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Email : editorijhess@gmail.com

Dual Use Technology in the Indonesian Defense Industry

Very Hadi Kuncoro [1)]*, Gita Amperiawan[2)], Imanuel Dindin[3)], Erzi Agson Gani[4)], Sumaryadi[5)]
[1,2,3,4,5)] Teknologi Daya Gerak, Faculty of Defense Science and Technology, Republic of Indonesia Defense University

*Corresponding Author
Email: Very.Kuncoro@tp.idu.ac.id

Abstract

Indonesia needs to build and develop capabilities and resilience in facing every threat including threats that arise due to the disruption of dual use of technology. Dual Use Technology refers to technology that has dual functions-it can be applied to both civilian and military needs. The relevance of Dual Use Technology is increasing because the development of modern technology allows for synergy between the defense and civilian sectors in creating efficient, innovative solutions. The characteristics of the Industrial Revolution 4.0 include artificial intelligence technology, big data, machine learning, automated systems, and robot technology. This research uses a qualitative research approach where qualitative research as a scientific method is often used and carried out by a group of researchers in the field of social sciences. Creswell's framework for qualitative research provides a structured approach to conducting secondary data analysis. The Industrial Revolution 4.0 technology also encourages the integration of technology into a series of innovative new weapons systems, such as electromagnetic weapons, directed energy weapons, high-speed projectiles, hypersonic missiles, and secret technology weapons used during war.

Keywords: Dual Use Technology, Defense, Industry

INTRODUCTION

Dual use technology refer to technologies with civilian and military use. There are three concepts which are included in definition of dual use: research, technology and artefacts. These three items need regulation so that scientists, engineers and authorities can be aware of their responsibilities. National Research Council of Canada (NRC) defines dual use technology as “In the language of arms control and disarmament, dual use refers to technologies intended for civilian application that can also be used for military purposes.’’(Afshar, 2020)

Law Number 3 of 2022 concerning National Defense Article 6 states "National defense is carried out through efforts to build and foster the capabilities, the resilience of the state and nation, and to overcome every threat". Indonesia needs to build and develop capabilities and resilience in facing every threat including threats that arise due to the disruption of dual use of technology. Various technologies that were affected by this disruption were the impact of the Industrial Revolution 4.0 and Society 5.0. Bribery and management of national resources consisting of human resources, natural resources, artificial resources, national facilities, and infrastructure for dual-use interests (national defense interests and national interests) are important things to do. In national defense efforts, Indonesia implements a universal defense system that includes all elements, both military and civilian (dual use). This is based on Article 30 Paragraph (2) of the 1945 Constitution which states "The detention and security of the American state is carried out through a system of protection and security of the people by the Indonesian National Army and the Indonesian National Police, as the main force, and the people, as the supporting force.” The Industrial Revolution 4.0 and Society 5.0 have opened the door to an intelligent system that allows computers to connect to each other, communicate, and make decisions without human involvement.

Dual Use Technology (DUT) refers to technology that has dual functions—it can be applied to both civilian and military needs. The relevance of DUT is increasing because the development of modern technology allows for synergy between the defense and civilian sectors in creating efficient, innovative solutions. Technological disruption due to the Industrial Revolution 4.0, especially in the defense sector, has expanded the dimensions of combat from land, sea, and air to the dimensions of space and cyberspace. This is in line with the Attachment to Presidential Decree Number 8 of 2021 concerning the General Policy of State Defense for 2020-2024 Paragraph 5 which states "In addition to the above, the Industrial Revolution 4.0 also expands the dimensions of combat from land, sea, and air to the dimensions of space and cyberspace. The characteristics of the Industrial Revolution 4.0 include artificial intelligence technology, big data, machine learning, automated systems, and robot technology. On the other hand, nanotechnology has caused a shift in weapons systems, for example, small unmanned vehicles have extraordinary destructive power. The Industrial Revolution 4.0 technology also encourages the integration of technology into a series of innovative new weapons systems, such as electromagnetic weapons (railguns), directed energy weapons, high-speed projectiles, hypersonic missiles, and secret technology weapons used during war."

Attachment to Presidential Decree Number 8 of 2021 concerning the General Policy of State Defense for 2020-2024 also explains the direction of defense technology development which contains "the utilization of artificial intelligence, large data sets (big data), machine learning, automated systems, and robot technology for the benefit of state defense". Robotics, Artificial Intelligence and Cognitive Computing, Internet of Things, Big Data Analytics, Autonomous Systems, Blockchain Technology, Artificial Intelligence, Additive Manufacturing, Next Generation Sequencing and Future Advanced Materials: Nanotechnology are all dual-use. These technologies, especially in the military field, are needed to support the implementation of the Network Centric Warfare (NCW) concept or network-centric warfare based on communication and data network connectivity. Minister of Defense Regulation Number 12 of 2021 concerning the 2020-2024 National Defense Implementation Policy Article 1 Paragraph (3) letter f contains "modernization of the main weapons systems of the Indonesian National Army with priority on the acquisition of the main strategic weapons systems including military satellites, strategic missile systems, subsurface sensing systems, and aircraft/drone systems integrated with the Network Centric Warfare (NCW) concept".

Dual-use technological disruption positively contributes to the development of the global Defense Industry. Various advanced, efficient, integrated and innovative Alpalhankam technology has been developed by various countries in the world. One of them is in the form of directed energy weapons such as High Power Microwave (HPM), High Energy Laser (HEL) and High Power Radio Frequency (HPRF) weapons. Innovation is important as an impact of the Industrial Revolution 4.0 and Society 5.0 and in accordance with Law Number 16 of 2012 concerning the Defense Industry Article 3 letter (a) which states "The Implementation of the Defense Industry aims to realize a professional, effective, efficient, integrated and innovative Defense Industry". The General Policy of State Defense for 2020-2024 directs the development of defense technology and industry so that they can master the key technologies of priority programs including fighter jets, submarines, propellants, rockets, guided missiles, radar, military satellites, medium-sized tanks, unmanned aerial vehicles and underwater sensing. In addition to the key technologies of the priority programs, the development of defense technology and industry is also directed to develop technologies that are born as a result of technological disruption such as technologies that support attack power, locomotion, sensing, electronic warfare, cyber warfare, development of technology and communication that supports NCW, communication systems, navigation, remote sensing and

military satellite-based intelligence, artificial intelligence, big data, machine learning, automated systems and robot technology. The development and development of dual-use technological disruption in addition to mastering the key technologies of the priority programs is expected to support the realization of an advanced, strong, independent and competitive national defense industry. For this reason, this article will discuss further the concept and benefits of dual use technology as well as the role of BUMN in the context of Dual Use Technology (DUT) in Indonesia.

RESEARCH METHODS

This research uses a qualitative research approach where qualitative research as a scientific method is often used and carried out by a group of researchers in the field of social sciences. Creswell's framework for qualitative research provides a structured approach to conducting secondary data analysis. Agreeing to (Creswell, 2013), the taking after steps are fundamental in utilizing subjective inquire about strategies successfully, analysts must distinguish clear investigate questions to direct the examination of auxiliary information. These questions ought to be outlined to dive into the center marvels beneath examination and point to reveal the basic implications and structures of participants' encounters. The phenomenological strategy in inquire about can be viably connected utilizing auxiliary information, writing considers, and other supporting archives. This approach includes methodicallly analyzing existing information sources to investigate and get it the lived encounters and recognitions of people inside a particular setting. Subjective inquire about is carried out in common conditions and is revelation in nature. In subjective inquire about, the analyst is the key instrument. Hence, analysts must have hypothetical information and wide understanding so they can inquire questions, analyze and build the question being considered more clearly. This inquire about places more accentuation on meaning and values.

Qualitative research methods are characterized by their emphasis on exploring phenomena in-depth, seeking to understand the complexities and nuances of human experiences and social interactions. One such methodology within qualitative research is social phenomenology, which focuses on the lived experiences of individuals and the meaning they ascribe to their everyday lives. Social phenomenology is a research method that involves in-depth interviews, participant observations, and personal narrative analysis to understand participants' experiences and contexts. It aims to uncover underlying social life structures and patterns, allowing researchers to understand how individuals interpret their experiences and how these interpretations influence their behavior. These methods are particularly well-suited for investigating complex social phenomena, where contextual factors, and stakeholders roles on Dual Use Technology.

RESULT AND DISCUSSION

1. Concept and Benefits of Dual Use Technology

Technology itself is an inseparable part of industry. The progress of an industry requires integrated joint efforts, one of which is mastery of technology (Susdarwono, 2021). There are still many other weaknesses that may not have been mentioned in this paper. Therefore, a special strategy analysis is needed to deal with existing obstacles, especially related to the low mastery of technology in the defense industry. According to Zhang (2018), the rapid development of technology today does not occur evenly. As a result, income polarization arises, in countries with higher technological mastery. From here we can understand the importance of mastering technology for a country.

Especially in this digital era, where technology is the center of the great revolution in the future (Manning, 2018). Military technology, which was previously developed through special programs that were limited and fully supported by the military, since the 1970s has begun to utilize technology developed by the commercial/civilian industry. Technology that can be used for both civilian and military purposes is better known as Dual-Use Technology (DUT). Included in dual-use technology are: process technologies that are used in the manufacture of components for civilian and military systems; technologies embodied in products that enhance the performance of military and civilian systems; and know-how or applied knowledge that is necessary for the design, development, and manufacture of military and civilian products. (Schweitzer, 1994).

Dual-use Technology refers to technology, goods, or knowledge that can be used for both civilian and military purposes. This technology is flexible and contributes to various non-military sectors such as industry, transportation, health, and energy but can also be adapted to support the interests of national defense and security. At its core, military-civil fusion encompasses the seamless integration of defenserelated technologies, talent, and resources into civilian industries and vice versa. This integration is facilitated by policies that promote dual-use technologies, encourage collaboration between defense and civilian sectors, and incentivize innovation and knowledge transfer (Can & Vieira, 2022).

From an economic and political perspective, the application of dual-use technology helps optimize resources, especially in the context of countries with limited military budgets. By utilizing versatile technology, countries can reduce dependence on imports of military components while encouraging the independence of domestic industry.

There are at least eight civil industry sectors that have the most potential to support the development of military technology, namely: microelectronics, computers, telecommunications equipment, nuclear power, biotechnology, chemistry, aviation, and space. (Cliff, 2001) The consequence of the 'strategic-military' and 'commercial-civil' values contained in DUT is that Dual-Use Technology and National Security Interests are relatively more difficult to control their distribution than military technology or items alone. Through the diversion of its utilization, DUT can be used to develop strategically dangerous armaments (SDA) technology which may ultimately be used to threaten the national security of the country of origin of the DUT or other countries, and can even threaten regional and international stability and security. Dual Use Technology (DUT) provides strategic benefits because it allows technology, knowledge, and products to be used in two ways, both for civilian and military purposes. With effective implementation, this technology can encourage innovation, and resource efficiency, and increase the country's defense capacity. Here are some important benefits of DUT in various aspects:

A. Economic Efficiency and Budget Savings

Dual Use Technology allows countries and industries to reduce costs because the technology developed can be used in two sectors at once. With focused research and development (R&D), state spending can be optimized, avoiding double spending between the civilian and military sectors. This is very relevant for countries with limited defense budgets that still want to build technological independence.

Optimizing the government budget can reduce defense costs by sharing technology components with the civilian sector. The use of technology together will reduce research and production costs on certain equipment such as drones used for border monitoring can also be used for natural disaster mitigation.

Technology that can be utilized in the civilian and military sectors allows savings in development and production costs for the development of drones used for both military surveillance and civilian area mapping, saving costs while expanding the function of technology. Likewise with cyber

technology, which in addition to being used for military security, also plays an important role in protecting civilian data.

B. Increasing National Technology and Innovation Independence

Through Dual-Use Technology, the country can strengthen the independence of the domestic technology industry. The development of technology that can be applied in two sectors spurs collaboration between universities, industry, and government. This synergy triggers knowledge transfer and accelerates innovation in the technology sector.

Dual-use products have a wider market, allowing Indonesia to export technology to other countries for military and civilian needs. This can increase competitiveness and grow the national economy. Dual-use products have the flexibility to be adapted to various needs. Technologies such as drones, for example, can be sold for civilian purposes such as mapping, logistics, and agriculture, as well as for military missions such as reconnaissance and border patrols. This flexibility makes the market for dual-use products wider than for military or civilian-specific products.

These initiatives highlight the importance of a strong industrial base in maintaining technological superiority and ensuring national security. By investing in advanced industries and promoting innovation, countries can not only strengthen their economic competitiveness but also bolster their defense capabilities. As global competition intensifies, governments are increasingly recognizing the strategic significance of a robust industrial base in achieving their geopolitical objectives. Furthermore, the convergence of technology and defense industries underscores the interconnectedness of economic and national security interests in the modern era (Gudger, 2015; Watts, 2011).

By producing dual-use technology independently, Indonesia can reduce its dependence on foreign technology. This is especially important for vital components used in national defense and infrastructure. Dual-use products open up opportunities for international cooperation in the form of strategic alliances and trade agreements. Exporting countries often form partnerships with destination countries to develop joint technology or provide after-sales services. This cooperation not only strengthens diplomatic relations but also expands access to the global market.

C. Encouraging National and Economic Resilience

The benefits of Dual-Use Technology are also seen in increasing national resilience and economic stability. With the ability to produce critical technology components that can be used for civilian and military purposes, a country becomes more resilient to global crises or technology embargoes. Independence in action is the most important form of independence. In terms of politics, Indonesia is a neutral country that does not have major conflicts with other countries and is not under international pressure, therefore Indonesia can independently realize its defense equipment production. In addition to various obstacles such as limited funds, infrastructure, human resources, and technology, this freedom factor still needs to be utilized properly. Independence in weapons production must continue to be utilized and evolved. If Indonesia produces its defense equipment, it will gain various benefits, starting from economic benefits that give birth to the Defense Industry to drive economic growth, provide many jobs, and improve technological skills, thus gaining the advantage of Indonesia's defense strength (its strength will not be easy to read when compared to when using defense equipment from other countries. (Ariani, 2023)

Industries that focus on DUT, such as the aerospace, automotive, and biotechnology industries, can support the economy through exports of high-tech products. This simultaneously reduces dependence on imports of military components and increases foreign exchange reserves.

Law No. 16 of 2012 concerning the Defense Industry provides a legal basis for the development, management, and supervision of the defense industry in Indonesia, including

policies related to the export of products that have Dual Use Technology (DUT) functions. In the context of the defense industry, this export policy is designed to ensure that the use of dual-use products does not pose a security risk, either to Indonesia or to the international community. The following is an explanation of the export policy for dual-use products based on the law:

- Regulation of Dual-Use Products in Law No. 16 of 2012 concerning the Defense Industry. Dual-use products are goods or technologies that can be used for both civilian and military purposes. Due to their strategic nature, these products need to be regulated so that they are not misused or fall into irresponsible hands. Law No. 16 of 2012 concerning the Defense Industry places export control and supervision as part of defense industry management to avoid risks such as weapons proliferation or violations of international law.
- Principles of Export Control and Supervision. Articles in Law No. 16 of 2012 emphasize the importance of control and supervision of the production and export of defense goods and technology, including those with dual functions. The main principle is Government Approval, Export of defense products and dual technologies must obtain permission from the government through the Ministry of Defense and related institutions. This is to ensure that the export does not violate national defense and security policies. Then the second principle is compliance with International Agreements: Indonesia is bound by various export control agreements, such as the Wassenaar Arrangement, which limits the export of sensitive technology to prevent weapons proliferation. Law No. 16 of 2012 emphasizes that export policies must be in line with these international agreements.
- Sanctions and Export Bans
  Law No. 16 of 2012 provides administrative and criminal sanctions for parties that export dual-use products without a permit. These sanctions include Revocation of business licenses for companies that violate export provisions. Fines or criminal penalties for parties proven to export dual-use products for illegal purposes, such as supporting terrorism activities or human rights violations. This strict supervision aims to ensure that Indonesia not only protects national interests, but also complies with international commitments in maintaining global peace and security.

2. The Role of State-Owned Enterprises in the Context of Dual Use Technology (DUT) in Indonesia

BUMN plays a strategic role in the development of Dual-Use Technology (DUT) in Indonesia, aiming to meet defense needs while simultaneously driving the national economy with innovations that can be applied in both the military and civilian sectors. The following is an explanation of the roles and contributions of various entities in Indonesia in this context: 3.2 The Role of BUMN in the Context of Dual Use Technology (DUT) in Indonesia. State-owned enterprises, especially those in the defense industry, have a mandate to produce technology that can be used for both military and civilian purposes. Some of the main state-owned enterprises in this sector are:

A. PT.Pindad Persero).

PT Pindad (Persero), as one of the strategic State-Owned Enterprises (BUMN) in Indonesia, plays an important role in the development of Dual Use Technology (DUT). Pindad develops various technology products that can be used for military and civilian purposes, helping to strengthen national resilience while simultaneously boosting the domestic industrial and economic sectors. Pindad produces combat vehicles such as Anoa and Komodo, which are not only used for military operations but also play an important role in humanitarian missions, such as disaster management and logistics transportation. The Anoa vehicle, for

example, in addition to being used for patrols and security by the TNI, can be used by civilian institutions for security missions in international peace operations. The Komodo 4x4, in addition to functioning as a combat vehicle, is often used in SAR and rescue operations in disaster areas, showing that this product has the flexibility for non-military needs.

B. PT Dirgantara Indonesia

PT Dirgantara Indonesia produces military aircraft (such as the CN-235 and N-219) which are also used for civil aviation and cargo services. PT Dirgantara Indonesia (PTDI) continues to demonstrate its commitment to encouraging the independence of the national aerospace industry through innovation and mastery of technology which is real evidence of the Company's contribution to the advancement of Indonesian aerospace technology.

N219 Aircraft, the Right Solution for Pioneer Flights The N219 aircraft, a collaboration between PTDI and LAPAN, is specifically designed to meet the needs of pioneer flights in Indonesia. With a capacity of 19 passengers and the ability to take off/land on short and unpaved runways, the N219 aircraft is very suitable for operation in remote areas in Indonesia that are difficult to reach.

The N219 aircraft is equipped with modern avionics technology that guarantees passenger safety and comfort, where the N219 aircraft will be one of the highlights at the InaRI Expo 2024, showing the pride and ability of the nation's children in creating reliable transportation solutions. Currently, PTDI is in the commercialization stage and is trying to develop an aerospace ecosystem through the N219 aircraft, so that the implementation of the N219 aircraft as a connectivity solution in Indonesia can be realized soon. (PTDI Public Relations, 2024)

C. PT PAL Indonesia

PT PAL Indonesia (Persero) as a state-owned company engaged in the shipbuilding and maritime industry, plays a strategic role in the development of Dual Use Technology (DUT) in Indonesia. Products and technologies produced by PT PAL have dual uses, both for the defense (military) and civil (commercial) sectors. This is in line with the government's vision to increase the independence of the national industry and reduce dependence on imports, especially in the maritime and defense sectors. The following are PT PAL's important roles in the development of dual technology.

PT PAL produces various types of ships that can be used for military and civil purposes. The main example of PT PAL's dual-use product is the Fast Missile Ship (KCR). In addition to patrol and maritime security missions, this type of ship can also be used in search and rescue (SAR) missions or disaster response operations. Landing Platform Dock (LPD), this type of ship functions as military transportation, but can also be used for humanitarian missions, such as transporting logistical assistance and evacuating disaster victims. LPD ships made by PT PAL are often involved in disaster response operations in Indonesia, such as during tsunamis or earthquakes. Through this flexible ship design, PT PAL can bridge defense and civil needs at once, ensuring that its products are not limited to military functions.

With dual-use products, PT PAL makes a direct contribution to national resilience and humanitarian operations. Ships made by PT PAL, such as LPD and KRI, are not only used by the Indonesian Navy but are also dedicated to humanitarian aid and disaster management missions. For example, PT PAL plays a role in providing ships for humanitarian missions in disaster-affected areas, such as sending aid during the earthquake or tsunami in Palu and Lombok. This shows that the technology developed by PT PAL is useful in critical situations outside the military context.

In addition, PT PAL also builds Hospital Auxiliary Ships which are a transfer of function from KRI Semarang (594). The BRS ship is a support ship in carrying out military operations.

The nature of the ship is a support ship for Military War Operations (OMP), during peacetime, the ship can be used in Military Operations Other Than War (OMSP). Based on TNI Law No. 34 of 2004, in the OMSP mission, the BRS ship can carry out operational tasks to help overcome the effects of natural disasters, and evacuation, and provide humanitarian assistance as well as assist in search and rescue in accidents (search and rescue). Not limited to that scope, the BRS Ship also can carry out international diplomatic missions.

The function of the BRS Ship is very fitting with the characteristics and maritime insight of Indonesia. Indonesia is an archipelagic country as a country located in the Ring of Fire area is vulnerable to natural disasters such as volcanic eruptions, and earthquakes that can be followed by secondary disasters such as tsunamis and others. With this situation, the BRS Ship is mobile and can be moved at any time to disaster-affected areas to carry out emergency disaster response activities. The BRS Ship is equipped with various medical functions to medical actions. The medical facilities owned are equivalent to a hospital, so the nickname of a floating hospital is worthy of being given to the BRS Ship. (Public Relations Department of PT PAL Indonesia.

CONCLUSION

Dual Use Technology plays an important role in building connections between the civil and military sectors while increasing the effectiveness and efficiency of resource use. The implementation of this technology not only provides practical benefits to the wider community but also strengthens the defense sector. However, strict regulations and synergy between government, industry, and academia are needed to maximize the benefits and minimize the risks of this dual-potential technology. Dual Use Technology provides broad benefits in various sectors, from budget efficiency to strengthening the economy and defense. This technology also plays an important role in overcoming global challenges such as health crises and natural disasters. With the right regulations and synergy between government, industry, and academia, the use of Dual Use Technology will be increasingly optimal, strengthening national resilience, and supporting sustainable development. Increasing technological independence and national innovation through Dual Use Technology is very important for countries that want to be independent in facing global challenges. By reducing dependence on imported technology, strengthening the R&D ecosystem, and increasing industrial capacity, countries can create sustainable and competitive innovations in the global market. The synergy between the civil and military sectors will continue to drive innovation, open economic opportunities, and strengthen national resilience in the long term.

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