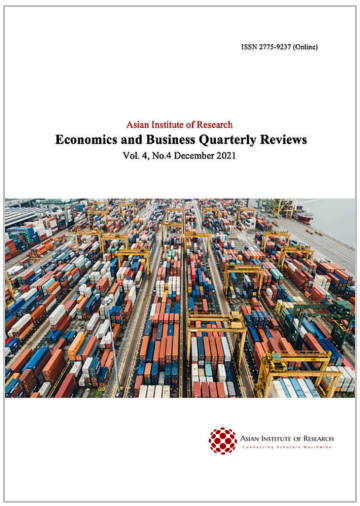

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Indonesian Defense Economy in the Industrial Revolution Era 4.0

Ivan Yulivan[1]

[1] Universitas Pertahanan Republik Indonesia. Email: ivan36yulivan@gmail.com

Abstract
The defense economy as an economy that has an important role, of course, in its journey faces challenges, especially the low national Research and Development budget of <1% of GDP/Per Capita. Director-General of Research and Development (R&D) Kemenristekdikti Muhammad Dimyati previously said that Indonesia's research growth in the last four years had grown rapidly. Based on 2017 data from the Ministry of Research, Technology and Higher Education, Indonesia's research budget is only 0.25 percent of total GDP, if converted into IDR 30.78 trillion. The second challenge is the entry of the digital era which must be responded wisely and anticipated as the 4.0 industrial revolution in the development of science. The purpose of this study is to describe more about how research & development and the industrial revolution 4.0 are in building a defense economy. In this study, the authors used data analysis techniques with a qualitative descriptive analysis strategy model. The results of the research show that the results of research and development funds are used to innovate to support increased productivity. As a result, the country's production performance has improved and boosted economic growth. The Industrial Revolution 4.0 makes work done by individuals or companies more effective and efficient. With this efficiency and effectiveness, the economy will increase and automatically the defense will also increase. So research & development and industrial revolution 4.0 in practice can build and strengthen the existing defense economy in a country.

Keywords: Defense Economy, Industrial Revolution 4.0, Indonesia, Research and Development

1. Introduction

The defense economy as an economy that has an important role, of course, in its journey faces challenges, especially the low national Research and Development budget of <1% of GDP/Per Capita. Director-General of Research and Development (R & D) Kemenristekdikti Muhammad Dimyati previously said that Indonesia's research growth in the last four years had grown rapidly. Based on data from the Ministry of Research, Technology and Higher Education in 2017, Indonesia's research budget is only 0.25 percent of the total GDP, if converted into IDR 30.78 trillion (Rikin, 2019). Whereas in the sense that research and development or R&D are research, development activities and have commercial interests in relation to pure scientific research and applicative development in the field of technology. This research and development or R&D has an important role and is an indicator of the progress of a country.

Currently, almost all countries providing large-scale military equipment are supported by study skills and the empowerment of strong technological capacities from within the country (Haripin, 2011). However, the development of the defense industry in the country has in fact caused certain problems, including the development of the national defense industry. The country is required to fulfill the needs of the defense department as soon as possible. Basically, the procurement of defense equipment cannot wait a long time because the main weapon system is an integral part of the Strategic Plan and the goal is that the defense equipment system must be ready to use whenever it is needed (Al-Fadhat, 2019).

With the development of the globalization era, it has resulted in the increase of countries in order to protect regional integrity and maintain sources of competitive advantage, both natural and human energy sources as well as their national interests. In the context of protecting this competitive advantage, research and technology development are important aspects for each country that is developing its defense industry and aspires to achieve independence in the procurement of military equipment (Susdarwono, 2020).

The second challenge is the entry of the digital era which must be responded to wisely and anticipated as the 4.0 industrial revolution in the development of science. The Industrial Revolution 4.0 is a comprehensive transformation of all aspects of production in the industry through the incorporation of digital technology and the internet with conventional industry (Merkel, 2014). The President of Indonesia said that science and technology are developing very fast, even very fast. The industrial revolution 4.0 has given birth to many new technologies. Technology that changes the ways of life of the world's citizens. Furthermore, Jokowi pointed out that advanced robotics and artificial intelligence have made it easier in many ways, including in the military and police world (Widyastuti, 2019). In this article, the author will describe more about research & development and the 4.0 industrial revolution in building a defense economy. Based on this, the author is interested in writing an article on Research & Development and the Industrial Revolution 4.0 in Building a Defense Economy.

2. Research Methods

This article in Research is qualitative research using a literature research approach. Literature research is a study that studies various reference books as well as the results of similar previous research that are useful to get a theoretical foundation on the problem to be studied (Sarwono, 2006). Literature studies in this research are conducted by looking for and studying various literature, scientific articles, whether in the form of books, journals and other documents related to Research &Development and the Industrial Revolution 4.0. The data sources in this study are books, journals, web pages and other references that are considered relevant to the theme in this research, namely reviewing the role of Research & Development and the Industrial Revolution 4.0 in building the Defense Economy. According to Miles and Huberman, data analysis is an activity that refers to systematic research or testing of a thing in order to determine the parts of the data.
In this study the authors used data analysis techniques with qualitative descriptive analysis strategy models. This analytical technique model can provide an overview of how the flow of logic of data analysis in qualitative research can provide input to how qualitative data techniques are used.

3. Results and Discussions

3.1. Research and Development

Each country's defense budget can usually be grouped into budgets to finance research, development, testing and evaluation or Research, Development, Test and Evaluation (RDT&E). Shopping for RDT&E has shown constant long-term development since the 1940s. During the period 1948-2007, the total cost of RDT&E constituted approximately 42% of the cumulative expenditure of the U.S. Ministry of Defense (Yusgiantoro, 2014). By equalizing the pay incurred for RDT&E activities in developed countries, most importantly excelling in the development of defense forces, is the U.S., Germany, France, Britain, Italy, Japan, and Canada, after the Cold War (1991), the U.S. still allocates payments for RDT &E for the defense sector is very large. This is shown in the U.S., the basic principle of defense force development is (a) it needs to be supported by a strong defense industry, and (b) it needs to have a solid and strong foundation of intensive activities for RDT&E (Yusgiantoro, 2014).

In a post written by Doctor Derek Braddon entitled "Commercial Applications of Military R&D: US and Eu Programs Compared," we can learn that during the Cold War, for example, countries' R&D spending for the defense industry recorded a record of up to US$120 billion. Of the total amount of this fund, 35 percent of which includes US military R&D spending.

The benefits of this massive funding for R&D are felt by the commercial sector in the form of a spillover effect and spinoff of commercial products derived from military products. The computer that we know today, for example, actually came from the Electronic Numerical Integrator and Computer (ENIAC) project which was initiated by the US since 1945. The virtual network project that DARPA developed in 1974 became the basis for the development of the internet that we enjoy today. Other products such as the Global Positioning System (GPS), semiconductors, jet engines, coolers, nuclear reactors, ship containers, weather satellites, and navigation systems were actually born from R&D for military purposes (Bitzinger (ed.), 2012)

The moral lessons that can be learned from the pattern of R&D development of the defense industry in the country, various discussions show trends to the aftermath of a change in state commitments such as that which occurred with the birth of BAE Systems in the UK. In Indonesia at this age, perhaps, like what happened in England in 1986, there was a LINK program that linked several universities, leading study institutions, commercial companies, to the defense industry (Karim, 2014).

The top 3 countries with the most research funds are the United States, China and Japan. The allocation of research funds owned by the 3 countries is more than 2% of the total GDP. Meanwhile, in Indonesia, it is only close to 0.25% of GDP. When compared to neighboring countries such as Vietnam, Thailand and Malaysia, Indonesia is still lagging behind. The 3 ASEAN countries have riser funds of 0.44%, 0.78%, 1.3% of GDP (Prasetyo, 2019).
By looking at Strategic Theory according to Purnomo (2007: 4) says that the word strategy comes from the Greek strategos, which comes from the word stratos which means military and ag which means to lead. Strategy in the initial context is defined as generalship or something that generals do in making plans to conquer the enemy and win the war.

Therefore, the strategic objective to be achieved by research and development is to increase the productivity of inventions and to strengthen the transformation of a competitive and sustainable economy. As well as increasing good governance in the context of bureaucratic reform.

Internationally, it has been proven that investment in research and development, both by the government and the private sector, greatly encourages economic growth. The research and development funds are used to innovate to support increased productivity. As a result, the country's production performance has improved and boosted economic growth. Countries that do not develop the technology will be left behind. It should be remembered that building science and technology cannot be instantaneous (Dipua, 2020). Requires a long process and the support of adequate human and financial resources. Therefore, Indonesia must think about increasing the research and development budget in order to build a Defense Economy.

3.2. Industrial Revolution 4.0

According to Herman (2015) said that the Industrial Revolution 4.0 is a digital industrial era where all the parts contained in it work together and talk in real-time anywhere at any time with the use of IT (information technology) in the form of the internet and CPS, IoT and IoS to create new innovations or other optimizations that are more efficient and effective.

Some of the industrial design 4.0 principles are as follows, first, interconnection is the ability of machines, sensor devices and people to connect and talk to each other via the Internet of Things (IoT), this principle requires the cooperation of security and standards. Second, data transparency is the ability of data systems to produce virtual replicas of the physical world by enriching digital models with sensor information including information and data provision. Third, technical support which includes the ability of drive systems to support humans by mixing and evaluating data consciously to make the right decisions and uncover pressing problems in a short time (Prihantoro,

2020). Fourth, decentralized decisions, which is the ability of the virtual body system to make its own decisions and carry out tasks as effectively as possible (Hamdan, 2018).

The industrial revolution 4.0 is known as the digital revolution because there is a proliferation of computers and recording automation in all fields, because automation and connectivity in a field will make significant changes in the industrial world and job competition is non-linear. One of the characteristics of the industrial revolution 4.0 is practicing the application of artificial intelligence (Tjandarawinata, 2016).

The field of Economics in the 4.0 industrial revolution is currently in the middle of a major transformation in technological advances enabling automation in almost all fields. Among the challenges that are currently being experienced, technology that mixes the physical, digital world with methods that fundamentally change humanity, to the extent that this transformation will have a positive impact (Hamdan, 2018).

One example of the results of the development of the industrial revolution 4.0 is drones. Drones are unmanned aircraft that can fly remotely controlled using a remote control or sophisticated computer. Regular drones have various types of sizes, shapes, and functions. The drone material is made of lightweight materials, so it can fly quickly and fly at low altitudes or certain heights. Drones themselves have cameras, infrared, GPS, sensors, and other supporting tools (Rizal, 2021).

With these advantages, the beginning of the largest use of this drone was in the military field. Along with the times, drones are also increasingly being used for civilian (non-military) needs, for example, as we know today, there are many uses of drone technology for photography and videography purposes. Not only that, the agricultural sector is also entering a new phase by utilizing drone technology (Aryanto, 2020).

The Ministry of Industry has set four strategic steps in facing Industry 4.0. The steps to be implemented are: First, to encourage the workforce in Indonesia to continue to improve their abilities and skills, especially in using internet of things technology or integrating internet capabilities with industrial production lines. Second, the use of digital technology to spur productivity and competitiveness for small and medium- sized industries (IKM) to be able to penetrate the export market through the E-smart IKM program. Third, more optimal use of digital technology in national industries such as Big Data, Autonomous Robots, Cybersecurity, Cloud, and Augmented Reality. Fourth, encourage technological innovation through the development of start-ups by facilitating business incubation so that there are more technology-based entrepreneurs in the territory of Indonesia (Satya, 2018).

The industrial revolution 4.0 has a very good impact on building the defense economy. As the researcher explained from the benefits of one of the results of the industrial revolution 4.0. The existence of drones that can become military weapons and can also fulfill non- military activities is used for farmers to increase their productivity or activities related to big data. The Industrial Revolution 4.0 makes the work carried out by individuals or companies more economic growth. Countries that do not develop the technology will be left behind. Indonesia must think about increasing the research and development budget in order to build a Defense Economy. The Industrial Revolution 4.0 makes the work carried out by individuals or companies more effective and efficient. With this efficiency and effectiveness, the economy will increase and automatically the defense will also increase.

4. Conclusion

The conclusion of writing this article is that the results of research and development funds are used to innovate to support increased productivity. As a result, the country's production performance has improved and boosted economic growth. Countries that do not develop the technology will be left behind. Indonesia must think about increasing the research and development budget in order to build a Defense Economy. The Industrial Revolution 4.0 makes the work carried out by individuals or companies more effective and efficient. With this efficiency and effectiveness, the economy will increase and automatically the defense will also increase. So research & development and the industrial revolution 4.0 in practice can build and strengthen the existing defense economy in a country.

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