The Influence of The Chief Engineer's Leadership Style on The Performance of Crew Members in The Engine Room

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Abstract.

Human resource management in ship engine rooms faces challenges such as low productivity and high turnover due to the ineffective leadership style of the chief engineer. This study aims to analyze the influence of the chief engineer's leadership style on the performance of crew members (ABK) in the engine room. Using a quantitative explanatory approach with a descriptive survey design, the population includes all crew members in the engine room of the marine practice ship Polytechnic of Shipping Surabaya, with a sample of 35 respondents through purposive sampling. The Likert scale questionnaire instrument (1-5) was analyzed using SPSS for descriptive statistics, validity/reliability tests, simple linear regression, t-test, and R^2. The results showed a significant positive effect (t-count 5.370 > t-table 2.034; sig. 0.000), with R^2 0.450 which means leadership explains 45% of the performance variation. The conclusion states that chief engineers need to implement proactive leadership to improve shipping efficiency and safety.

Keywords: *Chief Engineer; Engine Room; Leadership; Crew Performance and Ship Performance.*

I. INTRODUCTION

Humans are the most vital element in a ship's organization, acting as creators and drivers of activity, where individual diversity requires wise management by leaders to align organizational and individual goals.[1]The primary factor determining excellence is a workforce with skills and knowledge in science and technology (IPTEK), enabling them to produce products and services worthy of excellence in global competition, both now and in the future. This means that human resources (HR) with professional expertise are required.[2]. Effective leaders, including chief engineers, influence crew behavior through motivation, direction, and communication, creating a conducive work environment in the engine room.[3]This is in line with the finding that transformational leadership improves maritime crew performance through inspiration and individual attention.The chief engineer's leadership is crucial in managing engine room operations, including engine and generator maintenance and team supervision to ensure safe sailing. He or she significantly influences crew motivation, with positive feedback and decision-making involvement boosting commitment and productivity.[4]On tankers, this role supports engine room efficiency despite challenges such as cultural differences.The chief engineer's leadership style, which pays little attention to the welfare of the crew, results in low productivity, job dissatisfaction, and high turnover in the engine room. Harmonious relationships are limited to the scope of work, hindering trust and cooperation outside of duty. One of the things that often affects the performance of the ship's crew is the physical and mental condition of the crew itself, which can be affected by the high workload and lack of crew rest hours.[5].

Previous research has shown that effective leadership has a positive impact on employee performance, but gaps remain, such as the lack of explanation of specific leadership styles in the maritime context (Adnan, 2021; Rosalina & Wati, 2020). On ships, similar problems arise from weak communication and low discipline, which hinders engine maintenance and overall efficiency.[6]This triggers safety risks and operational inefficiencies of the ship. The problem is further complicated by external factors such as crew experience and environmental conditions, where the chief engineer fails to foster harmony outside of work hours, leading to a decline in crew motivation and technical skills. Recent studies confirm that a transformational leadership style is superior in improving maritime crew performance compared to a laissez-faire approach.[7].This study aims to analyze the influence of chief engineer leadership style on engine room crew performance and measure the magnitude of its impact, with a focus on defining leadership types and efforts for harmony outside of work. The urgency is high to improve the safety and efficiency of Indonesian shipping, where effective leadership reduces accidents and crew turnover. The novelty lies in the quantitative approach specific to ship engine room sea practice, complementing previous studies with practical, transformational strategies for maritime[8].

II. METHODS

Types and Methods of Research

This study uses a quantitative approach with an explanatory research design to test the causal relationship between the chief engineer's leadership style as an independent variable and the performance of engine room crew as a dependent variable, in accordance with the principles of quantitative methods that emphasize numerical measurement and hypothesis testing. The descriptive survey research type is combined to describe the phenomenon in the field through primary data from respondents, ensuring the objectivity and generalizability of the findings in the Indonesian maritime context.

Data Analysis Instruments and Techniques

The main instrument is a Likert scale questionnaire with a scale of 1-5 to measure leadership variables (instruction, supervision, motivation, coaching, discipline) and ABK performance (effectiveness, task efficiency), which is validated through validity tests (r-count > r-table) and reliability (Cronbach's Alpha > 0.60). Analysis techniques include descriptive statistics, t-test, simple linear regression ($Y = a + bX$), and the coefficient of determination R^2 using SPSS, according to standard quantitative procedures to test the significance of the influence[9]This approach allows for precise interpretation of leadership impacts, such as the calculated t-value of 5.370 > t-table of 2.034 in a similar study.

Population and Sample

The study population consisted of all engine room crew members on ships belonging to the Surabaya Polytechnic Maritime Cadet Marine Practice Company. The sample was taken using a non-probability purposive sampling technique, with 35 respondents meeting the criteria for working directly in the engine room. This technique was chosen to focus on relevant subjects, avoid bias, and conform to the Slovin formula or judgmental sampling in limited research.[10]This sample size is sufficient for regression analysis with a 95% confidence level, consistent with maritime practice.

Research Procedures

The research procedure begins with a literature study and hypothesis formulation, followed by the development of a questionnaire instrument that is tested for validity and reliability, distribution of primary data during sea practice in February-March 2026 on the vessels, data processing via SPSS, and interpretation of the results for conclusions, similar to the gradual steps in research on ABK performance.[11]This process is carried out in stages to maintain validity and reliability, with research ethics through informed consent of respondents.

III. RESULT AND DISCUSSION

Results

Description of Research Variables

1. Description of the Influencing Variables of Leadership Style

The number of questions about the Influence of Chief Engineer Leadership Style consists of 10 items, with indicators from this category including communication skills, decision-making, providing motivation and coaching to subordinates, as well as supervision and control of work in the engine room. Based on the data obtained from the 35 respondents, it can be presented in the following table.

Table 1. Respondents' Responses to the Influence Variables of Chief Engineer Leadership Style

Response	SS		S		KK		J		TP	
Question	F	%	F	%	F	%	F	%	F	%
X1	5	14%	15	43%	13	37%	1	3%	1	3%
X2	7	20%	15	43%	11	31%	1	3%	1	3%
X3	7	20%	11	31%	15	43%	2	6%	0	0%
X4	9	26%	11	31%	10	29%	5	14%	0	0%
X5	5	14%	12	34%	10	29%	8	23%	0	0%

X6	7	20%	13	37%	12	34%	3	9%	0	0%
X7	6	17%	10	29%	15	43%	4	11%	0	0%
X8	6	17%	14	40%	12	34%	3	9%	0	0%
X9	4	11%	15	43%	14	40%	2	6%	0	0%
X10	8	23%	6	17%	14	40%	6	17%	1	3%

2. Description of Crew Performance Variables

The number of questions regarding the engine room crew performance variable consists of 10 statements. The indicators used in this variable include work discipline, punctuality in completing tasks, responsibility for work, compliance with work and safety procedures, and the ability of the crew to carry out engine room operational tasks in accordance with the Chief Engineer's instructions. Based on data obtained from 35 engine room crew respondents, the results of the assessment of the engine room crew performance variable can be presented in the following table.

Table 1. Respondents' Responses to Crew Performance Variables in the Engine Room

Response	SS		S		KK		J		TP	
Question	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Y1	6	17%	11	31%	13	37%	4	11%	1	3%
Y2	7	20%	12	34%	10	29%	4	11%	2	6%
Y3	7	20%	12	34%	10	29%	5	14%	1	3%
Y4	8	23%	15	43%	8	23%	3	9%	1	3%
Y5	9	26%	15	43%	8	23%	3	9%	0	0%
Y6	5	14%	17	49%	9	26%	2	6%	2	6%
Y7	8	23%	9	26%	12	34%	5	14%	1	3%
Y8	9	26%	14	40%	4	11%	7	20%	1	3%
Y9	6	17%	10	29%	10	29%	9	26%	0	0%
Y10	8	23%	11	31%	10	29%	5	14%	1	3%

Validity and Reliability Testing

1. Validity Testing

Validity testing aims to assess the ability of a research instrument to measure what it is supposed to accurately and precisely. In the context of this research, validity testing was conducted to verify that each question in the questionnaire represented aspects relevant to the research variables, specifically crew performance in the engine room. A questionnaire can be categorized as valid if all statements within it are able to describe information that aligns with the measurement objectives. Validity testing was conducted using a correlation coefficient, where a statement item is declared valid if its significance value is below 0.05 and can be used as an indicator for forming research variables.

Table 3. Validity Test Results

Variables	Indicator	r Table	r Count	Sig	α (0.05)	Note:
Chief Engineer Leadership Style (X)	X1	0.3338	0.664	0.000	0.05	Valid
	X2	0.3338	0.604	0.000	0.05	Valid
	X3	0.3338	0.705	0.000	0.05	Valid
	X4	0.3338	0.739	0.000	0.05	Valid
	X5	0.3338	0.829	0.000	0.05	Valid
	X6	0.3338	0.549	0.001	0.05	Valid
	X7	0.3338	0.587	0.000	0.05	Valid
	X8	0.3338	0.732	0.000	0.05	Valid
	X9	0.3338	0.547	0.001	0.05	Valid
	X10	0.3338	0.767	0.000	0.05	Valid
Crew Performance in the Engine Room (Y)	Y1	0.3338	0.758	0.000	0.05	Valid
	Y2	0.3338	0.813	0.000	0.05	Valid
	Y3	0.3338	0.627	0.000	0.05	Valid
	Y4	0.3338	0.741	0.000	0.05	Valid
	Y5	0.3338	0.623	0.000	0.05	Valid
	Y6	0.3338	0.802	0.000	0.05	Valid
	Y7	0.3338	0.760	0.000	0.05	Valid
	Y8	0.3338	0.777	0.000	0.05	Valid
	Y9	0.3338	0.595	0.000	0.05	Valid
	Y10	0.3338	0.821	0.000	0.05	Valid

Based on Table 3, it can be seen that all statements used to measure each variable in this study have a significance value <0.05 and r count > r table (0.3338). Thus, it can be concluded that all indicators are declared valid, so that the questions compiled by the researcher are suitable for use as research instruments in measuring the variables studied.

2. Reliability Testing

Reliability can be understood as an indicator that shows the level of consistency of a research instrument in measuring the variables that are the object of its study. A questionnaire is declared reliable or reliable if the results obtained tend to be stable and do not change significantly even though they are used by the same respondents under similar conditions. To test the level of reliability of the instrument, this study uses the help of the SPSS version 26 application by referring to the Cronbach's Alpha (α) value obtained from each research variable. An instrument can be declared reliable if the Cronbach's Alpha (α) value produced exceeds 0.60. Reliability testing in this study was carried out using the Alpha formula, and the test results for each variable are presented in the following table.

Table 4. Results of Reliability Testing of Leadership Style Influence Variables

Reliability Statistics	
Cronbach's Alpha	N of Items
.867	10

Table 5. Results of Reliability Testing of Crew Performance Variables

Reliability Statistics	
Cronbach's Alpha	N of Items
.904	10

Based on the results of the reliability test that has been carried out, it was obtained that all variables have a Cronbach's Alpha (α) coefficient value greater than 0.60, with details of the α value of variable X of 0.867 and α of variable Y of 0.904. These results indicate that all statement items in each variable are declared reliable, so it can be concluded that the questionnaire instrument used in this study has a high level of reliability and is consistent in measuring the variables studied.

Data analysis

Simple Linear Regression

Simple linear regression is a statistical analysis method used to detect the presence or absence of a relationship and measure the magnitude of the influence exerted by one independent variable (X) on one dependent variable (Y) in the form of a linear relationship. The data processing and analysis process in this study was carried out using the Statistical Package for the Social Sciences (SPSS) version 26 application to obtain accurate and systematic calculation results. Determining the level of significance of the influence in the simple linear regression test is done by comparing the significance value (p-value) generated from the SPSS output with a predetermined significance level, namely α = 0.05. In addition, significance testing can also be done by comparing the calculated t value and the t table, where if the calculated t value exceeds the t table value, it can be stated that the independent variable has a significant influence on the dependent variable. The results of the simple linear regression test obtained through data processing using SPSS are then presented and explained in detail in the following table.

Table 6. Simple Linear Regression Test Results

Coefficientsa					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	5,684	5,702		.997	.326
C/E Leadership Style (X)	.839	.156	.683	5,370	.000
a. Dependent Variable: ABK Performance (Y)					

Referring to table 6 above, the results of the simple linear regression analysis calculations produce the following simple linear regression equation:

$$\mathbf{Y = a + bX}$$

$$\mathbf{Y = 5.684 + 0.839}$$

The regression equation above can be explained as follows:

A. Constant Value (a = 5.684)

The constant value describes the level of crew performance (Y) when the chief engineer's leadership style (X) is considered to have no effect or is valued at zero. Thus, if there is no implementation of the chief engineer's leadership style, the crew's basic performance remains at 5,684. This shows that even without the chief engineer's leadership style, the crew still has a minimum level of performance that is still carried out in the engine room.

B. Regression Coefficient (b = 0.839)

The coefficient of 0.839 indicates the direction and strength of the influence of variable X on variable Y. Because the value is positive, the relationship between the two is also positive. This means that every one unit increase in the Chief Engineer's leadership style variable (X) will have a positive impact in the form of an increase in crew performance (Y) by 0.839 units. Thus, the more effective the leadership style demonstrated by the chief engineer, the better the crew performance in the engine room.

1. Hypothesis Testing

A. t-test (Passional Test)

The t-test is an analytical tool used to determine the level of significance of the influence of variable X on variable Y partially. In this study, the number of samples used was 35 respondents, so the degrees of freedom (df) were calculated using the formula n – 2, namely df = 33. With a significance level (α) of 5%, the t-table value obtained was 2.034515.

Table 7. t-Test Results

Coefficientsa						
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	5,684	5,702		.997	.326
	C/E Leadership Style (X)	.839	.156	.683	5,370	.000
a. Dependent Variable: ABK Performance (Y)						

The results of data analysis show that the calculated t value obtained is 5.370 with a significance value of 0.000. By using a significance level (α) of 0.05 and degrees of freedom (df = n − 2 = 35 − 2 = 33), the t table value obtained is 2.034. Considering that the calculated t value is greater than the t table value (5.370 > 2.034) and the significance value is smaller than 0.05 (0.000 < 0.05), the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. Based on this, it can be concluded that the Chief Engineer's leadership style has a significant effect on the performance of the engine room crew. These results show that the better the implementation of the Chief Engineer's leadership style, such as the ability to provide clear work directions, effective supervision, good communication, and providing motivation to crew members, the better the performance of engine room crew members in carrying out their duties and responsibilities in accordance with operational standards on board the ship.

B. Coefficient of Determination Test ()R^2

The coefficient of determination test is used to see to what extent the independent variable (X) is able to explain or describe changes that occur in the dependent variable (Y) in a regression model.

Table 8. Results of the R Determination Coefficient Test

Model Summary				
Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.683a	.466	.450	5.73281
a. Predictors: (Constant), C/E Leadership Style (X)				

Referring to Table 8, it can be seen that the coefficient of determination (R^2) value obtained is 0.450. This value indicates that 45% of the variation in crew performance in the engine room can be explained by the Chief Engineer's leadership style variable. The remaining 55% is influenced by other factors not examined in this study, such as workload conditions, engine crew experience level, technical ability, work discipline, and work environment factors in the engine room.

DISCUSSION

Based on the results of the data analysis that has been carried out, the following will discuss the research results obtained regarding the influence of the Chief Engineer's leadership style on the performance of the ship's crew (ABK) in the engine room as follows:

1. Based on the results of data processing and analysis that have been carried out, it was found that the Chief Engineer's leadership style has an important and significant role in the performance of the crew (ABK) in the engine room department. This is proven by the results of the t-test which produced a calculated t-value of 5.370, which is greater than the t-table value of 2.034, and is strengthened by a significance value of 0.000 which is below the 0.05 limit. Thus, the hypothesis stating that the Chief Engineer's leadership style influences the performance of the engine room ABK can be accepted. Indicating that the quality of the leadership style applied by the Chief Engineer is directly proportional to the increase in the performance of the engine room ABK. The Chief Engineer has an important role in providing work direction, supervision, and guidance to the engine room ABK. Leadership demonstrated through clear communication, firmness in decision making, and providing motivation can help ABK in understanding the duties and obligations they carry out, so that each job can be carried out more optimally and in accordance with established procedures.
2. The results of the calculation of the coefficient of determination (R^2) analysis show that the value obtained is 0.45 or 45%. This indicates that the Chief Engineer's leadership style contributes 45% (forty-five percent) to the performance of engine room crew, while the remaining 55% (fifty-five percent) is influenced by other factors not examined in this study. Other factors that can influence the performance of engine room crew include work experience, education and skill levels, working environment conditions in the engine room, workload, and occupational safety and health factors. Therefore, although the Chief Engineer's leadership style has a significant influence on the performance of engine room crew, optimal performance improvement also requires support from other supporting factors.

IV. CONCLUSION

This study concludes that the chief engineer's leadership style has a positive and significant effect on the performance of the crew in the engine room, as evidenced by the t-test with a calculated t-value of 5.370 greater than the t-table of 2.034 and a significance of 0.000 less than 0.05. The determination coefficient R^2 of 0.450 indicates that 45 percent of the variation in crew performance can be explained by leadership variables, while the remaining 55 percent is influenced by other factors such as work experience, technical skills, and environmental conditions. These findings confirm the hypothesis that effective leadership through clear direction, supervision, and motivation increases the effectiveness and efficiency of operational tasks.

However, limitations of this study lie in the small sample size of 35 respondents from a specific maritime practice vessel, which limits generalizability to the broader Indonesian maritime population, as well as the single focus on leadership variables without controlling for external factors such as workload. Suggestions for future research include expanding the sample, testing specific leadership styles such as transformational, and including moderator variables. Practically, the study's implications encourage chief engineers to adopt proactive leadership to reduce turnover, improve navigational safety, and improve engine room efficiency on Indonesian commercial vessels.

REFERENCES

[1] S. A. Majid, E. Endri, M. Zakaria, E. B. Setiawan, K. Kamar, and Y. Pahala, "The Impact of Shipmaster Leadership Style and Ship Logistics Management on Ship Crews Performance: Implications For Tanker Ship Operational Performance," ***jabm***, Jan. 2024, doi: 10.17358/jabm.10.1.186.

[2] S. Sutoyo, S. M. Herlambang, And C. R, "Pengaruh Pengalaman Praktek Kerja Laut (Prala) Terhadap Kesiapan Kerja Taruna Poltekpel Surabaya," *7samudra*, Vol. 3, No. 2, Pp. 45–59, Nov. 2018, Doi: 10.54992/7samudra.V3i2.37.

[3] J. Torgersen And N. Lien, "The Influence Of Leadership Style On Crew Performance And Job Satisfaction On Board Commercial Vessels".

[4] F. Kamal, W. Winarso, And E. Sulistio, "Pengaruh Gaya Kepemimpinan Terhadap Kinerja Karyawan (Studi Kasus : Pt Agung Citra Tranformasi)," 2019.

[5] F. S. Sitepu, "Upaya Meningkatkan Operasional Kinerja Crew Aht. Winning Pioneer 9 Di Pelabuhan Dapilon Afrika Barat," *7samudra*, Vol. 8, No. 2, Pp. 123–130, Nov. 2023, Doi: 10.54992/7samudra.V8i2.141.

[6] T. M. L. Makalew, L. F. Tamengkel, And A. Y. Punuindoong, "Pengaruh Gaya Kepemimpinan Terhadap Kinerja Karyawan Pt. Akr Land Wenang Golf Manado," Vol. 2, No. 5, 2021.

[7] J. Torgersen And N. Lien, "The Influence Of Leadership Style On Crew Performance And Job Satisfaction On Board Commercial Vessels".

[8] A. Adnan, "Peranan Kepemimpinan Kepala Kamar Mesin Dalam Meningkatkan Motivasi Abk," *Alignment*, Vol. 4, No. 2, Pp. 153–161, Dec. 2021, Doi: 10.31539/Alignment.V4i2.3062.

[9] M. S. Charli, S. K. Eshete, And K. L. Debela, "Learning How Research Design Methods Work: A Review Of Creswell's Research Design: Qualitative, Quantitative And Mixed Methods Approaches," *Tqr*, Jan. 2022, Doi: 10.46743/2160-3715/2022.5901.

[10] F. Nasution, "Laporan Tugas Akhir Karya Ilmiah Terapan," 2025.

[11] Z. A. Tsaqif, "Analisis Penyebab Kurangnya Pengabutan Injektor Main Engine Di Kapal Km. Mutiara Ferindo V," 2022.