



Indonesia Military Research and Development in Dealing With The Sixth Generation Warfare : The Use of Artificial Intelligence in War Operations

Irvan Arianto Randa Lembang^{1*}, Romie Oktavianus Bura², R Djoko Andreas Navalino³

Fakultas Teknologi Pertahanan, Universitas Pertahanan Republik Indonesia

Corresponding Author: Irvan Arianto Randa Lembang irvanarianto7@gmail.com

ARTICLE INFO

Keywords: Warfare, Military, Artificial Intelligence, Research and Development

Received : 09, December

Revised : 17, January

Accepted: 22, February

©2023 Lembang, Bura, Navalino:

This is an open-access article distributed under the terms of the

[Creative Commons Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).



ABSTRACT

Technological sophistication brings the world community to be faced with the 6th generation of war, namely war involving the latest technology, artificial intelligence (AI), satellites, and robotics. This indicates that war has gone beyond conventional means, No. longer having to face each other or face to face as happened in the first generation of war. Although in several parts of the world the "classic" war still occurs, it is more sectoral in nature and only in local scale conflicts. The qualitative descriptive research method was chosen because the researcher wanted to get a description of Indonesian military research and development in dealing with the sixth generation warfare: the use of artificial intelligence in war operations. Given the dynamics of the world's rapid technological developments, the Indonesian National Armed Forces (TNI) must be adaptable, one of which is by updating defense equipment that incorporates the concept of artificial intelligence (AI). The use of artificial intelligence by the TNI is a necessity, this is caused by increasingly sophisticated threat patterns, so the use of technology is very relevant to ensuring the security of border areas. Maintaining the integrity of the unitary state of the Republic of Indonesia is a "fixed price," and one of its forms is ensuring the security of the border area.

INTRODUCTION

Si Vis Pacem Parabellum is an adage in adherents of realism, where in this adage we will be seen that world conditions are indeed full of uncertainties and dynamics of security issues. When referring to the adage which means "If you want peace then prepare for war", it seems appropriate to describe the peace coveted by the realists. In realism itself, conflict can be resolved by war, because war is the simplest way when compared to diplomacy (Wardhani, 2016). Looking at peace itself, realists tend to be skeptical and assume that humans will never achieve true peace. However, that does not mean that realists do not long for peace, even though they know that peace is impossible to achieve, realists still long for a different perspective. The views of these realists seem to make sense when we look at the perspective of Thomas Hobbes in his book entitled "*De Cive*" in 1651, in his book he explains that there is a term romantic conflict which is very well known to this day, namely "*Homo Homini Lupus*", which means "man is a wolf to another man". In the context of war, humans are defined as greedy creatures who pursue their own interests without prioritizing the interests of other humans, this is a trigger for easy friction of interests that can lead to war. Regardless of human nature or not, war is the culmination of a chain of conflicts that occur between interested actors. But it turns out that there are impacts that are considered good from the war, if the war is over there will be an end point where the conflicting parties find a prescription for their conflict (there is diplomacy or there is a Stalemate situation or there is a losing party) so that the end of the conflict will result in problem solving. Also related to this matter, there is a common thread between the adage "*Si Vis Pacem Parabellum*" and the term "*Homo Homini Lupus*" that human life will not be free from what is called "war", as long as there is a conflict of interest between each actor, war will continue. develop according to the times.

As is well known, the history of the development of war in the world is always related to an event of war, invasion, power, expansion and conquest of one country against another. Countries that have power will allow them to conquer other countries' territories for political, economic and social interests. The outbreak of war between Russia and Ukraine raised fears of geopolitical tensions, this has turned into fear, following a large-scale invasion of major countries, to trigger a nuclear war. In this era of postmodernism, traditional wars such as those that occurred in the Middle East and Asia have actually begun to be abandoned. Technological developments in the form of scientific sophistication have brought the world community to the latest generation of war, namely the 6th generation war. Referring to a statement from Defense Minister Prabowo Subianto, along with technological sophistication, the world will or is facing a sixth generation of war. This war requires the use of technological advances, Artificial Intelligence (AI), satellites, and robotics. Even so, this technological prowess does not necessarily eliminate direct physical or face-to-face warfare. In theory, that battle is known as the first generation war. Therefore, war is still a major and relevant issue of international relations when it is discussed and analyzed. Furthermore, Minister of Defense Prabowo Subianto emphasized that the more advanced the development of Alutsista

technology, the farther the battlefield is, aka there is no need to face each other physically. Missile cruising range can even penetrate intercontinental. In addition, former KSAL Admiral TNI (Ret) Prof. Marsetio agrees that right now a world war is actually going on without many realizing it. The form of war is non-contact warfare. Then, reflecting on the development of war technology from developed countries that have integrated war operations with Artificial Intelligence (AI) technology.

Furthermore, reflecting on the development of Russian defense technology, which is currently ready to deal with the 6th generation warfare. Russia's readiness cannot be separated from the maximum Research and Development from the Russian military and government. Russia has been gradually integrating new force multiplier technologies into its advanced weapons systems, including nuclear and non-nuclear strategic weapons and regular troops by making use of asymmetric non-military methods and means. This new system must be adopted by Indonesia, especially the TNI as the main tool of national defense and the Ministry of Defense as the leading sector of the government / executive. This new system has the potential to provide an advantage in space and time. However, uncertainty will remain about Indonesia's ability to enter the competitive war technology contest. For this reason, research and development (R&D) activities must continue to be carried out by the TNI, research and development activities must always strive to adapt to the development of the war generation. TNI must try to find breakthroughs to obtain new knowledge that can enlarge the treasury of science and technology, seek the benefits of scientific and technological progress, and develop and prepare various aspects of its application in war operations.

The very rapid development of technology and information has implications for all aspects of national life, including one aspect of national defense. The increasingly sophisticated technology in the world needs to be seen as a threat to the sovereignty of the Indonesian nation. As the primary means of national defense, the TNI needs to improve itself in facing and responding to technological developments. This is to support the main task as the guardian of the Unitary State of the Republic of Indonesia. Based on technology, the TNI's ability to guard Indonesia's outermost regions can run more effectively and efficiently, considering that Indonesia's border areas are areas that are very difficult to rely on the capabilities of soldiers alone. The development of technology and artificial intelligence is the main concern of countries today. This needs to be a precaution as well as an example of safeguarding sovereignty as well as material for evaluating the existing conditions of the current TNI weapons system.

THEORETICAL REVIEW

Research and Development Concept

According to Sugiyono (2009: 297), research and development (R&D) is a basic research activity to obtain information on user needs (needs assessment), then proceed with development activities (development) to produce products and examine the effectiveness of these products.

Strategy Theory

According to the classical understanding, strategy is a military maneuver to achieve battle, and tactics are used when the two forces meet each other. Clausewitz (1812) in *The Principles of War* that strategy is the combination of individual engagements to achieve the goal of the campaign or war. According to Clausewitz (1832) in *On War*, strategy is the use of an engagement for the purpose of the war. To achieve the goals of war, it is necessary to use force or troops. So it can be concluded from Clausewitz's statement that strategy is the utilization of battle to achieve war goals by using existing forces or troops.

Artificial Intelligence Theory

Artificial intelligence is a technology that makes or prepares machines like computers to have intelligence or intelligence based on human behavior. Artificial Intelligence basically aims to make computers carry out a command, which can be done by humans. One part of artificial intelligence is an expert system that can be collected from theories about artificial intelligence, expert systems, web-based applications. and MySQL for database processing (Turban,1995). In this case, there are several meanings of artificial intelligence, including:

- a. Artificial intelligence is the science that studies how to make a computer do something that is still better done by humans.
- b. Artificial intelligence is a computer-based solution to existing problems that uses applications that are similar to human thought processes.
- c. Artificial intelligence is a branch of computer science that studies how computers do things at the same time that people do them better.
- d. Artificial intelligence is a subdivision of computer science that creates computer hardware and software in an effort to obtain results similar to those produced by humans. Artificial intelligence has many fields of application. Specifically:
 - 1) Expert System
 - 2) Natural Language Processing
 - 3) Computer Vision and Scene Recognition
 - 4) Intelligence Computer Aided Instruction
 - 5) Speech (voice) Understanding
 - 6) Robotics and Sensory System

METHODOLOGY

This study uses a qualitative research method, which adopts what is known as an ontological view-acknowledgment that reality is not objective. If it is associated with Devine's view, that researchers must enter into the social setting of the research focus. We can start to understand that, context is the main aspect behind qualitative research, "what we are really looking for answers to is not only what happened, but also, why and how" (Harrison, 2007). This type of research uses a qualitative type. Qualitative methods can be used to uncover and understand something behind a phenomenon that is not yet known at all. This method can also be used to gain insight into something that little is known about, and can help researchers provide complex details about phenomena that are difficult to reveal by quantitative methods. The qualitative descriptive format aims to describe, summarize various conditions, situations or various social reality phenomena that exist in society which are the object of research and seeks to draw that reality to the surface as a character trait, trait, model, sign or description of the condition, situation, or certain phenomenon.

According to Miles and Huberman (1984) Qualitative data analysis is carried out interactively and continues continuously until complete, so that the data is saturated. Activities in data analysis are data reduction, data display, and conclusion drawing/verification. Here the researcher uses the interactive model data analysis method as an example. The descriptive approach in social science refers to the description of the phenomenon characteristics that is being studied, "descriptive studies may be characterized as simply the attempt to determine, describe or identify what is, while analytical research attempts to establish why it is that way or how it came to be. The qualitative descriptive research method was chosen because the researcher wanted to get a description of Indonesian military research and development in dealing with the sixth generation warfare: the use of artificial intelligence in war operations.

RESULTS

The Sixth Generation Warfare and AI Technology

Sixth generation warfare is about non-contact warfare through the use of high-accuracy weapons, it's also about making the enemy do what you want them to do without making them aware of that fact (Edit Zgut & Janis Berzins, 2017). For example of that warfare is the operation desert storm. Sixth generation warfare was first developed by the Soviet Union's theoretical military thinking back in 1920, with the aim of conducting its operations on air, land, sea and space platforms using long-range and high-accuracy weapons. The sixth generation of war attack is an attack in psychological and information warfare through coordinated attacks and attacks at the most advantageous time on the opponent's territory (Mattson, 2015). Technological sophistication brings us to the 6th generation of war, namely war involving the latest technology, artificial intelligence, satellites, and robotics. Absolute HR quality improvement.

Readiness to modernize the Defense Equipment and Human Resources of the Indonesian Armed Forces by implementing AI into war operations

Immediate efforts to modernize the Alutsista are urgently carried out with a fast, effective, yet measurable plan. What is provided requires a mature and appropriate strategic plan according to the needs in the field. Procurement of defense equipment must be based on defense needs and an analysis of potential threats and disturbances to national sovereignty. Regarding the security of land border areas, currently Indonesia's defense capabilities for land area surveillance are still very limited. Then this could be an opportunity for the state to commit territorial violations and steal our land resources. One of the characteristics of the national defense and security system that is universal in nature is territoriality, in which the deployment of the defense force is carried out in a spread throughout the territory of the Unitary Republic of Indonesia in accordance with the geographical conditions as an archipelagic country. This title of strength can only be realized if the Alutsista owned is qualified, at least sufficient to defend the country. The plan to modernize the defense equipment has been included in the plan to strengthen Indonesia's defense posture. This is stated in the vision of Indonesia's defense defense to strengthen Indonesia's defense capabilities, which is actualized through the procurement of Alutsista. Procurement of new defense equipment is prioritized on procuring weapons with adequate quality and not just mere procurement in terms of quantity.

Defense equipment is very influential on the position of a country in the global political arena and the modernization of defense equipment is seen as very urgent because with the increasing intensity and escalation of threats as a result of developments in the environmental strategy, the professionalism of the TNI AD is required which is manifested through the modernization of the main weaponry system. To increase the security of securing Indonesia's border areas, this can be implemented through the improvement of Artificial Intelligence technology (such as drones, radar, signals, etc.). The involvement of Artificial Intelligence at the border in order to maintain state sovereignty, the importance of integration in the use of AI technology in a container so that security at the state border can be carried out properly. At present the state security system at the border is technologically still minimal and the use of Artificial Intelligence as a TNI Defense System is not yet optimal. If we look at the development of the world's military world, currently the development and application of technology and Artificial Intelligence or artificial intelligence is the choice of a number of developed countries to be integrated into weapons systems. This needs to be a warning as well as an example of maintaining sovereignty for Indonesia. The President of the Republic of Indonesia²⁷ in his statement said that technological advances had penetrated the defense system, one of which was unmanned aircraft or drones equipped with weapons and capable of chasing tanks, chasing and disabling military vehicles on target. Therefore we should not just be spectators but need to be involved with the presence of technology where there are not only improvements in machine instruments, but also in combination with the use of artificial intelligence²⁸. This is in line with what was conveyed by the Commander of the Indonesian Armed Forces²⁹ that the TNI's Main Armament System (Alutsista) will soon be developed to be

based on digital technology, this step of updating the Alutsista needs to be carried out considering that the industrial revolution 4.0 is currently underway.

Looking at the readiness of the TNI and the Ministry of Defense in implementing Artificial intelligence, it can be seen from the components they have. The TNI and the Ministry of Defense, especially the research and development agency, have part of the human resources and infrastructure needed to start programming the mastery of artificial intelligence technology to support the TNI's increasingly complex tasks. In addition, the TNI can build cooperation with the Agency for the Assessment and Application of Technology (BPPT) together with the Ministry of Research and Technology/National Research and Innovation Agency (Kemenristek/BRIN) in responding to developments in Artificial Intelligence technology in the world and applying this technology in carrying out the task of securing border areas. . In its development, currently the majority of defense technology in modern countries is robots. Therefore, the national defense industry needs to shift towards integrating artificial intelligence with robots built for military applications. With this development, the independence of the state defense and security system can be well created, so as to create a solid defense and security system for the Indonesian nation.

With full support from the government and carrying out the mandate of the 1945 Constitution, it will become an important capital for the Indonesian Army in increasing the readiness of the modernization of defense equipment that is integrated with Artificial Intelligence (AI). One of them is by starting to develop and adopt artificial intelligence in the Indonesian Armed Forces' defense equipment. The use of artificial intelligence in Indonesia's defense system can help maximize the security of Indonesia's territory, especially in border areas. Using AI allows the national defense system to easily find patterns of cyberattacks, then develop tools to counterattack. In the military field, the integration of artificial intelligence with military transportation can reduce transportation costs and reduce human operational effort. In addition, the use of AI in target recognition systems can also improve the ability of soldiers to determine enemy target locations, extract army medical data and assist treatment in complex diagnoses, as well as assist defense personnel to monitor threats thereby increasing situational awareness in the field.

DISCUSSION

The Projection in AI Research and Development for War Operations

As previously explained, development and research in the context of national defense is very important. Faced with the development of war towards the 6th generation, the TNI should have carried out research and development on AI that can be used in carrying out every main task, especially war operations. Various countries, as explained earlier, that AI must be applied in combat operations. Artificial intelligence (AI) is one of the many technologies that promises to change the face of war in the coming years. Many studies explain that there is a possibility and warn many countries that they will be left behind in the race for the development of AI technology, if they do not take this seriously.

the ministry of defense and the TNI should have created an artificial intelligence command center, in which there is also research and development, with the aim of being able to win every combat operation, especially AI battles. Artificial intelligence can be effective at certain tasks, such as image recognition, recommendation systems, language translation, and combat analysis. Many systems are designed for today's military tasks. Artificial intelligence models developed for military purposes will be very useful for specific tasks such as identifying battle tanks, drones, enemy locations, identifying enemy identities in civilian crowds, translating texts, and generating and analyzing information that can be used in information warfare operations.

Artificial intelligence will certainly play a role in military applications in the future, especially in applications in 6th generation warfare. In the development of this AI technology, there are many application areas that will increase productivity, reduce the workload of soldiers, and operate faster than humans without knowing fatigue. Ongoing research and development by the TNI will continue to improve the capabilities of TNI members in efforts to defend state sovereignty from any form of 6th generation war threats. The TNI and the Ministry of Defense certainly cannot ignore this technology.

As stated by the President of the Republic of Indonesia, the Minister of Defense and also various academics, that Indonesia must be prepared for the 6th generation of war, including the use of AI technology. Indonesia will be faced with this threat, one of the characteristics of the 6th generation of war is C4ISR (command, control, communication, computer, intelligence, surveillance, and reconnaissance) sensor control, which is a defense system using information and sensing technology (radar and satellite), including mastery of mindset and public opinion. Therefore, the 6th generation warfare does not only talk about war equipment and military equipment alone (electronic intelligence, cyber, satellite/ELINT, electronic control and measurement/ECM, network EW/electronic warfare, and remotely operated), but also war over space of mind (5th generation war). That is, influencing people's opinions and thoughts through misdirection, deception of information, to black propaganda is also the primary essence in the context of a strategy to win the war.

Because the target of war over space of mind is humans (Indonesia), fortifying human resources (HR) by increasing the quality of understanding Pancasila as the state ideology and the 1945 Constitution as the constitution and the highest source of law in the nation and state is important. Unfortunately, the low level of literacy (Program for International Student Assessment/PISA: Organization for Economic Co-operation and Development/OECD, 2019, places Indonesia in 62nd place out of 70 countries), not only brings the Indonesian people behind in global competition and competitiveness (The Global Competitiveness Report: World Economic Forum, 2019), places Indonesia in 50th place out of 141 countries, below Malaysia, Thailand and Singapore), but to adapt, the Indonesian nation still needs a long process.

Whereas in the future, mastery of technology and information is absolutely necessary in line with the development of military weaponry which demands standardization and specialization in operating a product (weapon system). Thus, quality human resources or professional human resources, supported by an adequate defense industry, modern weapons technology, and socio-political stability, and economic strength are keywords that reflect the readiness of a country (Indonesia) in facing the 6th generation warfare.

Supporting Factors and Inhibiting

Regarding what may be expected from AI in military applications over the next ten years, certain of its methodologies will define or re-define important cutting-edge military technology. First and foremost, AI systems will be intelligent, integrating knowledge-focused analytical AI capabilities. The AI solutions will then be connected to the network of physical and virtual domains, including sensors, businesses, people, and autonomous agents, while also utilizing blockchain technology's advantages for data integrity. To make use of decentralized and widespread large-scale sensor networks, storage, and processing, they will be dispersed. In order to facilitate new disruptive impacts, they will digitally integrate the human, physical, and information worlds.

However, there is an obstacle, because we know that in carrying out R&D activities to produce quality products, a large budget is needed because if the research budget is not met, it will cause research and development targets to be hampered or even fail. Because we know that the costs for research and development are indeed more expensive than buying finished products directly, so far it can be seen that the absorption of the existing R&D budget is still very small compared to the budget provided by the Indonesian Military, which is due to the fact that at the time the R&D proposal was submitted it was not according to the needs of the Indonesian Military, R&D values are too marked up, as well as R&D proposals that cannot be accounted for in front of the R&D program testers and assessors from Srenad.

Therefore, strategies or efforts that can be made to overcome these obstacles are as follows:

- a. Development of organizational competencies and human resources that can answer the challenges of developing the main tools of modern weapons systems so that the products resulting from the forthcoming Ditpalad R&D are products that have appropriate quality and are efficient
- b. Third-party involvement in R&D activities is hampered by the limited facilities and infrastructure owned by LIPI, universities, and private R&D institutions committed to producing R&D products that benefit the TNI.

- c. In anticipating developments in information technology advances and AI-based weaponry capabilities as well as other supporting facilities, the TNI needs to conduct a review of the defense equipment capabilities that must be owned by units within the ranks of the TNI, especially those related to security in border areas. Technology and human resources greatly influence the position of a country in the global political arena. Then, the modernization of the Alutsista, including the development of AI technology in war operations, is seen as very urgent because, with the increasing intensity and escalation of threats as a result of developments in the strategic environment, it demands TNI professionalism, which is manifested through the development of AI technology in war operations.

CONCLUSIONS AND RECOMMENDATIONS

Mastery of artificial intelligence (AI) is increasingly intensive in the military world. Many countries are developing artificial intelligence to maintain their sovereignty as well as to balance their military capabilities with other countries in the world. Along with the advancement of science and technology, military and non-military threats from within and without the country endanger sovereignty, territorial integrity, and national security, including the emergence of war in generation 6. Given the dynamics of the world's rapid technological developments, the Indonesian National Armed Forces (TNI) must be adaptable, one of which is by updating defense equipment that incorporates the concept of artificial intelligence (AI). The use of artificial intelligence by the TNI is a necessity, this is caused by increasingly sophisticated threat patterns, so the use of technology is very relevant to ensuring the security of border areas. Maintaining the integrity of the unitary state of the Republic of Indonesia is a "fixed price," and one of its forms is ensuring the security of the border area. Carrying out the task of securing border areas will be maximized with the help of artificial intelligence (such as drones, radar, signals, etc.).

FURTHER STUDY

Every research is subject to limitations; thus, as already explained, war will continue to develop as well as science. Therefore, further research can examine more specifically and technically the development and application of a program or defense tool related to the use of artificial intelligence technology to support national defense in the face of the 6th generation warfare.

ACKNOWLEDGMENT

We would like to thank to Republic of Indonesia Ministries of Defense, Indonesian National Armed Forces Headquarters, and Republic of Indonesia Defense University for all the Information and data that has been provided to support this research. We also would like to thank to Mr Romie Oktavianus Bura and R Djoko Andreas Navalino for fruitful discussions as well as their support and encouragement.

REFERENCES

- Bendet, Samuel. (2021). *Advanced Military Technology in Russia : Capabilities and Implications*. Chatham House, The Royal Institute of International Affairs
- Carl Von Clausewitz. (1812) *Principle of War*. Retrieved from: www.abika.com. p. 19.
- Edit Zgut, Jānis Bērziņš, “New Generation Warfare”, (2017), Visegrad insight, available at: <https://visegradinsight.eu/new-generation-warfare/>
- Gareev, Makhmut. (2005). *Future War*. Foreign Military Studies Office : Fort Leavenworth, Kansas
- Hobbes, Thommas. (1642). *De Cive*. Latin and English versions; Oxford: Clarendon Press.
- Horngren, Charles T., Walter T. Harrison Jr., (1984), *Accounting*. (Translated by: Gina Gandia and Danti Pujiati). Erlangga Publisher. Jakarta.
- Mattsson, Peter. (2015) “Russian Military Thinking – A New Generation of Warfare”, (*Journal on Baltic Security*, vol.1) p-p.62-63.
- Miles, M.B, Huberman, A.M, & Saldana, J. (2014). *Qualitative Data Analysis, A Methods Sourcebook*, Edition 3. USA: Sage Publications.
- Republic of Indonesia Ministry of Defense. (2020). *Bahan Pembelajaran Proxy War*.
- Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung : Alfabeta, CV.

Walker, Patrick William. (2019). War Without Oversight; Challenges To The Deployment Of Autonomous Weapon Systems. The University of Buckingham.

Wardhani, Baiq. (2016.) Realism. Materi disampaikan pada mata kuliah Teori Hubungan Internasional pada 10 Maret 2016. Surabaya: Departemen Hubungan Internasional Universitas Airlangga.