

# STRATEGY FOR THE DEVELOPMENT OF PROFESSIONAL ABILITIES FOR AAL OF ENGINEERING CORPS USING IPA, SWOT AND ISM METHODS

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## ABSTRACT

Mechanical engineering corps of Indonesian Naval Cadets Department in charge of producing professional Engineering Corps Officers with knowledge and skills in the field of Indonesian Navy logistics management and warship engine engineering. There were still some of the obstacles that exist in the Study Program will certainly have an impact on the performance displayed by the graduates in their duties. This study used the IPA (Importance Performance Analysis) method to see the performance of graduates, the SWOT (Strength, Weakness, Opportunities and Threat) method in formulating strategies and the ISM (Interpretative Structural Modeling) approach in determining priorities and strategy mapping with the aim of producing a roadmap of chosen strategy. The results showed that the mapping of the position of the performance attributes of graduates in the Quadrant Analysis and the level of satisfaction at the level was quite satisfied with a satisfaction score of 63.6%. By using ISM method approach, five levels of hierarchical structure are generated to be used as a reference in determining the roadmap for the professional development strategy of the engineering corps of Indonesian Naval Cadets.

*Keywords: Engineering corps of Indonesian Naval Cadets Department, IPA, SWOT, and ISM.*

## 1. INTRODUCTION

The duties of the Indonesian Navy based on Law No. 34 of 2004 concerning the Indonesian National Army are to carry out TNI duties in the marine sector in the defence sector, enforce the law and maintain security in the marine area national jurisdiction in accordance with the provisions of national law and international law that have been ratified, carrying out the diplomatic duties of the Navy in the context of supporting political policies outside country that has been determined by the government, carrying out TNI duties in development and development the strength of the marine dimension and carry out the empowerment of the marine defence area In order to support the implementation of this task, the Indonesian Navy carries out the preparation of human resources through task-oriented education.

Indonesian Naval Academy is one of the first educational institutions of Indonesian Navy Officers located in the city of Surabaya, with five study programs namely Marine Defense Management, Warship Mechanical

Engineering, Warship Electronics Engineering, Logistics Management and Marine Matra Finance and Defense Management. Marine Aspects Land aspect, with the vision "The realization of a Navy Academy that is capable of producing Responsive Navy Officers, Tanggon and Trengginas" and the mission "organizing an educational process consisting of effective and efficient teaching, training and nurturing to produce graduates of Indonesian Navy Officers who are fighting spirit, professionalism, discipline, pride, hard work and smart work as well as having high physical fitness, through the proper application of management and educational technology.

Mechanical engineering corps of Indonesian Naval Cadets Department which oversees the Warship Mechanical Engineering Study Program, is responsible for the Teaching and Learning Program for Technical Corps Cadets which aims to educate and equip Engineering corps of Indonesian Naval Cadets who have the spirit of a warrior saptamarga warrior who has

physical fitness, professionalism of the marine dimension with knowledge and skills in the field of Logistics Management of the Indonesian Navy and Warship Mechanical Engineering so that it can support the tasks of the Department of Machinery in preparing KRI as a Mechanical Division Officer, Electrical Division Officer and other positions at the same level as KRI and able to develop personally as a cadre of Navy leaders.

In the implementation of teaching and learning activities, the Study Program still experiences several obstacles in its implementation, this of course will have an impact on the output of the results of students, as for the constraints, these obstacles include:

- a. The absence of a Real Engine Simulator facility, this facility is a simulation of the field of duty of an engine division officer consisting of the Engine Control Room (ECR) and the Engine Room complete with Basic Motor equipment to the actual Auxiliary Motor, this can help cadets in facing the terrain. The assignment later, so far, is still using the Pusdiktek Kodiklatal so that the frequency of use is limited due to alternating with Kodiklatal students.
- b. Lack of laboratory education personnel (Laboran) in the Sapudi building and Jaya Wijaya building both in number and qualifications. So far, it has only been filled with members of the rank of NCO or civil servants without a course or training in accordance with the equipment or material to be taught to the cadets.
- c. There are no permanent lecturers who have linear postgraduate qualifications in the field of Mechanical Engineering so that the Department of Technology has difficulty finding the right lecturers for cadets.
- d. There are still conflicting schedules between teaching and learning activities in the classroom or in the laboratory with the parenting activities of the Youth Corps Regiment.

## 2. MATERIAL AND METHODS

### 2.1 Importance Performance Analysis

Martila and James (1997) introduced the Importance Performance Analysis (IPA) method which is a multi-attribute model and can be used to analyze the performance of the organization, this concept contains how to translate what customers want measured in relation to what service providers have to do in order to produce quality product, intangibles or

intangibles. Respondents were asked to access the level of performance and importance about service attributes.

**Table 1.** Performance and importance level assessment scores

Value	Performance	Importance
1	Very dissatisfied	Very unimportance
2	Not satisfied	Not Importance
3	Quite satisfied	Quite Importance
4	Satisfied	Importance
5	Very satisfied	Very imporyant

This study used two variables X and Y, where X is the level of performance and Y is the level of Importance / expectation from user's Indonesian naval 2<sup>nd</sup> fleet command materiel service, after the data is collected then the data is processed to assess the level of performance and level of Importance / expectations. The formula:

$$Tki = \frac{xi}{yi} \times 100\% \quad (1)$$

Description :

Tki = Respondent's level of conformity

Xi = Performance scoring scores

Yi = Importance assessment score

then the service attribute is mapped into quadrant Analysis where the horizontal axis (X) will be populated by the performance value and the upright axis (Y) will be filled with the Importance value:

$$x = \frac{\sum xi}{n} \quad (2)$$

$$y = \frac{\sum yi}{n} \quad (3)$$

Description:

X= Average performance score

Y= Average Importance score

n = number of Respondents

The informations are:

- a. The first quadrant (I), requires handling that needs to be prioritized by the management level due to high importance, while the satisfaction level is low.

- b. The second quadrant (II), indicates the area to be maintained due to the high level of importance, while the level of performance is also high.
- c. The third quadrant (III), as a low priority area due to low Importance rates while performance satisfaction levels are also low. In this quadrant there are several factors that are less Importance influence for customers. But the company should always display something better among other competitors.
- d. The fourth quadrant (IV), is categorized as redundant because there are factors that for customers are not Importance, but by the company is implemented very well. In addition, due to the low level of Importance while the level of satisfaction of performance is high so it is not a priority that is improved.

<b>I</b> <b>Concentrate here</b>	<b>II</b> <b>Keep up the good work</b>
<b>III</b> <b>Low priority</b>	<b>IV</b> <b>Possible overkill</b>

**Figure 1.** Importance Performance Quadran Analysis

### 2.2 Customer Satisfaction Index (CSI)

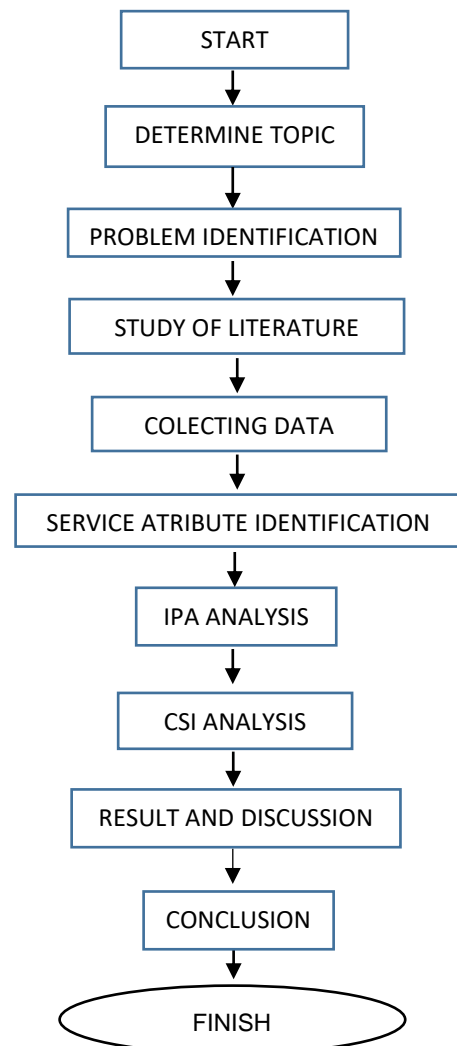
Customer satisfaction is the customer's perception that his expectations have been met or exceeded (Gerson, 2004). Customer satisfaction also means a comparison between what consumers expect and what consumers feel when using the product, Consument Satisfaction Index (CSI) is a quantitative analysis of the overall percentage value of consumers who are satisfied with the service of a product, the steps in calculating CSI are as follows (Stratford, 2004 in Nurmalia and astuti, 2012):

- a. Calculating weight factor (WF) that is to convert the average value of Importance into a percentage number.
- b. Calculating weight score (WS) which is multiplication value between WF value and Mean satisfaction Score (MSS)
- c. Collecting Total Weight (WT) by summing all WS values
- d. Calculating satisfaction index by dividing WT with the maximum scale used is 5.

**Table 2.** CSI Values and Criteria

CSI Value	CSI Criteria
<b>0,81 – 1,00</b>	Very satisfied
<b>0,66 – 0,80</b>	Satisfied
<b>0,51 – 0,65</b>	Quite satisfied
<b>0,35 – 0,50</b>	Less satisfied
<b>0,00 – 0,34</b>	Not satisfied

### 2.3 Experimental procedure



**Figure 2.** Flow Diagram

## 2.4 SWOT Method

SWOT analysis is an analysis that prioritizes studying and Identifying external factors Because they are considered to be more dynamic, then they will identify internal factors to then make adjustments and improvements to the internal potential to create opportunities which is advantageous, in other words, which is more dominant in seeing an external point of view than the internal one of an organization. As for what is meant by the factors of a SWOT analysis are:

a. Power(strengths)

It is a resource of skills or other advantages against competitors or market needs that the company serves or wants to serve.

b. Weakness

It is a limitation or deficiency in the source power, skills and capabilities that seriously hinder performance

c. Opportunities(opportunity)

Opportunity (opportunity) is an important situation profitable in a corporate environment.

d. Threats

Threats are important situations that are not profitable in a corporate environment.

From these factors, a SWOT matrix can be generated with four possible strategies, namely:

a. SO (Strengths-Opportunities) strategy, which is a strategy that uses your strengths to take opportunities.

b. ST (Strengths-Threats) strategy is a strategy that uses strength to avoid and overcome threats.

c. WO (Weaknesses-Opportunities)

Strategy as a strategy that uses that opportunity possessed to overcome weakness.

d. The WT (Weaknesses-Threats)

Strategy is a strategy to minimize weaknesses and avoid threat.

## 2.5 ISM method

ISM is an analytical tool used in decision support (decision support tool) that facilitates a comprehensive understanding of complex situations with linking and organizing ideas in a visual map (Darmawan, 2017). ISM begins with the identification of the elements that are relevant to the problem or problem and extends to group problem solving techniques. A structural self-interaction matrix (SSIM) developed based on comparison of the elements that are paired. There are procedures

or stages in using the Interpretative Structural Modelling method, these stages include:

a. Parameter identification.

The elements must consider for identification of relationships obtained through literature surveyors by conducting surveys.

b. Development of Structural Self Interaction Matrix (SSIM).

Structural model development Interpretive begins with the construction of a structural self-interaction matrix, which shows the direction of contextual relationships among elements. In developing SSIM, following four symbols have been used to indicate the direction of the relationship between two constraints i and j according to the table 2.3

c. Reachability Matrix. From the self-interaction matrix (SSIM), the relational indicators are changed by the binary numbers 0 and 1 to get the square matrix, which is called the reachability matrix

d. Partition level.

From the reachability matrix, for each parameter, reachability set and the antecedent set was derived. Variables, which are common in reachability sets and antecedent sets, are allocated to intersection sets. The top-level element for each hierarchy is one where the antecedent set and the intersection set are the same in the ISM hierarchy. Once the upper-level barrier has been identified, it is removed from consideration and another upper-level barrier is found wherein this Process will be continued up to all levels of every barrier found.

e. Interpretive structural modelling (ISM) constructs. From the parameters that have been partitioned and reachability matrix, structured model is lowered, showing the parameters at each level and arrows indicating the direction of the existing relationship. As a graphical representation of the model is called a diagram.

f. MICMAC analysis. MICMAC analysis draws on the Matrice d'Impacts Croisés Multiplication Appliquée á un Classement and involves developing a graph for classifies various enablers based on driving power and dependence power. MICMAC is also used to check driving power and power dependencies. Variable is a concept that contains a variation of the value consisting of at least two variations. The variables have been classified into four categories which are referred to as Autonomous, Linkage.

### 3. RESULT AND DISCUSSIONS

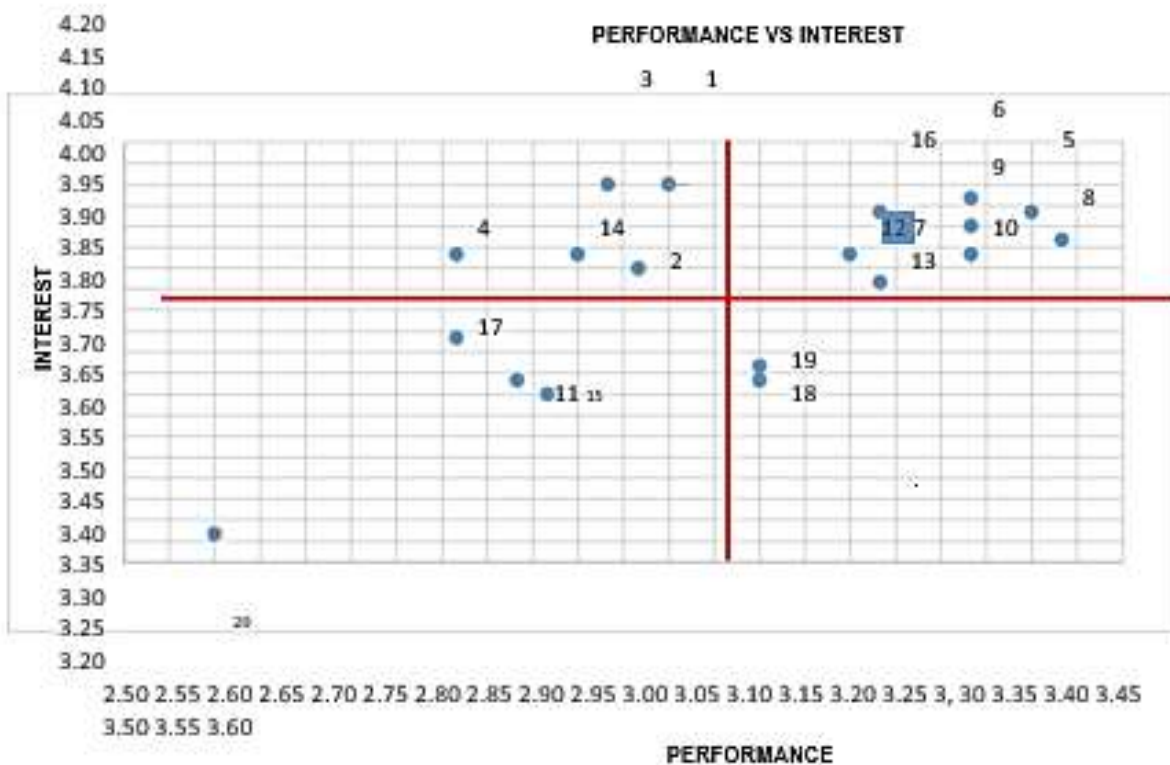
#### 3.1 Data Collection

In looking at the performance of AAL Engineering Corps graduates the data obtained is primary data in the form of questionnaires to user satker, namely cadresin in the ranks of Koarmada I and II as well as pasharmats in Koarmada II and secondary data in determining the performance attributes of graduates obtained from Book I and Book II of the Program. Warship Mechanical Engineering Studies. In formulating a strategy for developing the professional abilities of the AAL Military Corps cadets, the prioritization of the strategy

and the data roadmap obtained are primary data in the form of questionnaires given to officials in the Warship Mechanical Engineering Study Program.

#### 3.2 Performance Analysis of AAL Technical Corps Graduates.

Literature studies conducted in order to obtain performance attributes from AAL graduates obtained 20 (twenty) performance attributes, from the results of the questionnaire obtained an assessment of performance and interests and the mapping of performance attributes in Quadran analysis.



**Figure 3.** Quadrant Performance Analysis of AAL Corps Engineering Graduates

In the Quadrant Analysis, the results can be seen that 5 (five) attributes (1,2,3,4,14) of the AAL Engineering Corps graduates' batch 61 to 64 are still in quadrant I, 9 (Nine) attributes (5,6,7,8,9,10,12,13,16) in quadrant II, 2 (two) attributes (18,19) in quadrant III and 4 (four) attributes (11,15,17, 20) is in quadrant IV.

#### 3.3 SWOT Analysis

In formulating a strategy using the SWOT method. The first step is to analyze Internal and External factors in warship Mechanical Engineering Study Program are continued with the grouping of these factors into elements Strength, Weakness, Opportunity

and Threat. Then weighting of these factors is carried out to get the chosen strategy.

**Table 3.** SWOT Matrix

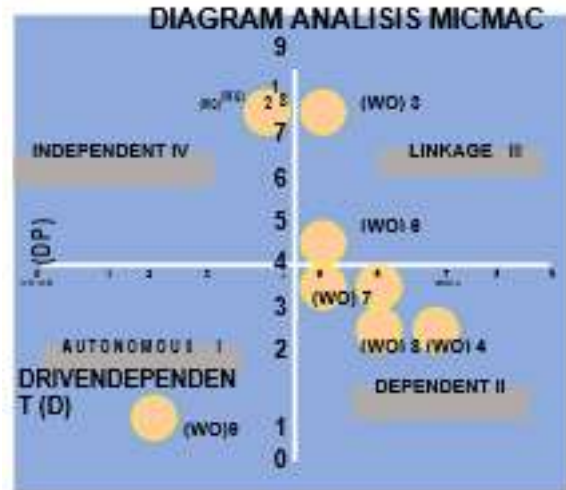
	S = 1.60	W = 1.81
O = 2.27	SO = 3.87	WO = 4.08
T = 1.07	ST = 2.67	WT = 2.88

### 3.4 Strategic Priorities and Roadmap

ISM method is to identify the elements to be studied, these elements are obtained from the results of determining the selected strategy (WO strategy) using the SWOT method. Followed by making the SSIM matrix (self-interaction matrix) from the SSIM matrix), the relational indicators are converted into binary numbers 0 and 1 to obtain a square matrix, which is called the reachability matrix based on the results of the questionnaire with expert obtained the value from the calculation of Dependent (X) and Driven Power (Y) with the following coordinates which will be mapped into the MicMac analysis diagram.

**Table 4.** Dependent and Driven Power Calculation Results

Alternative Strategies	X	Y
(WO) 1	4	8
(WO) 2	4	8
(WO) 3	5	8
(WO) 4	7	3
(WO) 5	6	4
(WO) 6	5	5
(WO) 7	5	4
(WO) 8	6	3
(WO) 9	2	1



**Figure 4.** Micmac Analysis Diagram

By looking at the Micmac Analysis Diagram, it can be seen that sector I (Autonomous Variable) consists of one variable, namely proposing an increase in the acceptance standards for cadets (WO9).

In sector II (Dependent Variable) consists of four variables, namely Implementing an upgrade of the instruction tool in the warship engine engineering study program adjusted to the development

Alutsista in the service (WO4), increasing the use of Indonesian Navy facilities outside the AAL in the process of teaching and learning activities as a training facility (WO5), increasing the publication of research journals (WO7) and carrying out community service programs in terms of warship mechanical engineering in collaboration with side outside AAL who have the same knowledge (WO8).

Sector III (*Linkage variable*) have two variable that is improve evaluation in scheduling cadets' activities by focusing on the achievement of the vision and mission of the study program and the TNI AL strategic plan in maintaining the professionalism of soldiers and improving the quality of human resources.

(WO3) and increasing the implementation of public lectures and seminars by inviting maritime experts and alumni as resource persons (WO6) Sector IV (Independent variable) has two variables, namely implementing the improvement of the competence of lecturers and educational staff in the warship mechanical engineering study program (WO1), and carrying out an evaluation of the educational curriculum by referring to the TNI AL strategic plan, mastery of marine technology, increasing the competence of

graduates according to a predetermined level of mastery and entering courses that refer to GMTT 2030 (WO2).

Based on the results of the ISM assessment from the Expert and the analysis of

the Micmac diagram, then will classify the elements of the strategy into five levels of structure hierarchical strategy and preparation roadmap.

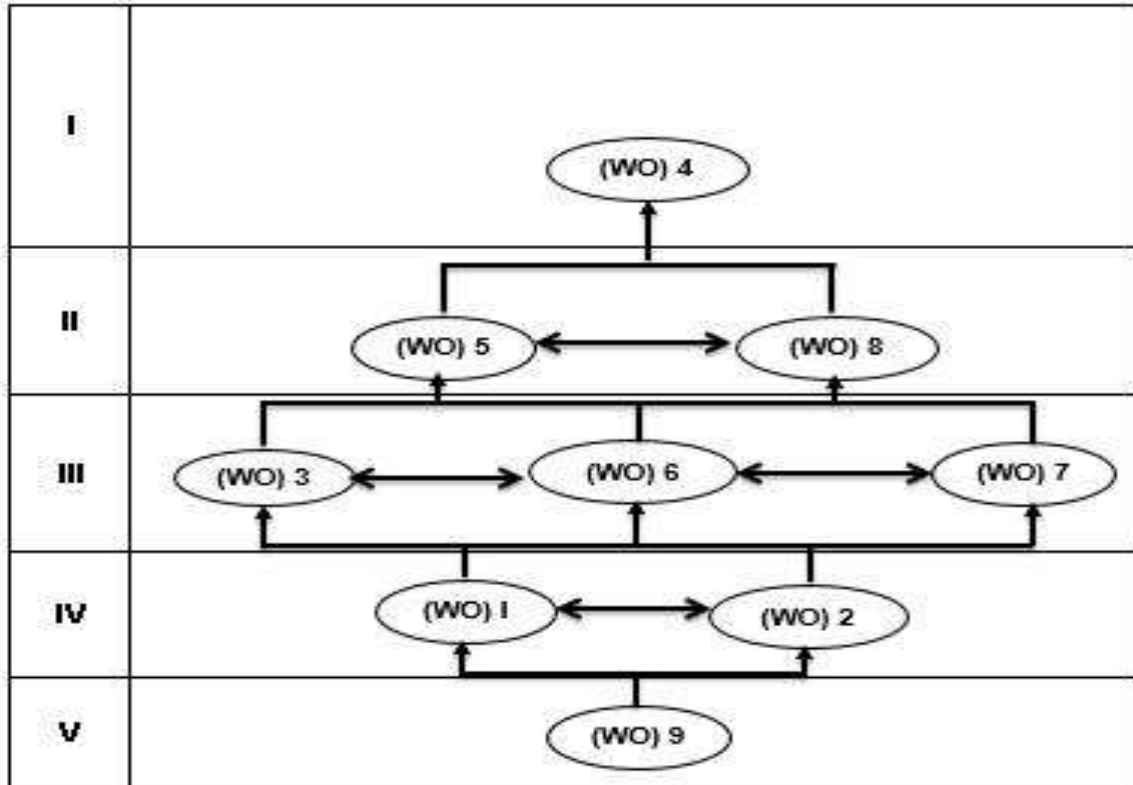


Figure 5. Hierarchical Structure of the Strategy

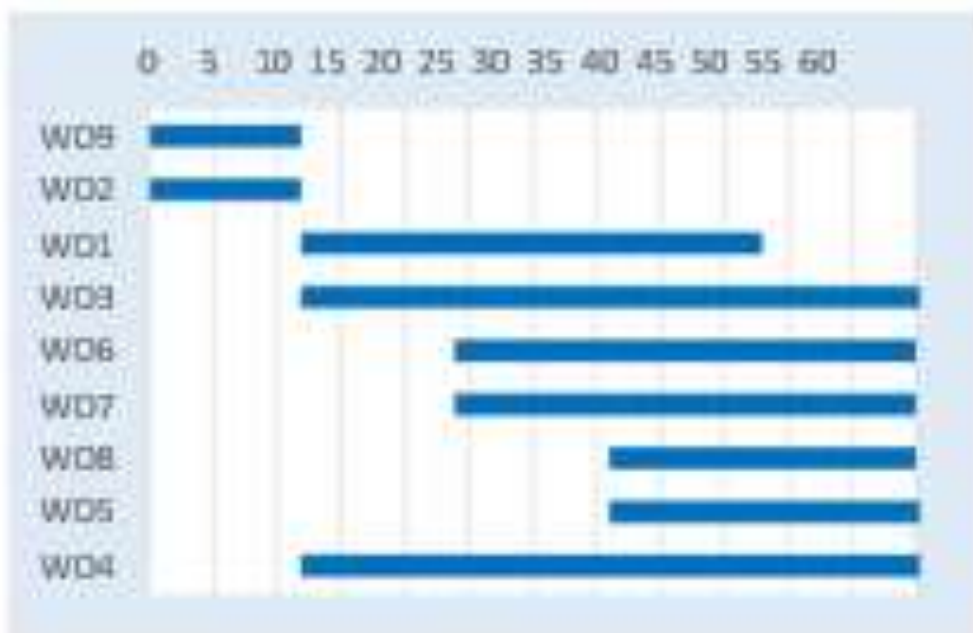


Figure 6. Stages of Strategy for the Development

The strategic roadmap for the development of the professional skills of cadets for the AAL Engineering Corps begins with proposing an increase in the standard of admission for cadets and improvements in the education curriculum with reference mastery technology marine, increasing the competence of graduates according to level mastery that has been determined, assessment of graduate performance by the user working unit and entering courses that refer to GMTT 2030 implemented in the first year. Increasing the competence of lecturers and educational staff for keep pace with the changes in curriculum and instructional tools that have been planned in supporting the learning of Mechanical engineering corps cadet. Improve evaluation in scheduling activities of cadets which aim to avoid conflicting schedules with cadets' activities consisting of class learning activities, field training related to equality, military and parenting activities in the cadet corps regiment by prioritizing the achievement of study program vision and mission and strategic plans Indonesian Naval in maintaining the professionalism of soldiers and HR quality improvement was carried out starting in the second year.

Increasing the implementation of seminars and public lectures as well as increasing published and indexed research journals national and international are the next steps that start in the third year to the fifth year, then carry out community service programs in the science of warship engineering in an effort to achieve the vision and mission of the study program and increase the use of the Indonesian Navy facilities outside the Indonesian Naval Academy as a training facility as an effort to prepare a ready-to-use profile of Indonesian Naval Academy mechanical engineering Corps graduates starting in the fourth year and upgrading existing instruction tools in study programs in line with curriculum changes it is meant so that the tool instructions that come with it Changes in subject matter are carried out from year two to year five considering that this sub strategy requires a large amount of money.

## **4. CONCLUSION**

### **4.1 Conclusions**

a. From the results of the research, it was found that the position of the cadets' performance attributes in the quadran analysis and the satisfaction index value of the user satker was 63.6%, which means that the user satker was quite satisfied with the performance

displayed by the AAL Engineering Corps graduate.

b. The formulation of the chosen strategy is the WO strategy with nine sub strategies.

Through the ISM method approach, the results were obtained in the form of a strategic roadmap for the development of education and training for Mechanical engineering corps of Indonesian Naval Cadets starting with proposals for raising the standard of cadets for cadets at Indonesian navy headquarters, conducting an evaluation of the educational curriculum with reference mastery of ocean lift technology and Grand Marine Trend Technology 2030 (GMTT 2030), continued with increasing the competence of lecturers and educational staff then increasing evaluation in scheduling activities for cadets. Increasing the implementation of public lectures and increasing journal publications are the next steps. Carrying out community service programs in mechanical engineering science, increasing the use of Indonesian Navy facilities in the process of teaching and learning activities and upgrading existing instruction tools in study programs adjusted to curriculum changes are steps the last of the strategic roadmap for the development of the professional abilities of the Mechanical engineering corps of Indonesian Naval Cadets.

## **4.2 Suggestions.**

Based on the conclusions of the research that the author has carried out; the authors can provide the following suggestions:

a. The results of the user satisfaction assessment are Quadrant Analysis and the Customer Satisfaction Index value can be used as input for study programs in evaluating and conducting improvement of the attributes that are considered less good so that the performance of graduates is better and the satisfaction score of the user can increase.

b. The results of the research were in the form of youth and professional development strategies the roadmap is used as a consideration in improving the professional abilities of cadets in facing the challenges of assignments in the official.

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