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STRATEGY TO IMPROVE NAVAL SHIPBUILDING INDUSTRY SELF-RELIANCE IN INDONESIA

by

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December 2017

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Naval shipbuilding in Indonesia is developing and becoming more self-reliant with the support of the government, which aims to increase industry capability by applying technology transfer as defense offset policy. This research studies countries similar to Indonesia in applying technology transfer as the method to increase self-reliance in the naval shipbuilding industry. Specifically, the research compares India, Malaysia, and South Korea in applying technology transfer and other policy to boost self-reliance for the industry.

Indonesia's government has emphasized using technology transfer as the strategy to build its industry's capability to construct naval ships. Yet many countries have had only limited success using this approach to build a defense industry. Thus, this research considers what other strategy can be applied by the Indonesian government to support industry self-reliance and increase its technological capability in building naval ships. The study underlines the importance of research and development for self-reliance in the defense industry, enabling Indonesia to compete with other shipbuilder nations.

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STRATEGY TO IMPROVE NAVAL SHIPBUILDING INDUSTRY SELF-RELIANCE IN INDONESIA

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Submitted in partial fulfillment of the
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LIST OF ACRONYMS AND ABBREVIATIONS

ADSB	Abu Dhabi ship building
BPPT	badan pengkajian dan penerapan teknologi (Indonesian agency for the assessment and application of technology)
CGT	compensated gross tons
DND	directorate of naval design
DPSU	defense public sector undertaking
DRDO	defense research and development organization
DSME	Daewoo shipbuilding and marine engineering
DSNS	Damen Schelde naval shipbuilding
EEZ	economic exclusive zone
FMPV	fast missile patrol vessel
FPB	fast patrol boat
IHI	Ishikawajima heavy industry
KCR	kapal cepat rudal (fast missile boat)
KPLP	Kesatuan Penjagaan Laut dan Pantai (Indonesian sea and coast guard)
KSEC	Korea shipbuilding and engineering corporation
LPD	landing platform dock
ME	marine establishment
MEF	minimum essential forces
MOD	ministry of defense
OPV	offshore patrol vessel
PSMB	Palindo marine ship building
PT PAL	Perseroan terbatas penataran angkatan laut (Indonesian state-owned shipbuilding industry named PT PAL)
R&D	research and development
SEWACO	sensor, weapon, and command
SSV	strategic sealift vessel
WESEE	weapons electronic systems engineering establishment

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I. INTRODUCTION

Every sovereign country needs to maintain proportional military power in order to create stability and provide security within its territorial area on the land, air, and, if applicable, sea. In carrying out its mission to protect its people and its territory, a nation's armed forces require sufficient weapon systems to support defense and security capability. For when security issues are present, they can hamper the pace of development within a country. Therefore, government has the main role in providing effective, well-equipped armed forces capable of anticipating and responding to any potential conflict that may happen in the future to protect its people, resources, and sovereignty from internal and external threats.

For this reason, Indonesia's government emphasizes the importance of conducting transfer of technology in every defense system or arms procurement as defense offset policy to enhance the development of domestic defense industry capability and self-reliance (Indonesian Ministry of State Secretary, 2015). The agreement for transfer of technology in every arms or ship procurement from foreign industry obliges the seller to provide transfer of knowledge on how to produce the arms or build the ship to their buyer. With this approach, Indonesia can benefit from technology development and economic growth by relying on investment in the defense industry sector. As the biggest archipelagic country in the world, Indonesia's demand for maritime technology is high. It requires this technology to be able to explore and exploit the sea's natural resources properly and maintain it as the nation's source for future assets. The previous government, after the reform era in 1998, had already realized the importance of self-reliance when it established several state-owned "strategic enterprises" to support the defense industry and economic development. These strategic state-owned enterprises are expected to be capable of supporting the nation's armed forces capability with indigenous arms production.

This thesis studies the growth within the naval shipbuilding industry in Indonesia compared to that industry in Malaysia, as the closest neighboring country, and other countries in the region with higher rates of development in the naval shipbuilding

industry. Such countries include India and South Korea. This research uses data from the comparative analysis so that Indonesia can better understand the government strategy on naval shipbuilding industry development. Indonesia is in the process of improving its naval shipbuilding capability through its grand maritime strategy,[1] the goal of which is to gain competitive advantage in the maritime industry. While taking his oath as the elected president of the Republic of Indonesia in 2014, President Joko Widodo restated his mission disclosed during his campaign, which is to build Indonesia by focusing on the development of Indonesia as a maritime nation and becoming a global maritime axis (Shekhar & Liow, 2014). The Indonesian government will work hard in enhancing maritime connectivity and commerce, as well as strengthening maritime security to promote safe conduct of maritime activity within Indonesia's ocean territory. Hence, Indonesia will also need to build the shipbuilding industry infrastructure to fill the need for ships by the domestic market. According to Marsetio, the Indonesian Navy has planned the navy blueprint to modernize and build its power based on a minimum number of essential forces (MEF) 2010–2024 (Marsetio, 2014a).

Underlining the grand maritime strategy and Indonesia's vision to be the global maritime axis, the Indonesian government's approach is to apply the transfer of technology as the nation's strategic method for producing as many naval ships as possible indigenously. The motivation behind this grand maritime strategy is to gain control across its vast economic exclusive zone (EEZ). This thesis argues the government motivation for boosting the self-reliance of the naval shipbuilding industry is supported by an insufficient application of policy. According to Lee, Indonesia's armed forces modernization included here for the naval forces capability improvement is based on domestic politics, with the stability of internal security as the main concern. The government's approach is to fulfill the people's desire to gain prestige by having a self-reliant defense industry, reducing the need for the procurement of various kinds of modern sophisticated military platforms from external sources, which was considered a corrupt defense policy that caused an unbalanced force structure (Lee, 2015).

[1] Indonesia's grand maritime strategy aims to enhance the inter-island connectivity supported by strong ships transportation, economic activity through and at the sea and to improve the maritime security by maximizing own industry capability (Shekhar & Liow, 2014).

According to Augier and Marshall, strategy differs from goals and it is important to differentiate between strategy and goals to properly analyze the strategy (Augier & Marshall, 2017). Strategy can be defined as "the science and art of employing the political, economic, psychological, and military forces of a nation or group of nations to afford the maximum support to adopted policies in peace or war" ("Strategy," n.d.). Strategy is rapidly changing and requires identifying its own advantage and the weakness of competitors to gain competitive advantage over the long-term while also taking into account external forces such as the environment and competition, which tend to change (Augier & Marshall, 2017). Indonesian government needs to evaluate its strategy continuously by providing proper analysis of the competitive environment to create long-term competitive advantage in the naval shipbuilding industry. Therefore, the government has to evaluate the defense offset policy approach by studying the successes of other countries such as India, Malaysia, and South Korea. At the same time, Indonesia must also learn from any inefficiency or ineffectiveness found in other countries' approach to applying the defense offset policy.

Indonesia's defense spending is considered low compared to that of other nations within the region. Even though it seems to increase in nominal value rapidly from the previous year's budget, the total budget for the nation's military spending still stays under 1% of gross domestic product (GDP) (Lee, 2015). For the naval force building plan, the country will strictly follow the navy's blueprint for fulfilling the navy MEF 2010–2024 (Lee, 2015). For the short term, though, the government must be able to compete with regional development in military power, especially naval power, by procurement of new and modern naval ships from other countries. While engaged in this procurement of naval ships in the short term, the government should consider the long-term strategy for the transfer of technology process and should be consistent in applying the grand maritime strategy for Indonesia's development in order to close the technology gap with other countries in the region. The military industry, such as naval shipbuilding, is a strategic industry. To beat the competition in the maritime industry is to become the potential market leader in the future, which will expand the work force in domestic ship production and enhance the technology mastery within the nation.

A. IMPORTANCE OF THE STUDY

The importance of this thesis research is to discuss and provide further information about the current position of Indonesia's naval shipbuilding industry by studying the history of India, Malaysia, and South Korea as comparisons. Those countries are considered as role models for successfully increasing the capability and the self-reliance within their respective naval shipbuilding industries. By maximizing the momentum from Indonesia's grand maritime strategy to support the maritime industry, this research provides an analysis with respect to the success of the Indian and South Korean governments' policy effectiveness and the steps that could be done by the Indonesian government in applying the same adjusted strategy and defense offset policy to support the naval shipbuilding industry.

What caused Indonesia, as a country with the same defense offset policy as India and South Korea, to have slower improvement in its naval shipbuilding industry over the 70 years since the nation gained independence? To answer this question, this thesis studies Indonesia's history in terms of the application of government policy that may inhibit the development of the maritime industry in Indonesia and the effects that policy has had on the current capability of Indonesia's naval shipbuilding industry.

B. BACKGROUND

The government as the policy maker and the consumer has an important role in supporting the sustainability of the naval shipbuilding industry so that it can compete with other producers overseas. The naval shipbuilding industry in Indonesia has had little improvement since the government first conducted the offset policy in defense systems procurement in 1960. Before we examine this history, it is important to define defense offset policy, which is an arms trade contract between countries that requires the seller country to provide certain added value for the benefit of the customer or purchaser country (Taylor, 2003).

The naval shipbuilding industry in Indonesia is an integral part of the government's quest to produce its own indigenous arms industry. PT Penataran Angkatan

Laut (PT PAL[2]) as a state-owned company and other domestic shipbuilding industries could provide the naval shipbuilding capacity for Indonesia's government to support the navy's requirement in building the MEF to compete with other military powers in the region. The government policy in defense procurement in the form of technology transfer is expected to improve the naval shipbuilding industry's self-reliance in Indonesia and meet these goals (Indonesian Ministry of State Secretary, 2015).

Defense offset policy has been practiced informally by Indonesia's government in the procurement of defense systems since the early 1960s (see Figure 1). Yet, it was not practiced officially until ten years later when the nation restructured PT PAL to support the naval shipbuilding industry and other strategic industries that serve the indigenous arms industry in Indonesia. Furthermore, the practice was not continued consistently by the government in 1985 when the offset policy could apply for transfer of technology in some strategic industry production of fast patrol craft and corvette ships. Defense offsets practice in Indonesia is still not sufficient to create self-reliance for building integral defense systems. This shortcoming is due to the lack of human resources, low defense spending, and the lack of ancillary industry to supply ship components in the shipbuilding industry such as the steel industry, propulsion machinery industry, advance sensor and weapon systems industry (Tippe, 2013). These problems still exist in Indonesia despite a small improvement within the industry to meet the nation's challenge.

[2] PT PAL is Indonesia's state-owned shipbuilding industry, which was nationalized by the Indonesian government after Indonesia gained its independent in 1945 (Kukuh, 2017).

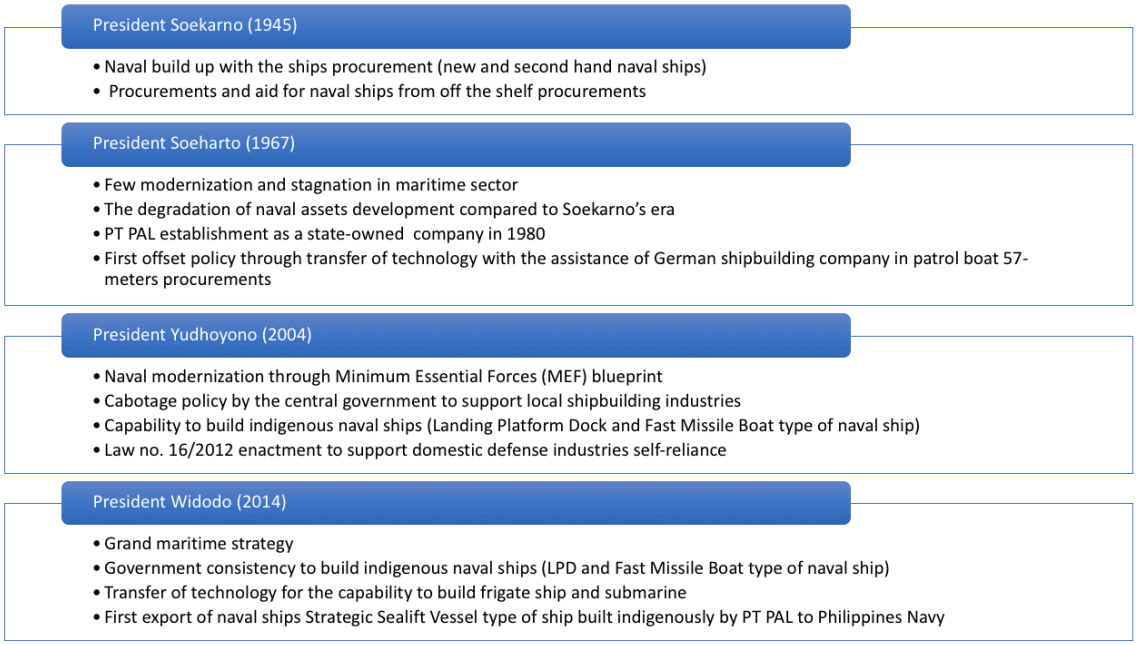

Figure 1. Indonesia's Shipbuilding Timeline

President Soekarno as the first president of the Republic of Indonesia had the same vision to strengthen Indonesia's maritime forces since it is an archipelagic nation of 17,508 islands. In this era, Indonesian Navy power constituted the largest naval power in South East Asia supported by strong naval force composition (Global Security, 2013b). President Soekarno gained better bilateral cooperation with Union of Soviet Socialist Republics (USSR) and strengthened the naval forces using ships from the USSR as a producer country willing to provide transfer of technology as the offset policy. When President Soeharto replaced President Soekarno on March 12, 1967, the government tended to choose Western defense systems to modernize its military power (Global Security, 2013a). President Soeharto was an army general at that time and shifted the nation's strategy and vision as an agricultural nation, not a seagoing power, and declined the navy influence within the armed forces (Global Security, 2013a).

The Indonesian government's inconsistency in applying the defense offset policy became the main factor for the defense industry's setback in achieving self-reliance (Tippe, 2013). During President Soeharto's era, the government of Indonesia seldom used offset policy for the procurement and acquisition of defense systems in Indonesia. This

weapons procurement program brought less benefit for Indonesia because it lacked any transfer of technology, which would have been useful to build a self-reliant defense industry within the country. Hence, weapons maintenance has been expensive since Indonesia has always relied on the producer country for spare parts and skilled technicians to fix the weapons. Government of President Yudhoyono started the initiation and promotion of the indigenous defense industry through transfer of technology, and the consistency of President Widodo's government continued the policy and emphasized it through a grand maritime strategy to build the nation's shipbuilding industry by building government's ships indigenously. Therefore, the government's consistency and sound strategy is required to support a sustainable shipbuilding industry.

C. SCOPE AND LIMITATIONS

This research discusses the government policy for a self-reliant naval shipbuilding industry in Indonesia. The naval shipbuilding industry is considered an integral part of the nation's effort in building indigenous defense industry self-reliance. This research also discusses the nation's general shipbuilding industry as the foundation of a sustainable naval shipbuilding industry. The focus is on government policies and whether the government can take any further steps to stimulate other ancillary industries for supporting a sustainable naval shipbuilding industry.

Using India, Malaysia, and South Korea for comparison, the discussion analyzes whether Indonesia could apply other countries' policies to improve Indonesia's shipbuilding industry. The study reviews each government's policies and then analyzes the strengths and weaknesses of each country's applied defense policy to support their respective naval shipbuilding industry.

D. METHODOLOGY

The research conducts a literature review on industry self-reliance and how current Indonesian defense officials and national policy makers have pursued this as a policy goal for several years. This research is supported by available web-based data and information to analyze the strategy suitable for applying Indonesia's defense offset policy to create self-reliance in the naval shipbuilding industry in Indonesia.

This thesis research took place at the Naval Postgraduate School in Monterey, CA, and relies on various journal articles gathered from the Internet and other library materials as sources for the literature review in these areas:

1. A review of Indonesia's grand maritime strategy
2. A review of naval modernization in a developing country
3. A comparison of policies between India, Malaysia, and South Korea
4. An analysis of existing policies in India, Malaysia, and South Korea and the effects of those policies on supporting technology and shipbuilding advances compared to Indonesia
5. SWOT (strengths, weaknesses, opportunities, and threats) analysis, including the risk in the shipbuilding industry as a consideration
6. A research report

E. RESEARCH QUESTIONS AND THESIS STATEMENT

Research questions to be addressed in this thesis are as follows:

1. What factors are likely to inhibit self-reliance in Indonesia's naval shipbuilding industry?
2. Is the policy applied in Indonesia as a developing country sufficient to achieve the goal of domestic naval shipbuilding industry self-reliance?
3. How do comparison countries conduct policy and strategy to support naval shipbuilding industry self-reliance?

A sustainable defense industry as a strategic enterprise owned by Indonesia holds an important role in the development of technology and the economy. Indonesia, which consists of islands and a vast area of territorial waters, requires robust naval forces. At the same time, the military budget limits the military expenditures for procuring naval ships abroad.

This research defines what self-reliance means for a naval shipbuilding industry and attempts to identify government policy and further strategy that contributes to the development of the shipbuilding industry, enabling it to become a self-reliant for supporting the Indonesian Navy.

F. ORGANIZATION OF STUDY

Chapter I presents an introduction and provides the purpose and importance of the thesis research. Chapter II reviews the literature and theoretical discussions of the concept of self-reliance for the defense industry; the chapter also includes an assessment of India, Malaysia, and South Korea as comparison countries. Chapter III provides an analysis of what self-reliance means in the context of the naval shipbuilding industry in Indonesia. Chapter IV provides the strategy to support naval shipbuilding industry self-reliance. Chapter V concludes this thesis research and discusses possible future research topics.

G. CONCLUSION

The research discusses the feasibility of Indonesia as a developing country to produce an indigenous arms industry, especially in the naval shipbuilding industry, and to develop military industry self-reliance within the country. Indonesia has already started with President Joko Widodo's vision for the nation to be the global maritime fulcrum and started to build the necessary infrastructure. The government provides the policies as regulations to enhance the growth of the maritime industry around the country. However, the naval shipbuilding industry carries high risk and requires high capital for investment. Thus, government policy and good strategy are required to support the shipbuilding industry and the mastery of naval shipbuilding technology that will promote Indonesia's national resilience and competitive advantage as a maritime nation.

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II. REVIEW OF SELF-RELIANCE IN THE DEFENSE INDUSTRY

This chapter provides a review of the literature on the concept of self-reliance associated with developing an indigenous defense industry through a defense offset policy applied to countries in the Asia Pacific. Then, the research discusses the nations in the region pursuing self-reliance in the naval shipbuilding industry. The main purpose is to elaborate the concept of self-reliance for the countries in Asia, especially countries near Indonesia, such as India, Malaysia, and South Korea that are potential models for pursuing self-reliance in the naval shipbuilding industry. The last section discusses the Asia Pacific nations' naval modernization efforts that also become the reason and opportunity to build the capacity for an indigenous naval shipbuilding industry.

A. THE LITERATURE REVIEW AND THEORETICAL DISCUSSION OF THE CONCEPT OF SELF-RELIANCE FOR THE DEFENSE INDUSTRY

The concept of self-reliance for the defense industry means the nation's capability to support its indigenous defense industry to arm military personnel with weapons and achieve autarky or self-sufficiency. Yet, according to Hoyt, the self-reliance concept still allows the nation to import weapon systems or military armament from reliable counterparts mostly to close the gap in technology and the capability in producing modern and sophisticated weapons to counter current threats (Hoyt, 2007). The concept of self-reliance for the defense industry mostly applies to countries developing strategic industries but still not capable of producing advanced weapon systems. In such situations, the government then conducts defense offset policy[3] to encourage the strategic industry to become involved in production through licensed production, co-development, transfer of technology, etc., to close the gap and avoid the cost for research and development (R&D) already accomplished by other countries with advanced defense industries. Figure 2 explains the relationship between levels of defense industry self-sufficiency with the corresponding strategy applied by a country and the degree to which that contributes to the cost of the effort.

[3] Defense offset policy is an arms trade contract between countries that requires the seller country to provide certain added value for the benefit of the customer or purchaser country (Tippe, 2013).

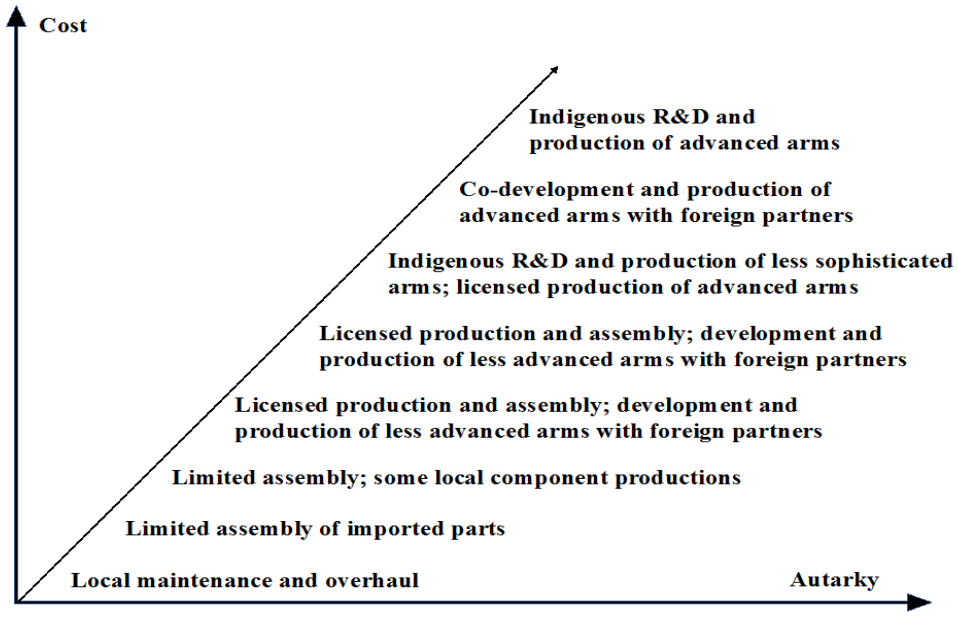

Figure 2. The Arms Production Ladder. Source: Bitzinger (2004).

The production ladder in the arms industry for less developed countries depends on the technology advances of other nations with greater defense industry capability, and commonly does so by using a defense offset policy mechanism (Bitzinger, 2004). Defense offset policy that supports the indigenous defense industry to achieve self-reliance based on the ladder shown in Figure 2 includes the transfer of technology[4] through licensed production and co-development or co-production with other nations.

The strategy in using the defense offset policy approach will vary among countries. According to Bitzinger, different goals and drivers explain how a country pursuing defense industrialization use defense offsets policy to support self-reliance. The most important factor will actually affect how offset approaches will be applied to fit into the particular country's strategy for self-reliance (Bitzinger, Offsets and defense industrialization in Indonesia and Singapore, 2004); those motivations when applied to domestic naval shipbuilding industry self-reliance are:

[4] The transfer of technology contract in arms or ship procurements from foreign industry obliges the seller to provide transfer of knowledge on how to produce the arms or build the ship to their buyer.

1. Strategic reason (Bitzinger, 2004).

- To be able to guard and defend the sovereignty of its territory, especially when countering a real or perceived security threat (Huxley & Willett, Defence Industries in East Asia, 1999). By having naval shipbuilding industry self-reliance, Indonesia as an archipelagic country can protect its sea natural resources from the threat of other countries and provide a degree of freedom to decide its own strength in building the maritime power of Indonesia.

2. Arms embargo (Huxley & Willett, Defence Industries in East Asia, 1999).

- To keep the nation's political independence by having a self-reliant naval shipbuilding industry and sustainable defense industry. A country's efforts to overcome terrorism or oppose drug smuggling, for example, must not be hampered by the supplier who intentionally tries to delay the delivery of a weapon. This motivation is to reduce the reliance on weapon procurements from other country. Thus, the navy can provide better service in guarding the sea border from other trespassers, including those who try to steal the nation's natural resources. Furthermore, the country's military operations will avoid feeling limited by embargoes or sanctions from another country as a type of supplier constraint.

3. National prestige (Huxley & Willett, Defence Industries in East Asia, 1999).

- To increase the country's prestige of having defense industry self-reliance, in this context, by having a sustainable naval shipbuilding industry that will enable the concepts of national power within a country. It will also demonstrate industrial and technological prowess.

4. Multiple effect (Midhio, 2016).

- To support technological development and modern industrial culture for economic strength. Ultimately, the country will be recognized by other countries as an arms exporter country and gain more foreign currency revenue. The government then can build the nation's military capability and develop its economy through industrialization simultaneously.

5. Domestic employment opportunity (Nackman, 2011).

- To create more job opportunities and stimulate the interest of scientists, engineers, and technicians in the naval shipbuilding industry consistent with technology advances. Sustainable shipbuilding industry requires continuous improvement and R&D capability which will promote better education and furthermore to enhance the growth of creative industries as ancillary industries to support domestic shipbuilding industry.

6. “Technology locomotive” (Bitzinger, 2004).

- To enhance the growth of other new industries as the nation’s pioneer to facilitate the modernization and create new technology improvement by having vital R&D in the military and naval shipbuilding industries. The technology developed through domestic naval shipbuilding industry such as Radar, marine machinery, ship’s components then can be applied for civilian shipbuilding industries.

7. Deterrent effect (Midhio, 2016).

- To deter potential threats through naval shipbuilding industry self-reliance capable of building and maintaining own naval power of a country. The capability provides the flexibility to produce as many advanced navy ships as possible within the government’s budget for military expenditure.

In the current government policy for supporting the maritime industry, questions remain on whether that policy to support self-reliance in the naval shipbuilding industry is sufficient to answer the future challenge for Indonesia. Self-reliance in the naval shipbuilding industry for this thesis means that the country’s shipbuilding industry is capable of producing its own naval ships based on the respective navy requirements of its forces composition. This thesis argues that the strategy for achieving self-reliance by transfer of technology as the only method will not be sufficient to support Indonesia’s quest for self-reliance in its naval shipbuilding industry.

Indonesia’s pursuit of self-reliance in this industry arises primarily from economic and industrialization motivation (Bitzinger, Offsets and defense industrialization in Indonesia and Singapore, 2004; Huxley & Willett, 1999). Understanding the nation’s motivation for defense industry self-reliance can help the government in crafting the strategy to strengthen the domestic defense industry with long-term planning and accurate decisions. While a strategic reason such as national sovereignty for guarding the sea border and “real or perceived external security threats as well as arms embargoes are [also] important in encouraging [the government] to promote domestic defense production” (Huxley & Willett, 1999). This thesis argues Indonesia’s motivation to apply the offset policy to achieve indigenous naval shipbuilding industry self-reliance does not sufficiently reflect strategic motivation, and thus, as previously asserted by this author, the strategy is not effective to support domestic naval shipbuilding industry self-reliance.

B. NAVAL SHIPBUILDING INDUSTRY SELF-RELIANCE

Building and maintaining the navy will depend on the government's willingness to spend its budget to build the desired navy. The bigger the navy a nation wants to have, the more resources and budget are needed to build the navy's capability. The government's policy to build the naval shipbuilding industry will ultimately influence the naval capability a country will have. Countries that want a large navy will also pay attention to the industry's ability to support building the desired maritime power. The government and domestic shipbuilding industries need to work together to improve industry self-reliance. The industry needs to improve competitive advantage by increasing its capability by having the government continuously procure to support the industry as a potential domestic market. Likewise, it must win export opportunities to maintain its sustainability as a long-term strategy. The relationship between naval shipbuilding capability and maritime power is shown in Tables 1 and 2.

Table 1. World Naval Shipbuilding Capability and Naval Hierarchy. Adapted from Todd and Lindberg (1996).

World Naval Shipbuilding Capability Hierarchy	**World Naval Hierarchy**
Group 1: China, France, Russia, UK, USA	1. Global-Reach Power-Projection Navy: United States of America
Group 2: Germany, **India**, Italy, Japan, **South Korea**, Spain	2. Limited Global-Reach Power-Projection Navies: France, United Kingdom
Group 3: Canada, Croatia, Denmark, Finland, Netherlands, Norway, Sweden	3. Multi/Extra-Regional Power-Projection Navies: **India**, Italy, Russia, Spain
Group 4: Australia, Brazil, Poland, Taiwan, Turkey	4. Regional Power-Projection Navies: Argentina, Australia, Brazil, Canada, Chile, China, Germany, Greece, Japan, **South Korea**, Netherlands, New Zealand, Pakistan, Peru, Portugal, Taiwan, Turkey
Group 5: Argentina, Belgium, Chile, Greece, **Indonesia**, Israel, **Malaysia**, New Zealand, North Korea, Romania, Singapore, South Africa, Thailand, Ukraine	5. Regional Offshore Coastal Defense Navies: Bangladesh, Colombia, Denmark, Ecuador, Egypt, **Indonesia**, Iran, Israel, North Korea, **Malaysia**, Norway, Poland, Romania, Saudi Arabia, Sweden, Thailand, Venezuela

Table 2. Current Naval Shipbuilding Capability and Naval Hierarchy for the Selected Countries

Naval Shipbuilding Capability Hierarchy	World Naval Hierarchy
India (Group 1) Considered as group 1 based on the capability to build aircraft carrier and having nuclear capability (Rai, 2015)	Limited/Global-Reach Power-Projection Navy India's improving capability as a blue water navy (Gokhale, 2013)
South Korea (Group 2) Considered as group 2 based on the capability to build fleet aircraft carrier Dokdo Class Landing Platform Helicopter with displacement of 14,000 tons and the country has no nuclear capability yet (Global Security, 2016)	Multi/Extra-Regional Power-Projection Navy Blue water navy capability with the capability for extended operations within East Asia (Schreer, 2013)
Indonesia (Group 5, improving to Group 4) The nation is still developing the capability to build submarine by building submarine facility and transfer of technology by the assistances of South Korea's industry (The World Folio, 2013)	Regional Offshore Coastal Defense Navy
Malaysia (Group 5) The nation is not yet to have submarine building capability and facility	Regional Offshore Coastal Defense Navy

The capability hierarchy shown in the two previous tables indicates the naval shipbuilding capability of the nation to support the development of naval power in building the naval ships required by the navy in these countries. South Korea has made the progress in developing its blue water navy capability by building more ships and submarines to raise its ranking in the world naval hierarchy with the support of domestic shipbuilding industry (Schreer, 2013). Without the capability of the shipbuilding industry, it would be very difficult for a country to build a large naval force as desired, as it would require a great deal of foreign currency for naval ships procurement. Whereas, if a country has the ability to produce a sustainable naval shipbuilding industry, it simply builds the desired maritime power by relying on its own industry, supporting the country's economy by employing its people.

Table 3. Characteristics of Naval Shipbuilding Industry Capability Groups. Adapted from Todd and Lindberg (1996).

Capability Group	Design Capability	Nuclear Capability	Submarine Construction Capability	Max. Tonnage Capability	Max. Size of Vessels Built	Marine Engineering Capability	Naval Subsystems Capability
1	Full	Yes	Yes	10,000+	Fleet Aircraft Carrier	Major Independent Producers	Major Independent Producers
2	Full/Limited Foreign Assistance	No	Yes	3,000 – 10,000+	Aircraft Carrier, Destroyer	Major Independent Producers	Major or Limited
3	Full	No	Yes	3,000 – 9,999	Frigate, Submarine	Major Independent Producers	Major Independent Producers
4	Developing still dependent on foreign assistance	No	Partial	3,000 – 9,999	Frigate, Submarine	Limited/Licensed Production	Limited
5	Very Limited	No	No	< 1,000	Fast Attack Craft, Patrol Boat	Limited/Licensed Production	No
6	None or Very Limited	No	No	< 500	Patrol Craft	No	No

When building its navy, a nation can choose whether to build it with its own shipbuilding industry or outsource the project to a foreign country already advanced in naval shipbuilding capability. When a country wants to pursue the first option, it must consider certain naval shipbuilding industry capability requirements to assess whether its own naval shipbuilding industry is sufficiently self-reliant to build its respective navy. These standard requirements are shown in Table 4.

Table 4. Standard Domestic Naval Shipbuilding Capability. Adapted from Todd and Lindberg (1996).

Type of Navy	Standard Domestic Naval Shipbuilding Capability Level
Global reach power projection	1
Limited global reach power projection	1
Multi regional power projection	2
Regional power projection	3 / 4
Regional offshore coastal defense	4 / 5
Inshore coastal defense	0
Regional offshore constabulary	6

For most Association of Southeast Asian Nations (ASEAN) countries, the naval shipbuilding industry is assumed to be a strategic industry owned by a nation to support building and maintaining its navy for the purpose of national security. The Indonesian Ministry of Industry website in 2015 described the importance of defense industry self-reliance for driving the economy and technology development, and mentions that the nation's defense industry should be controlled by the government (Indonesian Ministry of Industry, 2015). The website emphasizes the important role of the national strategic enterprise in Indonesia to be sustainable. A strong defense industry will support the

nation's military force by owning local armaments suitable for all services and can be improved to meet the warfighter or user requirements by the industry capability through R&D (Indonesian Ministry of Defence, 2015).

The Indonesian defense industry still cannot provide its own defense forces with strong military equipment. Thus, the government relies on the import of military armaments. In every defense system procurement, however, the Indonesian government conducts the transfer of technology to meet the requirements. This step is important in reducing the nation's dependence on other countries in defense procurement (Indonesian Ministry of State Secretary, 2015).

Based on Figure 3, we can see the naval acquisition strategy of the ASEAN countries applies defense offset policy to achieve self-reliant naval shipbuilding industry. The policy model for achieving this strategy will mostly be supported by an offset policy using the transfer of technology. Thus, the nation must have a sustainable defense industry to absorb the technology transfers conducted from the offset policy. Government involvement is important for industry sustainability because the naval shipbuilding's market is limited in demand to its own navy and exports to other countries through the government-to-government sales agreement procedure. Each ASEAN country emphasizes the importance of self-reliance through industrialization to fulfill their requirements for naval acquisition. Hence, the industry will experience competitive market, which will require updates and continuous evaluation to achieve competitive advantage to maintain sustainable naval shipbuilding industry.

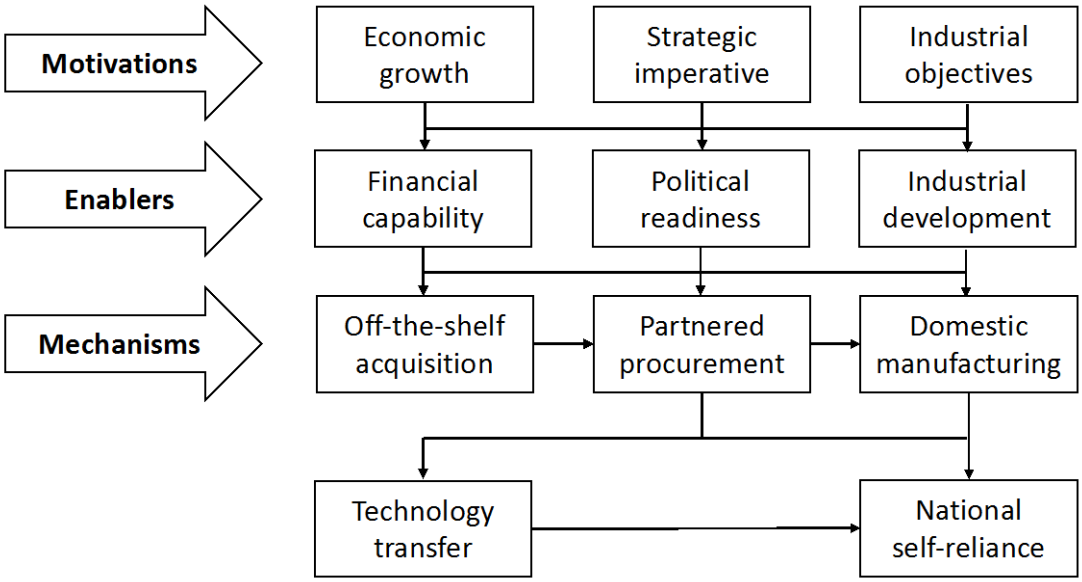

Figure 3. ASEAN's Naval Acquisition Model. Source: Matthews and Lozano (2014).

C. COMPARATIVE ANALYSIS WITH INDIA, SOUTH KOREA, AND MALAYSIA

India, South Korea, and Malaysia have applied defense offset policy for developing their respective indigenous naval shipbuilding industries to reach self-reliance. However, each country has its own approach to conducting the defense offset policy to improve domestic naval shipbuilding industry capacity and self-reliance. As shown in Figure 4, due to the high threat level with the region, India and South Korea give more attention to national security by providing a higher budget for defense spending. Because threats to Indonesia and Malaysia in the region are not as high as they are for South Korea and India, Indonesia and Malaysia also provide less defense spending than the two other countries. By comparing the military expenditures, we can identify each country's willingness to spend for the security of its territory.

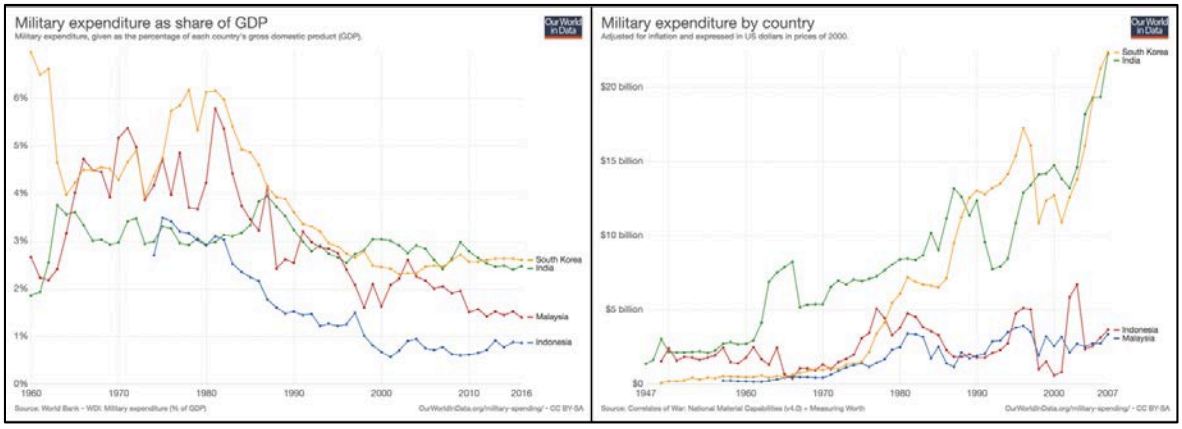

Figure 4. Military Expenditure for India, Indonesia, Malaysia, and South Korea. Source: Our World in Data (2017).

1. Review of India's Government Effort for Self-Reliance in the Naval Shipbuilding Industry

India's Independence Day was August 15, 1947, and the country has been pursuing self-reliance in the defense industry since that day. Officially, the effort to have an indigenous self-reliant naval shipbuilding industry started in 1950 when the nation started to build small naval ships consisting of survey ships, minesweepers, and patrol craft. India's Ministry of Defense (MoD) then nationalized a few naval shipbuilding companies in 1960 to support building the nation's maritime power and started to produce big naval ships of the frigate type indigenously at Mazagon Dock Ltd (MDL). Since then the MoD of India was able to manage four defense public sector undertaking (DPSU) companies involved in naval shipbuilding and, until mid-2011, contributed in building nearly 90 ships and submarines (Behera & Misra, 2012).

The Indian government's perception of national security is divided into four concerns, which are internal threats (counter-insurgence from separatist movements), regional threats from Pakistan, extra-regional threats from China, and superpower threats from Russia. The superpower threats were well taken care of by diplomatic relations in the form of a treaty of peace and defense cooperation (Hoyt, 2007). However, India's government takes the regional and extra-regional threats seriously by building its maritime force composition as a multi-regional power projection navy. This strategic motivation to guard the nation's sovereignty by building a large naval power requires a

significant amount of resources and military spending. India's goal to build its blue water navy for multi-regional power projection has been supported by the self-reliant naval shipbuilding industry. Without the industry, most of the military expenditure would have had to go to foreign naval shipbuilders, which would have meant losing the opportunity to build own economy from defense industry sector. This would have also become a financial burden in the form of national spending on foreign currency and increasing India's dependence on foreign naval shipbuilders.

Previously India's government pursued defense industry self-sufficiency to fulfill its requirements for military armaments. The government then shifted its policy to self-reliance in the defense industry during the 1970s to achieve technological improvement since the country was left behind in advanced technology development by the Western defense industry. The government policy for defense industry self-reliance provided the chance for the country to import weapon systems from trusted foreign country partners (Hoyt, 2007). The Indian government's approach has centered on implementing a defense offset policy. The concept of self-reliance in developing the indigenous defense industry can be seen from the Indian government's consistency in applying three major aspects of offset policy: transfer of technology/licensed production, defense procurements by using exports commodity "barter trade," and a "long-term credit" mechanism (Baskaran, 2004; Behera, 2009).

The naval shipbuilding industry in India has experienced improvement in infrastructure and an increase in capacity for shipbuilding due to the increase in demand for naval ships requirements of the navy since 1970. The industry provides more employment opportunities for the Indian people. The Indian government also supports R&D through its Defense Research and Development Organization (DRDO), which increases industry self-reliance for all military weapon systems purposes, including naval weapons capability. DRDO employs approximately 5,000 scientists and 25,000 technicians, highly skilled workers responsible for all defense industry R&D, in cooperation with Hindustan Aeronautics Ltd., Bharat Electronic Ltd., and Bharat Dynamics Ltd. (Hoyt, 2007).

Furthermore, the Indian naval shipbuilding industry has grown significantly to support the development of the Indian Navy, enabling it to have the capability of a multi/ extra-regional power-projection navy. The industry was included in Group 2 in the World Naval Shipbuilding Capability hierarchy, shown earlier in Table 1 (Todd & Lindberg, 1996). India's domestic industry's capability in supporting India's naval requirements has contributed to making India the world's fifth largest maritime power. Nevertheless, the naval shipbuilding industry is still experiencing inefficiency in cost and poor delivery time due to the non-competitive environment, lack of design capability, and unavailable ancillary industry, especially for marine machinery and engine propulsion (Behera & Misra, 2012).

2. Review of South Korea's Government Effort for Self-Reliance

South Korea's increase in industries development started in the 1970s when the government conducted defense industrialization to support the nation's economy. The nation's Independence Day was August 15th, 1948, and since then the naval shipbuilding industry capability in the country has been enhanced by the private shipbuilding industries with its advanced development in industrialization. Yet, South Korea's shipbuilding industry was not growing until the 1970s, when the government supported the industries by providing policy that promoted large enterprises and a competitive environment for the industry. The shipbuilding industry was then positioned as a strategic industry and the government opened the industry to stimulate investments in this sector (Hassink & Shin, 2005). Its significant effort to increase capability and capacity in the shipbuilding industry was achieved in 30 years, which was a relatively shorter time than that needed by India, which had started to pursue self-reliance since the 1960s. During the 1970s and 1980s, South Korea's shipbuilding industry became the leader in the region. The shipbuilding industry's capacity increased by a factor of five between 1975 and 1990, from 0.4 million compensated gross tons (CGT) to 1.8 million CGT, with the support of 45,000 employees (Global Security, 2017).

South Korea's motivation for self-reliance in the defense industry was prompted in 1977 by the President Carter's announcement of the withdrawal of United States

ground troops from South Korea, which caused concern about security and possible threats from North Korea (Han, 1978). At the same, generous U.S. support for technological transfer to its ally countries in the region, such as Japan, South Korea, and Taiwan, sparked South Korea's motivation for defense industrialization (Chinworth, 2004). The government's consistency in its policy for building South Korea's defense industry self-reliance created a new opportunity in every defense procurement to gain technological capability from the application of offset policy through transfer of technology packages from European shipbuilders and weapon system suppliers.

The government's policy for conducting defense offset policy supporting the South Korea's private shipbuilding industry promoted the naval shipbuilding industry's capability. The next factor to support the naval shipbuilding industry in the country was the government policy to support R&D. R&D investment for about 7% of a nation's GDP is considered strong support in R&D for the defense sectors (Business Monitor International Ltd., 2017). South Korea first acquired submarine shipbuilding capability by transfer of technology through a licensed production agreement with a German shipbuilder. The country acquired three Type 209–1,200 Chang Bogo class submarines. The first submarine was built in Germany by Howaldtswerke-Deutche Werft (HDW) and the other two were built in Korea by Daewoo Shipbuilding & Marine Engineering (DSME). The shipbuilding industry was then capable of building more advanced technology 1,800-tonne type-214 submarines (Storey, 2014).

The South Korean naval shipbuilding industry was growing rapidly to support the development of the Republic of Korea Navy, enabling it to have the capability of a regional power-projection navy. The industry was included in the Group 2 in the World Naval Shipbuilding Capability hierarchy, as shown earlier in Table 1 (Todd & Lindberg, 1996). The industry self-reliance makes it capable of supporting the current government's vision to build a blue water navy as an achievable goal. With its R&D capability, the nation currently plans to build a "3,000-ton submarine," which will be "equipped with vertical launch missile capability," to start the development President Kim Young-Sam approved in his chief of naval operations' proposal for South Korea's blue water navy (Schreer, 2013).

3. Review of Malaysia's Government Effort for Self-Reliance

Malaysia's shipbuilding industry started to build an offshore patrol vessel (OPV) indigenously in 1994. This was the first attempt to build navy ships using the indigenous defense industry since Malaysia's Independence Day on August 31, 1957. The effort included that transfer of technology through licensed production with German Naval Group and was assessed as a failure due to the production process that took ten times longer than previously planned and delivered only 18 OPV, nine fewer than planned. The unsuccessful application of offset policy caused a setback for Malaysia's government and was attributed to the lack of experience and technological expertise in the indigenous shipbuilding industry (Basiron & Kia, 2014). Only a limited number of defense industry-related jobs exist for the Malaysian people, and those are typically only low-skilled jobs (Basiron & Kia, 2014).

Transfer of technology in Malaysia has failed because of many factors. The local industries failed to provide improvements and support to supply high technology components for the defense industry. The nation still greatly depends on foreign industry by importing high technology, components or parts, and machinery. The industrial base still lacks capability and capacity to provide raw materials for the industry. As an example, Malaysia still needs to import steel and composites (Balakrishnan & Matthews, 2009). Furthermore, the offset policy did not support long-term R&D purposes which are expensive and limited domestic demand for defense procurement limits domestic defense industry sustainability (Balakrishnan & Matthews, 2009). Figure 5 shows the R&D expenditures of the four countries being compared in this research, reflecting the respective government's support and policy.

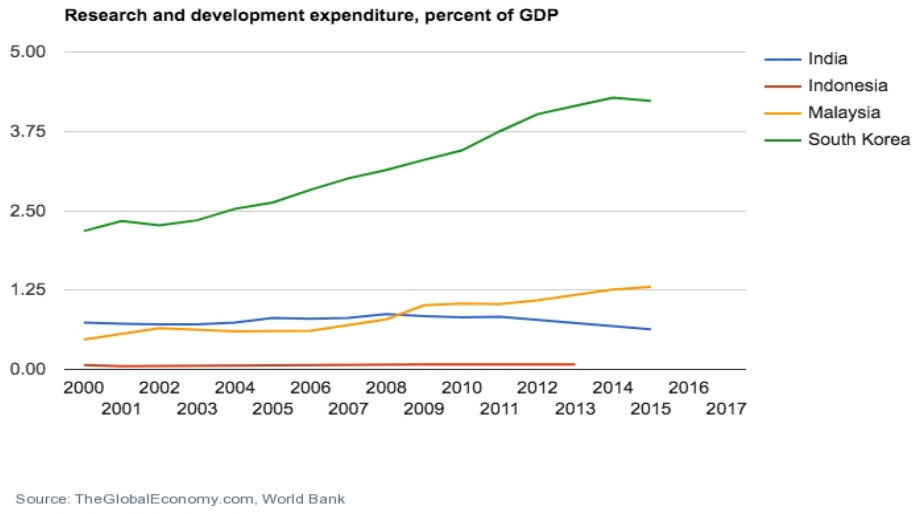

Figure 5. R&D Expenditure as a Percentage of GDP.
Source: The Global Economy (2017)

It should be noted that while Malaysia's R&D expenditure may appear higher than India's, the offset policy in Malaysia actually does not promote R&D for the industries. According to Balakrishnan and Matthews (2009), "Around 70% of Malaysian defense companies spend less than 10% of annual revenues on R&D, almost 90% lack in-house R&D facilities, and 100% have zero patents." The Malaysian naval shipbuilding industry was not robust enough to support the development of the Royal Malaysian Navy by its own industry capacity and capability. The industry was included in the Group 5 in the World Naval Shipbuilding Capability hierarchy, as shown earlier in Table 1 (Todd & Lindberg, 1996).

The defense industry such as the naval shipbuilding industry can maintain its sustainability because of the government capability in planning the strategy to support and protect the industry. The industry in a developed country needs government policy to create opportunity, competitive environment and cost efficiency to successfully gain market share through naval ship exports to counterpart countries. Table 5 shows each country's different strategy approach through policies applied to maintain the naval shipbuilding industry self-reliance. The country comparison shows better self-reliance for South Korea and India, which emphasized policy supporting R&D.

Table 5. Comparison in Strategy Approach to Support Indigenous Naval Shipbuilding Industry Self-Reliance

COMPARISON	INDIA	MALAYSIA	SOUTH KOREA
Defense offset policy	Transfer of Technology/licensed production, counter-trade/barter, long-term credit arrangement	Transfer of technology/licensed production	Transfer of technology/licensed production
Main motivation	Strategic motivation (higher threat level), economic motivation	Economic motivation.	Strategic motivation (higher threat level), economic motivation
Naval shipbuilding capacity	- High capacity - Public company shipbuilder, less incentive to increase efficiency	- Low capacity - Public company shipbuilder less incentive to increase efficiency	- Overcapacity (High) - Private company shipbuilder provides efficiency and effectiveness
Private shipbuilding company	Available, Limited to naval shipbuilding capability	Limited	Available strong private sector
Competitive Environment	Limited	Limited	Available
Ancillary industry	Not available, increases the dependence on foreign supplier	Not available, increases the dependence on foreign supplier	Ancillary industry already available to support naval shipbuilding industry
Military expenditure	High military spending	Limited military spending.	High military spending.
Government policy to support R&D	Available. The government provides R&D department, mostly for weapon system R&D	Limited	Available. The policy supports R&D in both industries (naval weapon systems and shipbuilding)
Corruption risk (the higher the score the lower the risk)	Scored 29 out of 100 (Business Monitor International Ltd., 2017a).	Scored 30 out of 100 (country risk score) (Business Monitor International Ltd., 2017c).	Scored 36 out of 100 (country risk score) (Business Monitor International Ltd., 2017d).
Highly skilled workers	Available	Limited	Available
Assessment	- Succeeded in supporting naval shipbuilding self-reliance - The industry still has some inefficiency, especially in cost and delivery time	- Few improvements. The nation's naval modernization still depends on foreign procurement - Technological gap and lack of experience inhibits technology transfer	Succeeded in supporting naval shipbuilding self-reliance

D. REGIONAL FACTORS DRIVING NAVAL MODERNIZATION AND ARMS RACE

The increase in economic development in Asia provides the opportunity for nations in the region to spend more to modernize military equipment and weapon systems. Many Asian countries are strengthening and modernizing their respective navies to protect their respective EEZ, which may be vulnerable to other nations' claims—particularly where there are overlapping claims for exploiting available natural resources, such as fishing and oil exploration

Nevertheless, nations with a strategic motivation, in the context of real or perceived threats, are typically more successful in their efforts to drive self-reliance by conducting offset policy. South Korea has experienced higher and more intensive threats from North Korea than the threat experienced by Japan (Chinworth, 2004). India's experience of war with and security threats from Pakistan and China motivates the nation to modernize its military by building an indigenous defense industry (Hilali, 2001). While challenges for Indonesia and Malaysia may not seem obvious, the motivation for naval modernization and an indigenous naval shipbuilding industry is driven more by economic concerns than the strategic ones. However, the Indonesian government may need to build and maintain a larger navy to protect its sovereignty at its outermost islands and at sea, given the nation's geographic condition as the biggest archipelagic country in the world.

Malaysia should be taken seriously as the neighbor country with the potency to claim Indonesian territory. A naval stand-off between Indonesia and Malaysia in the Ambalat sea area happened after Indonesia lost the Sipadan and Ligitan islands to Malaysia after a long-term territorial dispute that ended with the 2002 International Court of Justice decision (Greenlees, 2005). Building the navy with the capability to defend the sovereignty of the nation and protect Indonesian citizens and territory is also becoming a strategic motivation that should be acknowledged by the Indonesia's government.

Meanwhile, China is increasing its defense budget and developing its naval power to gain more influence in the region. Its claim for South China Sea, defined by a nine-dash line, has increased tension and poses threats to Indonesia's sovereignty in the

overlapping area (Business Monitor International, 2017). While the sea territory is defined by the sea line boundary, an invisible line, its authority is unclear in conflicts regarding the usage of other countries' territories. Malaysia's government is taking China's threat seriously by the procurement of Lekiu-class frigates, a Scorpene submarine, and other naval patrol ships to modernize its navy (Basiron & Kia, 2014). Currently, the Indonesian government has renamed the "South China Sea" area to the north of Natuna island as the "Natuna Sea." This reflects Indonesia's claim to the area as an EEZ. These situations increase the importance of the Indonesian government's efforts to build its maritime power to protect the sovereignty of the nation and to make sure the people of Indonesia can use the sea's natural resources for fishing and oil exploration and to promote the nation's prosperity.

When analyzing and comparing the efforts of other nations in the region to build enormous naval forces, it is clear that these other countries are competing to strengthen their own naval capabilities. Given this situation, the demand side for the procurements of naval ships will likely increase and make a country seriously consider strengthening its navy by spending the minimum amount on foreign currency and supporting domestic economic growth and technological development through the indigenous naval shipbuilding industry.

It is arguable whether there is an arms race among Southeast Asian countries. However, Indonesia as a nation consisting of islands will need to guard its sovereignty at sea. Based on tensions caused by overlapping sea borderline issues as well as the illegal activities of neighboring countries in Indonesia's EEZ and territorial waters, as well as losing claim to the Sipadan and Ligitan islands, it is obvious that Indonesia must see the potential for conflict in the sea. Therefore, having a powerful navy to protect the sovereignty of the country is a primary need for Indonesia and the nation's leadership must emphasize developing Indonesia's naval power by promoting the self-reliance of the domestic shipbuilding industry, which can enhance the building of a sustainable naval shipbuilding industry.

III. ANALYSIS OF SELF-RELIANCE MEANS IN THE CONTEXT OF NAVAL SHIPBUILDING INDUSTRY IN INDONESIA

> The six important elements of sea power are geographical position, physical conformation, extent of territory, number of population, national character, and character of the government."
>
> —Alfred Thayer Mahan,
> U.S. Naval Officer, Historian, and Strategist (Marsetio, 2014b).

As an archipelagic country, Indonesia has all the elements to build naval capability to be a world-class navy. Therefore, the government must support the nation's shipbuilding if Indonesia is to become a global maritime fulcrum nation with sufficient naval power. Indonesia's main shipbuilding company PT PAL has grown significantly under the administration of President Joko Widodo with his ambitious concept to increase activity at sea by ensuring the connectivity of the inter-island sea trade lanes and ports (Yosephine, 2016). Yet, a consistent government policy is needed that also supports maritime defense strength by maximizing the indigenous shipbuilding industry.

Indonesia's government underlined the strategic development of the country to expand the national economy through sea transportation and activity development. The geography of Indonesia as a country surrounded by ocean makes it vulnerable to other neighboring countries claims. As the nations in Southeast Asia are shifting their previous focus on land-based power to building and modernizing maritime and air military power, Indonesia needs to modernize its navy. This focus requires technology mastery for successful regional power projection.

A. INDONESIA'S GEOGRAPHICAL AND SOCIAL CONDITION

Indonesia's situation as an archipelagic nation and President Joko Widodo's vision for it as a global maritime fulcrum provide the nation with new economic activity and expansion opportunities in the maritime industry. The government requires the nation to provide a strong distribution system through sea transportation and growing fishery activities, which should also be supported by a strong sea defense for the security of its people conducting activity there. Government programs to promote economic growth

through the sea by enhancing the distribution of goods and trade activity between Indonesia's islands is an opportunity for 250 domestic shipbuilding companies to be able to meet the existing demand. The capacity of these domestic shipyards is being maximized by the government to support the merchant and naval shipbuilding industry in Indonesia. Figure 6 shows Indonesia's geographic location, which supports the domestic shipbuilding industry's existence.

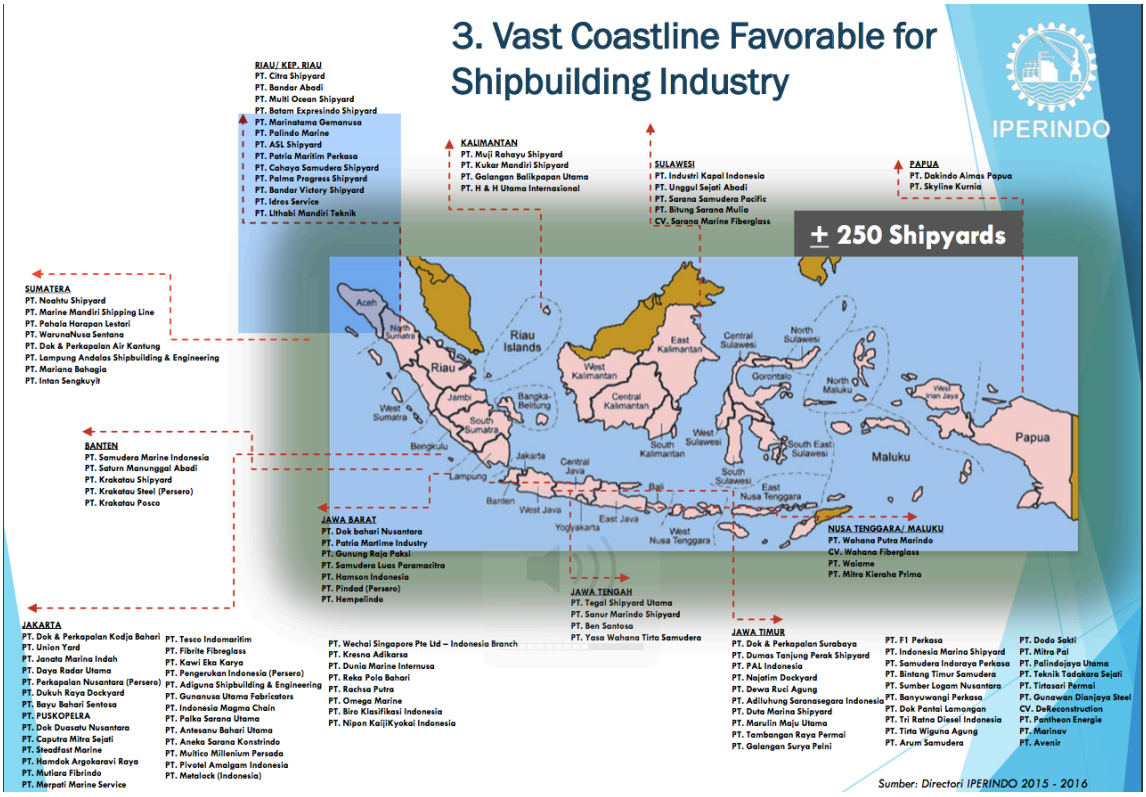

Figure 6. Indonesia's Local Shipbuilders. Source: IPERINDO (2015–2016).

The importance of the territorial waters and the EEZs of the Indonesian nation as areas of transportation, exploration, and exploitation activities further clarify the need for a stronger Indonesian naval force and other law enforcement institutions at sea. These institutions will ensure the safety and security of marine resources and components of the communities (e.g., fishermen and the oil and gas industry) using marine facilities to run their businesses.

One consideration for a country willing to build and maintain its navy is its geographical location. Indonesia is facing the problem of unresolved sea border disputes. The potential for conflicts related to disputes and claimants from other nations is highly possible due to unresolved agreement on the sea borderlines defining areas rich in natural resources. Building a large navy will require resources and support from the government, and a country with a large navy is most likely to use its indigenous defense industry to produce its naval ships.

The naval shipbuilding industry cannot work at its maximum capacity without strong ancillary industries. The industry will stimulate the growth of other industries, such as the marine engineering and machinery propulsion industry, electronics, and other high technology industries to support the ships' sensors and weapons. The defense industry will also expand the opportunities for highly educated people in Indonesia's universities, and for private companies to invest in R&D to support the industry, as happened in South Korea's shipbuilding industry. Furthermore, the military spending previously allotted to ship procurement overseas can now be used to grow the industry and economic activity within the country while also building and maintaining the navy.

From Figure 7, it is clear that Indonesia is facing a demographic bonus in its population growth. By 2025–2035, individuals in the most productive age group will dominate the population, offering the potential to be development agents. Yet, the demographic bonus would be wasted without adequate job opportunities (Rohmah, 2014). On the other side, the advantages posed by the demographic bonus can support the shipbuilding industry if the government is capable of managing the available human resources to participate in the naval shipbuilding industry, along with other indigenous defense industries.

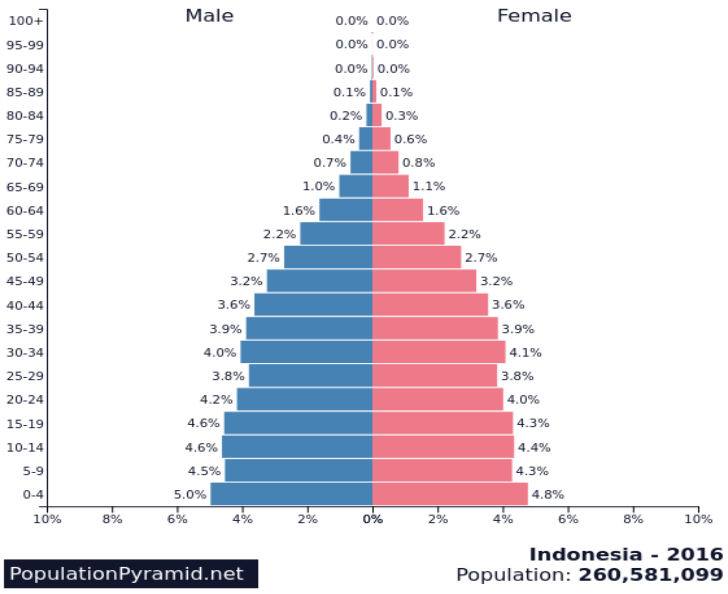

Figure 7. Indonesia's 2016 Population Pyramid. Source: Population Pyramid (2016).

B. HISTORY AND CURRENT STATE OF SHIPBUILDING IN INDONESIA

Indonesia's shipbuilding industry company PT PAL was the biggest shipbuilder company in Asia in 1939, when it was known as Marine Establishment (ME) during the Netherlands government era (Kukuh, 2017). The government then nationalized the company after Indonesia became an independent republic. The shipbuilding company was not used to its maximum purpose to increase the nation's capacity as a maritime nation. The government restructured the company as PT PAL in 1980 to become the leading company in the naval and merchant shipbuilding industry in Indonesia. However, PT PAL was not completely capable of producing ships for the Indonesian Navy.

A massive procurement of naval ships from the Soviet Union in President Soekarno's era had made the Indonesian Navy into a strong naval power in the region (Global Security, 2013b). This procurement, however, was conducted without any technology transfer agreement. Consequently, the massive naval capability grew weaker without proper maintenance or new procurement with the end President Soekarno's administration. Furthermore, diplomatic issues with Russia in 1970 made the navy incapable of maintaining its ships from Russia (Global Security, 2013a).

Under President Soeharto, Indonesia emphasized land-based military development to counter insurgency activity on land territory. The naval capability decayed as the naval ships became old and the main purpose of the PT PAL shipyards was limited to maintenance and ship repair activities. The Indonesian Navy procured 39 ships of various types in 1992, when the government chose to buy Germany ships to modernize the navy and fulfill the naval capability needed at that time. The ships, however, did not last long and many ships degraded rapidly due to the difference in climate and sea conditions between Germany and Indonesia (Global Security, 2013a).

Indonesian naval ship procurement was only conducted through off-the-shelf methods without any offset policy to support the naval shipbuilding industry. This did not change until the 1990s when Professor B. J. Habibie aimed for Indonesia's defense industrialization while he was Indonesia's minister of research and development (Willett, 1997). At that time, the naval shipbuilding entity PT PAL conducted joint production of a naval patrol boat measuring 57 meters under German license (Global Security, 2013a). Since the government owns the naval shipbuilding industry as a strategic industry, PT PAL also builds the merchant ships for domestic and export purposes. It also manages to conduct maintenance, repair, and repower activities on Indonesia's aging naval ships. To continue its activity, the naval shipbuilding company depends totally on government policy and support.

According to Figure 8, Indonesia's military expenditure has increased sharply during naval ship procurement. The procurement activity, however, did not contribute to Indonesia's economy because no domestic naval shipbuilding industry was included by the government during the procurement process. The naval ships needed to cover the vast area of Indonesian territorial water requires the country to spend more of its budget. Moreover, the price of a naval ship's technology is also expensive, which limits the number of ships that can be procured by the Indonesian Navy.

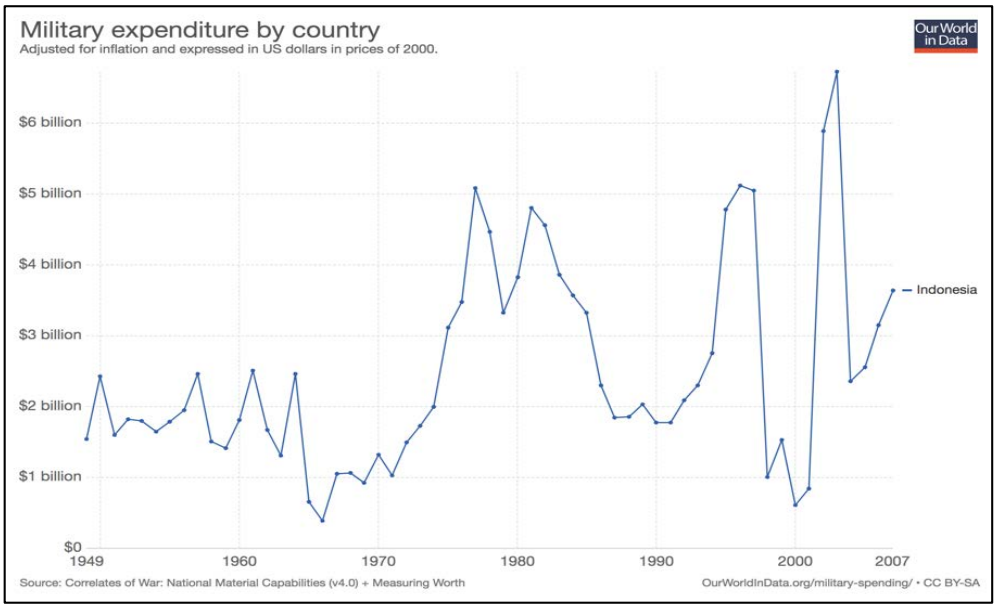

Figure 8. Indonesia Military Expenditure. Source: Our World in Data (2017).

Under President Soesilo Bambang Yudhoyono (2004-2014) the law for supporting an indigenous defense industry was passed, Indonesia's naval shipbuilding industry capability started to show much improvement. Since then, under President Joko Widodo's administration, government consistency in supporting the defense industry has been strengthened, and currently, Indonesia's shipbuilding industry holds an important role in supporting the government's vision to make the country into a global maritime fulcrum. PT PAL has now become the largest naval shipbuilding industry in the country and is capable of contributing to the nation's economic activity and maritime defense capability. Figure 9 explains the current state of PT PAL's components supplier sources to support the industry in building ships indigenously.

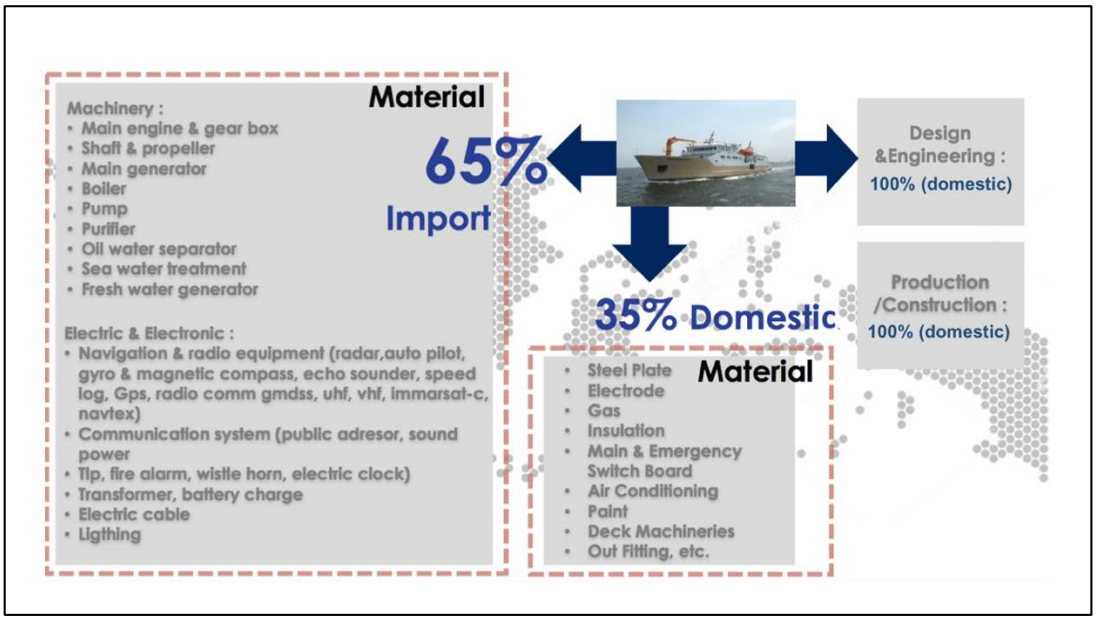

Figure 9. Indonesia's Current State Shipbuilding Capability.
Source: Arifin (2016).

Despite PT PAL's significant growth within the industry, Indonesia's shipbuilding industry still depends on importing foreign materials to build the ship's components. Based on Figure 9, in terms of technology mastery the current shipbuilding industry in Indonesia is still very far from the level of industry self-reliance as almost 65% of a ship's components are imported. This situation makes it hard for the industry to compete in delivery time and cost efficiency.

C. INDONESIAN NAVY BLUEPRINT FOR MEF AS THE MARKET FOR NAVAL SHIPBUILDING INDUSTRY

The growth in economic development and the government's awareness of protecting national sovereignty at sea, which contains a large amount of natural resources, centers the development of military power on air and naval technology mastery. In 2003, a naval modernization plan was developed as a 2013 blueprint for the Indonesian Navy by capability-based planning to achieve MEF capability. MEF is intended to build the naval forces up to the capabilities (depicted in Table 6) needed for dealing with threats that endanger the sovereignty of the state and national security interests (Marsetio, 2014a).

The navy modernization process increasingly opens opportunities for the defense industry to be involved in building the MEF program for the Indonesian Navy. The government policy, as outlined in a defense white paper, prioritizes the procurement of weapons, including warships, through domestic industry and emphasizes the important role of an indigenous naval shipbuilding industry being involved in building and maintaining the navy. Indonesian naval modernization towards MEF planning will expand Indonesian naval composition to 274 ships, consisting of 110 strike force ships, 66 patrolling ships, and 98 support ships (Laksmana, 2014). If the domestic naval shipbuilding industry cannot accomplish this alone, however, it can involve the outside defense industry by emphasizing added value through the transfer of technology to the national industry, which implements the offset policy. Table 6 explains the potential demand for the domestic naval shipbuilding industry in Indonesia and the potential loss for the shipbuilding industry if the government is not consistent in building its industry self-reliance.

Table 6. Indonesian Navy Operational Capability Requirements. Source: Laksmana (2014).

Naval Military Operations for War	**Naval Military Operations Other than War**
• Annihilation operations • Enemy naval lines interdictions • Self-protection of naval lines • Amphibious landing • Administrative landing • Coastal or beach defense • Mine warfare • Maritime security • Military sealift • Special warfare • Naval combat support	• Counter-insurgency (against armed rebellions) • Counter-terrorism (maritime) • Maritime border security • Protection of strategic and vital objects • International peacekeeping • Presidential and foreign VIP protection • Support of local governments • Territorial defense and management • Internal security support to the police • Humanitarian assistance and disaster relief • Search and rescue operations • Counter piracy, armed robbery, and illicit trafficking
o Corresponding basic operational capability and requirement	Ships required under MEF

Naval Military Operations for War	Naval Military Operations Other than War
o Capable of executing combined naval operations and sea control at two different locations	38 ships of various types for two task forces (19 each)
o Capable of executing an amphibious operation with one Marine landing team battalion (BTP)	24 ships of various types 16 ships of various types
o Capable of executing an administrative landing operation with one army combat battalion	10 ships of various types
o Capable of deploying a rapid reaction force (PPRC) with one marine BTP	Unspecified
o Capable of performing various naval presence operations as part of overall naval diplomacy	44 fast patrol boats Unspecified
o Capable of executing a wide range of maritime security operations	19 ships of various types
o Capable of executing special naval warfare operations, incl. intelligence, sabotage, or infiltration	
o Capable of providing various support functions in military force development and other military operations other than war	

The modernization in the Indonesian Navy increases the demand for naval ships procurement. As shown in Figure 10, the readiness condition of Indonesian naval ships is very low. Indonesia's fleet readiness was on average only 69% for striking, supporting, and patrolling force ships operationally capable and even worse, only 41% or nearly half, for the sensor, weapon, and command (Sewaco) system, which is between 25 and 50 years old (Laksmana, 2014). MEF as capability-based planning were designed to counter all the operational capability needed by the Indonesian Navy. Indonesia's government has planned the modernization of the navy since 2008 to fulfill its MEF requirements.

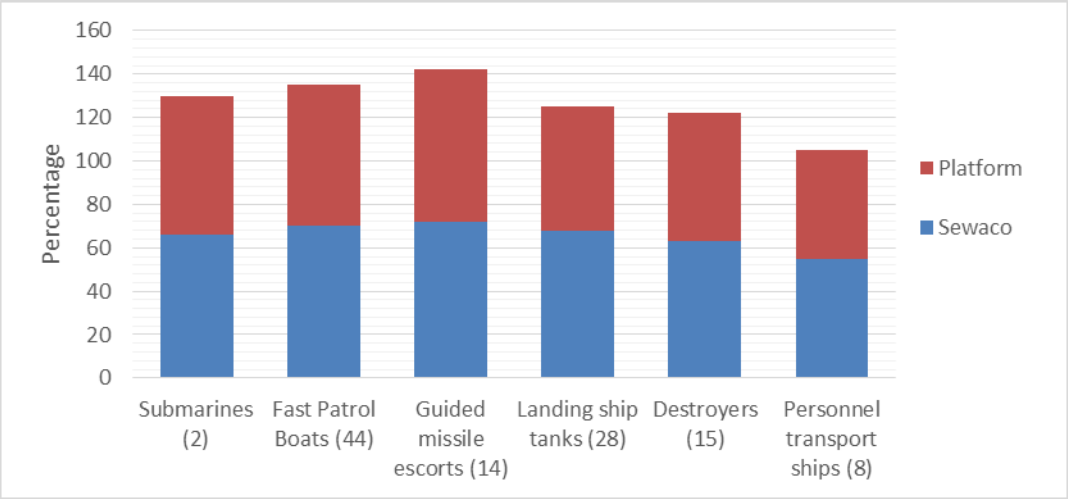

Figure 10. Basic Readiness of Primary Naval Assets, 2009.
Source: Laksmana (2014).

D. THE ROLE OF NATIONAL INDUSTRY IN THE NAVAL SHIPBUILDING INDUSTRY

The Indonesian naval shipbuilding industry is improving significantly and continuing to build the capacity and capability needed to provide the Indonesian Navy more ships domestically. The industry provides affordable naval ships that suit the Indonesian Navy's requirements. It supports the government program for conducting offset policy by providing the capability to absorb the technology transfers from foreign industries for the improvement of the indigenous defense industry.

PT PAL, as the strategic state-owned enterprise for producing naval and merchant ships, provides the ships' maintenance and repairmen, and general engineering with specifications based on client needs (as written in the PT PAL company profile). PT PAL has conducted transfer of technology from previous patrol craft based on Lurssen's PB 57 design and then built indigenously and launched the KCR 60-M missile guided FPB (Jane's by IHS Markit, 2013). Other technology transfer took place in building four Landing Platform Dock (LPD) Makassar class with the assistance of South Korea's Dae Sun shipbuilding company. That led to the indigenously built LPD class KRI Banjarmasin-592 for the Indonesian Navy (Fish, 2009). The company then delivered two Strategic Sealift Vessels (SSV) derived from the LPD ship model, for the Philippines

Navy. This accomplishment accounted for increased foreign currency earnings from export activity in January 2016. At the same time, PT PAL launched the first PKR frigate SIGMA class 10514 with the assistance of Netherlands shipbuilder Damen Schelde Naval Shipbuilding under a transfer of technology agreement and as part of government efforts for indigenous naval shipbuilding industry self-reliance (Business Monitor International Ltd., 2017b).

Some of Indonesia's private companies with naval shipbuilding capability that focus on smaller navy ships are PT Caputra Mitra Sejati, PT Palindo Marine Ship Building (PSMB), and PT Lundin. PT Caputra Mitra Sejati as a general contractor company has produced KCR 40-M class missile attack craft. The company has already produced three ships and is building a fourth ship for the Indonesian Navy (Business Monitor International Ltd., 2017b). PT PSMB has also already produced four KCR 40-M and two PC 28-M patrol boats for the Indonesian Navy (Fadli, 2013). Currently, PT Lundin is working toward the second fast missile patrol vessel (FMPV), the 63-meter Trimaran class for the Indonesian Navy, which replaces the first ship that caught on fire and was completely destroyed. The second ship is claimed by the industry to have better fire-retardant composite material (Jane's by IHS Markit, 2013). The Indonesian Navy requirements for naval ships is supporting the naval shipbuilding industry to keep productive and continue its production in the future. Furthermore, government support should allow the industry to export its product and also help to maintain a sustainable defense industry.

E. INDONESIA'S SHIPBUILDING PLAN IN THE CONTEXT OF SELF-RELIANCE

PT PAL, as the center of naval technology development in Indonesia, is responsible to carry out industry cooperation in the field of marine naval technology with the government's support. The plan of PT PAL as Indonesia's strategic industry is to improve domestic industry capability to increase the amount of local material content used in the process of naval shipbuilding. Furthermore, PT PAL is capable of absorbing the transfer of technology according to the government's offset policy to improve the

domestic naval shipbuilding industry capability, and to master submarine technology by preparing for better human resources capability.

PT PAL, as a company in charge of naval vessel development, continues to improve its ability to carry out ship production independently. One of the mechanisms it relies on is the domestic support industry, which enables support for the construction of the ship. As shown in Figure 11, the current naval shipbuilding industry still relies on foreign industry for most of its materials, especially high technology components related for naval shipbuilding.

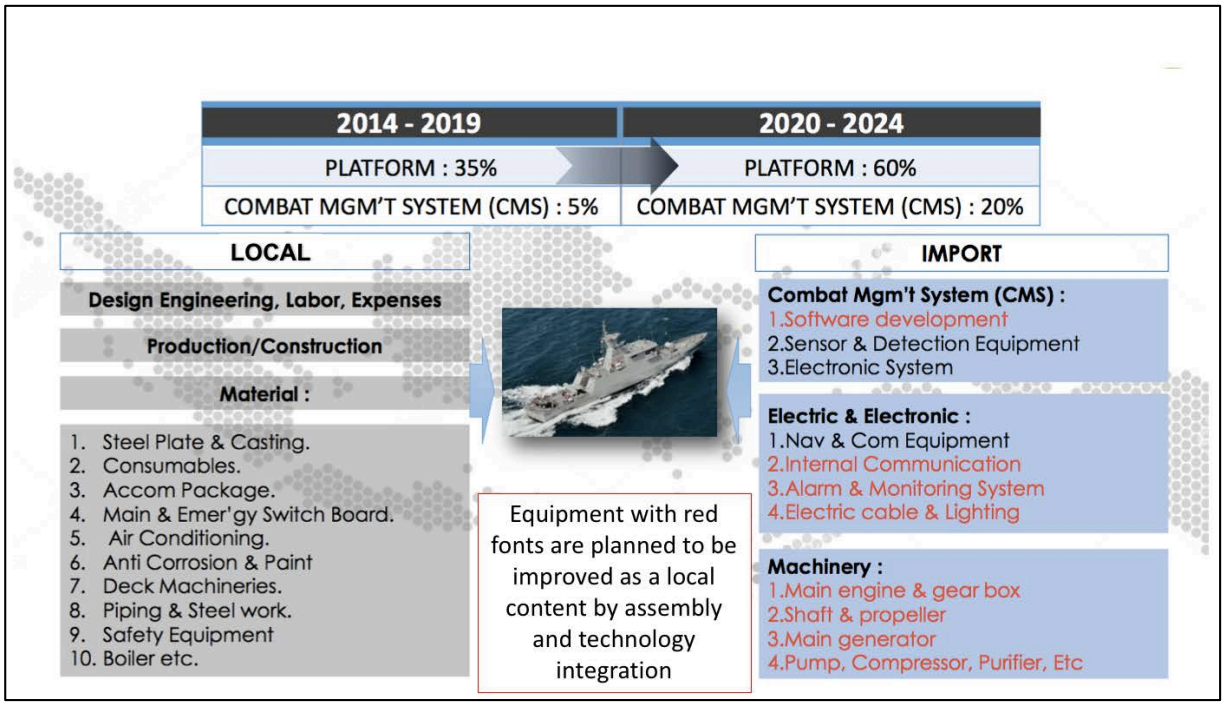

Figure 11. PT PAL Plan for Increasing Local Material Content in the Naval Shipbuilding Industry. Source: Arifin (2016).

PT PAL plans to increase the level of local material content in the naval shipbuilding process by assembly and technology integration. This effort is intended to increase the naval shipbuilding industry's self-reliance in Indonesia. It realized the dependency on foreign ancillary industries will directly influence cost as high import taxes and longer delivery times significantly increase the cost of shipbuilding (Arifin,

2016). However, the plan is not clearly defined and PT PAL cannot work alone to increase the capability in producing all the required electricity, electronics, and machinery. Moreover, the government policy does not support enhancing the research and the development capability of the industry high technology requirement with Indonesia's limited budget for R&D.

The government plans to expand the naval shipbuilding industry to be capable of building submarines from the transfer of technology program with South Korea's government through Daewoo Shipbuilding & Marine Engineering (DSME) Company. Based on the agreement, PT PAL then plans to expand the capability by building the submarine facility infrastructure to build the last type 209 Chang Bogo class submarine ordered from DSME (Ibrahim, 2016). Yet, a report of joint production problems between PT PAL and DSME Company in submarine production created a reluctance to transfer the submarine technology and to slow down the transfer of technology due to human resource capability issues (Tran, 2017). Therefore, the government of Indonesia plans to establish long-term cooperation with a French company, DCNS, in acquiring the Scorpene class submarine and to build it in Indonesia through the transfer of technology as an offset policy (Tran, 2017).

The government's consistency in supporting the industry is very important for defense industry self-reliance. Government support builds the submarine infrastructure facility within PT PAL in Surabaya. Another strategy applied by the government to support the defense industry is to market domestic warship industry products to international markets in order to ensure the sustainability of the market for the industry currently developing in Indonesia. PT PAL signed a cooperation agreement in naval shipbuilding with two United Arab Emirate firms: Abu Dhabi Ship Building (ADSB) and International Global Group at the IDEX 2017 show. PT PAL's cooperation with the two companies "will combine their capabilities and resources to create business opportunities in shipyards, maintenance, repair, and inspection of vessels" (Parameswaran, 2017).

F. SWOT ANALYSIS FOR INDONESIA'S INDUSTRY SELF-RELIANCE

The government support for naval shipbuilding industry self-reliance requires continuous analysis and evaluation to understand the competitive environment which tends to change. The capability to adapt with the competitive environment in the naval shipbuilding industry and to conduct the analysis will allow the government and the industry to provide adequate strategic planning to achieve goals. From Table 7, the SWOT analysis provides the strategic assessment to analyze industry strengths and weaknesses, and also the capability to forecast opportunity and threats as an external factor which need to be adjusted and evaluated to achieve competitive advantage within the industry.

Table 7. SWOT Analysis

Strengths • Strong strategic state-owned enterprise • Government defense offset policy and domestic market availability • Industry capable to produce military and general shipbuilding industry	Weaknesses • Lack of support for R&D • Lack of competitive environment with only 1 major state owned shipbuilder • Limited ancillary industry	Internal Factors
Opportunities • Naval modernization increases the demand for naval ships • Transfer of technology will increase the industry capability in naval shipbuilding • Opportunities to cooperate with other nations as the nation's position as a non-alignment movement.	Threats • Greater technology improvement by another foreign naval shipbuilder • The reluctance of foreign industry to conduct the obligation from offset policy agreement	External Factors
Positive Factors	Negative Factors	

(1) Strengths

- A strong strategic state-owned enterprise naval shipbuilder to support absorption of naval shipbuilding technology through defense offset policy by transfer of technology agreement.

- Government policy to support the development of an indigenous naval shipbuilding industry by the consistency of applying defense offset policy and by maximizing the existence and capability of a domestic industry to fulfill the government's ship requirements.

- The industry's purpose is not only for naval shipbuilding industry, but also to fulfill the national maritime purpose. This strategy is to make sure Indonesia's naval shipbuilding industry will survive in the long term. The shipbuilding industry will be capable of producing merchant and other governments' ships while the requirements or demand to build the naval ships from the Indonesian Navy are not yet needed.

(2) Weaknesses

- The government's policy is not enhancing R&D with only a limited budget to support the defense industry self-reliance.

- The defense industry in Indonesia is still limited to a state-owned enterprise in a strategic industry, which inhibits the motivation to compete for the development of the technology in the acquisition process (Business Monitor International Ltd., 2017b).

- There is no available ancillary industry that can support the naval shipbuilding industry.

(3) Opportunities

- The government plans naval modernization to guard the nation's sovereignty.

- The transfer of technology agreement will enhance mastery of the technology of the domestic naval shipbuilding industry.

- Indonesia's position as a non-alignment movement nation widens the opportunities for the government to open up cooperation in the defense industry to all nations.

(4) Threats

- Fast growing technology development in the naval shipbuilding industry and better ship design, sensors, and weapons offered by foreign industry inhibits the domestic naval shipbuilding industry from competing.

- The economic and strategic interests from counterpart nations must first be willing to conduct the defense offset policy, then it must not withdraw because of some objection and reluctance to continue the agreement.

By providing the SWOT analysis for Indonesian naval shipbuilding industry, the government can analyze and create policy to improve industry's competitive advantage. The Indonesian naval shipbuilding industry is ready to absorb transfer of technology with the current shipbuilding industry capability. However, the industry still needs the government's protection to provide stable demand by maximizing the contracts provided by the government as a requirement in building its own naval capability. The government then can expect the domestic naval shipbuilding industry to compete in the domestic and international markets to become self-reliant.

IV. THE STRATEGY TO SUPPORT NAVAL SHIPBUILDING INDUSTRY SELF-RELIANCE

Indonesia's naval shipbuilding industry is growing with government support by providing policies to allow it to mandate vessel procurement be built locally (Logam, 2017). The industry can currently produce some types of naval ships for the Indonesian naval power build-up and sell the SSV type ships to the Philippines Navy as an export to contribute to Indonesia's foreign currency earnings. Nevertheless, the strategy for improving self-reliance within the industry, which demands a rapid technological development and the integration of high-technology weapon systems and sensors, is insufficient to support industry self-reliance. The Indonesia's naval shipbuilding industry still lacks industry capability to produce the ship's components locally; almost 70% of ship components should be imported (Arifin, 2016). The naval shipbuilding industry in Indonesia still has limitations in its development that lead to a very low capability to build ships with local components. Most ship components still depend heavily on foreign industry such as marine machinery, radar, sonar, weapons system, etc. (Bitzinger, 2017). This capability is vital to support further logistics requirements for the shipbuilding industry. Thus, the government needs to improve and adjust the strategy to support naval shipbuilding industry self-reliance.

A. DEVELOP A STRATEGY TO MAXIMIZE STRENGTH OF INDUSTRY CAPABILITY AND BUILD AN ANCILLARY INDUSTRY

The naval shipbuilding industry capability and capacity currently already possessed by PT PAL as a state-owned company and private domestic shipbuilders, such as PT Caputra Mitra Sejati, PT PSMB, and PT Lundin should be used by government institutions to fulfill the needs for government vessel procurements. India's naval shipbuilding industry showed the advantage of having state-owned shipbuilding industry that already has had much experience in and been exposed to building naval ships. The industry in India, however, suffers from inefficiency due to an uncompetitive environment where most of its naval shipbuilding contracts are awarded by the government to state-owned shipyards without competitive bidding against a private

shipbuilder (Behera & Misra, 2012). By contrast, the South Korean naval shipbuilding industry has a strong private shipbuilding industry, which contributes to a competitive environment within the industry.

Maximizing the capability of the domestic naval shipbuilding industry will require a sound acquisition strategy and program management to ensure market demand for the industry and delivery time accuracy to fulfill the navy's MEF objective. The Indonesian Navy's requirements for navy ships LPD class and missile-guided FPB 60-meter class already mastered by PT PAL can be maintained through contracts for future procurement from the government. The Indonesian Navy requires 16 fast missile boat 60-meter ships and three have already been built. Currently, the shipbuilder industry has started the construction of a fourth ship based on the government order (Tempo, 2017). The current contract offered by the government is less efficient because the industry is already capable of doing full rate production. The contract will be more efficient by having multiple ships being built simultaneously to share overhead costs and to keep up the capability of the domestic industry through an ongoing learning process. This acquisition by the local naval shipbuilder will ensure the industry maintains its capacity to stay productive and maximizes the asset usage for the government's interest. Furthermore, the industry would be capable of meeting Indonesian naval ships' operational requirements in patrolling Indonesia's waters and to accomplishing all naval missions.

Government consistency in supporting a sustainable shipbuilding industry is very important as it will increase the capability and the capacity of the industry and the government's strategy to conduct domestic procurement for naval ships. The consistency in providing market availability for the naval shipbuilding industry makes the industry capable of maximizing its capacity and gaining further funding for industry development. The South Korean Navy is building its naval forces to have a capability as a blue water navy. Its government through the Republic of Korea Navy provides the availability of demand for the industry by ordering naval ships from the domestic shipbuilding industry. The navy becomes the shipbuilding industries' medium to advertise their naval

shipbuilding capability and generate export opportunities for the industry (The Diplomat, 2013)

The availability of ancillary industries to support self-reliance in the domestic shipbuilding industry is vital for industry efficiency and performance in building naval ships indigenously (Todd & Lindberg, 1996). According to Basuki et al., the shipbuilding process which caused the delay in PT PAL shipbuilding happened because the hull and machinery outfitting lacked proper materials. Their research was conducted using the Bayesian simulation method and found that material availability available for machinery was the main problem (Basuki, Manfaat, Nugroho, & Dinariyana, 2014). This situation caused the delay in the ships' delivery due to the unavailability of ancillary industries, such as the marine machinery industry. Consequently, the shipbuilder had to import materials from overseas. The ancillary industries in the future require technology mastery and could open up opportunities for work and R&D opportunities.

The availability of ancillary industries to support the shipbuilding industry is important. According to a PowerPoint presentation by Arifin, PT PAL's president director, the shipbuilding industry in Indonesia is still in an immature state and has even less capability in the marine machinery and local ship components areas to support the industry (Arifin, 2016). The industry's dependency on importing marine machinery and other ship components increases delivery time and additional high import tax costs for producing naval ships indigenously. High imports taxes for ship components and longer production time makes the industry less competitive, with 10% to 30% higher prices compared to the foreign shipbuilding industry (Arifin, 2016). This situation may cause the government to miscalculate in conducting the procurement of naval ships overseas and underestimate its own naval shipbuilding industry capability. India's naval shipbuilding industry experienced the same issue when the industry depended on importing most of its marine engines and components or equipment. This situation also increased the time needed to build naval ships and incurred more expenses for the industry (Behera & Misra, 2012). India's shipbuilding industry is still learning to overcome the lack of ancillary industries by increasing shipbuilding industry capacity. The goal is to gain recognition from the international marine machinery industry, so that

companies such as MAN, Rolls Royce, and Caterpillar will invest in building the ancillary industry in India (KPMG in India, 2008). India's shipbuilding industry also learns from South Korea in terms of how to provide incentives to private industry, how to support R&D, and how to absorb local content into the shipbuilding industry (Thangam & Sureshkumar, 2015).

Indonesia's Ministry of Industry supports the effort to establish a marine machinery industry to be built domestically. The industrial minister of the Republic of Indonesia through the Indonesian ambassador to Japan tried to open up the relationship and cooperate with Japan's Ishikawajima Heavy Industry (IHI) corporation to invest and build the marine machinery industry in Indonesia (Diela, 2014). The government of Indonesia needs to provide continuous improvement in its policy to support private industry to develop the growth of this ancillary industry for facilitating the growth of domestic shipbuilding industry. One of the policies is the cabotage policy, which restricts the shipping company from procuring ships from foreign shipbuilding companies. This policy will increase the demand on the national company to procure ships from the domestic shipbuilding company, which then will increase the demand for ships components from local industries (Yee, 2015). The involvement of the private sector will share the government's burden of capital investment to support in developing the industry.

B. BUILD RECOMMENDATIONS USING R&D AND LEARNING CURVE THEORY

The South Korean government policy to support the shipbuilding industry followed the steps of import and the import-substitution, before it shifted to provide a huge amount of R&D to build its shipbuilding industry in the 1980s (see Table 8). The South Korean government pursued the industry to contribute to exports and support the nation's economy. It then involved private industry to support the development of South Korea's shipbuilding industry (Hassink & Shin, 2005). According to Berkok et al., South Korea's offset policy aimed to support R&D and increase capability within the shipbuilding industry, which is mostly conducted by applying direct offset policy through the transfer of technology, co-production, and R&D assistance and participation in joint

R&D cooperation (Berkok, Penney, & Skogstad, 2012). Indonesia's current effort to improve industry self-reliance is still lacks policy support for R&D. While the South Korean government encourages the private sectors to invest in shipbuilding technology R&D, the Indonesian government lack of policy to support R&D and private sector investment will most likely inhibit the industry's development in Indonesia.

Table 8. Industrialization Sequence for Indonesia and South Korea Shipbuilding Industries

South Korean Shipbuilding	**Indonesian Shipbuilding**
Prior to 1970: No shipbuilding industry, the only industry available is Korea Shipbuilding and Engineering Corporation (KSEC). The industry is dominated by import and foreign aid	1945: PT PAL was nationalized as a state-owned company. Its main activity is to repair and maintain Indonesian naval ships
1970: The central government starts to industrialize the shipbuilding industry. The development of infrastructure, heavy and chemical industries. The industry gains investment from chaebol and government intervention to support the industry in gaining more investments. The development of private shipbuilding industries	1980: The restructuring of PT PAL as a public company to provide opportunity for public investment. Improve the activity to repair and maintain both merchant and naval vessels
	1985: Starts the transfer of technology for patrol boat from German company to build PB 57-meters patrol boat
1980-1990: Shifts the policy from industry to technology through R&D. The government supports education and prepares human resources development	2004: Transfer of technology of various types of naval ships, improving the human resources capability by sending skilled workforces to learn from the South Korean shipbuilding industry
1990-current: Transfer of technology with joint R&D and investment for the industry. Strong shipbuilding industries supported by strong ancillary industries	2012-current: Improvement in naval shipbuilding industry self-reliance. Government policy to support shipbuilding industry through domestic shipbuilding industrialization. The shipbuilding industry still lacks self-reliance to supply ship components

1. Building Naval Ships by Strengthening R&D

Transfer of technology as offset policy as applied by the government of Indonesia in naval ship procurement, such as submarines from South Korea, requires further improvement by the industry to be self-reliant in producing the next ships. The government should do its own R&D and maintain and improve the knowledge from transfer of technology to build the next submarines of the same type for the Indonesian Navy. Government support to improve self-reliance in the naval shipbuilding industry is limited to the military expenditure budget, which is still under 1% of GDP, and the general R&D budget, which is still under 0.1% of the GDP. This support is necessary to improve the naval shipbuilding industry's capability to compete with foreign industry and provide the export opportunities. The effort to achieve industry self-reliance by having only an import substitution policy and neglecting export orientation will cause the failure of industry self-reliance effort as happened in Latin America countries (Baer, 1984). The industry still depends on huge amount of imports of raw materials to fulfill the import substitution industrialization which increases the expenditure without the capability to compete in the international market to export its product (Baer, 1984). The same situation will be experienced by Indonesia's shipbuilding industry, which still depends on importing ship components and marine machinery from foreign industries.

The capability to build missile-guided FPB 60 meter is gained from PT PAL's own R&D capability to design the ship by improving the capability from the previous 57-meter patrol boat, which came from the transfer of technology by a German shipbuilder. The design is an improvement from its previous class to suit navy requirements for modern and advanced capability required to patrol Indonesia's waters. Currently, African nations such as Senegal have expressed interest in procuring two units of fast missile boats, of the 45-meter class and 60-meter class, and Guinea Bissau and Gabon have each expressed interest in procuring two units of missile guided FPB 60-meter (Defense World, 2017).

Indonesia's naval shipbuilding industry is relying on the process of technology transfer to increase its self-reliance and technology development. The nation's capability for R&D has not yet become the main effort to increase self-reliance for the defense

industry. India's and South Korea's shipbuilding industries apply different approaches to support their respective national capability for naval shipbuilding. The South Korean shipbuilder DSME provides investment for R&D specializing in the naval shipbuilding industry (OECD, 2015). The South Korean shipbuilding industry is supported by a strong private industry. This is an example of how the government can share its burden and the risk in developing the industry. While India's government consistently conducts R&D in naval ship designs and naval weapon systems through the directorate of naval design (DND) and the weapons electronic systems engineering establishment (WESEE) to support the indigenous naval shipbuilding industry (Rai, 2015). Both countries provide a common method to strengthen its naval shipbuilding industry by strengthening its R&D capability. The government of Indonesia through the Indonesian Navy is to cooperate with the agency for the assessment and application of technology (BPPT) in improving the technological capability in naval weapon systems and shipbuilding self-reliance through research in mini-submarine design, small ships, and submarine battery engineering design (BPPT, 2015).[5]

2. Learning Curve Theory

In 1947, J.R Crawford introduced learning curve theory, which predicted that the learning process in every production effort would become more effective and faster as producers learned the production process. The study was conducted during World War II on the production process of airplane parts for the war (Mislick & Nussbaum, 2015). According to cost estimation reference theory, the practice guidelines for the shipbuilding learning curve slope is 80–85% (Mislick & Nussbaum, 2015). Thus, this research uses the most conservative number for estimating the cost, which is 85%. This means the cost of a second ship is 85% of the cost of first ship. Therefore, it will give higher number for estimating the cost than using 80% learning curve slope (shallower learning curve slope). The industry realizes benefits when it produces more ships due to the economy of scale

[5] BPPT is an Indonesian non-ministry government agency under the coordination of the Indonesian Ministry for Research and Technology, with the main task to develop the application of technology and its main mission to improve industrial product and government agencies service competitiveness. For more detail, see: https://www.bppt.go.id/profil/sejarah

from the R&D of one type of ship (see Figure 12). The learning curves will keep on estimating lower costs as the learning process continues—even on a much smaller scale.

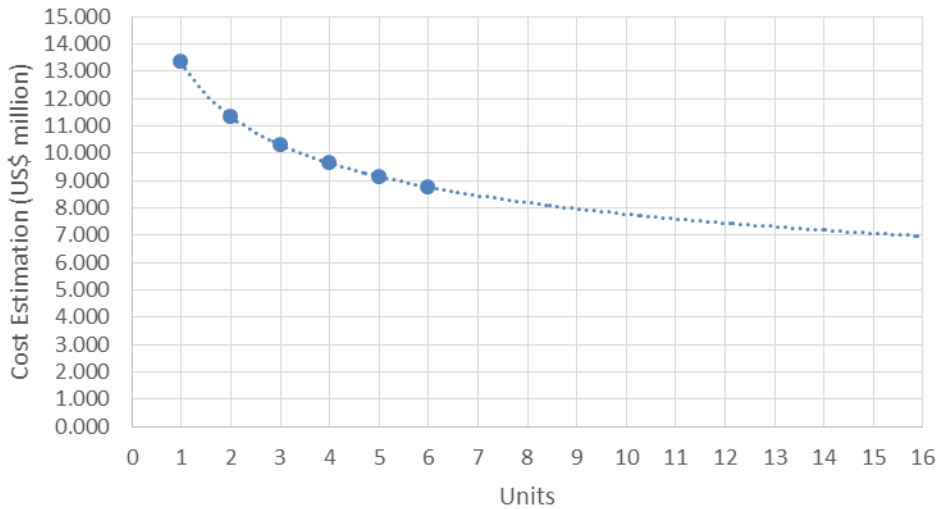

Figure 12. Learning Curve for Indonesia's Missile-Guided FPB Cost Estimation

Indonesia PT PAL launched three missile-guided FPB 60-meter with price tags of 375 billion rupiahs for all three, which is equal to around USD 35 million (Boediwardhana, 2014). The Indonesian Navy planned on procuring at least 16 ships of this type to fulfill the MEF requirements (Viva, 2014). Figure 13 shows the price of a unit missile guided FPB 60-meter produced by Indonesia's shipbuilder PT PAL. Domestic naval shipbuilding industry provides the opportunity to cut the shipbuilding cost by improving the efficiency through continuous learning process.

Slope parameter (b) $= \frac{\ln(0.85)}{\ln(2)} = -0.234465$; b + 1 = 0.765534

Total cost calculation (CT_N) is:

$$CT_3 = A \times (1^b + 2^b + 3^b) \quad \rightarrow 35m = A \times (1 + 2^{-0.234465} + 3^{-0.234465})$$

$$\rightarrow A = \frac{35m}{2.6229}$$

First unit price theory → A = 13.344 (US$ million)

Cost of unit $N = AN^b$

Cost for second ship = $15.094 \times \left(2^{-0.234465)}\right) = 11.342$ (US$ million)

Cost for third ship = $15.094 \times \left(3^{-0.234465)}\right) = 10.314$ (US$ million)

Total 3 ships cost = (13.344 + 11.342 + 10.314) m = 35 (US$ million)

Figure 13. Indonesia's Missile-Guided FPB Price Tag. Adapted from Pakistan Defence (2014).

Based on the learning curve theory, the cost for building the next missile-guided FPB will not cost as much as $36 million ($12m × 3 ships). Furthermore, the cost of building the next ships will be lower as the learning process improves. PT PAL is able to build the fourth boat faster than it was targeted to finish. The working process is using modular method that provides the way to work on the ship's parts in parallel at the same time (Tempo, 2017). The current shipbuilding process is faster and will cut the production time, labor hours, and variable overhead cost. Therefore, the cost for producing ships will be lower in each subsequent production of each ship due to the

increase in expertise and efficiency of the naval ship production, as shown earlier in Figure 12.

The domestic naval shipbuilding industry can also produce patrol ships of the same type, but with lower weapons specifications or without weapons for other government-owned ship procurements in Indonesia, such as the marine police and maritime security board, to increase the number of patrol ships produced and gain the advantage from learning curve theory. Another benefit from the indigenous naval shipbuilding industry is the contribution to foreign exchange earnings from exporting naval ships to other countries interested in procuring ships from Indonesia. The government's consistency in providing the demand for the domestic industry from the domestic demand for ships and promoting the industry to the global market will keep the flow of the money within the industry. The government should also support the private industry to get involved in the naval shipbuilding industry. Indonesia's state-owned industry will cooperate with one private enterprise to build 30 patrol ships for the Indonesia Sea and Coast Guard (KPLP) under the Ministry of Transportation state ships requirements (Chandra, 2016). Thus, the private and state-owned industry will be able to benefit from the nation's effort in building the industry.

C. CHALLENGES IN THE FUTURE TO DEVELOP A SUSTAINABLE NAVAL SHIPBUILDING INDUSTRY

According to Bitzinger, Southeast Asia's naval shipbuilding industry will mostly have the same challenges in the long range such as a lack of profitability, a lack of technology mastery, and corruption (Bitzinger, 2017). The challenges are likely to be experienced by Indonesia in its efforts to improve naval shipbuilding capability.

1. Low Utilization of Shipbuilding Production Capacity

According to Bitzinger, Indonesia's naval shipbuilding industry is experiencing a lack of profitability due to the government's inability to provide continuous contracts for the industry (Bitzinger, 2017). This situation may be caused by the R&D conducted by PT PAL to build a missile-guided FPB 60-meter, which has not yet reached the economy of scale to build more ships as per the nation's requirements. While Indonesia needs 16 of

these boats, it has only ordered one ship to be built after the first batch consisting of three ships, which raises costs. Capacity development for the naval shipbuilding industry should also consider market demand. Overcapacity will cause the industry to suffer from labor and other depreciation costs of the equipment; moreover, a state-owned company such as PT PAL should pay its employees, excluding temporary workers, regularly. Thus, the government should also pay attention to the lost-opportunity cost that would be incurred by not being consistent in procuring naval ships from its own industries. Promoting domestic naval shipbuilding to expand the opportunity to export naval ships to counterpart countries offers the potential to increase the industry by using the capacity available in shipbuilding industry. After the export launch of two SSV ships ordered by the Philippine Navy, PT PAL experienced an increase in ship orders from counterpart countries, including military and non-military orders from Malaysia, Senegal, Guinea Bissau, and Gabon for the SSV ship and the missile-guided FPB (Sari, 2017). Turkey ordered a power barge or power plant ship as a non-military order from PT PAL. The company needs to restructure its business not only to build military ships, but also to maintain and improve its capability to build merchant ships (Sari, 2017).

Even though there is no long-term contract the Indonesian government could provide to keep the business going, PT PAL can still survive, since naval shipbuilding is only one of several sub-divisions in the company. For example, merchant ship building is one of the primary businesses of PT PAL. Without a contract from the government, PT PAL can use its merchant ship building sub-division to sustain its business. Another sub-division is the naval ship repair and maintenance. The Indonesian Navy continues to give contracts to PT PAL in these areas.

2. Transfer of Technology as Offset Policy

Technology transfer as an offset policy has proven to be a strategy that can facilitate a nation's effort to reach self-reliance in the defense industry. The Indonesian government efforts to conduct transfer of technology in every naval ship procurement has improved PT PAL's capability to build indigenously the LPD ship and missile-guided FPB for the Indonesian Navy (Sindonews, 2014). However, many cases have shown that

the agreement requires the willingness of the nation owning the technology to facilitate the process, and most countries are not willing to transfer all their technology for reasons of national security or competition within the industry. Indonesia experienced this problem in the procurement of Frigate 10514 from DSNS (Damen Schelde Naval Shipbuilding), a company from the Netherlands. The transfer of technology process in the effort to build the naval ship indigenously still limits the domestic industry in building the ship modules as a whole by PT PAL. Although five out of six modules were built at PT PAL, the last module was built in the Netherlands and delivered to Indonesia. A more complex module, consisting of the mast, radars, and other sensors, was also built in the Netherlands where the company is based. This situation poses a challenge for the industry if it is to be fully capable in absorbing all the shipbuilding technology knowledge from the counterpart country.

3. Limited Shipbuilding Technology Expertise

According to Bitzinger, the shipbuilding industry in Southeast Asia faces challenges in building small ships such as patrol boats, OPV, and corvettes, which are simple in terms of technology (Bitzinger, 2017). The situation is also true for Indonesia's shipbuilding industry, which still lacks human resources capability. Therefore, the chief challenge is for the government to improve the capability of the available human resources within the industry to absorb current naval shipbuilding industry knowledge by sending its people to South Korea and gain the advantage of the transfer of technology process (The World Folio, 2013).

Another challenge is to promote and support the private sector's involvement in building the ancillary industries. In order to improve the shipbuilding industry, the government must increase available local content in the country by improving the market situation to promote both domestic and foreign investments that support the naval shipbuilding industry, especially the ancillary industry, which in general will also support growth in the private sector industry. The country's shipping industry requires many ships to support economic activity that covers the ocean surrounding the nation. The availability of ancillary industries will provide for a strong shipbuilding industry. And,

this ancillary industry must be sufficient to provide the components needed for the industry to build the ships at a competitive price.

The Indonesian government strategy to use the transfer of technology has a limitation when the process requires good cooperation between two countries willing to conduct the offset policy. Not all transfer of technology processes end in success. Such was the case of Malaysia in building its OPV indigenously, which ended with inefficiency, and now that navy can only acquire far fewer OPVs than previously planned. The industry lacked the readiness to conduct transfer of technology, which caused delays and technical problems (Balakrishnan & Matthews, 2009). The cooperation between the Indonesian Navy and BPPT should be maximized by preparing the domestic shipbuilding industry to absorb the transfer of technology conducted by PT PAL and DSME in building the submarine through a transfer of technology agreement.

4. Corruption

Indonesia's corruption risk position, according to a Business Monitor International research report, was assessed as the worst of the countries focused on in this study. Its corruption risk score was 24 out of 100 as compared to India (with a score of 29), Malaysia (30), and South Korea (36). Indonesia is in the highest position for risk of corruption, which in the future, will inhibit other nations' interest in investing in Indonesia (Business Monitor International Ltd., 2017b). The corruption case that involved the president and director of PT PAL may discourage foreign nation counterparts from continuing their cooperation with the company and from ordering more naval ships (Jakarta Globe, 2017). Corruption in Indonesia's shipbuilding industry may deter other nations from entering into contracts for naval ship procurements with Indonesia in the future. In fact, the export of naval ships to the Philippine Navy involved a broker or the third party to conduct defense systems procurement and acquisition. Handing over government control to a third party as the broker in defense systems acquisitions could minimize the chance of corruption (Hukum Online, 2017).

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V. CONCLUSION

Self-reliance in the naval shipbuilding industry is important for Indonesia to build its naval power for maritime security and defense purposes. The nation is motivated to develop its maritime power to grow the nation's economy through sea connectivity by supporting the domestic shipbuilding industry, enabling the indigenous production of both merchant and naval ships. Government support for the strategy and policy to enhance the industry is required due to the nature of the industry and the government's involvement with a major company such as PT PAL. The transfer of technology in the naval shipbuilding industry has been proved to contribute to the shipbuilding industry by increasing the capability of its shipbuilders. However, the government needs to enhance and enable research and development by increasing the budget and promoting development of ancillary industries, and by promoting exports to all interested nations.

The government strategy to reach self-reliance in the naval shipbuilding industry still faces many problems and challenges. Since the government still manages PT PAL, it currently bears all the risks of R&D in defense industry development. Furthermore, the government has yet to maximize the involvement of private industry in sharing the risk in developing the industry. Its policy does not provide any incentive to the people involved in the industry, which may prevent industry growth through the private sector in the future.

A. RECOMMENDATIONS

The application of a defense offset policy through the transfer of technology should be followed by future contracts to maintain the knowledge and capability already achieved in the naval shipbuilding industry. The availability of continuous contracts within the industry will ensure that the industry grows and achieves the necessary economies of scale by applying the transfer of technology.

The government also needs to provide policies to support the shipbuilding industry so that the industry can improve its competitive advantage through the

availability of ancillary industries. The existence of ancillary industries can also be improved through foreign investment in high technology industries, such as the marine machinery industry. Efforts must be made to build these industries locally, and one way to do that is to give foreign investors an incentive to invest and build the high technology industry not yet available in Indonesia.

Research and development is another way to increase self-reliance, especially in the naval shipbuilding industry, which requires technological improvements to be competitive and capable of becoming export oriented. The government cannot rely only on technology transfer to increase self-reliance in the defense industry. The government can promote the defense industry as a creative industry and involve more people by increasing incentives through a better policy to support R&D within the country. The strategy to improve self-reliance for the naval shipbuilding industry as a part of defense industry will require a significant amount of capital for R&D for self-sufficiency. Indonesia currently lacks R&D capability because of the government's policy and the limited budget allocated for the defense industry to conduct R&D activity. The Indonesian government would need to increase the military expenditure budget from the current allocation of less than 1% of GDP to 2% to significantly support R&D activity and increase self-reliance in the naval shipbuilding industry.

B. SUGGESTIONS FOR FUTURE RESEARCH

Research on the naval shipbuilding industry, especially in Indonesia, is still limited in terms of qualitative research assessing government policy effectiveness for naval ship procurements. In part, this is due to the limited data for military procurements. The number of procurements through transfer of technology as an offset policy applied by the government of Indonesia in every defense procurement can be recorded and quantitatively analyzed to understand the successes and failures of applying the strategy through effective policy in defense procurement to improve self-reliance in defense industrialization. Furthermore, the research can be measured more effectively by having enough quantitative data through the years. With sufficient data, research can try to identify the connection or even causality by having better R&D to support the industry in

marketing the product domestically or exporting it. This data then can be used by the government in decision making for future policy to build a sustainable defense industry. The Indonesian government will need to review and, if necessary, revise its strategy periodically to support self-reliance in the defense industry.

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