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Analysis of the effect of operator capability and system integration on missile firing in archipelagic warfare

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ABSTRACT

In present, missile is one of the weapons that along with the warship include fast patrol boat. The development of missile weaponry on warships grows rapidly along with technological developments. Armament technology including the firing control system has now entered the automation stage of the firing process. Automation process from aiming, data calculating until firing execution. Armament technology is a complete system by combining sensor systems, data processing systems, and firing decisions. This system is connected automatically as a firing system. Integration of a weapon system is sometimes not in a fully connected state. Disintegration that occurs generally on data connections regarding targets. Disintegeration of targeted data systems requires the role of humans as operators as executors of data input. Automatic data input will be different from data charging done by humans. This study discusses the importance of system integration and the ability of operators to carry out shootings in naval battles in an archipelago such as Indonesia. The hope to be obtained is as a basis for selecting weapons systems and the ability of operators to procure weapons for fast patrol boats.

1. Introduction.

A large archipelagic area such as Indonesia archipelago, is something that is not shared by most countries in the world. The archipelagic country which consists of more than 17 thousand islands and stretches along 5000 km from west to east becomes an area that requires special treatment in defense. The specific treatment in question is a way of survival which will certainly differ from most other countries in the world. Geographically, which is composed of thousands of islands, is a unique field in the implementation of sea warfare. Limitation cause by islands and waters among it can be used to own an advantage in developing sea warfare tactics. The use of high speed small-sized ships that equipped with anti-surface missiles is one option to carry out sea warfare effectively in the archipelagic territory. The concept of fast patrol boats with anti-surface missiles is choosen by many coastal countries to earn the efficiency and effectiveness from weapons purpose. Efficiency is obtained from the price and operation of the ship, and effectiveness is obtained by the ability of ships that have a large of destructive power.

missile firing is a system that integrates several systems to work together. Broadly speaking, the systems that support the missile firing are sensor system, data system, firing control system. All of these systems relate to the data and information needed to conduct missiles firing to targets with achieving the desired results. The main need for guided missiles to be able to reach their targets precisely is the accuracy of the data obtained. In general, the data needed is the ship's own data, external environmental data, and target data. The required data can come from the own ship's sensors or from other subers that are accurate. System integration allows all data sourced from sensors to be input automatically into the missile control system. The control system will carry out calculations that will produce output in the form of data as guide t missile gliding to the target. The question that arises is what if the required data is not automatically integrated into the missile firng control. how the role of humans as operators in the execution of missile firng in a sea battle.

Input data manual to system is one methodto conduct mis-

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sile firing where there is some data that is not inputted automaticly by system but done manully by humans as operators. this is because existing sensors as data sources cannot provide the data needed, particularly related with the need for target data. This specifically requires human intervention as an operator who will carry out the data input process manually.

Automatic and manual are empirical differences that can be immediately known. the most obvious difference are action speed, data accuracy, and the quantitative amount of the data. This study analyzes the factors of human ability as operators and system disintegration in the ability of a missile to be used in a naval battle. Knowing the capabilities of the missile with the condition of the data system that is not integrated will facilitate the user in developing tactics and the use of guided missiles that are installed on a Fast Patrol Boat to carry out a naval battle.

2. Research Method.

The study was carried out on Fast Patrol boat "A" and "B" which were equipped with "YG" missiles as the main weaponry. The object of research is the ship personnel who are competent in the process of implementing the Missile. YG missiles are additional installations installed on ships A and B with system conditions that are not fully integrated. Research conducted begins with research questions arising from the circumstances of missile installations that are not fully integrated with the ship's data system and how big is the role of the operator in the system the shooting. The basic questions that arise are:

1. What about the capabilities of fast patrol boat missiles that are not integrated with the weapons system on board?
2. What about the ability of fast patrol boat crews as operators to carry out missile firing in archipelago warfare concept.

From the research question, a research hypothesis was prepared as a temporary answer to the research question. The hypothesis is "There is a relationship between the capability of the missile on the Fast Patrol Boat with the ability of the operator and the disintegration of the system to carry out the shooting in a battle"

In this study, researchers used quantitative methods in carrying out research related to the analysis of missile capabilities on Fast Patrol Vessels influenced by the ability of operators and system disintegration. Quantitative research method is a process of finding knowledge using numerical data as a means of analyzing information about what you want to know. Researchers use quantitative research methods because they have found clear problems related to the ability of weapons am this study, researchers have determined the variable namely the ability of the missile as a variable "Y", the ability of the operator as a variable "X1, and the disintegration of the system as a variable" X2 ".

The integration of the system between the firing system at the missile consul and the data system of the ship's sensor is something that should be fulfilled. The missile firing system itself is designed to process data received automatically and continuously, this is related to the accuracy of the calculation of the data input to the missile by the system just before the missile launches from the container. due to several reasons, many found that the missile firing system installed on a ship is not all connected automatically.

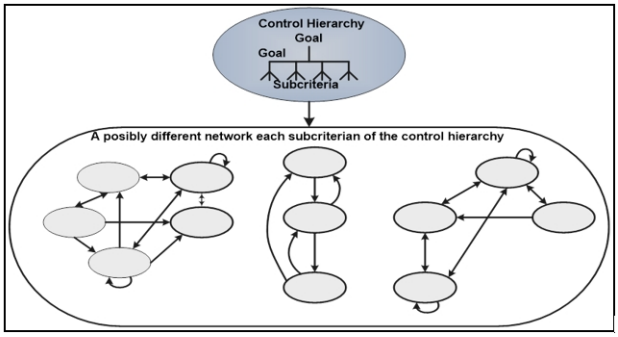
The incompletely integrated system requires humans as operators as data connectors from the sensor system in the firing control system. The role of the operator as a connector between systems will affect the ability of missile fire carried out in battle. The operator will determine the amount of data input into the shooting system. Input data will directly affect the data output of the control system in terms of accuracy and accuracy of calculations with external conditions in real time. Output data that is processed by the system both automatically and manually entered by the operator will determine the direction of the missile launch. The accuracy of the missile to be able to hit the target depends on the exact launch direction according to the data generated and will demonstrate the ability of the fast patlrol boat missile to carry out the sea warfare.

Analytic Network Process (ANP) method is the development of the Analytical Hierarchy Process (AHP) method. ANP method is able to improve the weakness of AHP in the form of the ability to accommodate inter-criteria or alternative linkages. Interdependence of variables in the ANP method there are 2 types, namely interrelationship in a set of elements (inner dependence) and interrelations between different elements (outer dependence). Weighting with ANP requires a model that shows the interrelations between the criteria and sub-criteria they have. In modeling a system that wants to know its weight, there are 2 controls that need attention. The first control is hierarchical control, which shows the interrelationship of the criteria and sub-criteria. This control does not need a hierarchical structure like the AHP method. Another control is linkage control which shows the interrelationship between criteria or clusters. If it is assumed in a system there are N clusters in which the elements in each cluster interact with each other or have an influence on some or all of the existing clusters. If the cluster is denoted by Ch, where h = 1, 2, ..., N, and as many elements as nh are denoted by eh1, eh2, ..., ehnh. The effect of a set of elements in a cluster on other elements in a system can be represented through ratio scale priority vectors drawn from pairwise comparisons. The main steps in the ANP method are as follows:

1. Build a hierarchy of the decision network that shows the relationship between decision factors.
2. Make pairwise comparisons of factors that influence decisions.
3. Calculate Calculate the relative importance weight vectors of these factors.
4. Make a supermatrix, which is a matrix consisting of relative importance vectors. Then normalized so that the numbers in each column in the supermatrix have a value of 1 (one).
5. calculates the final weight by increasing the matrix by 2k + 1, where k is any large number until stability is obtained, that is, the condition of the values in the matrix does not change when multiplied by itself, which is

called convergent.

Figure 1: ANP scheme.



Source: Author.

3. Results and Discussion.

3.1. Result.

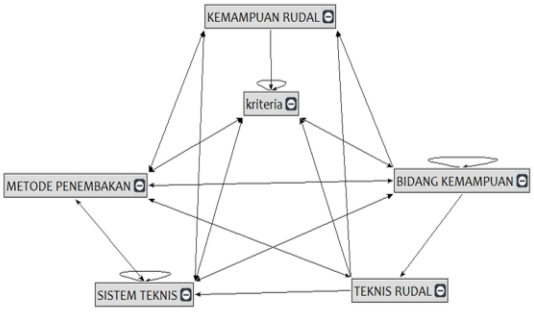
The calculation process using the ANP method is carried out using the Superdecision 2.8.0 application. The questionnaire compiled using the Super Decision Application is the result of a model built with existing variables. The initial variables used are missile capability as a dependent variable or "Y", system integration as an independent variable 1 or "X1", and the ability of the operator as an independent variable 2 or "X2".

The integration variable (X1) is derived into one cluster, namely the Shooting Method and contains two sub-variables, namely independent firing (X1.1) and firing with TRU (X1.2). This sub variable is a way of firing missiles based on data sources that are used and processed by the system. independent firing uses data entirely obtained from ship sensors, while shooting with TRU uses data that is partially sourced from other elements as third parties

The independent firing sub-variable (X1.1) is derived as a Technical System cluster consisting of three sub-variables, namely the target acquisition sub-variable (X1.1.1), manual data input (X1.1.2), and the speed of action (X1.1.3). Three sub-variables have an influence on the implementation of the shooting themselves and also on the implementation of shootings with TRU. The operator capability variable (X2) is derived as a cluster of Capability Fields consisting of two sub-variables, namely the technical capability sub-variable (X2.1) and the tactical capability sub-variable (X2.2). This field of capability cluster is the knowledge capability possessed by the operator for the use of missiles in the implementation of the firing. The technical capability and understanding of the missile shooting system technically, while the tactical capability is the knowledge and understanding of the tactical operator in carrying out the shooting.

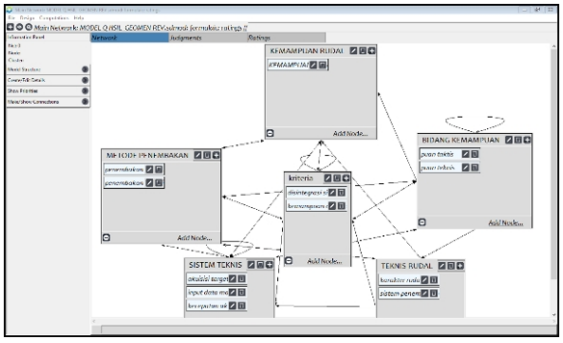
The technical capability sub-variable (X2.1) is derived as a Missile Technical cluster in the model and contains two sub-variables namely the firing system sub-variable (X2.1.1) and the missile character sub-variable (X2.1.2). This sub-variable of the shooting system is an understanding of control systems and the flow and use of data generated. Missile character sub-variable is knowledge about the character, flight patterns and missile behavior based on the output data generated by the control system. The composition of the model obtained is as shown in Figure 3 and 4.

Figure 2: Cluster model in ANP.



Source: Processed by researchers using a super decision application..

Figure 3: Model nodes in a cluster ANP.



Source: Processed by researchers using a super decision application..

Primary data obtained through questionnaires given to respondents who are considered as experts in the operation of missiles on fast patrol boats. Respondents found were ship crews who were direct operators who had carried out test firing, personnel outside the crew were personnel who became missile maintenance, and personnel who determined the operating tactics of the fast patrol boat unit. Researchers found 6 respondents who fit the criteria as expert

a. He once served as an operator and carried out a test of firing a missile on a fast patrol boat,
b. Have been involved in testing missile firing as maintenance and preparation of missiles at the base
c. Have participated in missile operational and maintenance training directly from the manufacturer.
d. Occupy a position as an operational coach and material for fast patrol boats.
e. Have attended formal education on short and medium range surface anti-ship missiles

Stage 1- Data that has been compiled and grouped regularly, for each question from each respondent and carried out a consistency test to determine the value of the inconsistencies of the

respondents' answers to each question questionnaire. Inconsistency tests are carried out one by one for each question on the questionnaire. The data that can be used is data that has an Incosistence value smaller than 10% (<0.1). Examples of checking the value of incoistence on questionnaire questions for comparison of the field of capability with missile capability using the Super Decision application.

Inconsistency tests were carried out on all questions to respondents. After the results of the consistency test the respondents' answers are obtained with results below ten 10%, it shows that the data from the questionnaire answers obtained can be used for further processing.

Stage 2- Determine the Mean Geometric value of the data for the same question for all respondents. Geometric Mean (geometric mean) is the midpoint between two or more opinions in a different decision making. Geometric averages are calculated using the formula:

Information:

$$A = \sqrt[n]{a_1 \times a_2 \times a_n}$$

a_1 = respondent number 1 (first)

a_2 = respondent number 2 (second)

a_n = respondent nth (nth / next)

n = total number of respondents

The results of calculating the geomean value from the answers of all respondents are shown in Figure 5 below:

Table 1

perbandingan klaster dengan kemampuan rudal			GEOMEAN
kriteria	><	metode penembakan	1,088867
kriteria	><	sistem teknis	0,793701
metode penembakan	><	sistem teknis	0,196672
perbandingan klaster dengan kriteria			GEOMEAN
bidang kemampuan	><	kriteria	4,679487
bidang kemampuan	><	metode penembakan	5,581663
bidang kemampuan	><	sistem teknis	6,406202
kriteria	><	metode penembakan	1,944161
kriteria	><	sistem teknis	1,944161
metode penembakan	><	sistem teknis	1,122462
perabandingan klaster dengan metode penembakan			GEOMEAN
bidang kemampuan	><	kemampuan rudal	6,354761
bidang kemampuan	><	kriteria	4,481405
bidang kemampuan	><	sistem teknis	5,726924
bidang kemampuan	><	teknis rudal	2,44949
kemampuan rudal	><	kriteria	2,154435
kemampuan rudal	><	sistem teknis	0,778272
kemampuan rudal	><	teknis rudal	0,335596
kriteria	><	sistem teknis	2,139826
kriteria	><	teknis rudal	0,408248
sistem teknis	><	teknis rudal	0,216914
perbandingan klaster dengan bidang kemampuan			GEOMEAN
bidang kemampuan	><	kemampuan rudal	6,475482
bidang kemapuan	><	kriteria	6,127312
bidang kemampuan	><	metode penembakan	7,215472
bidang kemampuan	><	sistem teknis	4,42429
bidang kemampuan	><	teknis rudal	2,803966
kemampuan rudal	><	kriteria	0,87358
kemampuan rudal	><	metode penembakan	0,681292

Source: Author.

Table 2

kemampuan rudal	><	sistem teknis	0,613526
kemampuan rudal	><	teknis rudal	0,331319
kriteria	><	metode penembakan	0,629961
perbandingan klaster dengan sistem teknis			GEOMEAN
bidang kemampuan	><	kemampuan rudal	4,451018
bidang kemampuan	><	kriteria	4,50865
bidang kemampuan	><	metode penembakan	6,572921
bidang kemampuan	><	sistem teknis	4,791156
kemampuan rudal	><	kriteria	1,200937
kemampuan rudal	><	metode penembakan	2,492883
kemampuan rudal	><	sistem teknis	1,467799
kriteria	><	metode penembakan	1,906369
kriteria	><	sistem teknis	2,102579
metode penembakan	><	sistem teknis	1,44225
perbandingan klaster dengan teknis rudal			GEOMEAN
kemampauan rudal	><	kriteria	1,037891
kemampuan rudal	><	metode penembakan	0,401142
kemampuan rudal	><	sistem teknis	0,900533
kriteria	><	metode penembakan	0,429187
kriteria	><	sistem teknis	0,550321
metode penembakan	><	sistem teknis	1,817121
PERBANDINGAN NODE DALAM KLASTER			
node kemampuan rudal pada klaster kriteria			GEOMEAN
disintegrasi sistem	><	kemampuan operator	0,154303
node kemampuan rudal pada klakster sistem teknis			GEOMEAN
akuisisi target	><	input data manual	7,132978
Node kemampuan rudal pada klaster penembakan mandiri			GEOMEAN
akuisisi target	><	Input data manual	7,132978

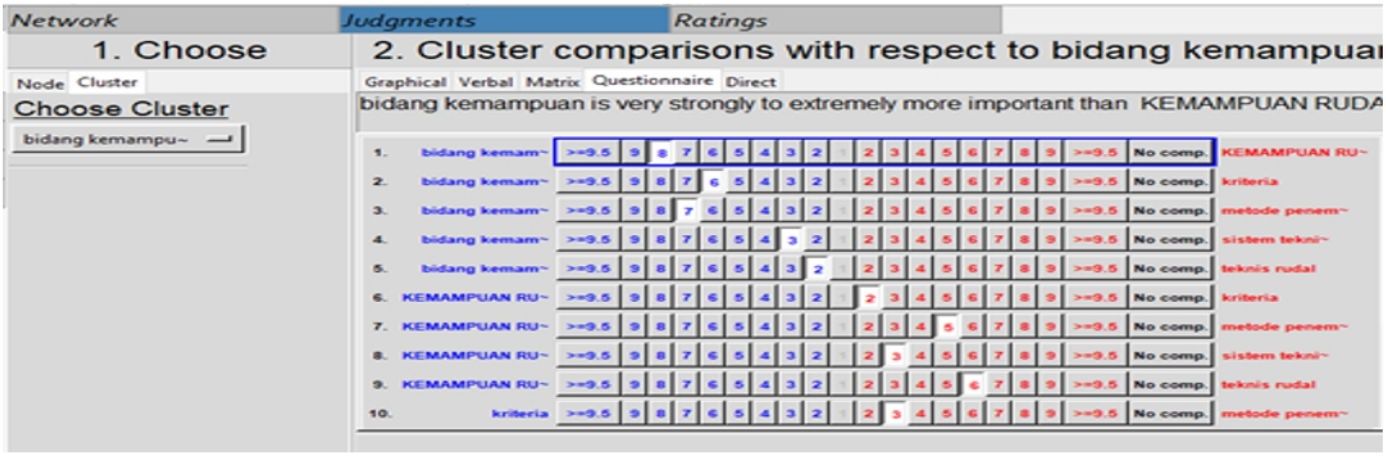
Source: Author.

Table 3

sistem pada klaster metode penembakan			GEOMEAN
penembakan TRU	><	penembakan mandiri	5,060789
node disintegrasi sistem pada klaster sistem teknis			GEOMEAN
input data manual	><	Kecepatan aksi	0,354954
node kemampuan operator pada klaster sistem teknis			GEOMEAN
akuisisi taarget	><	kecepatan aksi	6,822448
node kemampuan operator pada klaster bidang kemampuan			GEOMEAN
kmampuan taktis	><	kmampuan teknis	0,15039
node kemampuan operator pada klaster metode penembakan			GEOMEAN
Penembakan TRU	><	Penembakan mandiri	5,377891
node penembakan mandiri pada klaster bidang kemampuan			GEOMEAN
Kmampuan taktis	><	kmampuan teknis	0,168239
node penembakan mandiri pada klaster kriteria			GEOMEAN
disintegrasi sistem	><	kemampuan operator	0,168239
node penembakan mandiri pada klaster sistem teknis			GEOMEAN
akuisisi target	><	input data manua	5,875965
akuisisi target	><	kecepatan aksi	3,846722
input data manual	><	kecepatan aksi	0,413519
node penembakan TRU pada klaster sistem teknis			GEOMEAN
akuisisi target	><	input data manua	4,451018
akuisisi target	><	kecepatan aksi	3,036589
input data manua	><	kecepatan aksi	0,602047

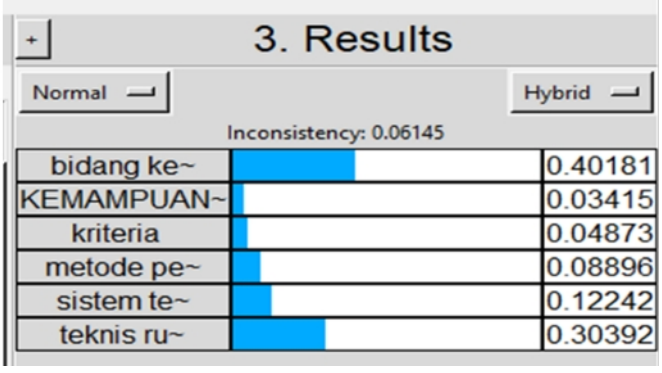
Source: Author.

Figure 4: Questionnaire data from respondent / expert no 1.



Source: Author.

Figure 5: The results of the consistency of the questionnaire respondents number 1 for comparison of Clusters with ”Field of ability with a value of 0.0615.



Source: Author.

Table 4

node penembakan Tru pada klaster bidang kemampuan			GEOMEAN
kemampuan taktis	><	kemampuan teknis	0,160915
node kemampuan taktis pada klaster metode penembakan			GEOMEAN
Penembakan TRU	><	penembakan mandiri	4,560794
node kemampuan taktis pada Klaster Kriteria			GEOMEAN
disintegrasi sistem	><	kemampuan operator	0,168239
node kemampuan taktis pada klaster teknis rudal			GEOMEAN
karakter rudal	><	sistem penembakan	0,201365
node kemampuan teknis pada klaster teknis rudal			GEOMEAN
karakter rudal	><	sistem penembakan	0,7339
node kemampuan teknis pada klaster sistem teknis			GEOMEAN
akuisisi target	><	input data manual	5,084606
akuisisi target	><	kecepatan aksi	5,157286
input data manual	><	kecepatan aksi	1,049115
node kemampuan teknis pada klaster kriteria			GEOMEAN
disintegrasi sistem	><	kemapuan Operator	0,188207
node kemampuan teknis pada klaster metode penembakan			GEOMEAN
penembakan TRU	><	Penembakan mandiri	4,529869
node kecepatan aksi pada klaster metode penembakan			GEOMEAN
Penenbakan TRU	><	penembakan mandiri	3,344681

Source: Author.

Table 5

node akuisisi target pada klaster bidang kemampuan			GEOMEAN
Kemampuan taktis	><	kemampuan teknis	0,177943
node akuisis target pada klaster kriteria			GEOMEAN
diisintergrasi sistem	><	kemampuan operator	0,167451
node input data manual pada klaster metode penembakan			GEOMEAN
Penembakan TRU	><	penembakan Mandiri	0,304683
node input data manual pada klaster kriteria			GEOMEAN
disintegrasi sistem	><	kemampuan operator	0,182574
node input data manual pada klaster sistem teknis			GEOMEAN
akuisisi targer	><	kecepatan aksi	5,875965
node karakter rudal pada klaster metode penembakan			GEOMEAN
Penembakan TRU	><	penembakan mandiri	0,308857
node sistem penembakan pada metode penembakan			GEOMEAN
Penembakan TRU	><	Penembakan mandiri	4,784797

Source: Author.

Stage 3- The data obtained from the Geometric Means calculations that have been obtained are the data that will be used in calculations in the pairwise comparison matrix. The data is input into the matrix and processed using the Super Decision application. The comparison display will also show the priority of each node into each cluster. The priority weights for each calster will add up = 1. The thing to keep in mind is the inconsistency index value of each paired comparison that remains constant <0.1. Geomean data input into pairwise comparison matrices produces supermatrics, namely unweight supermatrik and supermatrik weigth as shown by the following tebel picture.

The results of data processing using the Superdecision application also display the weight of each cluster or node in the network model that is compiled. The weight of each Cluster and Node which is a variable, sub variable, and sub subvariable consists of weights as a node compared to the overall network and the weights of nodes in the cluster that have been normalized so that they have accumulated number = 1. These weights indicate the level of importance of a variable in a system as a whole and the normal weighting results that show the weight ratio of the node or variable in a cluster. Figure 6 below shows the

Figure 6: Unweight supermatrik.

cluster	node	puan taktis	puan teknis	puan rudal	disintgrasi sistem	Puan opr	bak TRU	bak mdr	akuisisi trget	iput dta manual	kec aksi	krkter rdl	stem bak
BIDANG KEMAMPUAN	puan taktis	0.000000	0.523569	0.000000	0.000000	0.033468	0.089471	0.069813	0.082326	0.000000	0.000000	0.000000	0.000000
	puan teknis	0.000000	0.000000	0.000000	0.256591	0.223123	0.555723	0.415555	0.462508	0.000000	0.000000	0.000000	0.000000
KEMAMPUAN RUDAL	KEMAMPUAN RUDAL	0.122651	0.000000	0.000000	0.000000	0.000000	0.131147	0.098659	0.150160	0.329902	0.477053	0.327478	0.185739
kriteria	disintegrasi sistem	0.116799	0.011723	0.037638	0.000000	0.708126	0.000000	0.013782	0.020092	0.047716	0.000000	0.000000	0.161883
	kemampuan operator	0.019622	0.062358	0.244404	0.708126	0.000000	0.127372	0.082037	0.120309	0.260743	0.000000	0.000000	0.000000
METODE PENEMBAKAN	penembakan dengan TRU	0.151626	0.082240	0.146557	0.026562	0.025597	0.000000	0.000000	0.081866	0.042036	0.200075	0.159146	0.315493
	penembakan mandiri	0.033251	0.018155	0.020937	0.003795	0.004760	0.000000	0.000000	0.000000	0.137824	0.060011	0.513376	0.065948
SISTEM TEKNIS	akuisisi target	0.205160	0.080112	0.482781	0.000000	0.004297	0.061770	0.049992	0.000000	0.155339	0.000000	0.000000	0.270937
	input data manual	0.000000	0.015935	0.067683	0.001291	0.000000	0.013310	0.007303	0.082740	0.000000	0.262861	0.000000	0.000000
	kecepatan aksi	0.000000	0.015362	0.000000	0.003636	0.000630	0.021206	0.015140	0.000000	0.026441	0.000000	0.000000	0.000000
TEKNIS RUDAL	karakter rudal	0.058725	0.080658	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	sistem penembakan	0.292166	0.109888	0.000000	0.000000	0.000000	0.000000	0.247718	0.000000	0.000000	0.000000	0.000000	0.000000

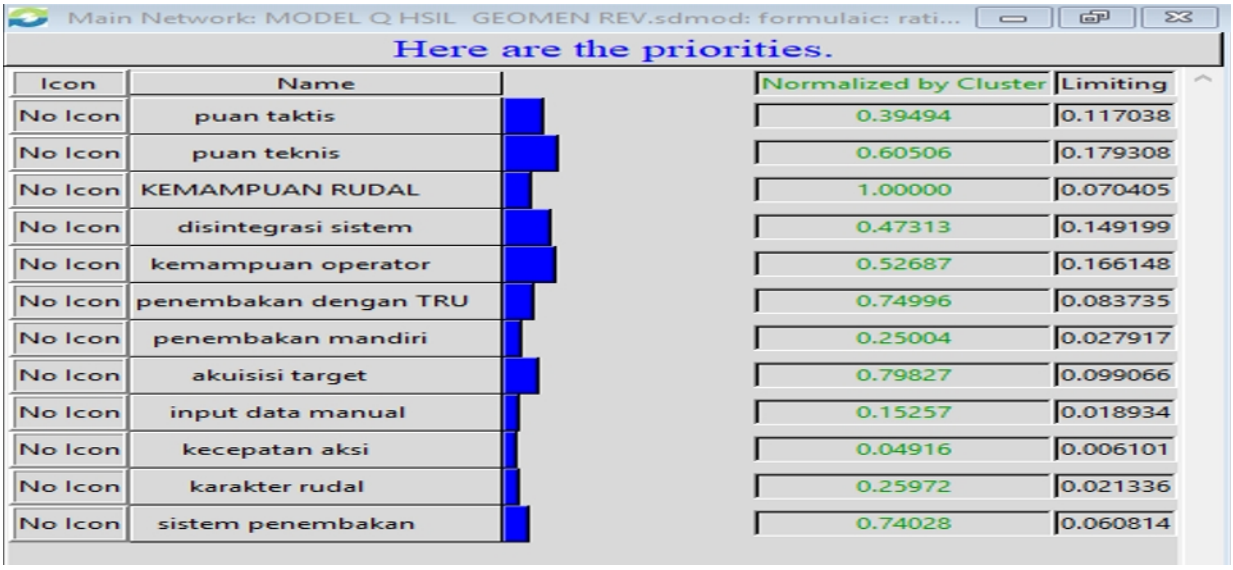
Source: Author.

Figure 7: Weight supermatrik.

CLUSTER	node	puan taktis	puan teknis	puan rudal	disintgrasi sistem	Puan opr	bak TRU	bak mdr	akuisisi trget	iput dta manual	kec aksi	krkter rdl	stem bak
BIDANG KEMAMPUAN	puan taktis	0.000000	0.523569	0.000000	0.000000	0.033468	0.089471	0.069813	0.082326	0.000000	0.000000	0.000000	0.000000
	puan teknis	0.000000	0.000000	0.000000	0.256591	0.223123	0.555723	0.415555	0.462508	0.000000	0.000000	0.000000	0.000000
KEMAMPUAN RUDAL	KEMAMPUAN RUDAL	0.122651	0.000000	0.000000	0.000000	0.000000	0.131147	0.098659	0.150160	0.329902	0.477053	0.327478	0.185739
kriteria	disintegrasi sistem	0.116799	0.011723	0.037638	0.000000	0.708126	0.000000	0.013782	0.020092	0.047716	0.000000	0.000000	0.161883
	kemampuan operator	0.019622	0.062358	0.244404	0.708126	0.000000	0.127372	0.082037	0.120309	0.260743	0.000000	0.000000	0.000000
METODE PENEMBAKAN	penembakan dengan TRU	0.151626	0.082240	0.146557	0.026562	0.025597	0.000000	0.000000	0.081866	0.042036	0.200075	0.159146	0.315493
	penembakan mandiri	0.033251	0.018155	0.020937	0.003795	0.004760	0.000000	0.000000	0.000000	0.137824	0.060011	0.513376	0.065948
SISTEM TEKNIS	akuisisi target	0.205160	0.080112	0.482781	0.000000	0.004297	0.061770	0.049992	0.000000	0.155339	0.000000	0.000000	0.270937
	input data manual	0.000000	0.015935	0.067683	0.001291	0.000000	0.013310	0.007303	0.082740	0.000000	0.262861	0.000000	0.000000
	kecepatan aksi	0.000000	0.015362	0.000000	0.003636	0.000630	0.021206	0.015140	0.000000	0.026441	0.000000	0.000000	0.000000
TEKNIS RUDAL	karakter rudal	0.058725	0.080658	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	sistem penembakan	0.292166	0.109888	0.000000	0.000000	0.000000	0.000000	0.247718	0.000000	0.000000	0.000000	0.000000	0.000000

Source: Author.

Figure 8: Weight yield table (source of researchers' processed).



Source: Author.

results of the weights of each calender and node in the network and the normality weights in each cluster.

3.2. Discusion.

Missiles today are the main weapon of battleships in battle. The ability of the missile as a weapon depends not only on the technology and sophistication of the missile itself, but will also be influenced by the system that supports the missile to be useful in its purpose.

To be able to glide towards the target, the missile requires preliminary data that will be used as a guide for the direction of flight. The initial data provided to the missile will be very influential in the expected final outcome of the wear. Proper missile guidance will heighten the likelihood of shooting. The initial data needed is obtained from a sensor system outside the missile, both the sensor of the gunner and the sensors of other companion elements that can provide the required data.

Broadly speaking the required data can be grouped into three parts. The first part is data that contains information about the target to be targeted, namely data about the position and movement of the target target. The second part is the data about the ship carrying the missile, which is in the form of position, movement and vertical gyro data about the ship's shaking and bobbing. The third part is data about the external environment (environment data), which is about data on environmental conditions such as wind and temperature. All the required data will be processed by the system in the shooting consul to be the initial data that will be used as a guide for the direction of the missile flying to the target. In ideal conditions, the data processing system inside the missile consul will be integrated with the system from the sensors that are the data source. This integration will connect the sensor system to the consul system, so the consul will receive data from the sensor automatically. Every data change that occurs will be entered automatically and will be calculated continuously by the consul to be able to produce accurate data that is real time to the size of seconds.

Missile conditions on ships A and B are different from the ideal conditions as described above. The integration between the data provider sensor system and the data processing consul is not entirely connected automatically. There is some data that still needs to be entered manually which will directly affect the accuracy of up to date and real time calculations.

The results of the analysis with ANP showed that the operator's ability and system disintegration showed different weights in determining the capability of the missile. The operator capability variable is more important and determines the missile capability than the system disintegration. The expected operator ability variable is the ability which is determined by the ability of technical matters. The weight of technical ability occupies the highest value in the network model that is **0.179307.**

3.2.1. Operator's ability to carry out missile firing on fast patrol boats.

Missile shooting operators on ships A and B are the teams involved from the initial preparation of the missile to the firing. The shooting team consisted of officers and soldiers in KRI who worked together to operate this weapons system together. The missile firing is led directly by the Commander of the ship and the weapons officer who carries out technical and close coordination with the bridge team and is supplemented with tactical advice from the Head of the Operations Department and Palaksa.

The main role in the implementation of Penambakan is carried out by the Weapon or Pasen officer. Pasen carries out technical commands from the preparation of the missile, data input, to the shooting. Pasen reported the phasing of the shooting to the commander who had the function of giving approval and further orders for the implementation of the next stage. The composition of the Missile Shooting organization is shown in the following chart;

The operation officer has the duty to give tactical advice about the enemy situation and the situation of the surrounding environment to the commander or to the Pasen directly the tactical situation will be a passive consideration regarding the use of shooting mode which will be suggested to the commanding officer. Executive officers who are on the bridge as assistances for navigation officers will carry out coordination with the control room regarding the direction and speed of the ship itself adapted to the conditions of the surrounding sea.

The ability of operators who work as a team in the implementation of missile shooting is different. This ability is closely related to humans who are dynamic. A standardization of the ability of an operator to be able to operate and carry out missile firing in combat action should be arranged. Observations made by researchers while serving on fast patrol vessels in 2006 to 2008 of the operator are that the ability of individual operators needs to be maintained in the face of rotations in the placement of personnel carried out and the lack of specialization for operators of early educational institutions. The general understanding of the operators is only to the understanding of the shooting scenarios that are prepared. Only a few people can understand the technical capabilities of the missile system and character well.

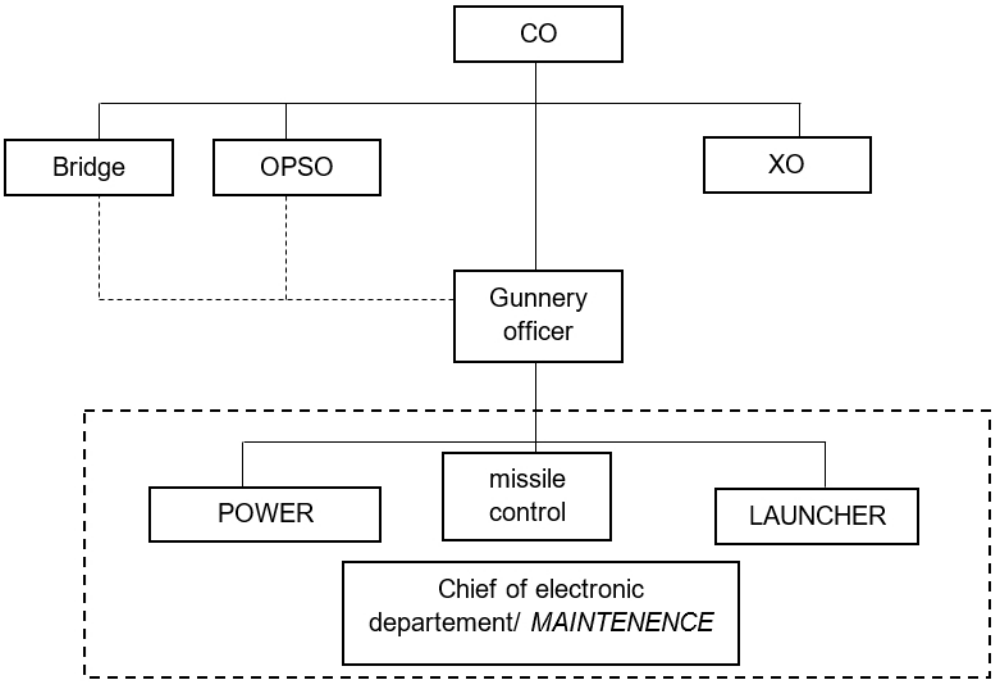
Ability is the nature of birth and learning that allows a person to complete his work. As for what must be owned by someone in facing their work according to Mitzberg, as quoted by Gibson, there are four abilities (qualities or skills) that must be possessed by someone in carrying out their duties as follows: 1. Technical skills, 2. Human skills, 3. Conceptual skills, 4. Management skills.

3.2.1.1. Technical ability.

The technical capability of the operator based on weighting carried out by the ANP method has the greatest value of 0.179307. This weight value indicates that the ability and mastery of the operator regarding technical implementation of missile shooting is the most important. The operator's technical ability will support the operator's understanding and introduction of the missile, both hardware and software, as well as the supporting components needed by the system to work and get maximum results.

Education and experience is one way to obtain the intended technical abilities. These two things are not owned by most of

Figure 9: Missile firing operator organizational structure.



Source: Author.

the personnel involved as operators.

The situation of operator readiness on the fast patrol boat B is also not much different. The operator on Ship B still left one personnel who had attended operational training and missile maintenance from the manufacturer. The ability of operators with branching weapons electronica systems are more likely towards Maintenance than operational. When compared with the ability of operators as a team of 6 to 7 personnel, the capabilities of all operators as a shooting team must be tested through the implementation of the shooting. The absence of a standardization of ability for operators makes it difficult to assess the ability of operators as a shooting team without the implementation of the pilot test.

The key to the value of the ability of the operator as explained above lies in the ability and implementation of the role of a weapons officer (pasen). The position of a pasen is filled by seafarers who have not yet followed Specialist Education (Dikspespa) so that in the educational background the patient's ability to lead the shooting is still in doubt.

The fulfillment of the composition of officers through officers' positions to fill fast patrol vessels has also not been fulfilled in full so that the fulfillment of personnel for the implementation of shootings prioritizes quantity over quality. Broadly speaking, the ability of operators on fast patrol boats still requires training and learning about the character of weapons technically.

3.2.1.2. Human Skills.

The skill of the operator as a human being to be able to interact with other humans in the shooting team. The weapons officer will function as a counterweight and implementer to determine the flow of the shooting process. the team working under the control of the weapons officer must be able to understand the equipment that is technically manned so as to know and determine the actions that can maintain the missile's capabilities.

Flexibility in the operation of missiles, especially for the implementation of combat obtained from the ability of operators in understanding the technical missile and tactical battles. The scenario is arranged based on the technical capabilities of the missile and the special situation encountered in the attempted shooting.

3.2.1.3 Conceptual Ability.

Is a mental ability to coordinate, and integrate all the interests and activities of the organization. In the shooting team, this function is more focused on the position of Gunnery Officer to regulate personnel who are incorporated as operators to be able to carry out their functions. Starting from the preparation of personnel readiness through partial and team training, organizing at the time of the shooting, shooting process, including giving advice to the commander regarding the implementation of the shooting to the target. The above can be done correctly based on the capabilities and technical challenges of the missiles.

The conceptual capability of the operator can be explored to the maximum if it is based on the knowledge and mastery of the technical aspects of the missile and the shooting system. By understanding the technical capabilities, the concept that is compiled will really be exactly as expected.

3.2.1.4 Management Ability.

Ability to plan, organize, execute and control execution of shootings. The work of the Operators as a team can run well if the arrangements are carried out properly. Proper setup can only be done if it is based on strong technical knowledge. With strong technical knowledge, the operator can determine the execution of the shooting and the process, including matters relating to data and the moment of carrying out the functions of each personnel in the firing process. The explanation above shows that the technical capability of the operator will underlie the ability to carry out missile firing on fast patrol boats.

3.2.2. The role of the operator's overall ability.

The operator capability variable of the model constructed weighs 0.166148 as the second priority in the model. The first priority is technical ability which has a weight of 0.179307. It is unique that Technical ability is considered the most important variable for the implementation of missile fire. In the model built, technical capability and tactical capability are subvariables of operator capability.

The competence of the operator as a team in carrying out missile shooting is something that must be met. According to Wirawan, competence as a characteristic of knowledge, skills, behavior, and experience to do a particular job or role effectively.

The relationship is that the ability of operators is an ability that is built from two capabilities, namely technical ability and tactical ability. Operator capabilities can be built with many combinations of comparisons between technical capabilities and operator capabilities. It can be built with tactical capabilities that are greater in weight than technical abilities, or can even be built with very large tactical abilities and very small technical abilities.

The result of weighting with ANP shows that the operator's ability must be composed of a large composition of technical capabilities. Great technical ability in the ability of an operator to be the most important thing in the implementation of missile firing to get the expected results.

Operators who are subject to capabilities in the model are human factors that act as connectors to the disintegration of the system discussed earlier. The capability of this operator will determine the probability of the charge which will directly increase the capability of the missile towards the maximum.

In line with the results of calculations with ANP, the results of SPSS calculations also show the results that the ability of operators as variables X1 has a greater coefficient than the system disintegration. The negative coefficient value affects a linear relationship, that every change in the value of X1 will affect the direction of the missile capability. Increased operator capability will also increase the capability of the missile.

The level of ability of the operator on the battleship to carry out the battle shows the professionalism of a soldier in carrying out his duties. Huntington gives an elaboration on the growth of military professionalism, which is characterized by the expertise in carrying out their duties, specifically socially responsible, and has a corporate character that gives birth to a strong sense of esprit de corps.

The influence of the ability of the operator who comes from a professional soldier functions as a variable that will mandate the ability of the missile to the maximum direction by minimizing the weakness caused by disintegration by the system.

3.2.3. System Disintegration In Missile Firing On Fast Patrol Ship.

The disintegration between the data provider system and data processing is described as one of the variables that will affect the missile's capability. This disintegration variable is also related to sub-variables and sub-variables related to the shooting implementation.

The results of data processing with the ANP method produce weights from as a priority for system integration in the model made is 0.149199, which is the third priority in the model.

The definition of the system from Gordon B. Davis in his book "Management Development" which states that the system consists of parts that together operate to achieve several goals. The intended parts work according to their respective functions to support one another in achieving the goals. C802 missile firing can also be said as a system that works to achieve goals. Partially, each support system and shooting system has worked in accordance with their respective functions. The only problem is that the connectivity that connects the two systems that work is not fully established. Systems that are supposed to work automatically and have full connectivity require interference from humans as connectors so that the system can work to achieve goals.

Humans as part of the system carry out more functions than the original function. As a modern system, connectivity between systems relating to the whole intertwined, so as to ensure that all data information can be received in full as well. The human factor that connects data connectivity is a dynamic factor, and will always be different. Human abilities will always be dynamic in different times and places.

Lack of data connectivity due to system integration will affect the use of missiles to obtain maximum capabilities as expected. This influence can be analyzed from the results of weighting twelve elements into variables, sub-variables, and sub-variables connected in an ANP network that disintegration into the system is the third variable that is important for the capability of a missile.

Logically, system disintegration which is a lack of connectivity between systems will also cause a reduction in the capability of the missile itself.

Such a reduction in ability will have an effect on the probability of the operation of a system to be able to demonstrate the capabilities as expected. This will relate to the reliability of the missile at work. K. C Lime defines reliability as the probability that when the operation is in certain environmental conditions, the system will show its ability to match the expected function within a certain time interval.

The end result of firing a missile is the right to hit the target. The higher the probability of the case the better the reliability of the existing system, so it can be that the probability of the

case will be directly proportional to ability. To get high missile capability, a high probability of damage must be created. Disintegration in the system which becomes a deficiency in the working of the system as a whole must be minimized by the factors of the human being the connector.

The disintegration of the missile system with the weapons system on the Fast Patrol boat is a static value and will not change up or down.

3.2.4. The missile's ability on patrol ships is fast in carrying out battles.

In general the Battle of the Islands is defined as a strategy and tactic of warfare that utilizes and synergizes the geographic and hydro-oceanographic characteristics of the archipelago with the right weapon technology to create superiority for its own strength. The logical consequence of the state of Indonesia as an archipelago is that it must have a Navy posture that is able to cope with any threat that comes through the sea, especially in strategic funnels (choke points control). In the context of maritime warfare, the title of naval combat operation is directed to implement strategies and tactics of sea warfare that are in accordance with the conditions of maritime geography, hydro-oceanography and meteorology to be able to realize absolute sea control and strategic funnels.

The concept of warfare in the Indonesian archipelago is closely related to the implementation of litoral warfare, because almost half of the Indonesian archipelago's waters are shallow waters. Is a type of war that has high complexity because it includes / synergizes Anti-Surface Ships (ASuw), Anti-Air Warfare (AAW), Anti-submarine War (ASW), mines warfare, asymmetric warfare and requires extra high vigilance against incoming threats. ashore (beach cannon, surface missile, speed boat, etc.).

The use of missiles is the main choice in carrying out litoral battles in the waters of the islands. The use of missiles in combat is carried out by two methods, namely independent firing or shooting using a target reporting unit (TRU).

The weighting results from the method of shooting carried out resulted in a value of 0.083735 for shooting with TRU and a value of 0.027917 for independent shooting. The capability of the missile is affected by the disintegration of the system and the ability of the operator to place the firing with the TRU more important than independent firing. This is in accordance with the concept of warfare for tactics for missile fast ships as a bat for targets that have been known before by other elements. Fast ships are only directed to approach at high speed towards the target to the range of fire and fire missiles at the target based on data that has been previously obtained by the comrades. The hallmark of litoral warfare is to allow changes in the assignment of ships in the organization of warfare, namely Assignment of ships (Tasking) in accordance with tactical considerations, so as to enable the change in the task of escorting destroyers into pickets or as a TRU for elements of fast patrol vessels.

Associated with the capability of the missile from the perspective of the concept of litoral warfare in the islands, the capability of the missile will still be optimized by implementing the TRU method of firing carried out by operators who have high capability, especially the ability in mastering the missile technically.

Conclusions.

The results of the research that began from the planning stage [research, research execution, data collection, and processing and analysis carried out obtained a conclusion that is in accordance with the hypothesis that there is an influence of operator capability and system disintegration on the ability of missiles on fast patrol boats to carry out shooting in combat .

The most dominant influence between the two variables X1 and X2 is the operator ability (X1). The operator's capabilities are more important and determine the capabilities of the Missiles on a fast patrol boat to carry out battle. and if related to the constituent variables in the ANP network is "the ability of the operator which is dominated by the technical ability of the shooting system on the ship more determine the ability of missiles on fast patrol boats in carrying out battle.

The ability of Personnel as Operators to Carry out Missile Shooting on fast patrol boats.

The operator's ability further determines the magnitude for the ability of the missile to carry out the missile firing on a fast patrol boat. The most important area of capability from technical and tactical capabilities is the operator's ability regarding technical. In more decisive technical abilities is an understanding of the shooting system.

The relationship between the ability of the operator is a significant and linear relationship. Missile capability will increase if the ability of the operator also rises. The operator capability is a dynamic value and will be different for each operator who carried out the shooting. The higher the capability of the operator, the higher the capability of the inner missile and will increase confidence in the target target.

Disintegration System In Implementing Missile Patrol Ship Shooting.

System disintegration is a fixed value, because it is the value of connections between materials. This value depends on how many data connections are established during the installation and installation of a missile system to a fast patrol boat. Connections that have been built will always be fixed as long as there are no changes or additions to integration. The constituent variables of disintegration are for the implementation of independent ponding and shooting with TRU. Shooting with a TRU further strengthens the ability of a missile to hit an opponent, This is because shooting with a TRU can maximize the missile's range. The shooting using the TRU carried out is to carry out the acquisition of the target as the first priority, then pay attention to the implementation of manual data input as the second priority, and the speed of the action as the third priority.

Missile Ability on fast patrol boats to carry out battles.

The implementation of island warfare by fast patrol boats is to place the ship in a waiting position and act as an element that carries out blows using the TRU method. The blow is carried out by utilizing the speed and dimensions of a small ship to be able to approach until the range of weapons can reach the target.

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