather it is the path that the military of the world will take in the future. The practice of continuing to rely on human strength policy or sheer manpower is antiquated and has been eradicated by the course of history.

Following that, MAF should require an integrated command system in order to take the relationship between humans and machines to a higher level. A number of different machines or systems are typically integrated into the command centre. Examples include unmanned aerial vehicles (UAVs), combat aircraft, satellites, support equipment, transport vehicles, warships and the communications tools of soldiers. Through the consolidation of a substantial amount of data, we are able to arrive at decisions that are more well-informed, to deploy combat forces early, or to compensate for the outcomes of the battle. The machine interface is something that commanders and soldiers need to be familiar with in order for them to be able to retrieve the appropriate data at the appropriate time and make the appropriate recommendation. Consequently, in order to function properly within this integrated command structure, sophisticated communication networks are required. In order to facilitate machine connection while the task is

being carried out, military personnel are required to rely on a communication network that is both secure and powerful.

It will be the first choice to use 5G networks, secure satellite communication systems and encrypted data channels in order to guarantee that soldiers and machines will remain connected, even in distant or hostile locations and that they will be able to communicate without any obstructions. This is due to the fact that all machines, sensors and combat personnel need to connect with one another in a seamless manner in order to guarantee that troops and command centres are able to acquire accurate implementation information and have a clear understanding of the criteria that have been outlined above regarding the battlefield situation. Therefore, the Malaysian military invested large of money on integrated command system (network-centric warfare) in order to build the concept of an effective communication and data exchange system.

Rome was not constructed in a single day, despite the fact that this system has not yet been put into formal use. Clearly enhancing our fighting capabilities is only possible with the implementation of an efficient integrated command system that is characterized by high levels of transparency and long-term improvements in organizational structure. The fact that this will result in a significant rise in the amount of money spent on the military cannot be denied. This also demonstrates the zeal and awareness of the human-machine link that the Malaysian military possesses in terms of enhancing the effectiveness of battle. Therefore, the only way to ensure that soldiers are able to easily operate machines and reduce their physical and cognitive burdens through automation is to ensure that we effectively connect people and machines, strengthen human-cantered design methods or interfaces, provide continuous training, establish communication systems that are seamless and cultivate trust between operators and the systems they use. It is clear that the relationship between humans and machines has the potential to significantly enhance the effectiveness of military operations and the percentage of successful missions. The enhancement of the human-machine interface is frequently an incalculable expense and a significant burden on the national economy. This is something that cannot be denied in terms of the expenditures that are made for the military. On the other hand, this is unavoidable by virtue of concerns regarding national sovereignty and security.

MAN-METHOD

The linking of people and methods is yet another approach. One of the most important things is to ensure that the personnel (people) are seamlessly integrated with the operational procedures, theories, doctrines and decision-making processes. In order to accomplish this, it is necessary to guarantee that military personnel are able to successfully integrate into the overall fighting system, achieve strategic triumph through organizational goals and make use of the procedures and techniques that are utilized. The way that is most readily apparent is the correlation between theory and strategy. Every single combatant is required to have a comprehensive comprehension of the military doctrine and military strategy of own army and they must also ensure that they are able to effectively apply the pertinent strategies and theories that they have acquired in training to their respective responsibilities. They are required to have a comprehensive understanding of military philosophy and the ability to strike a balance between humanitarian rules, combat tactics and operational aims.

For the purpose of providing theoretical instruction at all levels, the Army has both an Officer College and a Soldier College in addition to the training centres that are individual to each corps of the military. In addition, the Senior Officer Staff College and the National Defence College are both part of the three-service joint level. By means of a series of training sessions, in conjunction with annual simulation exercises, which may take the form of live-fire exercises or sandbox exercises, it is possible to guarantee that all combatants, ranging from soldiers to officers have a comprehensive understanding of the practicability of military theories, as well as their shortcomings and advantages. Subsequently, regular briefings and seminars are held to discuss decisions that are in accordance with our strategic objectives in a variety of scenarios. All combatant should be fully integrated with the procedures and philosophies of the military.

In the following step, training and skill development must be adapted to the specific conditions of the nation. This is due to the fact that military operations need to be adaptable in order to be able to undergo continuous transformations, adjust to varying battlefield situations, and successfully implement pertinent combat procedures and theories in an environment that is continuously changing. Since our nation's independence, we have consistently accepted military theories from the United Kingdom or Australia, in addition to incorporating some of our own distinctive domestic battle experience. Specifically, during the time of the domestic emergency, certain military techniques are utilized for the purpose of training. Since the passage

of time has progressed, it's possible that many theories or ways of fighting are no longer applicable to the technology or equipment that are available today. A significant amount of importance has been placed on new military ideas, as well as professional and cross-functional training. For this reason, our armed forces constantly stress the importance of conducting a comprehensive assessment of all strategic ideas and combat tactics once every five years. Specifically, this is due to the fact that whenever our nation acquires new pieces of equipment or weapons, there will be modifications to the fighting processes, increased flexibility and a more diverse approach to battle thinking.

In order to be effective, methods need to be multi-dimensional, diverse, extremely flexible and adaptable. Only the most appropriate strategies can equip soldiers with the ability to engage in effective warfare in a variety of circumstances. Without a doubt, regardless of how effective the military theories and procedures may be, leaders at every level are required to set an example for others to follow. Leaders that are effective are able to instil theories and strategic thinking in their individual teams, as well as build the relationship between soldiers and tactics. Combatants can only improve their ability to implement theories and tactics through continual learning if they utilize this method. Because of this, having outstanding trainers or leaders is absolutely necessary in this aspect.

In addition to that, after the ongoing revision of operational processes or doctrines, the combination of leadership and sense of responsibility will play a fundamental role in the future. The ability of the troops to carry out their duties must be reflected in the leaders at every level. If they want to demonstrate or implement theories and procedures, commanders need to set an example for others to follow. At every level of command, commanders are required to display a comprehensive awareness of military procedures and to actively implement these doctrines when making decisions or conducting operations. It is important for subordinates to observe that their leaders adhere to theories and plans in a rigid manner and then they should follow suit. There is no denying the fact that every officer and leader have their own unique style of leadership. In order to ensure that the overall military strategy is consistent and that there is no cognitive bias in the ultimate strategy, each commander is able to apply a leadership framework that is tailored to their own preferences and change their tactics in accordance with the circumstances that are occurring in the present moment.

In order to guarantee that all combatants are held accountable, the accountability system must be put into place for those soldiers who are unable to comply. Keep in mind the appropriate procedures and theories. Make sure that the accountability system is implemented in a fair and equitable manner by conducting regular performance reviews, mission reports and providing excellent feedback. This will prevent them from having a mentality of being influenced by a single event. It is only through this manner that it is possible to mix people and methods in such a way that they contribute to the overall operational strategy. On the basis of this it is clear. Still, the mentality of individuals (soldiers) is the most important factor in establishing connections between people and procedures in military organizations. Approaches are unchanging, whereas individuals are subject to change. It does not matter how successful the methods are or how complete the ideas are if individuals are unable to fully comprehend and effectively apply them, the entire business will still be unable to change. In a setting that is both complicated and dynamic, it will be impossible to progress toward military objectives while simultaneously implementing reforms.

CONCLUSION

In short, the reform of the military is impossible without the participation of people, machines, and method. The Malaysian Armed Forces will be able to significantly improve their fighting capabilities if they are able to successfully link people, machines, and method. It is necessary to change or improve all of the three key components, which include human resources, decision-making, logistics, training, leadership, military technology and combat procedures among other things. The Malaysian military should be able to maintain a high degree of sensitivity, continue to perform effectively and continue to engage in combat efficiently. This can be accomplished by continual feedback and updating. Despite the fact that it appears to be straightforward, it must be put through a number of tests that are grounded in reality. For instance, a great deal of opposition and criticism will be brought about by some factors, such as talent, economy, technology, land governor distribution, people's awakening, and so on. In spite of the fact that Malaysia has always committed to peaceful coexistence, the country does not permit an excessive amount of national resources to be invested in unknown threats.

Military reform is something that cannot be stopped in the wheel of time. The first thing that our military needs to do in order to guarantee that all of the resources that are allocated to the military are utilized in an efficient and successful manner is to implement a military policy that is both methodical and prepared for the long term. The most obvious

illustration of this is the utilization of the same type of transport aircraft or helicopters. It is possible for the all services to share the responsibility of assigning teaching staff and trainees if they have a training centre that is equipped with the same technology. It is possible to distribute the resources and instructors among the three training facilities for the armed forces in a consistent manner. By doing so, wasteful expenditures in the areas of arms purchase and training will be significantly reduced. This is despite the fact that there may be a situation in which certain parts and logistics are stuck during operations need. But as long as the Malaysian military acts in accordance with the United Nations Charter and ensures that Malaysia's military stance will not favour any country or harm the interests of other countries, the procurement of machines logistics should not be a major problem.

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THE TRILOGY OF MAN, MACHINE AND METHOD IN HOLISTICALLY ENHANCING THE FUTURE OF MALAYSIAN ARMY

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INTRODUCTION

The Malaysian Army is celebrating its 31st anniversary, a milestone that underscores its growth and development. As the army has matured, it has continuously adapted and evolved, keeping pace with the rapid advancements in global technology. This evolution is evident in the army's increased versatility and capability, reflected in its strategic acquisition of advanced, high-tech assets. These assets are designed to ensure that the Malaysian Army's capabilities are on par with those of neighbouring countries, thereby enhancing its operational effectiveness and readiness.

Furthermore, the Malaysian Army has strongly emphasised improving the educational standards for its officers and enlisted personnel. By raising these standards, the Malaysian Army demonstrates its commitment to nurturing a knowledgeable and skilled workforce. This focus on education ensures that personnel are not only adept in their roles but also capable of adapting to and leveraging new technologies and strategies. As a result, the Malaysian Army's human resources are well-equipped to support and drive ongoing modernization efforts and the integration of new assets, aligning seamlessly with the army's strategic goals and modernization plans.

In recognition of these crucial needs, the 30th Chief of Army (COA), Jeneral Tan Sri Datuk Wira Hafizuddeain bin Jantan, presented his strategic vision in his *Perintah Ulung* issued on October 31st, 2023. His comprehensive framework centres around the synergy of **3M; Man, Machine, and Method** designed to drive the achievement of three pivotal objectives: Readiness, Organizational Sustainability, and Professional Integrity.

By emphasizing "Man," COA underscores the importance of developing a skilled and knowledgeable workforce capable of adapting to evolving challenges. "Machine" represents the integration and utilization of advanced technologies to enhance operational efficiency and effectiveness. At the same time "Method" highlights the implementation of innovative strategies and practices to streamline

processes and maintain high standards. Through this strategic vision, he aims to transform the Malaysian Army into a highly credible future force, equipped to meet future demands and uphold its reputation on the global stage. This approach not only positions the Army for operational excellence but also ensures its enduring relevance and resilience in an increasingly complex and dynamic environment.

PERSPECTIVES ON THE MAN, MACHINE AND METHOD TRILOGY

The COA's perspective on the integration of the 3M synergy in strengthening the Malaysian Army is indeed aligned with the arguments presented by military theorists such as Rupert Smith and P.W. Singer. As clearly seen, several developing nations globally are adopting the 3M trilogy as a cornerstone of their military development strategies. This adoption is driven by the trilogy's interdependent framework, where each element is intricately interconnected and mutually reliant, ensuring a cohesive and synergistic approach to building effective military capabilities.

Rupert Smith (2005) in his book "The Utility of Force: The Art of War in the Modern World", explores the crucial role of human factors, including the conduct and leadership of soldiers; the integration of advanced technology, such as modern weaponry and communication systems; and strategic methods, encompassing both tactics and operational strategies, in contemporary military operations. Smith thoroughly explores the profound impact of human elements in contemporary military operations. He emphasizes the essential role of soldiers' conduct and leadership, arguing that these factors are not merely supportive but fundamentally crucial to operational success. Smith illustrates how effective leadership and disciplined conduct among military personnel are pivotal in navigating the complexities of modern conflict, where technology and strategy alone cannot achieve victory without the human element driving them.

On the machine side, Smith delves into the revolutionary impact of advanced technology on military operations. He provides a comprehensive analysis of how modern weaponry, from precision-guided munitions to advanced defence systems, has transformed the nature of combat. Similarly, he examines the role of sophisticated communication systems that enhance real-time coordination and information sharing among forces. Smith's discussion highlights how these technological advancements have not only increased the precision and efficiency of military engagements but have also fundamentally altered the strategic and tactical approaches to warfare.

Additionally, Smith covers the evolution of tactical and operational strategies in contemporary conflicts. He analyses how military methods have adapted to new realities, including the complexities of modern warfare environments. Smith explores various tactical approaches and strategic frameworks that have emerged to address the unique challenges of today's multifaceted battlespaces. His analysis provides insight into how armed forces must continually evolve their tactics and strategies to maintain effectiveness in an ever-changing global landscape.

Besides Rupert Smith's perspective on the 3M trilogy, P.W. Singer also offers his interpretation of this trilogy. Singer in his book "Wired for War: The Robotics Revolution and Conflict in the 21st Century," elucidates the interconnectedness of the 3M trilogy, which is driving transformative changes in the military landscape. He explores how advancements in technology and robotic systems (Machine) are reshaping military strategies and operations, while also considering the implications for personnel (Man) and operational methods (Method). Singer's analysis provides a comprehensive understanding of how these elements interact to redefine modern warfare. Although he places considerable emphasis on the use of robotics and unmanned vehicles in his writing, the discussion of the 3M synergy is significantly evident, demonstrating the interdependence of these three elements.

Singer explores how humans interact with and control robotic systems. He emphasizes that despite advancements in robotics, human operators remain central to the operation and management of these technologies. The effectiveness of robotic systems often depends on the skills, decision-making capabilities, and judgment of their human controllers. He examines the need for specialized training for military personnel to effectively operate and manage robotic systems. He also notes that as robotics technology becomes more integral to military operations, soldiers must adapt to new roles that involve managing advanced systems and interpreting data from these technologies. On the leadership approach, the integration of advanced technologies can shift command structures and decision-making processes, requiring leaders to adapt to new forms of operational control and coordination involving robotic systems.

He then explores how the integration of robotics and unmanned systems is transforming traditional military strategies. These technologies enable new forms of warfare, including precision strikes, remote surveillance, and automated responses, which shift the strategic focus from large-scale engagements to more targeted, technology-driven operations. Robotics does alter the dynamics of

warfare by introducing new methods of engagement and combat. The use of autonomous systems can change the tempo and nature of conflicts, potentially leading to faster, more dynamic engagements and the need for innovative operational approaches.

NATIONAL ASPIRATION AND MALAYSIAN ARMED FORCES PLANNING TOWARDS FUTURE FORCES

Unveiled in December 2019, Malaysia's Defence White Paper (DWP) stands as the cornerstone of the nation's defence strategy, setting a clear and comprehensive roadmap for the decade ahead (2021-2030). This pivotal document articulates Malaysia's strategic imperatives to protect national sovereignty, preserve territorial integrity, and ensure the security and prosperity of its people in the face of dynamic global and regional challenges. Through the DWP, Malaysia reaffirms its commitment to adapting its defence posture to an increasingly complex security environment. The Defence White Paper (DWP) outlines several key objectives that are crucial to shaping Malaysia's defence strategy for the future:

- **Modernization of the Armed Forces**. A primary focus is on upgrading military hardware and incorporating advanced technologies to enhance the operational readiness and effectiveness of Malaysia's defence forces.

- **Human Capital Development**. The DWP emphasizes the importance of investing in the recruitment, training, and overall welfare of military personnel, aiming to build a highly skilled, professional, and resilient force capable of meeting modern security demands.

- **Defence Diplomacy and Regional Cooperation**. Strengthening diplomatic ties and fostering partnerships, particularly within ASEAN, is a priority to collectively address shared security challenges and enhance regional stability.

- **Cyber and Information Warfare**. Recognizing the growing threat of cyberattacks, the DWP stresses the need for developing robust cyber defence capabilities to safeguard critical infrastructure and counter emerging cyber threats in an increasingly digitized world.

- **Domestic Defence Industry**. Promoting and expanding the local defence manufacturing sector is seen as vital for achieving technological self-reliance, while also contributing to

national economic growth and innovation in defence technologies.

As outlined in the key objectives of the Defence White Paper (DWP), the government has strategically concentrated on the transformation of the Malaysian Armed Forces (MAF) to become a cohesive, agile, and focused force. This transformation is designed to ensure the MAF's capability to effectively address a broad spectrum of threats, which include both conventional security challenges and unconventional, emergent threats, whether these occur in periods of peace or during times of conflict. The overarching goal of this development strategy is to elevate the MAF to a high level of operational readiness. This means that the armed forces will be prepared to undertake military operations in an environment characterized by security uncertainties and rapid changes. The plan envisions a robust and adaptable force structure that can swiftly respond to dynamic and complex scenarios.

Central to this enhancement is a meticulously crafted long-term investment framework. The government has committed to this framework by ensuring substantial and sustained investment in the MAF's modernization. This includes the acquisition of advanced military assets and state-of-the-art equipment necessary for effective operations. Furthermore, the investment extends to the development of human capital, emphasizing the importance of a workforce that is not only well-equipped but also possesses a high degree of expertise, specialized knowledge, and technical skills. This approach aims to foster a highly capable and resilient military force, ready to tackle both conventional and unconventional threats in a variety of operational contexts.

In response to the evolving defence requirements and national security goals, the MAF has meticulously crafted an action plan dedicated to the development and enhancement of its military capabilities. This plan is designed to align closely with the broader defence aspirations of the nation, ensuring that the MAF remains a formidable and effective force. Building on the foundations laid by previous strategies, the National Military Strategy (SKN) 2.0 represents Malaysia's updated National Military Strategy. It aligns closely with the DWP, providing a detailed roadmap for operationalizing the DWP's strategic objectives. It also provides a structured framework and strategic direction that the MAF utilizes to guide its development efforts. This updated strategy is a pivotal component of the overall action plan, serving as a comprehensive and detailed roadmap for the MAF's future. The core components of SKN 2.0 focus on enhancing

Malaysia's defence capabilities through a comprehensive and forward-looking approach:

- **Integrated Defence Planning**. Achieving alignment between military strategies and national security policies through coordinated planning and effective execution, ensuring a unified approach to defence.

- **Force Structure Optimization**. Reconfiguring the Armed Forces to improve adaptability to present and future threats, prioritizing flexibility, rapid deployment, and enhanced operational readiness.

- **Enhanced Interoperability**. Fostering seamless collaboration across all branches of Malaysia's military, as well as with allied nations, to facilitate joint operations, intelligence sharing, and mutual support in complex security environments.

- **Technological Innovation**. Prioritizing research and development in cutting-edge defence technologies, such as unmanned systems, artificial intelligence, and cyber capabilities, to stay ahead of evolving threats.

- **Sustainable Defence Practices**. Incorporating environmentally sustainable practices within defence operations, infrastructure, and development projects, ensuring long-term operational efficiency and ecological responsibility.

The SKN 2.0 is designed to clarify and define the MAF's mission and vision with greater precision. It provides a structured approach to strategic planning, ensuring that all aspects of the MAF's development are integrated and aligned with national defence objectives. This holistic strategy not only addresses immediate and emerging threats but also positions the MAF to achieve long-term military goals. The significance of the SKN 2.0 extends beyond mere strategic alignment; it is essential for driving the MAF towards the specific military objectives articulated by the government. By doing so, it enhances the MAF's strategic capabilities and operational effectiveness. This development plan aims to fortify the MAF's role as the principal entity responsible for defending the nation's sovereignty, ensuring that it can effectively respond to a range of security challenges and uphold national interests in an increasingly complex global security environment.

THE MALAYSIAN ARMY UPHOLDS THE ASPIRATIONS OF THE NATION AND THE MALAYSIAN ARMED FORCES

As discussed at the beginning of this discussion, the Malaysian Army is making significant strides towards becoming a more dynamic, versatile, and modern military force. This transformation is aimed at enabling the Malaysian Army to compete effectively and on equal terms with the armed forces of neighbouring countries. Furthermore, this shift is intended to strengthen and streamline the existing military system to become more sophisticated and capable of defending national sovereignty. This vision is clearly articulated in the Army 4nextG framework and the Land Domain Strategy (SD2), which serve as fundamental guides for the modernization of the Malaysian Army.

The Malaysian Army is undertaking an extensive modernization effort to boost its operational capabilities and strategic effectiveness. This initiative is essential for adapting to the rapidly changing security landscape and ensuring the Army remains competitive with neighbouring armed forces. The modernization aims to make the Army more dynamic and versatile by integrating new technologies, enhancing operational flexibility, and improving its capacity to address a broad spectrum of threats. The objective is to develop a force that can swiftly adjust to evolving circumstances and effectively manage both conventional and unconventional security challenges.

This comprehensive modernization includes upgrading military hardware, adopting advanced technologies, and refining training programs. The effort is designed to enhance the Army’s efficiency and capability to operate within a complex, technologically advanced environment. Through these modernization efforts, the Malaysian Army intends to maintain parity with the armed forces of neighbouring countries. This requires not only upgrading equipment and technology but also advancing operational strategies and tactics to sustain a competitive edge in the region.

To elaborate more, this initiative is strategically aimed at reinforcing and refining the current military system to enhance its overall effectiveness and sophistication. This comprehensive effort involves a multifaceted approach to upgrading the Malaysian Army's organizational structure, improving its strategic planning capabilities, and ensuring that its systems and processes are advanced and efficient. By focusing on these areas, the modernization seeks to integrate cutting-edge technologies and methodologies, thereby increasing the Army's operational effectiveness and adaptability. By advancing its capabilities and refining its operational systems, the Army

will be better prepared to safeguard the nation's borders, respond promptly to emerging threats, and ensure comprehensive national security. This improved capability will enable the Army to maintain a robust defence posture and address potential security challenges with greater precision and effectiveness.

In essence, the modernization effort is a transformative process that seeks to bring the Malaysian Army's organizational structure, strategic planning, and operational systems up to the highest standards of modern military practice. By integrating sophisticated technologies and enhancing strategic and operational efficiency, the Army will be well-positioned to fulfil its role in protecting national interests and securing the country's sovereignty. This initiative represents a significant step towards ensuring that the Malaysian Army remains a formidable and effective force in an increasingly complex and dynamic security environment.

3M SYNERGY: SHAPING THE FUTURE OF THE MALAYSIAN ARMY

The vision of the Malaysian Army, as articulated through the 30th Chief of Army inaugural directive, revolves around the concept of the 3M Trilogy, which includes Man, Machine, and Method. This trilogy is not just a slogan, but the foundation of TDM's strategic transformation to meet future military challenges. Each of these three elements is interconnected and plays a vital role in ensuring that TDM develops into a dynamic, modern, and effective force.

The first element of the "3M Trilogy" is "Man", representing the soldiers who form the backbone of any military organization. In his directive, COA highlights that the true power and effectiveness of a military force are determined not just by its weapons or technology but primarily by the quality of its personnel and leadership. This concept places a strong emphasis on the human capital of the army, recognizing that well-trained, motivated, and capable soldiers are the key to achieving operational excellence. This vision for "Man" focuses on several core aspects:

- **Training**. The development of highly skilled soldiers is essential. Rigorous and continuous training ensures that personnel are capable of adapting to new technologies, strategies, and battlefield environments. This includes both physical and mental preparedness.

- **Education**. Beyond technical skills, the vision emphasizes intellectual growth and critical thinking. This ensures that soldiers, especially leaders, can make informed and strategic decisions. Education programs aim to foster a deeper understanding of military doctrine, leadership principles, and global defence trends.

- **Leadership**. Strong leadership is viewed as a crucial component of this element. The ability to inspire, guide, and make decisive, ethical decisions is vital for any military organization. Leadership development programs aim to cultivate officers and NCOs (Non-Commissioned Officers) who can command with authority and compassion, building trust among their teams.

- **Welfare and Well-being**. Recognizing that soldiers' effectiveness is tied to their well-being, the vision also incorporates aspects of welfare. This includes looking after the mental health, physical health, and overall quality of life for military personnel. Ensuring that soldiers and their families are supported both on and off duty fosters loyalty and enhances morale, which is critical to sustaining a capable and committed force.

By prioritizing the development of its people, the Malaysian Army seeks to build a professional, resilient, and adaptive fighting force. This holistic focus on "Man" reflects the belief that, ultimately, it is the soldiers armed with training, knowledge, and leadership that will define the success of the army in any conflict or mission.

The second element is "Machine", representing the vital role that technology and modern equipment play in the military. In an age where warfare is becoming more sophisticated and multifaceted, the reliance on advanced technologies has become essential for maintaining a competitive edge. Malaysian Army recognizes that technology is a force multiplier, enhancing the effectiveness, speed, and precision of military operations, and is critical for ensuring that this organization can face both traditional and emerging threats. In this context, "Machine" refers to several key aspects:

- **Modernization of Equipment**. To stay relevant in contemporary warfare, the Malaysian Army must continuously upgrade its arsenal. This includes acquiring state-of-the-art weapons systems, vehicles, aircraft, and communication tools. Modernizing military equipment ensures that the Malaysian

Army can effectively respond to threats, maintain operational readiness, and achieve superiority on the battlefield. Upgrades may involve replacing outdated machinery or integrating new technologies that offer improved capabilities.

❖ **Technological Innovation**. The COA stresses the need for the Malaysian Army to embrace innovation, whether in terms of weapons, defence systems, or support infrastructure. Advanced technologies like drones, artificial intelligence (AI), cyber defence mechanisms, and unmanned systems are becoming increasingly integral to military strategy. By adopting such innovations, the Malaysian Army can better detect, track, and neutralize threats while reducing the risk to personnel.

❖ **Operational Efficiency**. Modern machines enhance not just combat power but also the logistical and support systems that sustain military forces. Sophisticated surveillance, reconnaissance, and data-processing systems improve decision-making and operational execution by providing accurate, real-time information. Additionally, modern equipment reduces the time needed for tasks like transport, communication, and resupply, ensuring smoother and faster operations.

❖ **Interoperability**. As Malaysia continues to engage in international military collaborations, the COA also emphasizes the importance of ensuring that the new equipment is interoperable with those of allied nations. Having technology that can seamlessly integrate with the systems of partner forces is critical for joint operations, exercises, and missions.

❖ **Cyber and Electronic Warfare**. Beyond physical machinery, the “Machine” element also includes tools for cyber defence and electronic warfare. In the modern battlefield, electronic systems can be targets for disruption or manipulation, and having robust capabilities to protect, defend, and counter such threats is crucial.

By focusing on the upgrading and modernization of equipment, the Malaysian Army is positioning itself to navigate the complexities of modern warfare, ensuring that its soldiers are equipped with the most reliable, efficient, and advanced tools available. This emphasis on technological advancement supports the Malaysian Army’s broader goal of becoming a highly capable and adaptable force capable of facing the challenges of 21st-century military operations.

The third element of this trilogy is “Method”, which pertains to the strategic and operational approaches that the military adopts to conduct its missions. The 30th COA underscores that, in order to effectively face the challenges of the future, the Malaysian Army must embrace a more flexible, adaptive, and innovative approach to warfare. This element focused on evolving military doctrine and tactics to ensure that the Malaysian Army can respond to the dynamic nature of modern conflicts. Key aspects of “Method” include:

- **Strategic Flexibility**. The military must develop a range of adaptable strategies that can be tailored to various types of conflicts. Whether dealing with conventional warfare, peacekeeping operations, or disaster relief, the ability to swiftly change tactics based on the situation is crucial for mission success.

- **Innovation in Operational Tactics**. Modern warfare demands constant innovation. Traditional battle formations and methods are no longer sufficient in a world where combat is increasingly digital, decentralized, and multi-dimensional. There is a need for the continuous refinement of tactics, incorporating lessons learned from contemporary conflicts and adapting to new technologies. This includes exploring unconventional approaches such as hybrid warfare, which blends military force with cyber, information, and economic strategies.

- **Geopolitical Awareness**. The Malaysian Army’s operational approaches must take into account the evolving global geopolitical landscape. Conflicts today are often influenced by international politics, economic conditions, and alliances, making it essential for military strategies to align with the broader geopolitical context. By understanding the global power dynamics, The Malaysian Army can anticipate threats, form strategic partnerships, and operate effectively in multinational coalitions.

- **Asymmetric Threats**. The Malaysian Army acknowledges that future conflicts will increasingly involve asymmetric threats, where non-state actors such as insurgents, terrorists, and guerrilla forces challenge conventional armies. These groups often use unconventional tactics, such as ambushes, IEDs (Improvised Explosive Devices), and guerrilla warfare, which require a different kind of response. Our “Method” must therefore include counter-insurgency strategies,

counter-terrorism operations, and methods for dealing with irregular forces that operate outside traditional battlefields.

❖ **Cyber and Information Warfare**. The cyber domain is now a critical battleground, and military operations can no longer ignore the digital aspects of modern warfare. Cyberattacks, electronic warfare, and information manipulation are increasingly used to weaken adversaries without physical confrontation. It is a need for the Malaysian Army to build its capabilities in cyber defence, intelligence gathering, and information operations to protect critical infrastructure, disrupt enemy communications, and maintain an information advantage in conflicts.

❖ **Joint and Multidimensional Operations**. Warfare today requires integrated operations across multiple domains; land, sea, air, space, and cyberspace. We must develop methods that enable smooth coordination between different branches of the military and other security agencies. This also includes collaboration with international partners, requiring joint operations that can span across national boundaries and involve combined arms tactics and interoperable systems.

By embracing flexibility and innovation, the “Method” element ensures that the Malaysian Army is prepared to respond to both traditional and emerging threats. It allows us to operate in a rapidly changing security environment, where challenges can arise from unexpected directions. The focus on adapting military doctrine, understanding the broader geopolitical landscape, addressing asymmetric threats, and strengthening cyber capabilities ensures that the Malaysian Army remains a modern, agile, and capable force that is ready for the complexities of 21st century warfare.

CONCLUSION

With a focus on Man, Machine, and Method, the 3M trilogy is set to become the key to improving the Malaysian Army in the future. From the perspective of “Man”, underscores the paramount importance of human capital within the military framework. The advancements in training and welfare will ensure that the Malaysian Army possesses highly skilled, motivated, and resilient personnel, which is fundamental to the success of any military force. This commitment to human capital is aligned with global military theories that emphasize the essential role of leadership and conduct in operational success. By investing in rigorous training programs and professional development, the

Malaysian Army aims to ensure that its personnel are not only adept in their roles but also capable of leveraging new technologies and adapting to evolving strategies.

From the “Machine” standpoint, incorporating modern technology will bolster the Malaysian Army's ability to address increasingly sophisticated threats, whether they are physical or cyber. In an era where technological advancements are rapidly transforming the landscape of military operations, the role of “Machine” cannot be overstated. By incorporating these high-tech assets, the Malaysian Army aims to maintain parity with neighbouring countries and address a broad spectrum of threats. This emphasis on technological integration is in line with global military trends that highlight the transformative impact of technology on warfare. The strategic focus on modernizing equipment ensures that the Malaysian Army remains at the forefront of military innovation, capable of executing operations with greater precision and effectiveness.

Finally, from the “Method” perspective, adopting more flexible operational strategies and fostering international cooperation will help the Malaysian Army maintain its relevance and competitiveness in the global military arena. The focus on “Method” reflects a broader recognition of the need for continuous evolution in military strategies to remain effective in an increasingly complex security environment. By fostering a culture of innovation and adaptability, the Malaysian Army aims to ensure that its operational methods are aligned with contemporary security challenges and strategic objectives.

Overall, the 3M Trilogy represents a comprehensive and integrated approach to modernizing the Malaysian Army. By emphasizing the development of human capital, the integration of advanced technologies, and the adoption of innovative strategies, the Malaysian Army’s vision aligns with both global military theories and national defence strategies. This multifaceted approach is designed to enhance the army’s operational excellence, resilience, and relevance on the global stage. Through these strategic initiatives, the Malaysian Army is positioned to effectively address the complexities of modern warfare, maintain a competitive edge in the regional and global security environment, and uphold its commitment to national defence and security.

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THE ROLE OF MAN, MACHINE, AND METHOD IN SHAPING THE FUTURE OF MALAYSIAN ARMY CAPABILITIES

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INTRODUCTION

A holistic integration of human, technological, and strategic assets is required for armed forces to adapt to new threats in today's fast changing defence scene. This is necessary for the military to survive. The Malaysian Army is currently at a critical juncture in its efforts to improve its capabilities by concentrating on the combination of man (human resources), machine (technology and autonomous systems), and method (military plans and doctrines). The purpose of this assessment is to investigate how the combination of these three factors is influencing the future of the Malaysian Armed Forces, ensuring that they continue to be flexible, adaptable, and prepared to deal with both conventional and non-conventional security problems.

HUMAN RESOURCES AND CAPABILITY DEVELOPMENT

There is a strong correlation between the readiness and flexibility of a military force's members and the subsequent success of that force. Within the framework of the Malaysian Army, human capital is an extremely important factor in guaranteeing the successful deployment of new policies and technologies. Within the context of the 3M paradigm, the term "Man" alludes to the requirement for warriors who are highly trained, flexible, and capable of navigating modern warfare, which increasingly encompasses hybrid threats and the utilization of new technology such as Artificial Intelligence (AI) and autonomous systems.

❖ Skill Development and Training

The Malaysian Army's modernization necessitates the creation of skills and training programs designed for current conflict. These training initiatives seek to prepare soldiers with both conventional combat abilities and proficiency in technology-oriented warfare, including cyber defence, data analysis, and autonomous system operations. The emphasis on multidisciplinary training is essential as the Army adapts to integrate advanced technology such as AI and robotics. A

crucial domain of advancement is training in cyber defence and information warfare.

In response to the emergence of hybrid warfare, characterized by the integration of cyber-attacks and disinformation tactics in military conflicts, the Malaysian Army has initiated revisions to its training programs to incorporate cybersecurity and data management competencies (Loo, 2019). These abilities are essential for enabling military personnel to safeguard critical infrastructure and systems against cyber-attacks that could jeopardize war operations.

Furthermore, AI training is becoming integral to the Malaysian Army's skill enhancement initiatives. Military personnel are being instructed in the use of AI-augmented decision-making instruments, capable of analysing extensive battlefield data to provide commanders with immediate intelligence and recommendations for strategic manoeuvres (Zain, 2022). These AI systems can aid in activities such as danger identification, resource allocation, and mission planning; nevertheless, their efficient utilization relies on humans proficient in handling both data inputs and decision making output.

The Malaysian Army is prioritizing the development of cognitive resilience and leadership capabilities with technical skills in its soldiers. The erratic characteristics of contemporary combat necessitate that leaders possess the ability to make swift, educated judgments under intense pressure. The Army is incorporating scenario-based training, wherein soldiers participate in simulations that encompass both conventional combat and hybrid warfare situations, including cyber-attacks and disinformation campaigns (Rahman, 2021)

Moreover, leadership development programs are highlighting the necessity for leaders who possess tactical expertise and the ability to navigate intricate man-machine interactions. As robots and AI technologies increasingly integrate into military operations, leaders must comprehend how to utilize these tools while preserving the morale and cohesion of their human personnel. In this context, leadership encompasses both the management of personnel and the management of technology.

The Malaysian Army is conducting joint military exercises with regional and international allies, including Singapore, Thailand, and the United States, to advance skill development. These exercises enable soldiers to function in varied environments and situations, enhancing their interoperability with other forces. Collaborative training allows the Malaysian Army to assimilate best practices from its partners, especially with emerging technology such as drones and cyber defence systems (Zain, 2022). These training exercises familiarize soldiers with international command structures, equipping them for future operations that may include coalition forces. This is especially significant in Southeast Asia, where regional security issues frequently necessitate international collaboration.

❖ Psychological Resilience and Leadership

The psychological resilience of military personnel is essential for the efficacy and adaptability of armed forces. In the Malaysian Army, the integration of sophisticated technology, including autonomous systems and AI, renders the mental preparation of soldiers increasingly critical. This chapter emphasizes the cultivation of psychological resilience and the development of leadership capable of addressing both conventional and contemporary difficulties in modern conflict.

The escalating intricacy of contemporary warfare, particularly in hybrid warfare contexts where cyber assaults and information warfare converge with conventional battle, imposes a considerable psychological strain on soldiers. The Malaysian Army has acknowledged this and is concentrating on resilience training to assist soldiers in managing high-pressure circumstances.

Resilience training programs aim to augment the cognitive and emotional strength of soldiers, equipping them to handle stress, make rapid judgments under pressure, and recuperate from setbacks during operations. Chin (2020) asserts that resilience is an essential characteristic for soldiers who engage with both human teams and autonomous systems, necessitating a distinct skill set compared to conventional combat training. A fundamental aspect of psychological resilience is mental agility—the capacity for critical thinking and rapid adaptation to novel circumstances. Soldiers are trained to manage situations necessitating both physical and mental resilience, such as addressing cyber threats while concurrently

overseeing ground combat operations. This complicated style of warfare requires warriors that are proficient in battle and adept at multitasking and managing technological intricacies under pressure (Loo, 2019).

Leadership within the Malaysian Army is seeing a shift as new technology such as robotics and AI become increasingly integrated into military operations. Leaders must now oversee both their human teams and the technology that underpins them. Contemporary leadership necessitates the capacity to make rapid, educated judgments with data derived from both human insight and machine-generated analytics (Buang,2021).

The Army's leadership development programs now incorporate training cantered on human-machine interaction, equipping officers to manage teams that utilize autonomous drones, robotic vehicles, and AI-driven decision tools. Leaders must synthesize information from diverse sources, including traditional ground intelligence and AI-generated insights, while preserving the cohesion and morale of their human workforce. This is a divergence from conventional leadership training, which primarily emphasized interpersonal contact and authority (Rahman, 2021).

The notion of Emotional Intelligence (EQ) is progressively highlighted in leadership development within the Malaysian Army. Modern warfare encompasses not only direct combat but also psychological and informational aspects, necessitating that leaders cultivate emotional stability for themselves and their teams. Elevated emotional intelligence enables leaders to regulate their stress, communicate proficiently in high-pressure situations, and instil confidence in their subordinates (Loo, 2019).

Furthermore, leaders with emotional intelligence are better equipped to tackle the issues associated with the integration of sophisticated technologies in the military. As troops increasingly engage with AI systems and robotics, leaders possessing strong emotional intelligence can facilitate the integration of human personnel and technology, assuring seamless operations while resolving psychological or emotional opposition to these technologies (Chin, 2020).

TECHNOLOGICAL INNOVATIONS AND MACHINE INTEGRATION

The incorporation of modern technologies is reshaping the operational capabilities of the Malaysian Army. Advances in **robotics**, **unmanned systems**, and **AI** are central to the "machine" component of the 3M framework. These technologies not only enhance the Army's ability to conduct surveillance and reconnaissance but also minimize the risk to human soldiers by taking on high-risk tasks.

❖ Robotics and Unmanned Aerial Systems (UAS)

Unmanned Aerial Vehicles (UAVs) and robotics are important to the technical advancement of the Malaysian Army. These devices facilitate military surveillance, reconnaissance, and combat missions while minimizing risk to human people. UAVs, or drones, deliver real-time intelligence that improves battlefield awareness, facilitating better informed decision-making (Rahman, 2021).

UAVs have proven highly efficient in border security and marine surveillance, offering constant oversight of regions that are challenging or perilous for human personnel to reach. Drones are being outfitted with offensive capabilities, allowing them to accurately target adversaries with precision-guided missiles (Zain, 2022).

Robotic vehicles are being developed for logistical and support tasks, including the transportation of goods in conflict zones and the disarmament of explosive devices. These robotic devices diminish the necessity for human warriors to perform perilous duties, thus reducing losses (Chin, 2020). In disaster response situations, such as floods or other natural disasters, robots and UAVs have been utilized for search and rescue missions, highlighting the adaptability of these technology in both military and humanitarian applications (Zain, 2022).

❖ Artificial Intelligence (AI) and Machine Learning

AI is a vital component in the technical evolution of the Malaysian Army. AI technologies evaluate extensive battlefield data in real-time, assisting commanders in making swifter and more precise judgments during operations (Rahman, 2021). AI can analyse diverse inputs, including as surveillance footage, sensor data, and intelligence reports, to deliver predicted

insights into adversary movements, ideal strategic responses, and the probability of mission success.

Machine learning algorithms are integrated into cyber defence systems to facilitate real-time detection and response to cyber-attacks. These technologies may independently detect irregularities in network traffic and implement corrective measures without human involvement, thus enhancing the security of the Army's communication and information systems (Chin, 2020).

Moreover, AI is employed in war simulations to prepare soldiers for diverse circumstances. These AI-driven simulations generate dynamic environments for soldiers to rehearse tactical manoeuvres, decision-making, and cooperation with autonomous systems. This enhances soldiers' operational capabilities and assures their familiarity with the intricacies of man-machine collaboration (Zain, 2022).

❖ Integration of Cyber Defense and AI

The dependence on digital technology in military operations has rendered cybersecurity a paramount concern for the Malaysian Army. The implementation of AI-driven cybersecurity solutions enables the Army to safeguard its essential infrastructure from cyber-attacks that might potentially disrupt communications, intelligence, and operations (Chin, 2020). AI systems can independently oversee network traffic and identify potential dangers, like malware or hacking attempts, in real time.

This proactive strategy for cyber defence is crucial, especially as the Malaysian Army integrates further digital and autonomous technologies. The heightened dependence on networked systems, such as command and control platforms, renders the military susceptible to cyber-attacks that could incapacitate operational capabilities. AI-driven defences not only diminish response times but also guarantee that the Army can sustain operational continuity during a cyber conflict (Rahman, 2021).

Furthermore, AI is employed in war simulations to prepare soldiers for diverse circumstances. These AI-driven simulations generate dynamic environments for soldiers to rehearse tactical manoeuvres, decision-making, and

cooperation with autonomous systems. This enhances soldiers' operational capabilities and assures their familiarity with the intricacies of man-machine collaboration (Zain, 2022).

❖ **Challenges in Machine Integration**

Although technical developments offer significant advantages, the incorporation of machines into military operations presents obstacles. A primary concern is guaranteeing interoperability between human soldiers and technology. Military personnel must be educated to collaborate with autonomous systems, comprehend their constraints, and make rapid judgments informed by both human intuition and machine-generated information. This necessitates continuous training initiatives that highlight human-machine collaboration (Loo, 2019).

A further problem is the ethical quandary related to the deployment of autonomous systems, especially in military contexts. Autonomous systems capable of targeting adversaries prompt inquiries over responsibility and decision-making. Ensuring compliance of these systems with international humanitarian law (IHL), especially regarding the differentiation between combatants and non-combatants, continue to be a persistent challenge (Chin,2020)

Ultimately, there are apprehensions regarding the long-term viability of these technologies, especially concerning maintenance, logistics, and expenses. The immediate advantages of UAVs, AI, and robots are evident; yet, sustaining these systems in operational environments necessitates substantial resources and specialized technical knowledge. The Malaysian Army must invest in training soldiers to operate, maintain, and troubleshoot these systems in real-time combat scenarios (Rahman, 2021).

STRATEGIC METHODOLOGIES FOR MODERN WARFARE

As the nature of warfare evolves, modern military strategies must adapt to meet emerging threats, including **hybrid warfare**, **cyber conflicts**, and **non-state actors**. The Malaysian Army is rethinking its traditional doctrines and adopting **strategic methodologies** that integrate **advanced technologies**, **multinational cooperation**, and **flexible operational frameworks**. These methodologies are essential for maintaining security in a rapidly changing global landscape where

conventional military operations are often intertwined with new-age threats.

❖ Hybrid Warfare and Multidimensional Threats

Hybrid warfare, which combines traditional military tactics with irregular measures including cyber-attacks, disinformation, and proxy battles, has emerged as a pivotal concern for military strategists globally. In Southeast Asia, characterized by geopolitical tensions and regional wars, the Malaysian Army must be equipped to confront these multifaceted threats (Loo, 2019).

Hybrid warfare encompasses a blend of strategies, including direct military confrontation and psychological as well as cyber operations. An enemy may execute a cyber-attack to incapacitate key infrastructure while concurrently implementing disinformation campaigns to undermine public morale and impede governmental decision-making (Chin, 2020). These strategies aim to obscure the distinctions between peace and conflict, so complicating military and political responses.

The Malaysian Army is concentrating on the countering hybrid warfare by:

- **Cyber resilience**: Allocating resources to cyber defence systems and staff equipped to mitigate digital breaches.

- **Information operations**: Augmenting the Army's ability to combat misinformation and propaganda through collaboration with civilian agencies and the media.

- **Integrated defence strategies**: Combining conventional and irregular tactics in training exercises to guarantee adaptability and preparedness in uncertain settings (Rahman, 2021).

❖ Joint Operations and Multinational Cooperation

The Malaysian Army acknowledges the significance of multilateral defence alliances and collaborative military operations due to the interrelated nature of contemporary conflicts. Strategic collaboration with regional and global partners has emerged as a fundamental element of Malaysia's

defence strategy, especially within the intricate security environment of Southeast Asia, shaped by maritime conflicts, terrorism, and regional military escalations (Zain, 2022).

Collaborative operations with nations such as Singapore, Thailand, and the United States augment the operational capabilities of the Malaysian Army by facilitating access to sophisticated military technologies and equipment by:

- Providing avenues for the exchange of intelligence and best practices in combating asymmetric threats, including terrorism and cyber-attack.

- Executing extensive military drills that equip the Army for coalition operations in multilateral environments (Loo, 2019).

The Exercise BERSAMA SHIELD, held yearly among Malaysia, Singapore, and other regional allies, emphasizes integrated air, ground, and sea operations. These exercises are essential for establishing interoperability and ensuring that Malaysia can effectively participate in joint defence initiatives during regional or global conflicts (Zain,2022).

❖ **Flexible and Adaptive Operational Frameworks**

The Malaysian Army is not only implementing joint operations but also evolving to a more flexible and adaptive operating architecture. This entails restructuring forces to promptly address various threats, including from conventional warfare to low-intensity conflicts and disaster relief missions (Rahman, 2021). The focus is on agility and rapidity in decision-making and implementation, as contemporary conflicts frequently evolve swiftly and unpredictably.

One component of this operational structure is the creation of quick deployment units capable of responding to crises within hours. These units are trained for several circumstances, including counter-terrorism operations, humanitarian assistance missions, and cyber defence actions. This versatility enables the Army to sustain a strong defence posture while participating in international peacekeeping and humanitarian activities.

❖ Cybersecurity as a Strategic Priority

Cybersecurity is seen as an essential element of national defence strategy globally, and Malaysia is no different. The increasing reliance on digital infrastructure for military operations, logistics, and communications renders the Army susceptible to cyber-attacks from both state and non-state entities (Chin, 2020). The Malaysian Ministry of Defence (MINDEF) has prioritized the enhancement of cyber capabilities to protect military networks and safeguard essential national infrastructure.

Integrating cyber defence into comprehensive military strategy entails:

- Forming cyber defence units within the Army to oversee and safeguard against network intrusions.

- Educating personnel in cyber warfare strategies and cooperating with civilian authorities to protect national cyber infrastructure.

- Employing AI-powered cybersecurity instruments to identify and alleviate risks instantaneously, hence decreasing the response duration to cyber incidents (Chin, 2020).

Cybersecurity drills, frequently executed in collaboration with international allies, guarantee that the Malaysian Army is equipped to counter state-sponsored cyber assaults and other digital threats that could incapacitate military operations or national infrastructure.

❖ Non-Traditional Security Threats and Military Adaptation

Contemporary military tactics must incorporate non-traditional security concerns, such as climate change, natural catastrophes, and pandemics, which jeopardize national security. The Malaysian Army has incorporated disaster response and humanitarian assistance into its strategic framework, demonstrating an increasing acknowledgment that the military must be equipped for a wide range of security situations (Zain, 2022).

In crisis events, the Army's responsibilities encompass maintaining order, delivering logistical support, providing medical assistance, and facilitating infrastructure reconstruction. During the 2021 floods in Malaysia, the Army utilized UAVs and autonomous vehicles to evaluate damage, provide supplies, and orchestrate evacuation operations. This illustrates the Army's capacity to utilize its military resources in non-combat functions, hence augmenting its overall strategic effectiveness (Rahman, 2021).

The Malaysian Army's strategic tactics demonstrate a sophisticated comprehension of the intricacies inherent in modern combat. By emphasizing hybrid warfare readiness, global collaboration, cybersecurity, and the capacity to address non-traditional challenges, the Army guarantees its versatility and adaptability. Ongoing investments in technology, worldwide collaborations, and adaptable operational structures are crucial for sustaining Malaysia's defensive stance in an uncertain geopolitical environment.

ETHICAL AND LEGAL CONSIDERATIONS IN THE INTEGRATION OF MAN, MACHINE, AND METHOD

The increasing integration of autonomous systems, AI, and advanced technologies into military operations brings several ethical and legal challenges. As the Malaysian Army advances its technological capabilities, it must carefully navigate these issues to ensure that its practices align with international humanitarian law (IHL), while also addressing concerns related to accountability, human rights, and ethical decision-making in warfare.

❖ Autonomous Systems and Accountability

The deployment of autonomous technologies in military operations, including drones, robotic vehicles, and AI-driven decision-making tools, prompts significant inquiries over responsibility. Autonomous weapons, capable of functioning without direct human oversight, provide an ethical quandary: who bears responsibility for the decisions made by these systems, especially when they lead to injury or unforeseen outcomes (Chin, 2020).

International humanitarian law mandates accountability for activities conducted during combat. This responsibility has traditionally been assigned to human commanders and soldiers

who make judgments based on their interpretation of the rules of engagement. Nonetheless, when autonomous systems render decisions, such as identifying and engaging an adversary, the question of legal accountability becomes ambiguous. The employment of AI-driven systems to identify and engage targets is especially concerning, as these systems often depend on machine learning algorithms that are challenging for humans to comprehend or anticipate (Rahman, 2021).

In response to these worries, others contend that autonomous systems ought to be utilized exclusively in non-lethal capacities, such as surveillance or logistics, where the likelihood of ethical dilemmas is reduced. Some assert that human monitoring is essential in lethal operations to guarantee adherence to International Humanitarian Law norms, including distinction, proportionality, and military necessity (Zain, 2022).

❖ The Principle of Distinction and AI Targeting

A fundamental element of international humanitarian law is the principle of distinction, mandating military forces to differentiate between combatants and non-combatants. This principle is especially significant in contemporary conflicts, as civilian and military forces may be integrated within urban settings (Chin, 2020). The utilization of AI for target identification presents a substantial ethical dilemma, as computers may lack the nuanced discernment necessary for effective application of this concept.

AI systems, especially those powered by machine learning, depend on previous data for decision-making. In battle, this may encompass visual or sensor data utilized for target identification. Nonetheless, if the data is deficient or biased, AI systems may erroneously categorize civilians as combatants, leading to inadvertent civilian casualties. Moreover, AI systems are incapable of comprehensively grasping context, including the dynamic patterns of civilian movements in combat zones, which may result in excessive or unlawful targeting (Rahman, 2021).

To alleviate these concerns, international organizations and ethical committees advocate for rigorous testing and validation procedures prior to the deployment of AI systems in combat situations. Moreover, AI-driven targeting must

consistently incorporate a human-in-the-loop system to guarantee that human discretion is exercised prior to the execution of any fatal measures (Zain, 2022).

❖ Compliance with International Humanitarian Law (IHL)

The use of autonomous systems and AI in military operations raises concerns with adherence to International Humanitarian Law, especially concerning the criteria of proportionality and necessity. Autonomous systems must equilibrate the advantages of military aims with the risks to population and infrastructure. The deployment of drones to neutralize a high-value target must account for the risk of collateral damage to adjacent civilian zones (Loo, 2019).

At present, there is no global agreement on the integration of autonomous weapon systems within the current International Humanitarian Law framework. Various international organizations, including the United Nations, have advocated for limits or even moratoriums on the development and utilization of lethal autonomous weapons systems (LAWS) until their ethical ramifications are more comprehensively understood (Zain, 2022). Malaysia, as a member of the global community, must participate in these talks to ensure that its technical advancements comply with international legal standards.

❖ Ethical Considerations in Human-Machine Collaboration

The growing collaboration between people and robots in military settings raises ethical concerns regarding the psychological effects on soldiers. The deployment of autonomous technologies in warfare may modify the moral obligations of soldiers, potentially resulting in moral disengagement or a decline in ethical standards (Rahman, 2021). Soldiers may have a sense of disconnection from the repercussions of their actions when they depend extensively on computers for life-and-death choices.

The utilization of robots and AI in military functions historically executed by people may engender a moral ambiguity, blurring the distinction between human agency and machine autonomy. This may result in ethical issues when

soldiers are assigned to oversee autonomous systems with significant operational autonomy.

To resolve these challenges, it is imperative to establish ethical rules and training programs that enable soldiers to comprehend the moral ramifications of collaborating with autonomous systems. Ethical training must underscore the significance of preserving human accountability in all processes, irrespective of the degree of automation present (Chin, 2020).

❖ The Role of Policy and International Cooperation

Confronting the ethical and legal dilemmas presented by autonomous systems necessitates both national rules and international collaboration. Malaysia and similar nations must engage in international forums addressing the regulation of autonomous weapons and the ethical application of AI in military operations. Cooperation with other countries can facilitate the establishment of international standards and regulatory frameworks that guarantee accountability and transparency in the utilization of these technologies (Loo, 2019).

Malaysia's involvement in United Nations deliberations over Lethal Autonomous Weapons Systems (LAWS) demonstrates its dedication to upholding ethical and legal responsibilities in the context of military technological advancement. The objective of these negotiations is to establish a worldwide agreement on the constraints of AI and autonomous systems in combat and to guarantee adherence to International Humanitarian Law by all governments (Zain, 2022).

The Malaysian Army encounters various ethical and legal dilemmas as it integrates modern technologies, particularly concerning autonomous systems and AI-driven warfare. Ensuring adherence to international humanitarian law, upholding accountability for machine-generated judgments, and addressing the psychological effects on soldiers are essential factors. International collaboration and ethical frameworks will be crucial in determining the future of military operations, safeguarding that technology advancements do not compromise the moral and legal principles of conflict.

CONCLUSION

The future of the Malaysian Army hinges on its ability to effectively integrate man, machine, and method into a cohesive strategy that addresses both traditional threats and the complexities of modern warfare. As global conflicts evolve, the MAF must navigate the challenges of technological integration, while ensuring that their human personnel are equipped to manage and adapt to rapidly changing battle environments.

Human Capital: Adapting to Technological Change. The role of human resources remains central, even as advanced technologies such as AI and robotics take on increasingly significant roles in military operations. The Malaysian Army must continue to focus on skill development, ensuring that soldiers are not only trained in traditional combat tactics but are also proficient in cyber defence, AI operations, and data analysis (Rahman, 2021). Psychological resilience and leadership development are also critical, particularly in an environment where soldiers are expected to collaborate with autonomous systems and make rapid decisions under pressure (Chin, 2020).

Technological Integration: Enhancing Combat Effectiveness. The deployment of unmanned systems, robotics, and AI enhances the operational capabilities of the Army by providing real-time data and improving decision-making processes. However, ensuring interoperability between human operators and machines is vital to maintaining an efficient and effective fighting force (Zain, 2022). The future vision for the Malaysian Army must include sustained investments in cybersecurity, autonomous system maintenance, and AI development, while also addressing the ethical and legal challenges that accompany these technologies (Loo, 2019).

Strategic Flexibility: Adapting to Hybrid Warfare. Hybrid warfare, which combines conventional military tactics with cyber-attacks, disinformation campaigns, and non-traditional threats, is a key challenge that the Malaysian Army must be prepared to face. The Army's strategic methodologies must be flexible, allowing for rapid adaptation to new threats while maintaining readiness for traditional conflict scenarios (Rahman, 2021). Multinational cooperation and joint operations will be critical in ensuring Malaysia's military forces can effectively collaborate with allies in addressing both regional and global security challenges (Zain, 2022).

Ethical and Legal Considerations: Navigating New Frontiers. As the Malaysian Army increasingly integrates AI and autonomous systems into its operations, it must address significant ethical and legal concerns. Compliance with international humanitarian law (IHL) and ensuring accountability in the deployment of lethal autonomous systems is paramount (Chin, 2020). Collaborative efforts at the international level, such as participation in discussions on the regulation of lethal autonomous weapons systems (LAWS), will help ensure that Malaysia's military operations remain ethical and legally compliant (Zain, 2022).

The Malaysian Army's future vision must balance the human, technological, and strategic elements that are vital to modern military operations. By continuing to invest in human capital, technological infrastructure, and ethical frameworks, the Malaysian Army can maintain its readiness and effectiveness in an increasingly complex and uncertain global environment. Ultimately, a successful integration of man, machine, and method will position the Malaysian Army to respond to both current threats and the unpredictable challenges of the future.

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