

# SUBMARINE UNIT DEVELOPMENT STRATEGY IN SUPPORTING THE MAIN TASKS OF THE INDONESIAN NAVY

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## ABSTRACT

Indonesia is on the International Sea Lanes of Communication (SLOC) and Sea Lines on Trade (SLOT) shipping lanes. Indonesia's geographical position provides advantages and disadvantages, namely threats to Indonesia's sovereignty and security. Indonesia's strategy to maintain sovereignty at sea is guided by the Archipelago Sea Defense Strategy (SPLN). The SPLN is an operational guideline for the Navy to carry out its main tasks, namely preventing interference with sovereignty and overcoming threats to the sovereignty and territorial integrity of Indonesia. The Republic of Indonesia Fleet Command Organization underwent organizational validation into three fleet commands. The addition of fleet command requires the addition of warships, including submarines. This study aims to formulate the right strategy in the pattern of submarine operations throughout the fleet command. This study carried out data analysis using Analysis of Strengths Weakness Opportunities and Threats (SWOT) combined with the Analytical Hierarchy Process (AHP). The result of the research is that the submarine units in the Fleet II Command Submarine Unit have a strength factor, namely modern submarine units and modern submarines have good combat capabilities. The weakness factor is that Indonesia has not yet operated tender vessels and Search and Rescue vessels. Another weakness is that the location of the submarine base is only in Surabaya. The opportunity factor used is the opportunity to develop a new organization under the Fleet Command. And the threat factor is the pattern of the Navy's title which still focuses on maritime security operations using surface warships as the main means. The new organization will serve as a submarine operations commando under the command of the fleet. This organization will embody the pattern of future submarine operations titles.

**Keywords:** SWOT, AHP, Submarine, Operation, Organization Validation.

## 1. INTRODUCTION

The geographical position of the Unitary State of the Republic of Indonesia (NKRI) is between two continents, namely Asia and Australia. Indonesia is also located between two oceans, namely the Indian Ocean and the Pacific Ocean. Indonesia's position is an advantageous position in relations between countries in the world. This geographical position makes Indonesia located on international shipping lanes, which are Sea Lanes of Communication (SLOC) and Sea Lines on Trade (SLOT). (SD, 2020). Indonesia must carry out the enforcement of state sovereignty to prevent threats from other countries.

The Indonesian Navy as the enforcer of state sovereignty at sea has operational guidelines to ensure security on SLOC and SLOT shipping lanes. These guidelines are known as the Archipelago Sea Defense Strategy / SPLN (Mustari, Supartono and Barnas, 2018). SPLN is intended to prevent the arrival of threats which include threats from abroad, threats in the Indonesian Archipelago Sea Lane (ALKI), terrorism, transnational crime and all forms of threats and security disturbances at sea.

One of the elements of the Indonesian Navy's strength that is used to support the successful enforcement of sovereignty at sea is the RI warship unit (KRI) from ships under the guidance of the Submarine Unit. (Bupu and Sumarjiana, 2021). The Submarine Unit has a base in Surabaya under Fleet Command II. There are no submarine units in the other Fleet Commands: Fleet Command I and Naval base III. Submarines when carrying out operations in the working area of Naval base II are fully under the supervision and control of Naval base II. When submarine operations are in the area of another fleet command, the supervision and control is handed over to the command of the fleet. Of course, operators in the Fleet Command who do not have submarines are not familiar with the nature and characteristics of submarines.

Ideally the supervision and control of submarine operations is carried out by a special organization that handles submarine operations. The organization in other countries that operate submarines is called the Submarine Operation Authority (Subopauth). (Walter, 2010). Indonesia as the first country to operate submarines in the region

should form a similar organization. The new organization will be in charge of and fully responsible for the operation of submarines in all jurisdictions along with the facilities and support required during operation.

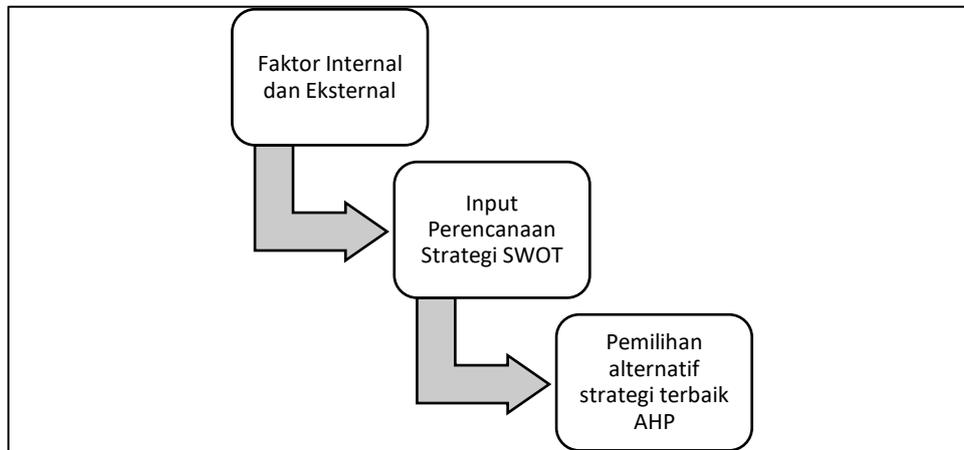


Figure 1. Problem-Solving Mindset

## 2. MATERIAL AND METHODS

This study applies a quantitative approach that focuses on data collection and processing. Data as research material to determine Internal and External factors as input for the preparation of the SWOT matrix. The SWOT method is expected to be able to formulate several alternative strategies (Affandy, 2017) for organizational development in the Submarine Unit. Some of these alternative strategies are then processed into the Analytical Hierarchy Process (AHP) so that they can determine the best alternative strategies that can be implemented for the advancement of the Indonesian Navy.

## 3. RESULT AND DISCUSSIONS

### 3.1 SWOT for Strategy Formulation based on Internal and External Factors

Based on the primary data sources and secondary data sources that have been collected, then the Internal Factors and External Factors are arranged according to the table below:

#### 3.1.1 Internal factors

The following table is an overall internal factor and has not been grouped into Strength (S) or Weakness (W) aspects.

Table 1. Internal Factors

No	Factor
1	The capabilities of the submarine owned
2	Submarine quantity

3	Tender assist ship
4	Rescue ship
5	The existence of the organization in the main command
6	Support operations to other special units
7	Number of Crew
8	Base readiness in Surabaya

#### 3.1.2 External Factors

The table below shows the external factors that have not been separated into groups of Opportunity (O) or Threats (T) aspects.

Table 2. External Factors

No	Factor
1	Geographical conditions, underwater contours and salinity
2	Cooperation with other countries on new procurement
3	Indonesia-South Korea submarine ToT process
4	Strategic environmental development in the region
5	Plans for the formation of a new organization
6	Submarine simulator training facilities
7	Combat training activities at sea
8	Marine security operations degree
9	Ship maintenance system
10	Distribution of practice areas in the jurisdiction

After the questionnaire was carried out to the respondents, the weight value of each factor on the Internal Factors and External Factors was obtained above. The weight assessment is based on the scale table below.

**Table 3.** Rating and Rating Scale

Mark	Condition	Rating	Scale interest
1	Bad	1	Not important
2	A little bit bad	2	Somewhat Important
3	Less than enough	3	Urgent
4	Enough	4	Very important
5	More than enough		
6	Slightly Good		
7	Well		
8	Very good		
9	Very Very Good		

The weight of values on Internal Factors can be seen in Table 4 below:

**Table 4.** Rating and Rating Scale

No	Internal factors	Mark
1	The capabilities of the submarine owned	7.53
2	Submarine quantity	4.12
3	Tender assist ship	1.82
4	Rescue ship	2.00
5	The existence of the organization in the main command	2.82
6	Other support operations	6.82
7	Number of Crew	6.12
8	Base readiness in Surabaya	5.41
	Average Score	4.42

And the weight of external factor assessment can be seen in Table 5 below:

**Table 5.** Rating and Rating Scale

No	External Factors	Mark
1	Geographical conditions, underwater contours and salinity	5.53
2	Cooperation with other countries on new procurement	8.00
3	Indonesia-South Korea submarine ToT process	4.29
4	Strategic environmental development in the region	6.06
5	Plans for the formation of a new organization	6.12
6	Submarine simulator training facilities	8.12
7	Combat training activities at sea	6.29
8	Marine security operations degree	4.29
9	Ship maintenance system	6.29
10	Distribution of practice areas in the jurisdiction	4.53
	Average value	5.95

The results of the above assessment are then searched for the average value as a benchmark value. The benchmark values are used to identify internal factors into strengths and weaknesses and identify external factors into opportunities and threats.

The benchmark value for internal factors is 4.42 and for external factors is 5.95. Furthermore, the internal factors can be determined aspects of strength (S) that is everything that is worth above the benchmark and the aspect of weakness (W) is

everything that is worth below the benchmark. Likewise for external factors, the benchmark value is used as a benchmark to separate opportunities (O) from threats (T). The next SWOT factor can be seen in the table below:

**Table 6.** Internal Strength Factor (S)

No	Internal Factors Strengths (Strengths)	Mark
1	The capabilities of the submarine owned	7.53
2	Other support operations	6.82
3	Number of Crew	6.12
4	Base readiness in Surabaya	5.41

Internal factors (S) above can be defined as follows:

- Submarine capabilities: Submarines operated in Indonesia are modern submarines equipped with high technology. Able to operate in all Indonesian archipelagic waters. Submarines are equipped with strategic weapons in the form of torpedoes and have long sailing/diving endurance.
- Other support operations: Submarines have a quiet manoeuvrability characteristic that is difficult for surface ships to detect. This is very beneficial for the submarine when it has to penetrate the enemy's line of defence or enter enemy bases.
- Number of Crew: The composition of the crew serving in the submarine ranks has now reached a fairly ideal portion of all the required personnel needs, especially in the ranks of non-commissioned officers and enlisted men. For the ranks of officers adjust the mutations regulated by the Human Resources field. The positions of the soldiers were divided into 2 (two) groups, namely as submarine crews and as support staff in the staff office.
- The readiness of the submarine base in Surabaya. The base in Surabaya is a well-prepared submarine base, including auxiliary stations for charging submarine batteries, docks, pontoons, as well as docking facilities and protective hangars from the open weather.

Furthermore, the Internal factor (W) can be seen in the table below:

**Table 7.** Internal Factors of Weakness (W)

No	Internal Factors Weaknesses	Mark
1	Submarine quantity	4.12
2	Tender assist ship	1.82
3	Rescue ship	2.00
4	The existence of the organization in the main command	2.82

The definition of the factors above are:

- Submarine quantity: Currently, the number of submarines operating in Indonesia is 4 (four) submarines. This amount is still not able to meet the ideal standard when compared to the area of the sea that must be covered.
- Submarine tender ship: It is a logistical support vessel needed to supply submarines when carrying out operations at sea. The logistical supplies are in the form of support facilities for

distilled water, drinking fresh water, washing fresh water and supplies food for the crew of the ship.

c. Submarine rescue ship: That is a ship with the ability to detect the presence / position of a submarine that is experiencing an emergency under the water surface. This type of ship is equipped with a mini-submarine that functions as a submarine position finder in an emergency (Sun et al., 2019).

d. The existence of a submarine organization in each of the main Fleet Commands. The submarine organization since it was formed in 1959 is based in Surabaya and there has been no construction of bases elsewhere.

On external factors, the calculation of the average value as a benchmark is 5.95. By comparing the value of each factor with the benchmark value, external factors can be grouped into Opportunities and Threats. External factors (O) and (T) can be seen in the table below:

**Table 8.** Opportunity External Factors (O)

No	External Factors Opportunities	Mark
1	Cooperation with other countries on new procurement	8.00
2	Strategic environmental development in the region	6.06
3	Plans for the formation of a new organization	6.12
4	Ship simulator training facilities	8.12
5	Combat training activities at sea	6.29
6	Ship maintenance system	6.29

The Opportunity Factors above are further defined as follows:

a. Cooperation with other countries on the procurement of new submarines: Offers of cooperation from other parties to build Indonesia's submarine strength came from several countries such as South Korea, Spain, Germany, Turkey and Russia. This provides a fairly good opportunity for the development of the domestic submarine fleet.

b. The development of the strategic environment in the region: The Asia Pacific region is a dynamic region with changes and developments in its military strength. This should be observed and used as a basis for thinking and decision-making as well as developing strategies to deal with uncertain situations in the region in the future.

c. Plans for the formation of a new organization: Assignment of operations to submarines, requires supervision and control from an authority body

Submarine Operating Authority (Subopauth). This organization will always communicate with the submarine, to ensure its safety. This organization does not yet exist in Indonesia, so the supervision of submarine operations has so far been identical to that applied to surface ship operations. The absence of an organization for submarine operations is an opportunity for the Submarine Unit to develop its organization.

d. Submarine simulator training facilities: Training facilities for submarine soldiers are located at the Surabaya Naval base II Training Command. The facility is in the form of a training complex called the Submarine Training Centre / STC, consisting of several simulators, namely the Simulator Control System / SCS as an embodiment of the Engineering Control Room on the submarine, Submarine Command and Team Trainer / SCTT, Machinery Propulsion Control Simulator / MPCS and Fire and Damage. Control Simulator / FDCS and Submarine Escape Team Trainer / SETT. This training facility is used to improve the capabilities and professionalism of submarine soldiers.

e. Combat training activities at sea: In addition to training submarine crew members through training in simulators, actual training at sea as a training medium is actually an activity that must be carried out. The natural conditions and technical conditions of the ship that can change at any time due to technical problems and the training procedures that must be followed will shape the combat instincts of the soldiers to reach the ideal standard of a submarine crew.

f. Ship maintenance system: Ship maintenance system must be implemented according to plan in order to realize the technical condition of the ship which is always ready to operate and fight. Good technical conditions will increase the readiness of the submarine so that it can be operated at any time to support the main tasks of the Navy.

Next is the External Threat Factor (T) which can be considered in the following table:

**Table 9.** External Threat Factors (T)

No	External Threats	Evaluation
1	Geographical conditions, underwater contours and salinity	5.53
2	Indonesia-South Korea submarine ToT process	4.29
3	Marine security operations degree	4.29
4	Distribution of practice areas in the jurisdiction	4.53

The definition of the threat factors above is further elaborated as follows:

a. Geographical conditions, underwater contours and marine salinity of Indonesia: In submarine operations, mastery of underwater data is the main thing and must always be considered. Underwater manoeuvres include embossed diving, depth-to-bottom manoeuvres that really require knowledge of the conditions of the seabed. Salinity data and acoustic wave propagation data are important in determining a safe area for submarine tactics.

b. Submarine TOT process. One of the ongoing collaborations with foreign parties is the construction of a submarine between Indonesia (PT.PAL) and South Korea (DSME). This submarine development cooperation goes through

the ToT process where Indonesia purchases 3 units of submarines, 2 are built in South Korea and 1 unit built in Indonesia. After the construction of the submarine is underway, it is not yet known how the collaboration will continue and how successful the ToT process will be. Therefore, the failure of this process is a threat to Indonesia in facing challenges regarding the procurement of submarines in the future.

c. Marine security operations degree pattern. The frequent violations of territorial waters / jurisdictional seas by foreign vessels, especially fishing theft have caused the Indonesian Navy to increase patrols of ships over water. The deployment of this fleet is a maritime security operation to create conditions for national waters that are free from all acts of theft and crime.

Operational activities targeting fishing vessels can only be carried out by ships on water and are difficult for submarines to carry out. Therefore, this factor is a threat factor for the implementation of the submarine operations degree.

d. The distribution of the training area in all jurisdictional waters. The submarine training area is a training facility for combat manoeuvres at sea for submarines, which is free from all kinds of navigational obstacles / obstacles, limited by latitude and longitude and officially declared on the nautical chart. The position of the training areas scattered in each of naval base working areas will provide opportunities for submarines to practice throughout the territory of the Republic of Indonesia.

### 3.2 Calculation of Internal Factor Evaluation (IFE)

**Table 10.** Calculation of IFE Strength

Internal Factors Strength (Strength)					
No	Factor	Mark	Weight (a)	Ratings (b)	Score (axb)
1	The capabilities of the submarine owned	7.53	0.21	3.24	0.68
2	Other support operations	6.82	0.19	3.88	0.74
3	Number of Crew	6.12	0.16	3.53	0.56
4	Base readiness in Surabaya	5.41	0.15	3.24	0.49
		25,88	0.71		2.47

**Table 11.** Calculation of IFE Weakness

Internal Factors Weaknesses					
No	Factor	Mark	Weight (a)	Ratings (b)	Score (axb)
1	Submarine quantity	4.12	0.11	3.59	0.39
2	Tender assist ship	1.82	0.05	3.59	0.18
3	Rescue ship	2.00	0.06	3.82	0.23
4	The existence of the organization in the main command	2.82	0.07	2.53	0.18
		10.76	0.29		0.98
	<b>Internal Value (Strength + Weakness)</b>	<b>36.64</b>	<b>1.00</b>		<b>3.45</b>

The total internal value which is at 3.45 when compared with the rating in Table 3 will describe that internal factor greatly influence the formulation of strategy.

### 3.3 Calculation of External Factor Evaluation (EFE)

The calculation of the score for external factors can be arranged in the table below in Table 12 and Table 13 below, as follows:

**Table 12.** Calculation of EFE Opportunities

External Factors Opportunities					
No	Factor	Mark	Weight (a)	Ratings (b)	Score (axb)
1	Cooperation with other countries on new procurement	8.00	0.13	3.59	0.47
2	Strategic environmental development in the region	6.06	0.10	3.29	0.33
3	Plans for the formation of a new organization	6.12	0.10	3.82	0.38
4	Submarine simulator training facilities	8.12	0.14	2.78	0.39
5	Combat training activities at sea	6.29	0.11	2.43	0.27
6	Ship maintenance system	6.29	0.11	2.98	0.33
	<b>External Value</b>	<b>40.88</b>	<b>0.69</b>		<b>2.17</b>

The table above is the calculation of EFE opportunities while the following is the calculation for the EFE Threat.

**Table 13.** Calculation of EFE Threats

External Threats					
No	Factor	Mark	Weight (a)	Ratings (b)	Score (axb)
1	Geography, underwater contours and salinity	5.53	0.09	3.22	0.29
2	Indonesia-South Korea submarine ToT	4.29	0.07	3.42	0.24
3	Opskamla degree	4.29	0.07	3.14	0.22
4	practice area in the jurisdiction	4.53	0.08	3.87	0.31
		18.64	0.31		1.06
	<b>External Total Value (Opportunities + Threats)</b>	<b>59.52</b>	<b>1.00</b>		<b>3.23</b>

From here, we can then calculate the comparative score of each factor to determine the best strategy.

**Table 14.** Strategy Calculation Matrix

	<b>S= 2.47</b>	<b>W= 0.98</b>
<b>O= 2.17</b>	<b>SO=4.64</b>	<b>WO=3.15</b>
<b>T= 1.06</b>	<b>ST=3.53</b>	<b>WT=2.04</b>

To make it easier to observe, the calculation of the strategy above is sorted from the largest. and on Table 15 below shows that the SO strategy is the best strategy.

**Table 15.** Strategic Priorities

Priority	Strategy	Score
I	SO	4.64
II	ST	3.53
III	WO	3.15
IV	WT	2.04

The SO strategy formulations are then compiled through the Strategy Formulation Matrix in the table below.

**Table 16.** Strategy Formulation Matrix

<b>SO. Strategy Formulation Matrix</b>	<b>S=</b> (S1) Submarine Capability, (S2) Other support operations, (S3) Number of Crew, (S4) Base Readiness
<b>O=</b> (O1) Cooperation with other countries, (O2) Balingstra, (O3) Formation of a new organization, (O4) Simulator facilities, (O5) Latin at sea, (O6) Ship Maintenance System	1. SO1=(S1:2:O1,2)=Increase cooperation with other countries to maintain and maintain submarine capabilities according to developing technology to develop other support operations faced by Balingstra in the region. 2. SO2=(S3:O3,5)=Formation of a new organization in charge of ship operations, arranging combat training systems at sea and managing personnel needs / Number of Crew by taking into account their welfare. 3. SO3=(S4:O4,6)=Improve training facilities and infrastructure in the form of simulators, ship maintenance systems and support facilities to realize base readiness.

From table 16 above, we can see that there are 3 strategic formulations with different formulation bases. The SO1 strategy formulation focuses on equipment/defence equipment, namely submarines that are adapted to technological advances and adapted to the needs to deal with the development of the strategic environment. While the SO2 Strategy shows that the basic formulation is about organizational revalidation which will organize the operating system and training as well as the fulfilment of human resources that pay attention to welfare, in this case is career development so that the new organizational tasks can run well. Furthermore, the SO3 strategy formulation emphasizes meeting the needs of training facilities and ships.

With the basis / foundation of different formulations in the SO1, SO2 and SO3 formulations, a priority scale of which formulation should be decided and executed first in order to optimize the submarine deterrence effect at the regional-global level so as to increase the authority of the Indonesian nation and state.

and can provide a good bargaining position to government politics.

To choose the SO1, SO2 or SO3 strategy formulation, other considerations are needed that can be used as criteria in determining the right strategy and must be taken immediately.

### 3.4 Efforts to Realize SO. Strategy Formulation

Efforts will be made to formulate strategies produced by SWOT are:

a. SO1 strategy with keywords and strategy formulation as shown in Table 16. Therefore, the effort to realize the SO1 strategy is to submit a request to the top command/leadership element to fulfil the needs related to technical equipment that needs to be upgraded so that it does not out of date with consideration of the evolving strategic environment as well as the needs of necessary support operations.

b. SO2 strategy, with keywords and strategy formulations also contained in Table 16, the effort that can be made to realize this strategy formulation

is to propose to the leadership elements regarding the revalidation of the organization responsible for submarine operations. Then it is followed by increasing the number of personnel so that they are fulfilled according to the DSP so that the main tasks can be achieved perfectly and the implementation of good and systematic personnel management through career development.

c. The SO3 strategy can be pursued by requesting the procurement and maintenance of training facilities, management of the ship maintenance system to extend the ship's life time and meeting the needs of the base to achieve high preparedness.

The three formulations of the SO1, SO2 and SO3 strategies above, although they have

different objects, have the same strategic value in order to increase the deterrent effect of submarines.

### 3.5 AHP on Best Strategy Selection

In this study, the use of AHP was only applied to 3 levels, namely Goal, Criteria and Alternative. The goal is to determine the formulation of a strategy that can be used as a way to deploy the strength of the submarine fleet throughout Indonesian waters.

*Criteria* used is based on the supporting factors/objects that can realize the chosen strategy. And the chosen alternative is the choice of SO1, SO2 and SO3 strategies from the SWOT formulation above. To see the relationship between the objects that will be appointed as criteria and alternatives, it can be seen in the following table 17.

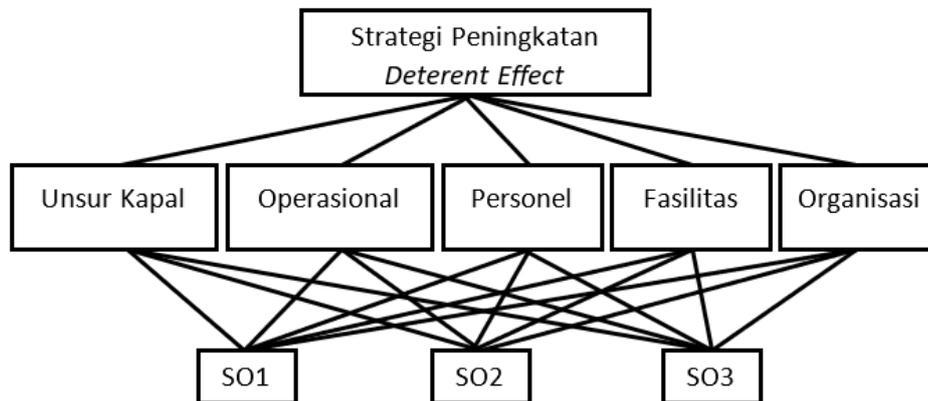
**Table 17.** Criteria and Alternative Relationship Matrix

Alternative	Supporting Objects/ Criteria				
	Ship Unit	Ops	Pers	Facility	Organization
SO1	x	x			
SO2		x	x		x
SO3				x	

Observing the table above that the three alternatives have supporting objects which are needs that must be met by a country whose military operates submarines. Therefore, it is quite difficult to make a selection in determining the best alternative. So, it is feasible to do the selection with AHP. With the selection using AHP tools, it is hoped that it will be difficult to choose a strategy the best

can be done correctly because the selection process is carried out through simplification with a hierarchical system.

Furthermore, to choose the best strategy, it is necessary to arrange the AHP model hierarchy as follows: which is shown in figure 2 below.



**Figure 1.** AHP Hierarchy Model

### 3.6 Pair Comparison

Before compiling a pairwise comparison matrix, it is necessary to first display a paired comparison scale in the form of a Likert scale starting from number 1 to number 9. Pay attention to Table 18 below.

**Table 18.** Likert scale

Intensity	Information
1	Both Factors "Equally Important"
3	One factor "Slightly more important"
5	One factor "More important"
7	One factor "Obviously more important"
9	One factor "Absolutely more important"
2,4,6,8	The degree of importance between two adjacent values

### 3.7 Pairwise Comparison of KRI Elements Criteria

The following is a pairwise comparison of the criteria for Unit Ships. The purpose of this comparison is to prove which strategy is the best when viewed from the aspect of the existing ship units at this time, both in terms of the number of as well as technical conditions. In Figure 3 there are red and black assessment numbers. Black indicates that the alternative in the left column is superior to the alternative compared in the top row. While the red color indicates the opposite situation.



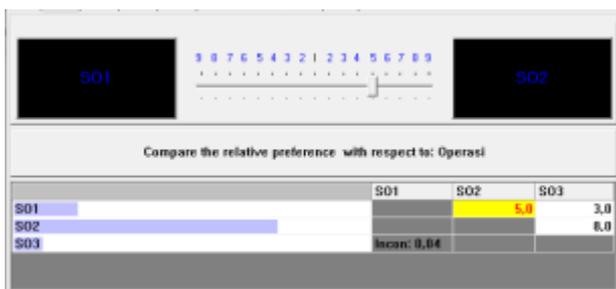
**Figure 3.** Pairwise Comparison on Ship Unit Criteria

In addition, the picture above also shows the value of "incon: 0.07" which means that the Consistency Ratio / CR (Ratio inconsistency) is 0.07. CR is used to measure the consistency of answers from respondents with the limit of CR value not exceeding 0.1. If it is more than 0.1, it is better to repeat the questionnaire to the respondent.

The pairwise comparison in Figure 3 shows that the handling of ship unit criteria can be improved both in quantity and quality of technology when there is a new organization that specifically handles ships and all aspects of the problem.

### 3.8 Pairwise Comparison of Operation Criteria

In Figure 4 above, it is shown that in order to improve ship operations both in terms of considering threats to state sovereignty, priority areas of operation, how long it must operate, to regulating / changing the use of ships to be operated, it is necessary to have a new organization that specifically handles this field.



**Figure 4.** Pairwise Comparison on Operational Criteria

### 3.9 Pair Comparison Criteria Personnel

Personnel problems, especially in terms of numbers, have never been fulfilled according to the DSP, causing a double task for each personnel. This is because the personnel in addition to having to handle the areas of duty that are their responsibility in accordance with what is written in the job description book / work manual, also have to handle other areas of duty that should be carried out by other personnel, but due to the absence of personnel to handle them, they are then charged to personnel in the work environment / related to the field of duty. This condition will cause an increase in the workload of each personnel in the submarine unit which will have implications for performance in the long term.

Figure 5 shows that the strategy formulation on the personnel criteria is SO2, with the strategy object being the formation of an organization. With the formation of a new organization, it is hoped that the problem of lack of personnel can be sought to be fulfilled in accordance with the DSP. The



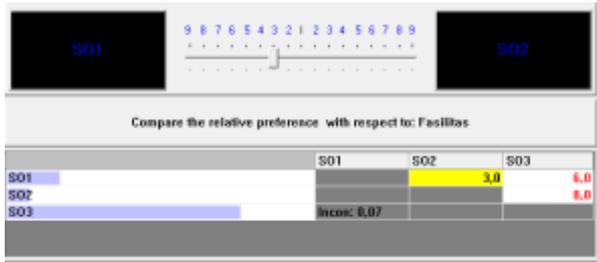
fulfillment of personnel needs needs to be carried out in order to ensure success in achieving the main tasks.

**Figure 5.** Pairwise Comparison on Personnel Criteria

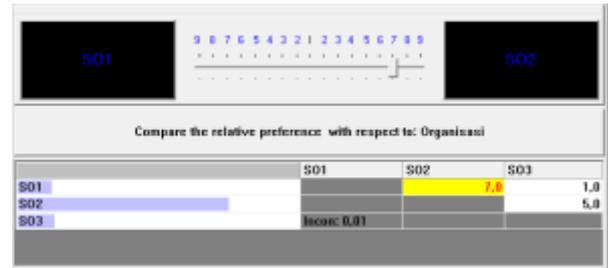
### 3.10 Pairwise Comparison of Facility Criteria.

The basic facilities related to the maintenance and operation of submarines are absolute needs that must be met by submarine operators. These needs include a special dock that is protected from Indonesia's extreme natural weather with rainfall, sunlight, humidity and high salt content. These weather factors greatly affect the condition of the ship and its equipment.

For the need for professional care of personnel, namely the crew, it is necessary to have training facilities in the form of ship simulators that have a broad scope to accommodate all areas of duty / corps of crew members. Professionalism is not only related to knowledge but must also be supported by skills. And skill is something that must be repeated through practice. Therefore, training facilities are a must in a professional institution.



**Figure 6.** Pairwise Comparison on Facility Criteria



**Figure 7.** Pairwise Comparison on Organizational Criteria

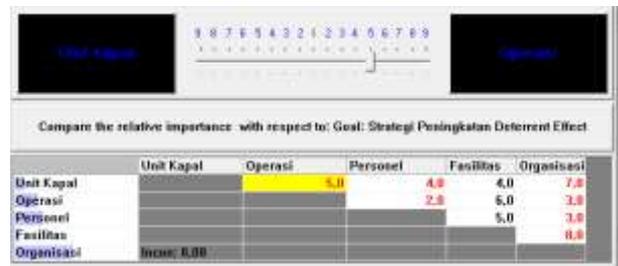
**3.11 Pairwise Comparison of Organizational Criteria.**

The organization in question is an organization that specifically handles the operational field of submarines and all matters relating to operational readiness, including scheduling operations within one year, areas where operations must be carried out, changing units of ships being operated, handling logistical needs needed when the ship is in an area. operations, change of crew personnel if needed, fulfillment of spare part needs that support operations as well as supporting facilities for docking / anchoring at a port in the operating area.

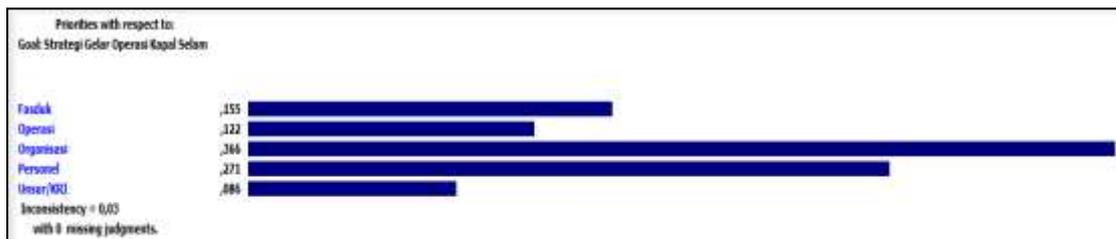
The many fields related to operations as mentioned above, require special handling in which the burden of responsibility must be handed over to the submarine operations work unit in a professional manner. Therefore, we need the right strategy to handle these needs. Figure 7 shows that the strategy in question is SO2.

**3.12 Pairwise Comparison between Criteria on Goal Deterrent Effect Improvement Strategies.**

At the level of the hierarchy of criteria, pairwise comparisons are carried out to determine what objects are most needed to realize the submarine deterrent effect. After finding the most dominant criterion object, it will then go to the most appropriate alternative strategy formulation in order to realize the expected goals.



**Figure 8.** Pairwise Comparison at Goal Level



**Figure 9.** Graphics Normalized Eigenvector Between AHP Criteria

The pairwise comparison matrix between criteria can be seen in Figure 8, where the matrix is prepared using an expert choice application. Furthermore, the eigenvector value is manifested in the form of a graph, where Figure 9 is the display of the expert choice application. Furthermore, the consistency calculation states that the expert choice provides a consistency score of 0.03. The calculation shows a very good consistency value. From the pairwise comparison between these criteria, it was found that the most likely factor to support the degree of submarine operations in the future is the organizational factor.

**3.13 Final Synthesis**

The results of pairwise comparisons of each criterion are then compared as a whole on all the criteria at the upper level. From this comparison, global priorities are obtained which can then show the ranking of each given alternative. Based on Figure 10 and Figure 11, it is found that the global priority value has placed the SO2 strategy formulation with a vision on organizational development as the best alternative. The formulation of the SO1 strategy which has a vision of increasing operations at sea is in the second position and SO3 which has a vision of optimizing facilities at the base is in the third position.

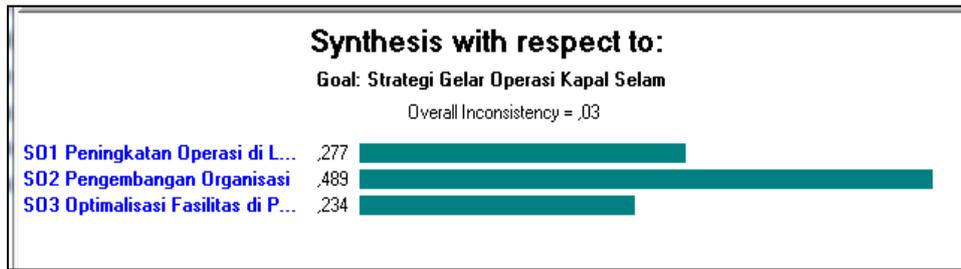


Figure 10. GraphicsSensitivity Goal AHP

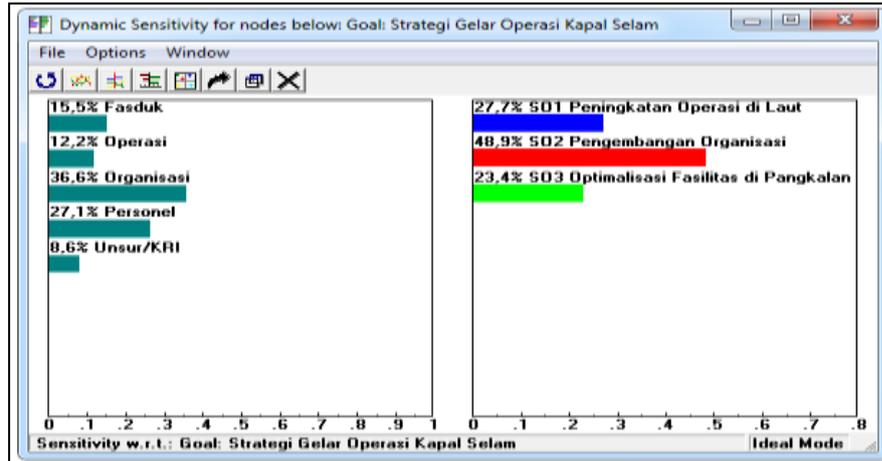


Figure 11. GraphicsDynamic Sensitivity Goal AHP

### 3.14 Sensitivity Analysis

The purpose of the sensitivity analysis is to find out what criteria have an effect on the chosen strategy and how much influence it has. To carry out a sensitivity analysis is to change the weight of each criterion by increasing or decreasing the existing value, thus indicating a change in the priority order of the chosen strategy.

In this study the criteria that will be used as material for the sensitivity test are taken from the AHP criteria, namely: Supporting Facilities, Operations, Organization, Personnel and Elements / KRI.

After the sensitivity test was carried out on all criteria, it was found that there was 1 (one) criterion that could not shift the best SO2 alternative to the second alternative, namely the personnel criteria. Although the value is reduced to 0.4%. While other criteria can have an effect even with a fairly large change. The amount of change can be summarized in the table below. From the table, it can be seen that the priority weights of the criteria can change the position of the best alternative, shifting to the second alternative after being raised or lowered in a far range of values, which is around 25%.

Table 19. Criteria Affecting SO2 Strategy

Criteria	Weight		Value Change
	Beginning	Take effect	
Fasduk	15.5%	41.9%	(+) 26.4
Operation	12.2%	38.4%	(+) 26.2
Organization	36.6%	2.7%	(-) 33.9
Elements/KRI	8.6%	33.0%	(+) 24.4

## 4. CONCLUSION AND RECOMMENDATION

### 4.1 Conclusions

Based on a series of data processing, scenario preparation and analysis of research results, some conclusions can be drawn as follows:

- a. The formulation of a submarine organization development strategy in Indonesia consists of the following factors: Submarine Units, Submarine Crew Personnel, Organizations, Supporting and Operational Facilities. The formulation of a strategy that can be applied to realize the title of submarine operations is the formation of a new organization.
- b. The formation of the new organization must have a role as the executing command for submarine operations under the Commander of the Fleet Command of the Republic of Indonesia. This organization is tasked with regulating the pattern of submarine operations, ensuring the logistical needs of initial and re-stocking in the area of operation and ensuring the safety of the submarine and its crew.

### 4.2 Suggestions

Based on the results of the research that the author has done, there are several inputs in improving and developing this research in the future, namely:

- a. Limited resources that support factors in the formation of the organization to be met immediately. It is hoped that the formation of a new organization can function ideally to regulate submarine operations.
- b. Submarine operations command organizations to immediately draw up activity plans and operational plans related to everything in the deployment of submarine operations throughout Indonesia.

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