



# Defense Industry Cycle: Development Of Highly Competitive National Defense Industry Technology

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## Abstract

The slow development of the defense industry makes Indonesia still dependent on foreign production, so for Indonesia, efforts to rebuild the defense industry are a policy that cannot be ignored. The need to protect territory, projected future threats, political-security dynamics in the region, and foster national pride are some of the many strategic factors that encourage security sector stakeholders in Indonesia to study and determine directions for achieving defense industry independence. In this study, with a literature review approach and field observations, the condition of the state seeks to renew the defense system to deal with threats related to the development of technology itself. For Indonesia, the life cycle of the defense industry is a matter of consideration for the perpetrators to continue to maintain technological sustainability. This can be done by continuously developing competitiveness, innovation and improving human resources.

**Keyword:** Defense Industry, Threat, strategic, technology, life circle

## Introduction

The need for rebuilding the defense industry is to identify the importance of the role of each stakeholder in the industry. It is often heard and discussed regarding the concept of triple helix in the defense industry. The importance of mapping the role of stakeholders is seen from the long historical experience, the government and private-national defense goods/services provider companies, in the country, are in a situation of a mutual need for each other. On the defense industry side, intense competition, large capital requirements to innovate, and the mobility of companies to obtain the best and most efficient production factors have motivated the internal consolidation of the defense industry. England and France, for example, only have one or two major players providing defense goods/services. Meanwhile, the government faces a complex security situation and requires specific and efficient defense products. The government is also required to improve the national defense industry because, first, it meets the needs of the armed forces in carrying out national defense tasks, and second, turning the wheels of the

national economy, one of which is by protecting and increasing the capacity of the national defense production chain.

Learning from countries that have the production of defense equipment needs to be understood that at least the government must have a function as; consumers (users), sponsors (supporters), and regulators (regulators). The Defence Industrial Triptych seeks to untangle the problems that arise and the government's response in tackling these problems. First, as a consumer, the United States along with Britain and Germany are loyal users of the defense goods/services that its national industry offers. Trends show that many of the government's defense duties/functions are now carried out by the private sector, and the government needs products offered and provided by the private sector so that the government can carry out its defense duties/functions. Second, the development and dynamics of threats are part of the wave of privatization that has hit developed countries. The government has set a focus on core defense tasks, such as training for soldiers, while the provision of logistics,

transportation, washing clothes, and maintaining headquarters is left to the private sector. Third, the government considers that this format of task sharing, or cooperation with the private sector, will ease the burden of tasks and save the government's budget, and no less important thing is that the government can build a national defense production chain that is expected to have a positive effect on the national economy.

In this situation, the government has great influence in determining the business plan of the national defense industry, because the government always has a demand that is always consulted with national industrialists. The defense industry life cycle uses the S-Curve Approach which includes Technology, Products, Business and the Defense Industry itself. In the defense industry, this usually means producing cost-effective, performant, user-friendly systems (Arnold & Wade, 2017). The life cycle is a science that needs to be considered in the development of the defense industry considering the need for efforts to maintain the sustainability of industrial products from the time they are first introduced until they are lost in the market. Industrial Lifecycles containing high levels of technology consist of Technology Life Cycle and Product/Business Life Cycle.

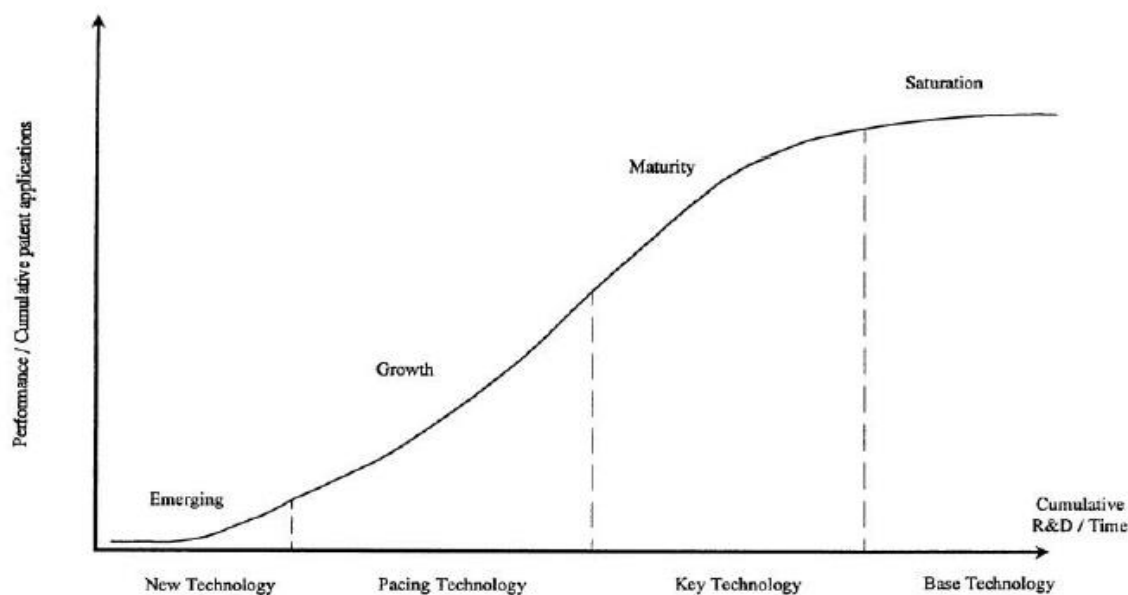
According to Crown Dirgantoro, competitiveness is the development of the value a company is able to create to buy it. Competitive advantage is something that allows a company to earn a higher profit than the average advantage obtained by competitors in the industry. Generic Competitive Strategies There are a number of well-known strategies that can be applied to a wide variety of industries and company sizes. These strategies are grouped under generic generic strategies. The term generic strategy was proposed by Porter. Its definition is an approach to corporate strategy in order to outperform competitors in similar industries. In practice, once the company knows its generic strategy,

its implementation will be followed up with a more operational strategy determination step. According to David (2006), competitiveness is everything that a company does very well compared to its competitors. When a company can do something and another company can't, or has something that its competitors want, it illustrates that competitive advantage is critical to the long-term success of an organization. Generally, a company can maintain a competitive advantage only for a certain period due to being imitated by competitors and weakening that advantage. In addition, the competitive strategy itself is a combination of the ends (goals) that the company strives for in which the company tries to reach the goal (Porter, 1980).

### **Thinking Framework**

The difference in the mastery of technology between developed and developing countries is quite a problem in itself. As a result, developing countries must apply appropriate technology instead of catching up with developed countries. However, the condition of low human capital, obsolete technology, and slow technology penetration makes it difficult for developing countries to be independent. The impact is that there is dependence on developed country technology.

Technology has a life cycle that is divided into 4 phases as follows: first; Emerging/Embryonic Stage: New technologies at the time they are created tend to slow down, do not yet have competitiveness and the degree of integration in the process is still low. Secondly; Growth Stage: Technology that is steady in the development period tends to grow stable and fast, so it has competitiveness with a high degree of integration in the process. Third; Maturity Stage: Technologies that are steady in maturity tend to grow slowly, becoming the key to maintaining competitiveness and integration in the process. Fourth; Saturation Stage: Technology is already losing competitiveness in the face of limitations, becoming a basic technology and replacing new technologies.



**Figure 1** Technology of life cycle

The shape of the S-Curve technology depends on its development efforts from time to time. The factors that make up the S-Curve = function (T, IT, C, R&D, Cet Par) are the technology factor itself, technological innovation, development costs, research and research and other factors that influence

### Methodology

Research is a process carried out systematically to find, interpret, and revise facts so that each study will produce a novelty that is useful for the development of science. In this study, the method used was qualitative. The use of this qualitative method refers to a paradigm shift when looking at reality or phenomenon. The purpose of this study is to find out a detailed picture of an object of study. Qualitative methods are aimed at understanding the phenomena of the experience of the subject of research, behavior, perception, motivation, action, and others. Holistic and descriptive in words and language in special natural contexts and using a variety of natural methods (Moleong, 2012:6). In this study, it will lead to data collection by using a literature review to find out a clear flow related to the stages of the defense industry cycle

### Discussion

#### Competitiveness Dimension

The dimensions of a company's competitiveness as stated by Muhardi

(2007:40) citing Ward et al (1998:1036-1037) consist of cost, quality, delivery time, and flexibility. The four dimensions are further explained by Muhardi (2007:41) Complete with the following indicators:

1. Cost is a dimension of operating competitiveness which includes four indicators, namely production costs, labor productivity, use of production capacity and inventories. The element of competitiveness which consists of cost is an absolute capital owned by a company which includes the financing of its production, labor productivity, utilization of the company's production capacity and the existence of production reserves (supplies) which can be used at any time by the company to support the smooth running of the company.
2. Quality as referred to by Muhardi is a dimension of competitiveness that is also very important, which includes various indicators including product appearance, product acceptance period, product durability, speed of resolution of consumer complaints, and product conformity to design specifications. The appearance of the product can be reflected in the design of the product or service, a good product appearance has a simple design but has a high value. The period of product acceptance is intended by the length of time the product can be accepted by the market, the longer the life of the product in the

market shows the better the quality of the product. As for the durability of the product, it can be measured by the economic life of the use of the product.

3. Delivery time is a dimension of competitiveness that includes various indicators including the determination of production time, reduction of production waiting time and determination of product delivery time. These three indicators are related, the determination of product delivery time can be influenced by the timing and length of production waiting time.
4. Flexibility is a dimension of operational competitiveness that includes various indicators including the variety of products produced, the ability to adapt to environmental interests.

### **Basic Defense Industry Life Cycle**

The life cycle is a cycle for producing and marketing Industrial products. The Life Cycle shows the stages of the life cycle of an Industrial product, starting from being first introduced to the market until finally disappearing from the market. The life cycle, especially in industries that contain high levels of technology, has two important elements, namely (i) Technology Life Cycle and (ii) Product/Business Life Cycle.

The technology life cycle grew from the dynamics of globalization, and technology in the defense industry became two gaps, namely the existence of technology from developed countries and developing countries. The technological progress of developing countries is a technology that has been developed before, not frontier technology that has not been proven.

#### **a. Innovation**

Innovation policy should be part of industrial policy. Made in China 2025 represents the latest far-reaching industrial policy on a continuum of such policies to develop not only national champions, but also global champions. Policy documents related to Made in China 2025 set global sales growth and market share targets that are to be filled by “domestic products“ (Kwan, 2019). The

development of science and technology, which can increase the stock of knowledge that can be combined for innovation purposes, should support industrial policy. It is not treated as its sector which is entirely the business of the Ministry of Research, Technology, and Higher Education.

The inability to integrate technology research and development (R&D) policies with industrial policies is a common symptom in developing countries. As if technological progress can be achieved only by allocating funds for technological R&D activities alone. The technological capabilities of Taiwan, South Korea, and China are demonstrated by their technological products flooding the world market. This technological capability has raised their level of prosperity from a low-income country to a high-income country. Meanwhile, countries such as Indonesia, Malaysia and Thailand, because they cannot continue to improve their innovation capabilities, are in the Middle Income Trap.

The above makes many people think that technology R&D activities are the main thing in pursuing technological progress. Their focus is only on encouraging the development of science and technology, without fixing the conditions that encourage such development, and ignoring the factors that limit or reduce the motivation for the development of science and technology. According to Paper & Series (2019), that very often different policies coexist in the same country more or less coherently, and more or less linked to a 'mission-oriented' approach to science and technology policy, or industry policy more broadly. If we only focus on technology development activities, our country has already done it in the era of B.J. Habibie became the minister of research and technology. Our country has allocated a large budget to develop the aerospace industry and several other strategic industries. Many students have also been sent to study engineering or engineering sciences to developed countries, such as the Netherlands, Japan, Germany, and others. Attention B.J. Habibie was very good at that time because he tried to strengthen certain industries and their supporting R&D activities.

Currently, science and technology development policies are separate from industrial policies. Efforts to synergize industrial and R&D activities intensively and deeply are still not visible.

In the development of national technology, various parties have different roles. And, what needs to be realized, the attacker is not R&D institutions or technical colleges, but the industry itself. Because the end of a nation's competitiveness is industrial competitiveness. In the end, the fruits of innovation must be fought in the market, or other areas of non-commercial use. Therefore, for commercial innovation, the business sector must be the main target of innovation policy. Meanwhile, R&D institutions, universities, government research funding, and others related are the supporting structures needed to support the business sector.

Innovation policies need to align support structures with the business sector. Technology R&D institutions need to plan their activities to meet industry needs. For that, their research must start from the needs of the industry. In addition, their incentive system must also be designed so that they are willing to work in serving the industry, and even able to work according to the fast-paced rhythm of the industry, not following the bureaucratic budgeting system.

During the New Order era, Indonesia was more like South Korea than Taiwan in setting targets. Indonesia focuses on several industrial sectors and each relies on one state company. This is similar to South Korea starting its technology development through state companies that make steel, then through some local giant companies. Meanwhile, Taiwan chose one sector, namely microelectronics, and involved many industrial actors. Through the government agency Industrial Technology Research Institute (ITRI), Taiwan actively diffuses new knowledge and technology to dozens of local companies. Initially this technology was obtained by licensing the technology from outside, and gradually they did their own development.

This innovation policy that relies on many companies is more open to the possibility of giving rise to superior and innovative companies. Meanwhile, those who rely on one company are more at risk, because if they fail, there is nothing else to rely on. And relying on government companies is even riskier because the government will do everything possible to keep the company from appearing to be a failure. South Korea, which relies on chaebols, can overcome this risk. This is partly because their innovation policy is not merely technology development, but uses other policies that are mutually reinforcing. And, what is far more important is the existence of a policy learning process, the ability and willingness to detect failures, and immediately correct inappropriate policies. The results of previous studies show the demand for labour graduated from vocational colleges is further emphasised in recent Norwegian industrial policy, where vocational colleges are identified as one of the government's priority areas in terms of knowledge creation that facilitates the competitiveness of future industry and manufacturing in Norway (Ministry of Trade Industry and Fisheries, 2017).

Agency for the assessment and application of technology as an institution for the assessment and application of technology under the coordination of the Ministry of Research Technology/National Research and Innovation Agency has a strategic function in increasing mastery of technology and innovation. BPPT believes it is able to bring Indonesia into a victorious and competitive country in the future by developing mastery and utilization of science and technology through the implementation of its seven roles. The results of previous studies show VR technology can be put into application in education, military, sports training, and is portraying an important part in the evolution. The paper summarizes the developments in VR technology in the fields of education, military and sports, and then analyses the future trends of VR in these fields (Ahir, Govani, Gajera, & Shah, 2020).

A research and innovation ecosystem must be created comprehensively from upstream to downstream in the research and development

(R&D), design and innovation, manufacturing, and business sectors, which are oriented towards market demand so that it is hoped that its application can be realized towards a prospective initial market such as vehicles, government service or public transportation in Indonesia. To build an innovation ecosystem, it tries to play a role in being able to clear technology, transfer technology, and engineering to be able to pave the way for domestic industries to become principals who can take advantage of the initial market momentum in the early days of technology application in Indonesia.

#### **b. Improvement of Human Resources (HR)**

The government makes HR one of the five government priorities in the 2019-2024 period. This statement is still fresh in memory when President Joko Widodo made it in his inaugural speech, after being sworn in on October 20, 2019. That the government will "build hard-working, dynamic human resources. Building skilled human resources, mastering science and technology. Inviting global talents to work with us." To make it happen, he also said "It cannot be achieved by old ways. New ways have to be developed. We need a large endowment fund for our HR management." Likewise, "It is also important to optimize cooperation with industry. And also the use of technology that makes it easier to reach all corners of the country." We found several useful technologies of Industry 4.0 which help for proper control and management of COVID-19 pandemic and these have been discussed in this paper. The available technologies of Industry 4.0 could also help the detection and diagnosis of COVID-19 and other related problems and symptoms (Javaid, Haleem, Vaishya, Bahl, & Suman, 2020).

Meanwhile, various efforts to empower and improve human resources in the defense industry continue to be carried out on the basis of the existing vision, mission, and policies. Likewise, efforts in the scope of domestic and foreign. Symmetrically, it is more focused on efforts to collaborate with universities/research and development institutions as well as the defense industry, which is also increasingly being enhanced to reduce risks and anticipate

when there is a possibility of threats and embargoes from developed countries. Therefore, improving the quality of human resources whose priority is limited to the defense industry and the three pillars of science and technology actors does not reduce many meanings in the framework toward defense resilience. However, the actual development and capability of defense development have a lot of scopes. With a note, policies related to strategic plans and commitments must be consistent and directed to be realized. The results of previous studies show They further reveal that firms that develop products for the defense industry are more likely to gain investment capital, while those that supply the defense industry have higher sales (Nasra & Oliver, 2022).

Of course it is not as easy as turning the palm of the hand, there are many problems and challenges that we face to create superior human resources in the future. Sri Mulyani Indrawati (Minister of Finance) on one occasion said at least "there are several challenges that must be resolved in improving the quality of human resources. Indonesian Human Resources (HR) to face the industrial revolution 4.0". For example, the high rate of stunting and the quality of education. If you listen to the report of Nila F. Moeloek (former minister of health) before ending her term of office, she announced that the stunting rate in Indonesia this year was 27.67%. This figure has actually decreased by 3.1% from the previous year. But the struggle is not over. It is hoped that the stunting rate from year to year continues to decline. Because we know that children are the nation's assets in the future. If the stunting rate is still high in this country, it is the same as preparing the future generation of an unproductive nation. The Industry 4.0 concept, originating from German industrial policy, is used as a generic concept for technologies that have the potential to change manufacturing processes, product development, and the organisation and localization of manufacturing (Lund & Karlsen, 2019).

In fact, for matters of health quality, including stunting, the government has also tried various

efforts, including in allocating 5% of the APBN to improve the quality of public health. Then, it is necessary to increase the distribution of the quality of education in a very wide area of Indonesia. The hope is that none of the regions are left behind and unable to compete with other regions. It is hoped that with the concept of 3T regional development, lagging behind, leading and outermost, can be a solution for equal distribution of education quality. China has urban agglomerations (Yu, Zhou, and Yang 2019) which have been established to achieve coordinated and balanced regional development. Results show that the ecological efficiency of the regions show an "N" type change over time. LPI and PD show a significant impact in promoting ecological efficiency while FD inhibits ecological efficiency but is not significant until the regional scale reaches 1,352 km<sup>2</sup>. We conclude that the development of urban agglomeration is more conducive to improving regional ecological efficiency, which will give policymakers some inspiration in developing a regional development strategy (Wang, Jia, Zhou, & Fan, 2020).

From a budget perspective, of course, we don't need to doubt the government's commitment. Even the highest budget in the APBN is the education budget, which reaches 20%. The problem is, will the allocation of such large funds be right on target, really for the benefit of advancing superior human resources? In contrast to Sri Mulyani, Bambang Brodjonegoro emphasized the obstacles in improving our nation's human resources because the competitiveness of Indonesian human resources is still lagging behind other ASEAN countries. Then more than half of Indonesian workers are still in the informal sector with low productivity. Lastly, the low access of vulnerable groups such as women, persons with disabilities, and residents of disadvantaged areas to quality job opportunities. In fact, this is a new chapter in our struggle to develop superior human resources that are able to encourage Indonesia to be more productive, competitive, and flexible in facing global challenges that are dynamic and full of risks.

## Conclusion

Technological developments have had consequences for the military and defense of a country. This is inseparable from the adoption of various technologies and discoveries in the military field that aims to strengthen the national defense system. This condition makes all countries strive to update their defense systems to deal with threats related to technological developments themselves. For Indonesia, this is a challenge as well as an opportunity for the defense system it currently has. The life cycle of the defense industry is a matter of consideration for the perpetrators to continue to maintain technological sustainability. This can be done by continuously developing competitiveness, innovation, and improving human resources.

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