

DEVELOPMENT OF PERFORMANCE APPRAISAL MODEL FOR LOGISTIC STAFF PERSONNEL WITH THE KEY PERFORMANCE INDICATOR (KPI) AND ANALYTICAL HIERARCHY PROCESS (AHP)

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Nowadays, the performance appraisal system that exists within the TNI is still general and not specific, meaning that the performance appraisal of TNI officers does not represent in detail the specific criteria of the performance appraisal of TNI staff officers, so the assessment system still requires development criteria. This study aims to develop a model of performance appraisal evaluation instruments for logistics staff officers in the TNI environment. This study uses the Key Performance Indicator (KPI) and Analytical Hierarchy Process (AHP) approach. Based on the results of the research, it was found that the development of the TNI logistics staff performance appraisal model consists of 3 (three) criteria, namely logistical activities (A), logistics function (F), and logistical principles (L). Furthermore, logistics activities (A) consist of 5 KPIs (A1-A5), the logistics function criteria (F) consist of 5 KPIs (F1-F5), the logistics principle criteria (L) consist of 7 KPIs (L1-L7). Based on the calculation of the criteria values that have been carried out by referring to the Key performance indicators, it is found that the criteria that have the largest total are the logistic principle criteria with a weight value of 0.413; logistic function criteria is in the second position with a weight value of 0.327; Logistic activity criteria is in the third position with a weight value of 0.260. Furthermore, based on the total result value, the highest score is obtained, namely the Responsive sub-criteria with a weight value of 0.113; while the lowest value is the Survive Ability sub-criteria with a weight value of 0.028. This research is expected to be a model of performance appraisal evaluation and to make an important contribution to TNI organizations in particular and to function for unit organizations in general.

Key words: Performance Appraisal; Key Performance Indicator (KPI); Analytical Hierarchy Process (AHP); Logistics.

1. INTRODUCTION

Continuous performance appraisal will lead to the achievement of better and better quality HR performance (Mutmainah, et al., 2017). For those with good and quality performance as a consequence, they will receive awards in the form of appointments, promotions, benefits, and education (Javidmehr & Ebrahimpour, 2015). Nowadays, the performance appraisal system that exists within the TNI is still general and not specific, meaning that the performance appraisal of TNI officers does not represent in detail the specific criteria of the performance appraisal of TNI staff officers, so the assessment system still requires development criteria.

Based on these conditions, this study aims to develop a model of performance appraisal evaluation instruments for logistics staff officers in the TNI environment. This study uses the Key Performance Indicator (KPI) and Analytical Hierarchy Process (AHP) approach. The KPI method is used to formulate new assessment parameters within the scope of TNI logistics, while the AHP method is used to provide weights and identify priority parameters in the performance appraisal of Logistics Staff Officers.

This research is expected to be a model of performance appraisal

evaluation and to make an important contribution to TNI organizations in particular and to function for unit organizations in general. This research is limited to performance appraisal within the TNI logistics staff and office personnel.

There are several previous studies as references, namely Research on preliminary study offerings to identify key performance indicators (KPIs) for classroom facilities based on general indicators (Yusoff, et al., 2017). Research on a top-down framework in which 15 Key Performance Indicators (KPIs) are developed that represent the success rate of a simulation project from multiple perspectives (Jahangirian, et al., 2017). The impact assessment of the KPI system for the growth of shareholder welfare and satisfaction of the interests of other stakeholders (Strelnik, et al., 2015). The formulation of consensus-based Key Performance Indicators (KPI) for academic departments at universities (Rajkaran & Mammen, 2014). Evaluation and performance improvement needed to achieve competitiveness in dry port services from multimodal transportation (Bentaleb, et al., 2015). Java WEB servlet based KPI and AHP system (Ardiansyah, et al., 2017). KPI and AHP are used to investigate the academic staff performance evaluation index and evaluate

teacher performance (Karmaker, et al., 2018). KPI and AHP are used to analyze the deficiencies of the sales performance evaluation system in the company, as well as the market environment and the needs of the company's development strategy (Chen & Xia, 2020). KPI and AHP for information technology impact-based performance measurement (Irhamni, et al., 2017). KPI and AHP to provide an evaluation to logistics companies (Gozacan & Lafci, 2020). KPI and AHP are used to measure priority performance against strategic objectives (Vachnadze, 2016)

This research consists of several parts. Section 2 describes the theoretical study used. Development of the Logistics Staff Officer performance appraisal model, research methods in research, research flow diagrams. Section 3 describes the results and discussion of the research on the development of a performance appraisal model for logistics staff officers. Section 4 describes the conclusions and suggestions for further research development.

2. MATERIAL/METHODS

2.1. Performance Appraisal

Performance appraisal is the process of evaluating how well employees are doing their job

compared to a set of standards and then communicating that information to employees. Performance appraisal is also called employee rating, employee evaluation, job review, performance evaluation, and outcome appraisal. Four main factors affect how individuals work, namely: (1) The number of products manufactured, (2) The quality of products manufactured, (3) Timeliness in manufacturing a product, (4) Attendance at work (Mathis & Jackson, 2006). Performance appraisal serves as a management information system for organizations. Performance appraisal provides feedback to employees about their performance, therefore it can be used in general as a means of evaluating, analyzing, and making effective use of the abilities and knowledge of employees at all levels of the organization.

Performance appraisal can be defined as an evaluation process in which a manager or leader evaluates, compares, and provides feedback on employee performance (Kateřina, et al., 2013). In another view, performance appraisal is a systematic evaluation of an individual regarding his performance on the job and his development potential (Toppo & Prusty, 2012). Performance appraisals allow organizations to look back and evaluate past activities

by looking ahead and preparing for future performance. Meanwhile, the goals at the lower level are motivating and compensating. Each individual can evaluate personal performance and compensate. At the same time, performance measurement can motivate individuals for the future. In larger and more complex organizations, the steps are also expected to roll from the bottom to the top of the organization, down from the top to the bottom, and to facilitate comparisons of performance across organizational and functional units. (Meyer, 2002).

2.2. Logistics

Logistics is the management of the flow of goods between the point of origin and the point of consumption in order to meet some requirements. Resources managed in logistics can include physical items, such as food, materials, animals, equipment, and fluids, as well as abstract items, such as time, information, particles, and energy. The logistics of physical items usually involves the integration of information flows, material handling, production, packaging, inventory, transportation, warehousing, and often security. Logistic complexity can be modeled, analyzed, visualized, and optimized by specialized simulation software.

The minimization of resource use is a common motivation in import and export logistics (Li, 2014). Logistics is the process of planning and executing the movement and continuity of operations forces in the implementation of military strategy and operations. The art of logistics is how to integrate strategic, operational, and tactical support efforts within the theater while scheduling the mobilization and deployment of units, personnel, and supplies to support the work concept of a geographic combat commander.

2.3. Key Performance Indicator (KPI)

KPI is a measurement tool or tool in the form of financial or non-financial metrics that serve as navigation for companies to measure and determine the progress of predetermined goals or strategies. KPI can be a reflection of a measure of the company's target and the progress of achieving the goals in production. KPIs are used as business intelligence to assess the current state of a business and determine action for that situation (Velimirovića, et al., 2011). KPIs are important navigational tools used by managers to understand whether their company is on the path to success or its path to success. KPIs are financial or non-financial metrics

that are used to help an organization determine and measure progress against organizational goals (Stan, et al., 2012).

In the end, KPI determination must be done in accordance with the needs of the organization to achieve the best results. Good KPIs do not have to apply many measurements, only the main ones that support organizational goals. Several requirements in making KPIs: 1) Always related to goals or targets; 2) Measurable; 3) Having comparisons from the previous period; 4) Time-bound.

2.4. Analytical Hierarchy Process (AHP)

The AHP model describes a complex multi-factor or multi-criteria problem into a hierarchy; according to Saaty, the hierarchy is defined as a representation of a complex problem in a multi-level structure, where the first level is the

goal, followed by the factor, criteria, sub-criteria level and so on down to the last level of the alternative with a complex hierarchy of problems can be broken down into groups which are then arranged into a hierarchy as the problem will appear more systematically structured (Saaty & Vassag, 2006). In determining the weight of each criterion in AHP, it can be described as follows:

7 pillars are used and must be considered in AHP modeling (Saaty, 2003),-1) The ratio scale is the ratio of two values (a/b) where the values a and b are together with a type (unit); 2) Pairwise comparison; 3) Conditions for the sensitivity of eigenvectors; 4) Homogeneity and clusterization; 5) Synthesis; 6) Maintain and reverse the weighting order and the order in the hierarchy affected by the addition or change of criteria or alternatives; 7) Group considerations.

The scale of the comparison can be explained as follows:

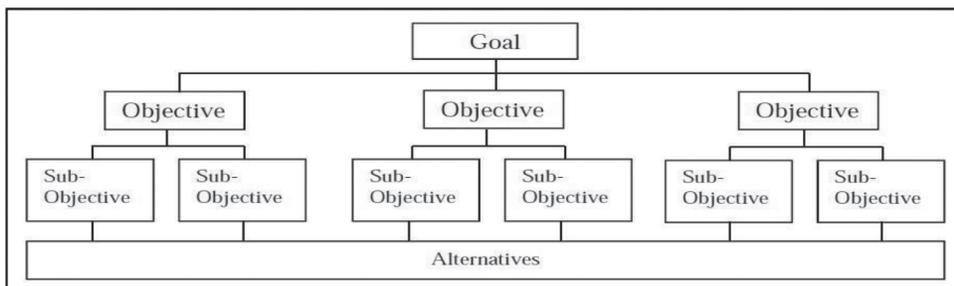


Fig. no. 1 Structure of AHP. (Saaty, 1990)

Table 1 AHP Rating Scale
(Saaty & Vassgas, 2006)

Scale of Interest	Definition	Explanation
1	Equal Importance	Two activities are contributing equally to a goal
3	Moderate Importance	One activity is slightly more important than the other
5	Strong Importance	One activity is more important than the other
7	Very Strong Importance	One activity is very important compared to other activities
9	Extreme Importance	One activity is very, very important compared to other activities
2, 4, 6, 8	Intermediate Values	
Reciprocal	Used for Inverse comparison	

2.5. Method and Steps

The place or location in the research is focused on the work unit that represents the performance condition, especially the logistics unit which as a whole plays a role in the evaluation process of staff officers performance appraisal policies. Each Main Command Office involved in the field of logistics was selected by expert sources as research informants purposively according to their needs. The process of determining policies,

strategies, and efforts, still refers to the principles of achieving goals and objectives facing the rationale. There are several stages of research consisting of:

- Identification of Criteria using KPIs.

Identification or responses in the form of criteria with an evaluation aspect approach. In identifying the criteria, a literature study from previous research was used and a questionnaire in the form of interviews with six selected experts was used.

- Weighting criteria using AHP.

At this stage, the weighting of criteria uses the Analytical Hierarchy Process (AHP) method. Weighted Key Performance Indicator (KPI), the KPI that has been compiled and is then made into a questionnaire given to expert sources to be allocate a weight. The results are processed using the Analytical Hierarchy Process (AHP) to determine the level of importance. The calculation can be done manually, namely by using Microsoft Excel.

3. RESULTS

3.1. Identification criteria

Based on the results of research studies, both in the

form of literature studies and brainstorming and in-depth interviews with expert sources, aspects of military logistics management can be divided into 3 major aspects, namely: 1) main activity aspects of the logistics system; 2) aspects of the logistics function; 3) logistic principles. Each aspect has sub-aspects that can be taken into consideration in evaluating the performance of TNI logistics staff officers. It can be concluded that the performance appraisal of logistics staff officers is closely related to the functions and responsibilities of these officers in military logistics management activities. These criteria and sub-criteria are described in Table 2.

Table 2 Criteria and sub-criteria of logistic performance assessment

ASPECT	CRITERIA	INDICATOR	CODE
LOGISTIC ACTIVITIES (A)	Customer service	Ability to select, procure, store, or distribute products to meet customer needs	A1
	Product Selection	Ability to select products used in support of operating tasks	A2
	Quantification	Ability to estimate the quantity and cost of the product required	A3
	Procurement	Quantification and quantity procurement process	A4
	Inventory Management	Storage and distribution process	A5

ASPECT	CRITERIA	INDICATOR	CODE
LOGISTIC FUNCTION (F)	Supply System	Acquiring, managing, receiving, storing, and releasing materials needed by operations forces	F1
	Maintenance	Actions were taken to keep equipment in repairable condition, to return it to service, or to update and upgrade its capabilities.	F2
	Transportation	Movement of units, personnel, equipment, and supplies from point of origin to the final destination	F3
	General Engineering	Provision of construction, damage repair, and facility operation and maintenance or necessary logistics improvements	F4
	Health services	Health services including evacuation, hospitalization, medical logistics	F5
LOGISTIC PRINCIPLES (L)	Responsive	Provide appropriate support when and where it is needed	L1
	Simplicity	Minimal complexity in logistics operations	L2
	Flexibility	Ability to improvise and adapt structures and procedures	L3
	Economy	Amount of resources required	L4
	Achievement	Guarantee that minimum supplies and basic services are required	L5
	Continuity	Ability to maintain and duration of operational activities	L6
	Survive Ability	Logistical capabilities in dealing with task forces	L7

Based on Table 2, implementation of the key performance indicator (KPI) development model for the activities

of TNI logistics officers can identify 17 performance indicators that can describe the performance conditions of logistics staff within the TNI in an

integrated and structured manner. The achievement of each performance criterion using the initial criteria with the results of the logistical activity criteria (A) consisting of 5 KPIs (A1-A5), the logistics function criteria (F) consisting of 5 KPIs (F1-F5), the logistical principle criteria (L) consists of 7 KPIs (L1-L7).

3.2. Weighting Criteria

The weighting of the KPI criteria and sub-criteria is carried out to determine the importance of the KPI from each perspective. The steps that are taken in weighting the criteria, are among others:

For each criterion and sub-criteria, it is necessary to make pairwise comparisons. The relative comparison values are then processed to determine the weight of each criterion. Both qualitative

criteria, as well as quantitative criteria, can be compared according to predetermined ratings to produce weights and priorities. Weights or priorities are calculated by matrix manipulation or by solving mathematical equations.

Table 3. Pairwise Comparison Matrix of Logistics Staff Performance Appraisal Criteria

	A	F	L
A	1	1	1/2
F	1	1	1
L	2	1	1

Table 4. Matrix Value of Logistics Staff Performance Appraisal Criteria

Criteria	A	F	L	weight
A	1	1	1/2	0,261
F	1	1	1	0,328
L	2	1	1	0,411
CR= 0,046				1,000

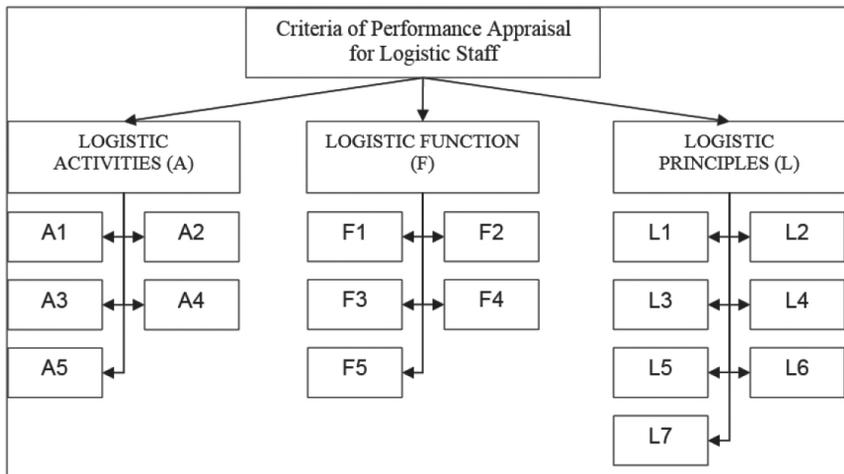


Fig. no. 2. Logistics Staff Performance Appraisal Hierarchy Structure

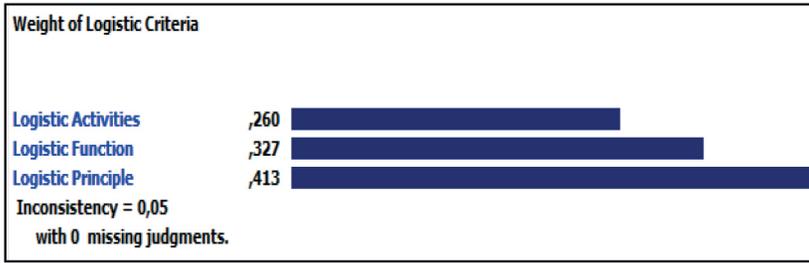


Fig. no. 3. Matrix Normalization of Logistics Staff Performance Assessment Criteria

Based on the calculation of the criteria value that has been carried out by referring to the Key performance indicator, the final value is obtained by multiplying each value on the criterion by the average or eigenvalue of the criteria as follows. The logistics staff performance appraisal consists of 3 (three) criteria. Table 4 and

Fig. no. 3 explains that the criteria that have the largest total are the logistic principle criteria with a value of 0.413; logistic function criteria is in the second position with a value of 0.327; logistic activity criteria is in the third position with a value of 0.260.

Table 5. Pairwise Comparison of Matrix Sub Criteria for Logistic Aspects

	A1	A2	A3	A4	A5
A1	1	2	1	2	2
A2	1/2	1	1/2	2	1/2
A3	1/2	1/2	1	3	1/2
A5	1/2	1/2	1/3	1	1
A5	1/2	2	2	1	1

Table 6. Value Matrix for Logistic Aspect Sub Criteria

Criteria	A1	A2	A3	A4	A5	weight
A1	1	2	1	2	2	0,299
A2	1/2	1	1/2	2	1/2	0,152
A3	1/2	1/2	1	3	1/2	0,178
A5	1/2	1/2	1/3	1	1	0,126
A5	1/2	2	2	1	1	0,245
CR=	0,010					1,000



Fig. no. 4. Normalization Matrix of Sub Criteria for Logistic Aspects

Table 6 and Fig. no. 4 explain that the criteria for the logistics aspect consisted of 5 (five) sub-criteria. Based on the calculation of the value that has been done, it is found that the sub-criteria that have the greatest total is customer service with a weight value of 0.277; quantification sub-criteria is in the

second position with a weight value of 0.235; inventory management sub-criteria is in the third position with a weight value of 0.230; product selection sub-criteria is in the fourth position with a weight value of 0.139; procurement sub-criteria is in the fifth position with a weight value of 0.118.

Table 7. Pairwise Comparison of Matrix Sub Criteria for Logistic Functions

	F1	F2	F3	F4	F5
F1	1	2	1/2	1/2	1/3
F2	1/2	1	1/3	1/2	1/3
F3	2	2	1	3	1
F4	2	2	1/3	1	1/2
F5	3	3	1	2	1

Table 8. Value Matrix for Logistic Function Sub Criteria

Criteria	F1	F2	F3	F4	F5	weight
A1	1	2	1/2	1/2	1/3	0,130
A2	1/2	1	1/3	1/2	1/3	0,088
A3	2	2	1	3	1	0,299
A5	2	2	1/3	1	1/2	0,168
A5	3	3	1	2	1	0,314
CR=	0,018					1,000

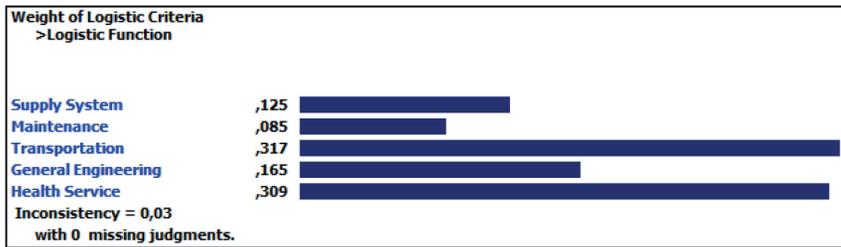


Fig. no. 5. Normalization Matrix of Sub Criteria for Logistic Function

Table 8 and Fig. no. 5 explains that the logistics function criteria consist of 5 (five) sub-criteria. Based on the calculation of the values that has been done, it is found that the sub-criteria that have the greatest total is customer service with a weight value of 0.277; quantification sub-criteria is in the second position with

a weight value of 0.235; inventory management sub-criteria is in the third position with a weight value of 0.230; product selection subcriteria is in the fourth position with a weight value of 0.139; procurement sub-criteria is in the fifth position with a weight value of 0.118.

Table 9. Pairwise Comparison Matrix of Logistics Principle Sub Criteria

	L1	L2	L3	L4	L5	L6	L7
L1	1	1	3	3	4	3	3
L2	1	1	3	2	3	3	3
L3	1/3	1/3	1	1	1/2	2	1
L4	1/3	1/2	1	1	1/2	4	2
L5	1/4	1/3	2	2	1	2	2
L6	1/3	1/3	1/2	1/4	1/2	1	2
L7	1/3	1/3	1	1/2	1/2	1/2	1

Table 10. Value Matrix for Logistic Principle Sub Criteria

Criteria	L1	L2	L3	L4	L5	L6	L7	Weight
L1	1	1	3	3	4	3	3	0,274
L2	1	1	3	2	3	3	3	0,245
L3	1/3	1/3	1	1	1/2	2	1	0,089
L4	1/3	1/2	1	1	1/2	4	2	0,123
L5	1/4	1/3	2	2	1	2	2	0,130
L6	1/3	1/3	1/2	1/4	1/2	1	2	0,072
L7	1/3	1/3	1	1/2	1/2	1/2	1	0,067
CR = 0,048								1,000

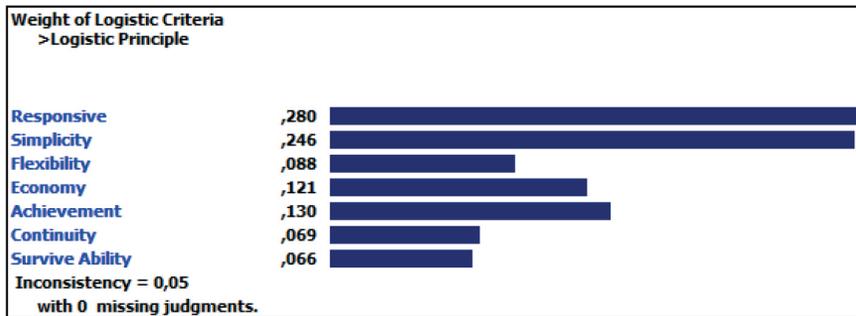


Fig. no. 6. Normalization Matrix of Sub Criteria for Logistic Principle

Table 10 and Fig. no. 6 explain that the criteria for the logistical principle consisted of 7 (seven) sub-criteria. Based on the calculation of the value that has been done, it is found that the sub-criteria that has the greatest total is responsive with a weight value of 0.280; the simplicity sub-criteria is in the second position with a weight value of 0.246; sub-criteria achievement in the third position with a weight value of 0.130;

the economy sub-criteria is in the fourth position with a weight value of 0.121; flexibility sub-criteria is in the fifth position with a weight value of 0.088; continuity sub-criteria is in the sixth position with a weight value of 0.069; the survive ability sub-criteria is in the seventh position with a weight value of 0.066.

After calculating the weight of the criteria and sub-criteria, a weight table can be created below.

Table 11. Weights of Criteria and Sub criteria for Logistics Staff Performance Appraisal

Criteria	Weight	Sub-criteria	Local Weight	Total Weight
LOGISTIC ACTIVITIES	0,261	Customer service	0,299	0,078
		Product Selection	0,152	0,040
		Quantification	0,178	0,046
		Procurement	0,126	0,033
		Inventory Management	0,245	0,064
LOGISTIC FUNCTION	0,328	Supply System	0,130	0,043
		Maintenance	0,088	0,029
		Transportation	0,299	0,098
		General Engineering	0,168	0,055
		Health services	0,314	0,103

Criteria	Weight	Sub-criteria	Local Weight	Total Weight
LOGISTIC PRINCIPLES	0,411	Responsive	0,274	0,113
		Simplicity	0,245	0,101
		Flexibility	0,089	0,036
		Economy	0,123	0,051
		Achievement	0,130	0,053
		Continuity	0,072	0,030
		Survive Ability	0,067	0,028

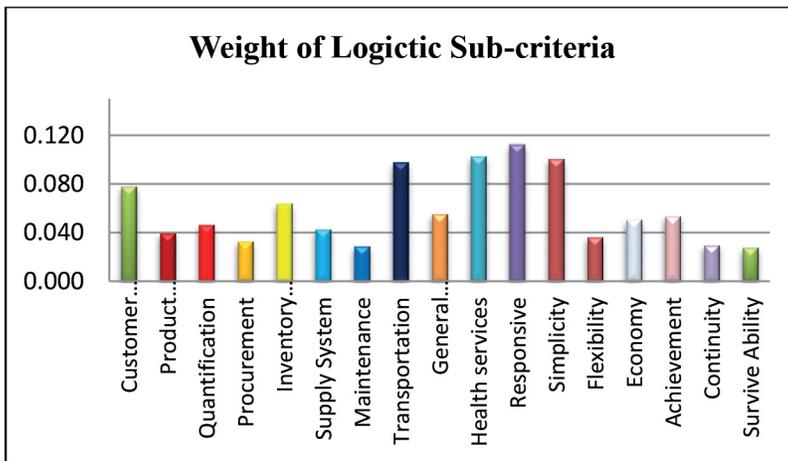


Fig. no. 7. Histogram Weight Criteria and Sub criteria for Logistics Staff Performance Appraisal

After getting the weight of each criterion and sub-criteria, the total weight is selected. Based on Table 11 and Fig. no. 7, after each criterion and sub-criteria is calculated for each intensity based on the total result value, the highest value is obtained, namely the responsive sub-criterion with a weighting value of 0.113; while the lowest value is the survive ability sub-criteria with a weight value of 0.028.

4. CONCLUSIONS

The performance appraisal system in the Logistics environment is still general and not specific so it is necessary to develop a performance appraisal evaluation instrument for logistics staff officers in the TNI environment. Based on the results of the research, it was found that the development of the TNI logistics

staff performance appraisal model consists of 3 (three) criteria, namely logistical activities (A), logistics function (F), and logistical principles (L). Furthermore, logistics activities (A) consist of 5 KPIs (A1-A5), the logistics function criteria (F) consist of 5 KPIs (F1-F5), the logistics principle criteria (L) consist of 7 KPIs (L1-L7).

Based on the calculation of the criteria values that have been carried out by referring to the Key performance indicators, it is found that the criteria that have the largest total are the logistic principle criteria with a weight value of 0.413; logistic function criteria is in the second position with a weight value of 0.327; logistic activity criteria is in the third position with a weight value of 0.260. Furthermore, based on the total result value, the highest score is obtained, namely the responsive sub-criteria with a weight value of 0.113; while the lowest value is the survive ability sub-criteria with a weight value of 0.028.

In the system, each criterion is given a weighted value based on the level of influence of its importance which is then compared. Suggestions that can be conveyed are that it is expected to be used as an evaluation material and can be developed in further research and given an assessment with a Likert scale with predetermined indicators.

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