

Optimization Of Synergy Research And Development Institutions And Universities Towards An Independent National Defense Industry

Ali Mashudi¹, Moeljadi², Sukarmi³, Herman Suryokumoro⁴

^{1,2,3,4}Brawijaya University, Malang, Indonesia



Abstract – Various efforts have been made by the National Defense Industry in order to improve and support the fulfillment of the national defense system independently. Although there are many factors that determine the success of empowering the national Defense Industry, one of which is related to the synergy of the Defense Industry (BUMN and BUMS), Research and Development institutions and Universities to produce the expected quality of Defense Industry products. The problem in this research is how to increase the synergy of the Defense Industry (BUMN and BUMS), Research and Development institutions and Universities. The purpose of this research is to make a strategic plan in the context of the synergy of the Defense Industry (BUMN and BUMS), Research and Development institutions and Universities to achieve the goal of empowering the National Defense Industry, namely the results of products that are sophisticated, modern and integrated with the basis of Network Centric Warfare (NCW). The method used in this study is to determine the weight of the criteria based on the hierarchy using the Analytical Hierarchy Process (AHP) and the determination of several criteria using the Delphi technique. The results showed that strategic priorities for increasing synergy obtained five strategies, namely 1) link and match the defense industry with the highest weight, 0.42. 2) training on the integration of human resources in the defense industry with a weight of 0.23. 3) defense industry research and development budget with a weight of 0.18. 4) improving the quality of research and development with a weight of 0.11. 5) stakeholder commitment related to the weight of 0.06.

Keywords – Strategy, AHP, Optimizing synergy of Defense Industry, Alutsista, Network Centric Warfare.

I. INTRODUCTION

The state defense and security system that is organized to achieve national goals really requires the availability of defense and security tools and must be supported by the ability of a strong and independent domestic defense industry. The Law of the Republic of Indonesia Number 16 of 2012 concerning the Defense Industry is a milestone in the implementation of fulfilling the needs of domestic defense equipment (Defense, 2021). (Army T. I., 2021)

In meeting the current needs for defense equipment, the defense industry faces several obstacles, for example in terms of the synergy of the defense industry with research and development institutions and universities, the defense industry's ability to create products that suit user needs and also the issue of commitment from stakeholders for the advancement of the defense industry. strong and independent (Defense, 2021).

In today's modern era, the use of advanced technology is indispensable in the defense system of a country. Indonesia has ambitions to create national defense capabilities with modern and sophisticated technology. To be able to achieve this, one of the ways used is by way of technology transfer. Therefore, Transfer of Technology is very important for countries that have not been

able to produce advanced technology, especially for Indonesia. Defense Industry Cooperation between Indonesia and other countries is one way for Indonesia to meet its defense equipment needs (Hartanto, 2013).

In carrying out research and development of defense and security technology products, it is necessary to have qualified human resources and empower research and development institutions and universities. For this empowerment, the government encourages and protects it with policies that favor the use of domestic products. In an effort to increase independence, it is necessary to have policies that spur national capabilities in meeting the needs of defense equipment and equipment and supporting facilities (Army T. I., 2021). (Sarjito, 2018).

Referring to various important issues in the Indonesian Defense Industry today, the most important thing is technology. The defense power of countries in the world today is not only supported by large manpower or active military personnel in quantity. The availability of modern and sophisticated defense and security tools, which are equipped with the latest technology based on Network Centric Warfare, also affects the defense power of a country. A country with a small area and population, such as Singapore, has modern and sophisticated defense equipment, so that with its equipment, Singapore is a country that is quite calculated (Defense M. o., 2014), (Susdarwono, 2020).

Furthermore, in terms of technology, Indonesia still needs cooperation with other countries, especially in the development of defense technology, especially defense and security tools. Indonesia's interests in the field of defense cooperation with other countries will become increasingly important in the future to be improved, along with the development of security issues in the regional and global scope that require common interests (Djarwono, 2017). In order to overcome some of the problems mentioned above and related to the development of the global and regional environment that continues to develop dynamically, faced with the many needs for national defense and security tools and the dynamics of Military Operations for War (OMP) and Military Operations Other Than War (OMSP) for assistance. humanity due to natural disasters and the handling of Covid 19, it is necessary to arrange efforts to optimize the empowerment of the National Defense Industry in order to support national defense. The challenge of interoperability does not only occur across dimensions (Army, Sea, Air) but interoperability is also a problem between components such as between ships and aircraft. The hope of future defense and security tools is Alutsista based on Network Centric Warfare which is capable and can be integrated with other Alutsista equipment and is able to support OMP and OMSP, especially disaster management operations. So that some analysis and studies are needed as well as regulations that state that the empowerment that covers the role of BUMN and BUMS, research and development institutions and universities can be improved. Human resources as well as facilities and infrastructure owned by BUMN are the main factors that greatly influence the success of the development of defense and security tools.

This paper has many literatures to support the research, such as literature with title Indonesian Defense Industry model Concept: A Study Framework for Defense Industry Building (Hartati & Muhammad, 2014), Civic Participation in Military Innovation: Cooperation between the Defense Industry of Indonesia and Turkey 2010-2018 (Luerdi & Marisa, 2013), Indonesian Interest in Cooperation with the Czech Republic in the field of Defense 2015-2018 (Lesmana, 2019), Technology and The Defense Industry: Real Threats, Bad Habits or New Market Opportunities? (Bellais, 2013).

This research is structured as follows, part 1 is introduction, part 2 is literature review and methodology, part 3 is results and data analysis and part 4 is conclusion.

II. LITERATURE REVIEW/METHODOLOGY

2.1. Synergy Theory.

Mamduh M. Hanafi, in his book "Management" states that synergy comes from the word synergy, which can also be called synergism or synergism. Synergy means a combination of elements or parts that can produce better or greater output. Meanwhile, according to the Big Indonesian Dictionary, synergy as quoted by Mamduh means joint activities or operations. Synergy is a combination or combination of elements or parts that can produce a better and greater output than being done individually, besides that a combination of several elements will produce a superior product. Therefore, synergy in development means the integration of various elements of development that can produce better and larger outputs. Synergy will easily occur if the existing components are able to think synergistically, there is a common view and mutual respect. Through the two conclusions above, the authors conclude that synergism can be interpreted as a joint or collaborative activity carried out in order to get maximum results by being

connected by several different but related roles in it. Therefore, all components of society and the Government are expected to work together in order to achieve community welfare (Mamduh, 1997).

In the context of defense industry empowerment, the synergy theory can be applied to coordination efforts at Research and Development institutions and universities to jointly advance the defense industry by creating several technological innovations independently.

2.2. Strategic Management Theory.

Good strategic management can lead organizations to be able to implement their strategies through program planning, budgeting processes, performance management systems, changes to organizational structures, and program and project management (Rastislav & Silvia, 2015). In addition, strategic management theory can be related to a strategic plan that is carried out to plan a strategy in making decisions in order to realize a desired goal (Ersoz & Karaman, 2011).

Another definition of strategic management is a series of fundamental decisions and actions made by top management and implemented by all levels of an organization in order to achieve the goals of the organization. The importance of a strategic plan in advancing the national defense industry, so that the best and appropriate steps can be carried out together (Jang, 2015).

2.3. Delphi Analysis Concepts.

The Delphi method is a method that is carried out through the creation of a series of rounds of questionnaires given to experts to reach a consensus of their opinions (Habibi, Sarafrazi, & Izadyar, 2014). The Delphi method was developed in the early 1950s by Derkley and his associates at the Rand Corporation, California. This method is recommended as a form of structured group communication process. Because repeated questionnaires used as the main tool can reduce the dominance of individuals in an effort to develop consensus on a matter. This technique aims to avoid the friction that occurs due to the prominence of someone's idea that is better than someone else's idea in a forum to achieve a concession.

In the Delphi concept, expert panelists are selected and their identities are kept confidential. This group of expert panelists is selected selectively and their position represents a number of experts who understand the problem for which consensus is to be found. These expert panelists were then asked to fill out a written questionnaire and collect it. After collecting this first result, the answers of the panelists will be combined to create new questions in the next round of questionnaires. The process of taking answers to this questionnaire will be repeated several times until a consensus is reached from all the answers from the expert panelists.

2.4 Concept of AHP analysis.

AHP analysis or Analytical Hierarchy Process is an analytical method that was developed to find a priority order or ranking of various alternatives contained in problem solving efforts. This analysis was developed by Prof. Thomas Lorie Saaty of Wharston Business School (Damdinsuren & Ishdamba, 2017). In complex circumstances, decision making is influenced by many factors that cover various levels and interests. So it is necessary to determine priorities and test the consistency of the various options available. AHP is basically a general theory of measurement used in an effort to find the ratio scale of discrete or continuous pairwise comparisons. This comparison can be obtained from an actual measure or a basic scale that reflects the strength of feelings and relative preferences.

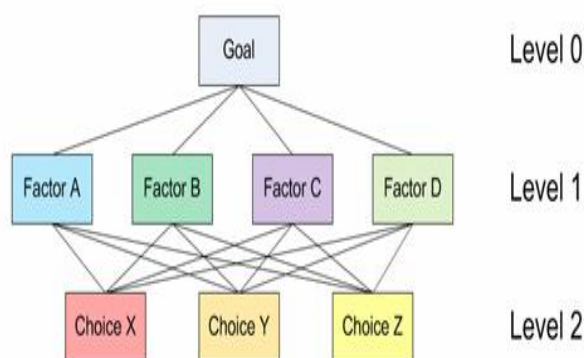


Figure 2.1: AHP hierarchical structure

2.5. Defense Industry

The establishment of the defense industry in Indonesia is part of the history of the Indonesian nation that cannot be denied. Starting with the establishment of the gunpowder, cannon and weapons industry in 1808 under the name *Artillerie Constructie Winkel* which was the forerunner of PT. Pindad which is domiciled in Bandung. In 1949 the Dutch government built a ship repair and maintenance facility in Surabaya which was named *Marine Establiment (ME)*. which is the forerunner of the Shipbuilding Industry. On December 27, 1949 it was handed over to the Indonesian government and named PT. PAL Indonesia (Indonesian Shipping Industry) whose duties and roles are to support the repair and maintenance of Indonesian Navy ships.

The history of the establishment of PT. PAL started when Governor General Van Der Capellen (1778-1848) formed a commission tasked with investigating the right place and means to establish the shipping industry. This was done in order to support the Royal Dutch Marine Fleet in the Asian region. Since 1822 observations have been made and recommend the Ujung area, Surabaya as an area that meets the requirements to establish a shipping industry. It took a very long time to realize the shipyard until it was inaugurated by the Dutch government in 1939 under the name *Marine Establishment (ME)*. ME was the largest shipyard in Asia at that time, employing 6,000 people, the majority of whom were indigenous. Japan managed to take over ownership of ME in 1942, then its name was changed to Nagamatsu Butai, then changed again to Kaigunse 21-24 Butai. When Japan lost, the Indonesian government nationalized and changed its name to Penataran Laut (PAL). On April 15, 1980, based on Government Regulation Number 4 of 1980, the status of the company PT PAL Indonesia (Persero) changed from a Public Company to a Limited Liability Company. The role of PT PAL Indonesia (Persero) is getting stronger after the issuance of Law no. 16 of 2012 concerning the Defense Industry, and for strategic BUMN, a wider space is given. Based on the law, PT PAL Indonesia (Persero) professionally carries out the mandate as well as the obligation to play an active role in supporting the fulfillment of the needs of the marine defense equipment and acts as the main guide (*lead integrator*) of the marine dimension.

The history of the embargo of the Navy's Alutsista in 1998 was a bitter experience that had to be borne by Indonesia, which caused the Navy's Alutsista to be unable to function. So that Indonesia needs to have the independence of the national defense industry (Hartati & Muhammad, 2014).

2.6. Methodology

To solve the problem of optimizing the synergy of defense industry empowerment in this research, it is necessary to take several steps to describe the approach and model of the problem. The steps taken are:

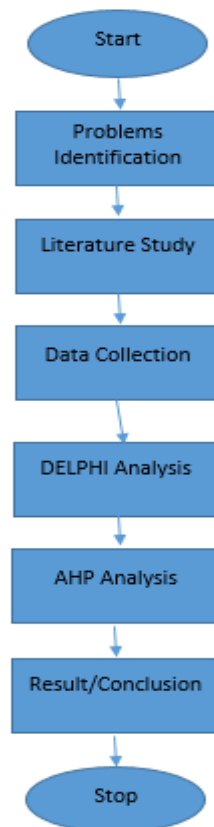


Figure 2.2: Research flow

Target: The purpose of this research is to obtain strategies that can be implemented in order to increase the synergy of Research and Development institutions and universities, so as to create an independent defense industry.

Steps: The steps of this research are: step 1 filters all the criteria that affect the process of developing institutional synergy in the defense industry using the Delphi method, step 2 performs criteria analysis, step 3 analyzes the system using AHP, step 4 provides suggestions for improvement and conclusions.

III. RESULTS AND DISCUSSION

3.1. Delphi analysis to determine criteria.

This research was carried out from April to August 2020. With experts or experts involved in the development of the national Defense Industry. In this study, it is described that in order to improve defense industry products, strong synergy is needed between Research and Development institutions and universities to produce technological innovations as expected by Alutsista users, so that in this study only discusses the synergy of Research and Development institutions and universities ideally.

The Delphi process is carried out by giving several questions to the experts to obtain several criteria that are very influential in improving the products of the national defense industry. Several existing criteria are then confirmed to other experts in turn until a criterion is found that is agreed upon by the experts in improving the national defense industry products.

The problem that arises at this time is that in its implementation it has not been directed and optimal as expected. The fact is that until now the national defense industry has not been independent enough to support the Indonesian National Army's Alutsista. Many Indonesian National Army Alutsista are imported from foreign countries, due to the inability of the defense industry to support them. The non-optimal involvement of research and development institutions and universities in the defense industry needs to find a solution so that the defense industry's future capabilities will be better. It seems that concrete steps are needed so that researchers from research and development institutions as well as from universities get back up and clean up to follow the developing model

and supported by strong regulations. The point is that with the development of Information and Communication Technology, the defense industry needs support in reliable human resources to create innovative products according to user needs.

Increased capability in strong defense industry technology will ensure the ability to support the needs of Alutsista and defense facilities in a sustainable manner. The ability to fulfill defense equipment in a sustainable manner is the main requirement for certainty to formulate a plan to develop defense capabilities in the long term, without any worries about political and economic factors such as embargoes or restrictions. The defense industry can have an effect on national economic and industrial growth, namely the absorption of a significant number of workers, technology transfer that can stimulate the research and development sector while meeting the needs of the national education sector in the field of science and technology.

The problem of not yet optimal empowerment of the defense industry is due to the still limited mastery of defense industry technology and the absence of policy synchronization that accelerates the rise of the defense industry and the absence of market guarantees for defense industry products both from within and outside the country.

In the link and match process in the defense industry, research and development institutions and universities must carry out research activities that are in accordance with the needs of Alutsista users so that several superior Alutsista prototypes are produced to be produced. The research and development process is carried out in the form of certain activities in accordance with the expertise of each institution and university. With the link and match method between the defense industry, research and development institutions and universities, many quality human resources will be obtained which are very helpful in empowering the defense industry.

The problem of the low quality of research and development in the defense industry also needs to find a solution immediately. This is because research and development is the beginning and also the end of the product to be made. With careful research, you will get results that are in line with user expectations, for example in the integration of defense equipment, you can take advantage of big data technology to ensure the speed of decision making in an operation. The need to improve the quality and quality of research and development to obtain results in line with expectations.

The commitment of makers is policy very much needed, based on the Omnibus Law no. 11 of 2020 it is stated that the main equipment industry is a BUMN and/or BUMS determined by the Government as the main (defense equipment *integrator* (*lead integrator*)) that can produce and/or integrate all main components, components, and raw materials into the main tool. The mandate of this Law has indicated that BUMS that have met the requirements can be appointed to carry out the production of The Indonesian National Army Alutsista. By using firm and clear regulatory instruments, as well as a systematic and organized form of industrial system development, the effectiveness and efficiency of empowering all capabilities of the national defense industry in supporting the fulfillment of the needs of the Indonesian National Army Alutsista can be increased. Therefore, the importance of the law on the defense industry in an effort to provide a legal basis for implementation in the field of national defense industry that can fully encourage and promote industrial growth that is able to achieve independence in meeting the needs of the Indonesian National Army Alutsista.

The limited state finances to support the development of the Indonesia National Army's strength, especially in the implementation of the modernization of the Alutsista, must remain a priority in the state defense budget. In order to achieve the targets and priorities that have been set and to ensure the continued development of the Indonesia National Army's strength, it is necessary for defense planning to be faced with limited budget allocations. This is in accordance with the theoretical basis of Defense Planning where in the defense planning process as outlined by Collins in his theory of "*Defense Planning Process*" it is stated that the consequences of determining a military strategy must be supported by the resources needed in this case the budget allocation for the defense industry. When faced with the available defense industry budget allocation, this will result in an adjustment process so that the defense industry budget allocation can support the empowerment of the national defense industry. This theory is in line with how defense planning optimizes the empowerment of the national defense industry to meet the needs of defense equipment in realizing National Defense. It is undeniable that the spearhead of Indhanas in producing the needs of the Indonesia National Army's defense equipment is greatly influenced by the ability of the defense industry budget allocation. The budget allocation for the National Defense Industry is expected to be fulfilled by 2% of GDP so that the budget is sufficient to produce defense equipment, market it, and deliver it to users on time.

Several assessments of reasons for optimizing the synergy of research and development institutions as well as universities in the defense industry are based on Research Stages Using the Delphi Concept. Several criteria were obtained for optimizing synergy

in the defense industry, namely: link and match research, research quality, defense industry budget, integrated training and also commitment from the government in advancing the defense industry. From the results of the criteria obtained from the Delphi results, the order of priority will be determined using AHP analysis.

3.2. Determination of the weight of the criteria using AHP (Analytical Hierarchy Process).

The next stage of this research is after processing the Delphi concept questionnaire data with four stages, namely determining strategic priorities through the method *Analytical Hierarchy Process* and in this data processing process is carried out using Excel software, with the data processed is questionnaire data which is the perception of respondents/experts. regarding the Criteria of the Defense Industry Empowerment Strategy. At this stage, pairwise comparisons are weighed against the criteria for the reasons why a defense industry empowerment strategy is needed, namely the weighting between criteria with the link and match criteria for the defense industry (X1), research and development quality (X2), defense industry HR integration training (X3), stakeholder commitment interests related to weighting (X4) and defense industry research and development budget (X5).

Table 3.1: Result of normalization of criteria matrix

Criteria	X1	X2	X3	X4	X5
X1	1	5	3	5	2
X2	0.2	1	0.25	4	0.5
X3	0.333333	4	1	5	1
X4	0.2	0.25	0.2	1	0.5
X5	0.5	2	1	2	1

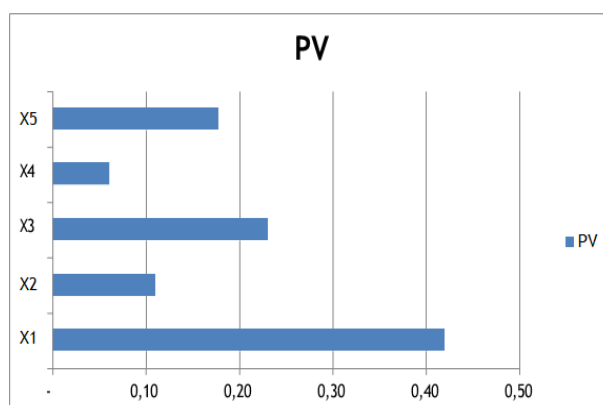


Figure 3.1: Results of pairwise comparisons between criteria

Based on the results of the total weighted values in the Figure above, it can be seen that the development strategies that have a major influence in determining the optimization of the empowerment of the defense industry, research and development institutions and universities are: 1) link and match the defense industry with the highest weight, 0.42. 2) training on the integration of human resources in the defense industry with a weight of 0.23. 3) defense industry research and development budget with a weight of 0.18. 4) improving the quality of research and development with a weight of 0.11. 5) stakeholder commitment related to the weight of 0.06.

3.3. Suggested strategy formula

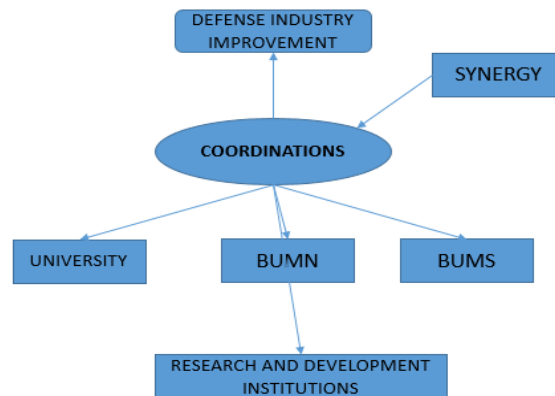


Figure 3.2: strengthening the synergy of the defense industry, R&D institutions and universities

After the results of the various stages of analysis that have been carried out, the next step is to formulate a strategy optimizing the empowerment of the defense industry, research and development institutions and universities, which includes a link and match strategy for the defense industry, improving the quality of research and development, commitment of policy makers in advancing the defense industry, research and development budgets, as well as integrated training among defense industry human resources in realizing advanced and modern technological innovation. The strategy was made so that in developing the empowerment of the defense industry, it would be able to create an independent defense industry and be able to support the needs of the national defense system. The following is a recommendation for the formulation of an empowerment development strategy defense industry, research and development institutes and universities.

To optimize the empowerment of the national defense industry, the first thing that must be done according to the opinions of experts is to combine the desires of the Alutsista users with the capabilities of the defense industry. The link and match research and development of the defense industry will produce a prototype of the Alutsista as desired by the user, so as to minimize product failures and ensure the quality of defense industry products. The link and match process can be carried out using the Focus Group Discussion (FGD) method of related actors to equalize perceptions in research development. The results of the FGDs can be used as a common guideline for further implementation in the field by considering various external and internal factors.

In order to improve the quality of research and development of the defense industry, it can be done by increasing the number of research materials related to improving the quality of defense industry products. Research does take a long time, but the output produced will be very influential in improving the quality of defense industry products.

To provide integrated training between human resources in the defense industry, research and development institutions and universities, it can be done using the technology transfer method from academics and researchers. Academics will determine various problems according to the theory they have while researchers carry out all research procedures based on several theories obtained from the academic team. Comprehensive collaboration will produce quality products as expected by users.

Increasing the research and development budget for the defense industry needs to be prioritized, because through thorough research it will produce product quality as expected by users. Research and development budgets can also be minimized without having to reduce the conditions that have been planned, while still being guided by existing theories.

Stakeholder commitment is needed in an effort to guarantee the legal power of the defense industry, research and development institutions and universities in order to improve the quality of defense industry products. The expected quality of defense industry products is a sophisticated, modern and integrated Alutsista based on Network Centric Warfare.

IV. CONCLUSIONS

To increase the synergy between the defense industry, research and development institutions and universities in the context of empowering the defense industry, it is necessary to pursue several steps which include a link and match strategy for the defense industry, improving the quality of research and development, commitment of policy makers in advancing the defense industry,

research budget and development, as well as integrated training among defense industry human resources in realizing advanced and modern technological innovations.

The order of criteria in order to optimize the empowerment of the defense industry, research and development institutions and universities are: 1) link and match the defense industry with the highest weight, 0.42. 2) training on the integration of defense industry human resources with a weight of 0.23. 3) defense industry research and development budget with a weight of 0.18. 4) improving the quality of research and development with a weight of 0.11. 5) stakeholder commitment related to the weight of 0.06.

Link and match research and development of the defense industry will produce prototypes of defense equipment as desired by users with the Focus Group Discussion (FGD) method of relevant actors to equalize perceptions in research development, to improve the quality of research and development of the defense industry, it is done by multiplying research materials related to improving the quality of defense industry products, for integrated training between defense industry human resources, research and development institutions and universities carried out using technology transfer methods from academics and researchers, the budget also needs to be increased to improve the quality of research results, commitment of important stakeholders to provide guarantee of the legal power of the defense industry.

Relevant policy makers must make these optimization efforts within five years and can be added with additional performance measurement models.

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