



Transfer of Technology Process between Indonesia and France

Waskito Dwiwicaksoputro; Gathut Imam Gunadi; Nadia Aurora Soraya; George Royke Deksinio

Defense Industry Study Program, Faculty of Defense Technology, Republic of Indonesia Defense University, Indonesia

E-mail: waskito.dwiwicaksoputro@tp.idu.ac.id; gathut.gunadi@tp.idu.ac.id; nadia.soraya@tp.ac.id;
george.royke@idu.ac.id

<http://dx.doi.org/10.47814/ijssrr.v6i1.918>

Abstract

Indonesia's bilateral partnerships, especially in defense-security equipment trade with various countries, have increased significantly in recent years. A distinctive feature of defense equipment imports in Indonesia is the obligation to carry out offsets. However, constraints on the offset process or suboptimal technology transfer often prevent the government and industry from mastering the technology of the products that have been purchased. This will have an impact on the entire life-cycle of the purchased product, starting from product procurement to its disposal phase. In addition, it also has its own effect on efforts to increase the research and development capabilities of domestic defense equipment. This paper will compare and describe the critical points of the technology transfer process of the French defense industry (Naval Group) with the Indonesian defense industry (PT PAL Indonesia).

Keywords: *Transfer of Technology; Technology Acquisition; Defense Industry Independence*

Introduction

The term "National Defense" refers to all actions taken to uphold state sovereignty, territorial integrity, and the safety of the entire nation against threats and interference with those interests (Connie, 2007: 49). This knowledge suggests the significance of defense as the core component of a nation's efforts to preserve its existence. The definition of defense itself, as well as the theories and technologies underlying it, have all undergone tremendous development in the modern era. Threats to state sovereignty have grown in the current global environment alongside technical advancements. Because it is constantly driven by deterrent capacities to be able to meet demands and adapt to constantly evolving threats, defense technology is always seen as representing the present. Humans have seen throughout history how advances in technology and the defense sector have altered how conflict is fought.

When the US, a supplier of defense equipment, enforced a weapons embargo in the 1990s, Indonesia's defense forces were put to the test. Due to this circumstance, Indonesia finds it challenging to update its defense equipment system. Even maintaining the current defense equipment system becomes highly challenging. It is well known that the main defense equipment system, which serves as the foundation for the Indonesian defense system, is in pretty poor condition. The Indonesian Navy is the defense force that has been most significantly impacted by the changes brought on by the advancement of weapon technology as seen from the current situation. The state of the Indonesian Navy does not now have

adequate fleets to protect Indonesian waterways. Old warships built in the former East Germany and the Netherlands are still being accommodated by the defense equipment system of the Indonesian Navy. The Indonesian Navy only has two submarines, which is obviously insufficient to defend Indonesia's maritime area even for a maritime nation like Indonesia. Due to this situation, Indonesia's marine area is obviously extremely exposed to intrusions, both those with criminal intent (such as piracy and fishing theft) and those connected to foreign espionage activities. The navies of surrounding nations and other nations already possess sufficient military tools to protect their oceans.

The state of the Indonesian Navy in relation to the defense apparatus that is now in use and ownership demonstrates that Indonesia continues to face challenges in completing the defense apparatus system to support the national defense apparatus. Since having defense equipment today is one of the primary requirements for fulfilling the requirements of the national defense system, it is crucial that this issue be resolved. If this is not fixed right away, threats from both inside and outside Indonesia that aim to undermine the sovereignty of the Unitary State of the Republic of Indonesia will be able to simply paralyze the Indonesian defense system.

One of the key players in a nation's efforts to create its own defense system is the domestic defense sector. This relates to meeting needs in terms of supplying sufficient and high-quality defense gear in accordance with regional features as well as ending political dependence on other nations. Through Law Number 16 of 2012 Concerning the Defense Sector, Indonesia, which is now speeding its program to achieve the minimum demand for military strength, has established a legal foundation for the growth of the local defense industry. Indonesia must cooperate in this area, especially with established nations, as a nation that is only beginning its efforts to develop its domestic defense sector. Joint development, a program of cooperation between the government and multinational corporations that develops and produces a weapon system, including evaluation, shared expenses, and profit sharing through sales of the weapon manufacture, is one type of defense industry activity (Perwita, 2013).

The Indonesian government consistently aims to include a technology transfer clause in it as an effort to strengthen defense cooperation with other nations. The local defense sector must be able to implement and build weapons in accordance with the established criteria in order for this transfer of technology to be successful. Given that the indigenous military sector is currently showing positive advancements, this does not appear to be a barrier for Indonesia.

Today, one of the factors influencing a country's progress is thought to be its technological advancement. Many nations, including Indonesia, are exchanging technology to better their own nations. Technology transfer is the process of fostering technical innovation through the transfer of concepts, know-how, instruments, and artifacts from top businesses, R&D institutions, and scholarly research to more extensive and efficient applications in business and industry. (Seaton and Cordey- Hayes: 1993: 46). In order for these new technologies to be used in developing countries, developed countries typically transfer technology to them. This is crucial for future research and use in the creation of new goods, methods, tools, materials, and services. Additionally, there are two types of technology transfer: horizontal transfer and vertical transfer. Technology transfer from one industry to another is referred to as horizontal. The transmission of technology from research to application is known as vertical transfer. (Grosse, Robert: 1996).

The development of the concept of Network Centric Warfare or modern warfare requires defense and security institutions, both Ministries, TNI and Polri, Universities, and the Defense Industry to consistently innovate and collaborate in order to master defense technology. The fulfillment of Indonesia's Minimum Essential Force (MEF) is one of the important priorities as a form of basic strength that meets standards and has a deterrent effect so that the country can minimize the potential for various threats and disturbances.

The acceleration of mastery of defense technology is carried out through innovation, one of which is by adopting a technology or we know it as Transfer of Technology (ToT). The existence of a ToT partnership allows the government (Ministry of Defense) as well as industry to maintain the desired level of technological innovation in an industrial environment with limited resources; under a technology transfer agreement, the Ministry of Defense can receive direct monetary benefits such as license fees, royalty payments, cost avoidance or other additional payments.

Fulfilling Indonesia National Army's defense equipment, in addition to purchasing six Rafale fighter jets made by Dassault Aviation, Indonesia also plans to buy two Scorpene submarines. The move began with the signing of an agreement between PT PAL and a French defense contractor company, Naval Group. As a form of implementing mastery of technology, the entire construction of the Scorpene type submarine is carried out at PAL and optimizes the capabilities of PT PAL's human resources with assistance from the Naval Group. The collaboration between PT PAL and the Naval Group is a form of realization of the modernization of defense equipment carried out by the Indonesian Ministry of Defense in an effort to strengthen the defense capabilities of the Indonesia National Army for the next 20 years. This agreement is also considered a mutually beneficial agreement. For Indonesia, the opportunity for joint production is also complemented by technology transfer. This shows the government's commitment in fulfilling technological updates on its defense equipment, both mastery of ship design and increasing human resource capabilities through the ToT (technology transfer) program in which the role of State-Owned Enterprises in the Defense Industry, especially the marine dimension, is a domestic industry that supports the independence of the national defense industry.

Methodology

Recent works and literature reference on topics to explore and search for explanatory findings resulting in a concrete concept theory. From the data collected, it will be interpreted into an analysis to support the elaboration of a comparative study of defense industry company website management. This research using qualitative method, in which his method is also referred to as the post positivist method which is based on the philosophy of postpositivism (Sugiyono, 2019). The necessary information and data that are used in this research were collected through literature study and personal communication/interview with experts in the discussed topic.

Findings

Transfer of Technology is one of the main drivers of innovation which then has an impact on the country's economic growth. Transfer of Technology is the process by which new technologies (in other words, innovations) are transferred and adopted for other purposes such as further research, new breakthroughs, or adaptation. Transferring technology is not just importing technology from one party to another but also giving access to control, use, develop, and abuse it. Technology can be imitated yet the quality couldn't be exactly the same as the real one while certain specifications are unique for each technology and nearly impossible to be copied. Hence why, transfer of technology is often the option for companies or product owners seeking to acquire technology that is needed.

R&D and production cycles are important components in the steps of implementing innovation and technology transfer by paying attention to the category of technology readiness level (TRL) to determine the level of defense companies involved with technological innovation. TRL is categorized from TRL 1 to TRL 9 with TRL 9 being the pinnacle of understanding about manufacturing operating systems. (Sezal & Giunelli, 2022).

Transfer of Technology occurs in various stages of the production process starting from the initial

development stage which is the beginning of technological discovery, the patent application stage, to the final licensing stage. While on that, the technology can be transferred, commercially, through attracting foreign capital to invest in the form of joint venture, license agreement, or several other agreement that related to the technology contracts including services (Hartono and Susilowati, 2007 as cited in Trisnawati, 2020, p. 50). Thursby and Thursby (2002) The success of technology transfer needs to be supported by a stable economy and the technology receiving industry has the relevant capacity. In addition, another factor that is a success in carrying out this process is the belief that the technology obtained is the latest and latest technology, it is necessary to evaluate the effect and real effectiveness of technology transfer. (Hristov, N., & Georgiev, M. 2017).

In the transfer of Technology process, there are 4 things that must be transferred, namely technower, Humanware, infower, and organower. Technower is part of the equipment or machine that becomes the main system in the technology transfer process in physical form and other main devices. Humanware is a human device that is the key to being given the ability to operate, maintain, repair and even innovate a technology. In many activities, this aspect is often neglected, but in fact this aspect is very important in supporting the continuity of the recipient's technology in the future in order to develop the broadest knowledge. Infoware is a framework of information, methods, procedures and analysis of a technology that is useful for the recipient to be able to develop existing designs and be able to make the same product by relying on the information obtained. Organower is an organizational device that collects components of technower, humanwer, and infower. In this process the recipient will be given training on good management in carrying out organizational processes between the three components so that they run well. (Lutfy, I. 2017).

The main purpose of the Transfer of technology (ToT) is to obtain an increase in the social and economical value of an industry (Madl & Radebner, 2021). Furthermore, the ToT can support the establishment of an independent defense industry in a country, for example, China. The said country is experiencing very rapid development in the field of technology and innovation in its defense industry. They have absorbed all forms of knowledge and development in defense technology from other countries, then converted and adapted it into output in the form of local products. To optimize the ToT, China has taken various ways, one of which is through large defense spending, involvement in collaboration with other countries, and even industrial cyber espionage (Cheung et al. 2019).

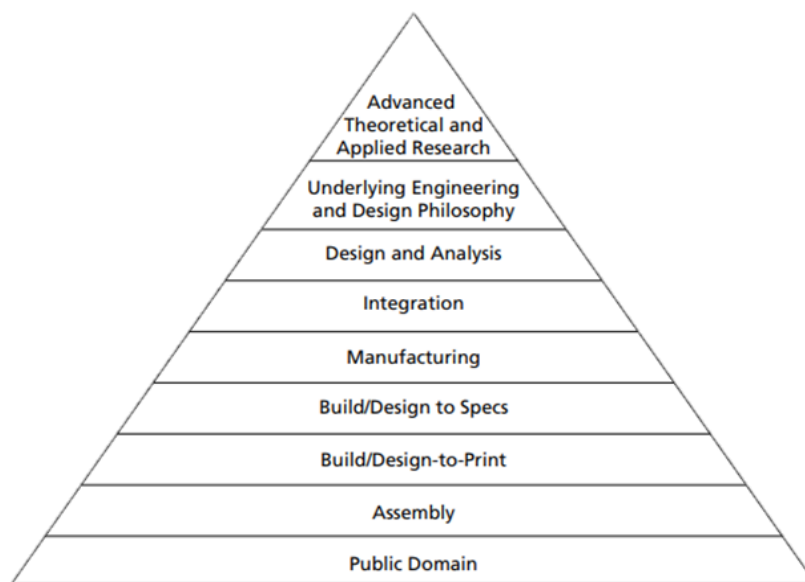


Figure 1. The technology transfer pyramid (Jameson, 2000 *inside of* Downes, 2012).

One of the leading companies in the U.S. has defined the stages in the ToT process. These levels are arranged in the form of the technology transfer pyramid (figure 1) (Jameson, 2000 *inside of Downes*, 2012). The ToT (G to G) process is strongly influenced by the bilateral relationship between the two countries. This can be achieved, among others, by the implementation of defense diplomacy between countries so as to provide opportunities for ToT agreements and offsets in the procurement of defense equipment (Riyadi & Dewi, 2022). On the other hand, to increase the effectiveness of the ToT process, China has adopted the concept of IDAR (advanced imitation; integrated innovation; and original innovation), which is accompanied by strengthening dual use technology in its country (Cheung et al., 2019).

Discussion

The commitment to advance the Indonesian defense industry which is based on Law No. 16 of 2012 and the implementing rules that follow, among others:

1. Government Regulation of the Republic of Indonesia No. 76 of 2014 concerning Trade Imbalance Mechanism in the Procurement of Defense and Security Equipment from Abroad.
2. Government Regulation of the Republic of Indonesia Number 141 of 2015 concerning the Management of the Defense Industry.

In order for the Indonesian Defense Industry to be strong, advanced and competitive in accordance with Article 7, Law Number 16, Law Number 16 regulates the three pillars of the Defense Industry, namely:

1. The government, its duty to issue policies related to the Defense Industry with the establishment of KKIP, provide guarantees and financing to the Defense Industry. The KKIP organization is chaired by the President, the Minister of Defense as the Daily Chairman of KKIP, the Minister of BUMN as the Daily Deputy Chairman of KKIP, and several Ministers as Members as well as the TNI Commander and the Chief of Police.
2. Users, whose job is to be able to use Defense Industry products, provide assistance and evaluation of defense equipment products made by the Indonesian Defense Industry.
3. The Defense Industry, whose task is to produce Defense Equipment that can be used by Users.

Regulation of The Minister of Defense of The Republic of Indonesia Number 14 of 2020 Concerning Amendment to Regulation of The Minister of Defense Number 16 of 2019 Concerning Implementation of Procurement of Defense Equipment and Security Equipment in The Ministry of Defense and The Indonesian Army: Article 1, No. 44, in this Ministerial Regulation what is meant by Transfer Of Technology (ToT) are the process of transferring skills, knowledge, technology, manufacturing methods, manufacturing samples and facilities between buyers / users and sellers as well as between other institutions to ensure that scientific and technological developments are accessible to a wider range of Users who can then further develop and utilize technology to become new products, processes, applications, materials, or services.

France is one of the providers of defense and security equipment needed to support the operations of the Indonesian National Army. Based on Law Number 16 of 2012 Article 43 Paragraph 5 Point c which explains related to Technology Transfer Obligations, which must be obeyed by Defense Industry players, including France, among others for Procurement of 155 mm caliber cannons from Nexter, France, which has been done. From the procurement, Nexter provides technology transfer in the form of making supporting vehicles in the form of Battalion Commander, Battery Commander, Meteo Vehicle, Logistic Vehicle and the ability to produce Caesar Barrel, the ability to produce 155 millimeter ammunition, integration and maintenance capabilities for Fire Control System to PT LEN and the ability to develop and produce vehicles to PT PINDAD. All the while, there are matters worth to be pointed at the implementation of the

Transfer of Technology from the France Defense Industry, namely NAVAL (Scorpene) and DASSAULT (Rafale) to Indonesia, there are:

1. The ToT has not yet been implemented, the plan is to maintain Rafale aircraft in our defense industry, including at PT. Dirgantara Indonesia, but not implemented yet due to waiting for effective contract.
2. From DASSAULT will provide assistance to fulfill medical equipment at Dr. Suyanto-Hospital, belonging to the Ministry of Defense which will be used as R&D facility for Republic Indonesia Defense University, especially for Medical Faculty students based on therapy as many as 30 items.
3. Engineering support package including:
 - A. ToT Static Load Analysis for RAFALE Aircraft Aero Mechanical Store Integration.
 - B. Industrial Excellency Training & ToT Safran aircraft (RAFALE's engine)
 - C. Defense Digital Factory for Indonesia.

That means, Indonesia is being taught to build the Industry 4.0 capabilities for 3 things including the engine industry, radar industry and UAV (Drone) industry. All these for the procurement of 6 aircraft.

4. The 36 aircraft have not been released yet, but the plan is for more ToT and Local Content to be provided.
5. As for the Scorpene Submarine from NAVAL, the Transfer Of Technology is based on a contract between NAVAL and PT. PAL Indonesia.

The technology transfer that has been carried out for Exocet Missiles for Ships from MBDA, MM 40 B3 and VL (Vertical Launcher), where the Indonesian side gets the ability to produce Missiles and also some of its components. In addition, France also provides the ability to know the function of Seeker, Function and Control System and Navigation System. As for the acquisition of Missile Workhead and Fuze, Propellant and Igniter technology, Indonesia also gained Missile Guidance capabilities.

In the future, cooperation between Indonesia and France will continue on the procurement of Scorpene Submarine, Rafale Airfighter and Ground Control Intercept Radar. As for Transfer of Technology process conducted by France defense industry, a case study of Transfer of Technology approach from Naval Group is being used in this discussion. Naval Group, a major French industry company specialized in naval defense, defining Transfer of Technology (ToT) as an operation that obliges the transfer of any Naval Group's technology and/or know-how aiming to develop the capabilities of a customer, a partner, or another beneficiary. It is executed through managerial approach which has two main components, there are (Leon & Leduc, 2022):

- Operational: Delivery of goods (materials and data) required to develop project activities; Training and support on technology and/or know-how required to develop skills and build capabilities. The technical support prepared through training by trainer is crucial in order doing step by step for certain activities/knowledges regarding the technology.
- Intellectual Property (IP) Rights: Granting of adequate rights to use and produce proprietary IP.

The French war experience led the Naval Group to successfully develop warship construction and through life support programs with ToT since the 1990s. An important point emphasized in ToT is the support of specific knowledge management methodologies in order to regenerate the capabilities and capabilities of partners. Naval group capabilities are reflected across ToT Capabilities related to ship operations, through assistance (maintenance, updates and upgrades), construction and design. Programs such as complete training system and simulation for the customers in terms of human resource

capabilities to prepare the crew before taking over the technology are provided by Naval Group. Minor design, modification, implementation, and integration are important to maintain the products as well as helping the customer to establish its local supply chain to maintain the product sustainability; those are the example of ToT that Naval Group provided. Throughout the lifecycle of the transfer, Naval Group is covering (Leon & Leduc, 2022):

- Assessment like shipyard audit and training needs analysis are prepared
- During the Ramp-up activities, necessary initial information like data packages and material packages are also given for the ToT recipient. Developing high performance training (theoretical, practical, on-the-job, and train the trainer– regenerating skills) are included. A certain level of competency needs to be met for the beneficiary to be able to acquire the product/technology.
- Support activities for ToT recipients during acquisition process of skills and development of critical activities are ensured. Naval Group delivered technical assistance and supervision for ToT beneficiaries too.

In return of receiving ToT from Naval Group, they encourage and support ToT recipients to apply the approach of Autonomy Assessments and Knowledge Managements. Both approaches are important during the process of acquisition and after the process is executed. Knowing the level of proficiency is crucial for ToT beneficiary as this helps the Naval group to provide appropriate training for the human resources that ToT recipients have. In addition, knowledge management is also able to upkeep and adapt during the transfer.

Conclusion

The mastery of defense - security technology within the triple helix of the national defense industry still has many areas of improvement. Stakeholders in the Ministry of Defense, KKIP, and in collaboration with industry players need to initiate and build a comprehensive strategy capable of launching negotiation execution. The absorption of Transfer of Technology that has been obtained should be repackaged in a data bank in order to share information and knowledge with the academic community. This will be very beneficial for R&D development and investment in the professional development of Indonesian human resources. As for short-term goals, the new approach will be useful for defense cooperation between the two countries in the procurement of Rafale Airfighter, Scopen submarine, and Ground Control Intercept Radar. This is supported by autonomy assessments and knowledge managements, which are essential points in the technology acquisition process for the recipient country so that the "blueprint" that has been received, although not all parts are known, can maximize the information available to be applied according to the framework of the national strategic defense-security equipment project development.

References

- Bakrie, Connie R. (2007). National Defense and Ideal TNI Posture, Jakarta: Yayasan Obor Indonesia.
- Cheung, T. M., Lucyshyn, W., & Rigilano, J. (2019). The Role of Technology Transfers in China Defense Technological and Industrial Development and the Implications for the United States. *Acquisition Research Program*.
- Downes, E. R. (2012). *Trust, Engagement, and Technology Transfer: Underpinnings for US-Brazil Defense Cooperation (Strategic Forum, no. 279)*. NATIONAL DEFENSE UNIV FORT MCNAIR DC INST FOR NATIONAL STRATEGIC STUDIES.

- Grosse, Robert & Len J. Trevino (1996). Foreign Direct Investment in the United States: An Analysis by Country of Origin. *Journal of International Business Studies*, 27(1),139-155.
- Hristov, N., & Georgiev, M. (2017). Offset implementation impact on technology transfer in Bulgaria. *Міжнародний науковий журнал «Інтернаука*, (10), 32.
- Leon, T., & Leduc, F. (2022). *Naval Group's Approach On Transfer of Technology: Benefits, Main Stakes, and Return on Experience*. [PowerPoint slides]
- Lutfy, I. (2017). *KERJASAMA INDONESIA DAN KOREA SELATAN DI BIDANG PERTAHANAN DALAM KONTEKS PENGEMBANGAN PESAWAT TEMPUR KFX/IFX (Studi Kasus Kerjasama Kementerian Pertahanan Indonesia dan Defense Acquisition Program Administration)* (Doctoral dissertation, PERPUSTAKAAN).
- Madl, L., & Radebner, T. (2021). Technology transfer for social benefit: Ten principles to guide the process. *Cogent Social Sciences*, 7(1), 1947560.
- Perwita, Anak Agung Banyu, et.al. (2013). *Introduction to Strategic Studies*, Yogyakarta:Graha Ilmu.
- Riyadi, F. A., & Dewi, I. M. (2022). The Role of Defence Diplomacy for the Development of the Indonesian Defense Industry. *Jurnal Ekonomi, Bisnis & Entrepreneurship (e-Journal)*, 16(1), 80-91.
- Seaton R.A.F. and Cordey-Hayes, M. (1993) 'The development and application of interactive models of industrial technology transfer', *Technovation*, Vol. 13, No.1, pp.45–53.
- Sezal, Mustafa Ali, Francesco Giumelli, (2022), "Technology transfer and defence sector dynamics: the case of the Netherlands", *European Security*, DOI: 10.1080/09662839.2022.2028277.
- Trisnawati, Bakti, (2020). The Importance of Technology Transfer for Indonesia. *Advances in Economics, Business and Management Research*, volume 140. pp. 49-52.
- Undang-Undang Nomor 16 Tahun (2012) tentang Industri Pertahanan, tanggal 05 Oktober (2012), Jakarta, (2012).

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).