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Analysis of the Influence of External Environmental Factors, Material Factors, Project Specifications and Team Capabilities on H3I Project Performance Installation of BTS Devices in Mobile Telecommunications Networks

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Abstract:- The purpose of the study was to determine the impact of external environmental elements, material considerations, project specifications, and team capabilities on the project performance of PT Adyawinsa Telecommunications & Electrical. The method of analysis employing regression analysis with SPSS statistical software. Adjusted R Square (R2) is calculated to be 0.772% based on the findings of the regression analysis. 77.2 percent of the variance in the dependent variable firm performance may be explained by internal environmental factors (X1), material factors (X2), project requirements (X3), and team capabilities (X4), whereas 22.8 percent is influenced by variables outside the scope of this study. Calculated F value = 51,655> F table = 2,534 with Sig. F 0.000 < = 0.05, meaning that the internal environmental factors, project specification material factors and team capabilities (X5) simultaneously have an effect on project performance (Y). The results of the t-test indicate that there are 3 independent (free) variables that significantly affect the dependent variable with an error rate of less than 5%. These variables are external environmental factor variables (Sig: 0.015), material factor variables (Sig: 0.000) and project specification variables (Sig: 0.000), while the team capability variable does not significantly affect project performance.

Keywords:- *External Environment, Materials, Project Specifications, Team Capabilities, Performance, Regression Analysis.*

I. INTRODUCTION

PT Adyawinsa Telecommunication & Electrical is a company that provides infrastructure and services for telecommunications. Management regulates the performance of the PT Adyawinsa Telecommunications & Electrical project team by setting monthly objectives. During this phase, the project team also reports on the project's real status. The majority of project performance in 2018 and 2019 fell short of expectations. It is known that the 2018 project performance did not meet expectations. Only one month in 2019 met the management goal for performance, and that was November with a 100 percent score. The majority of project performance in 2018 and 2019 has not been able to fulfill the target, according to this data.

Alamri, Amoudi, and Njie (2017) conducted a study that concluded that project delays were induced by external environmental factors, with weather factors being the most influential. The external environment is one of the indicators that can influence the performance of a project. Unpredictable and fluctuating climate/weather might hinder the efficient implementation of activities. Community disturbances, such as customary conflicts, land acquisition, and so on, are variables that aid in the smooth progression of development, whereas community disturbances impede the progression of development.

According to research conducted by Durdyev, Omarov, and Ismail (2017), material shortages, improper materials, and material supply delays are the root causes of project delays. The research indicates that material shortages, unsuitability, and delivery delays have an impact on project performance. Regarding the availability of materials for work, there are a number of common concerns, such as delays in material delivery, mismatched materials, material shortages, and material loss.

According to the findings of Fissalam (2018), the project specification factor has a substantial impact on project performance. Ideal teamwork on the job site and project management requires an understanding of the work's specifications. The team will find it easier to complete their tasks since they have adapted their resources, skills, and plan to meet the requirements of the project. Four project sites undergo alterations or revisions to the statement of work. SOW (Statement of Work) includes details on the project's objectives, work scope, description, and budget. As a result of having to adapt adjustments to the SOW to actual conditions, such variables can impede the progress of project work on-site.

Fadhillah, Abdullah, and Mubarak (2015) conducted research and presented the results, namely the factors that caused project delays, namely the lack of experts and labor productivity; and Adnan (2009) found that project delays were influenced by incompetent project leaders, inexperienced personnel, and qualified personnel. 11 out of 18 installers and 5 out of 8 engineers lack competence with microwave equipment and a PASS ID and WAH certification, respectively. This demonstrates that there is still a deficiency in team competency for the current project, as all people should ideally possess the skills required for their particular responsibilities.

Based on the identification of these issues, an investigation was conducted to determine the impact of external environmental factors, material factors, project specifications, and team capabilities on the project performance of PT Adyawinsa Telecommunication & Electrical using regression analysis and the SPSS statistical software.

II. RESEARCH METHODS

The purpose of the study was to determine the impact of external environmental elements, material factors, project specifications, and team capabilities on PT Adyawinsa Telecommunications & Electrical's project performance. This research is quantitative in nature. The study's sample consisted of 62 H3I project members. The instrument utilized for data gathering is a questionnaire. Using SPSS statistical tools, this study employs reliability testing, validity testing, descriptive analysis, classical assumption testing, and regression analysis.

Based on the formulation of the problem and the framework above, the hypotheses used in this study are as follows:
Hypothesis 1: The external environment (X1) has an effect on project performance (Y).
Hypothesis 2: Material factor (X2) has an effect on project performance (Y).
Hypothesis 3: Project specifications (X3) affect project performance (Y).
Hypothesis 4: Team Capability (X4) has an effect on project performance (Y).
Hypothesis 5: External environment, material factors, project specifications and team capabilities (X5) affect project performance (Y).

III. RESEARCH RESULTS AND DISCUSSION

A. Descriptive Statistics

Descriptive statistical analysis is a type of calculation used to determine the collected data by researchers. It is expected that descriptive statistical analysis will provide a description of the available data on the variables in the form of average (mean), minimum, maximum, and standard deviation values (Ghozali, 2009). Minimum value for the external environmental factor variable (X1) is 6 and maximum value is 10. The average value of the variable external environmental component (X1) is 8.2903. The value of the external environmental factor variable's standard deviation is 1.116488. The minimum value for the material factor variable (X2) is 12 and the highest value is 15. The average value of the variable material factor (X2) is 13.5645. The value of the material factor variable's (X2) standard deviation is 0.98548. Minimum value for the project specification variable (X3) is 7 and maximum value is 10. The mean value of the variable in the project specification (X3) is 8.2581. The standard deviation of the variable characterizing the project (X3) is 0.90419. The minimum value for the team capability variable (X4) is 8 and the maximum value is 10. The average value of the variable team competence (X4) is 9.5968. The standard deviation of the variable representing team capability (X4) is 0.75660. The minimum value for the performance variable (Y) is 10 and the highest value is 15. The mean performance variable (Y) value is 13.2903. 1.40709 is the standard deviation of the performance variable (Y).

B. Validity and Reliability Test

Validity testing is used to determine the accuracy and accuracy of the data on the questionnaire. The criteria in testing the validity of the data are: If r count > r table (at a significance level of 5%), then the questionnaire items used in the study can be declared valid and vice versa.

Indicator Items	Pearson Correlation	r table	Significance
X1.1	0,934	0,2500	0.000
X1.2	0.790	0,2500	0,000
X2.1	0,904	0,2500	0,000
X2.2	0,921	0,2500	0,000
X2.3	0,524	0,2500	0,000
X3.1	0,821	0,2500	0,000
X3.2	0,885	0,2500	0,000
X4.1	0,933	0,2500	0,000
X4.2	0,951	0,2500	0,000
Y1	0,733	0,2500	0,000
Y2	0,864	0,2500	0,000
Y3	0,842	0,2500	0,000

Table 1: Validity Test Results
Source: Data processed, 2022

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Variable	Value of Croncbach's Alpha
Environmental Internal Factors (X1)	0,621
Material Factor (X2)	0,721
Project Specifications (X3)	0,654
Team Capability (X4)	0,868
Customer Satisfaction (Y)	0,745

Table 2: Reliability Test Results

Source: Data processed, 2022

IV. CLASSIC ASSUMPTION TEST

A. Normality

The normality test analyzes the graph to determine whether or not the data used in the study are regularly distributed. Normality can be determined by examining the distribution of points along the diagonal axis of the graph. The results of the graph indicate that the data is distributed around the diagonal line and follows its direction, indicating that the normalcy condition is met. The normality test produced the following results:

Fig. 1: Normality Test Results

This study's normality test utilizes normal probability plots and histograms. Figure 1 depicts the data scattered around the normal line and following the direction of the normal line or histogram graph, enabling one to deduce from the results of the normality test that the data are normally distributed and satisfy the classical assumption of normality.

B. Multicollinearity

Multicollinearity assumption test denotes that multicollinearity in the independent variables of a single model is not anticipated in the test findings. The multicollinearity test can also be interpreted whenever there is a perfect link between the model's independent variables. If independent factors interact, it is difficult to identify the independent variables that influence the dependent variable. The tolerance value and variance inflation factor (VIF)can be used to determine whether the model demonstrates collinearity. If the tolerance value is larger than 0.10 and the VIF value is less than 10, the regression model is said to be free of multicollinearity issues. The findings of the multicollinearity test are as follows:

Variable	Tolerance	VIF
Environmental Internal Factors (X1)	0,602	1,660
Material Factor (X2)	0,631	1,584
Project Specifications (X3)	0,378	2,643
Team Capability (X4)	0,551	1,813

Table 3: Multicollinearity Test Results

Source: Data processed, 2022

The testing of the multicollinearity assumption can be seen in Table 3 above. The independent variables do not show multicollinearity, as seen in Table 3. The test findings are considered free of multicollinearity if the tolerance value of each independent variable is more than or equal to 0.10 and the variance inflation factor (VIF) value of each independent variable is less than or equal to 10. According to the testing of the multicollinearity assumption, there is no multicollinearity between the independent variables in the regression model used in this study.

C. HETEROSCEDASTICITY

The heteroscedasticity test evaluates the regression model to determine whether the residuals of one observation differ significantly from those of another. To determine whether there is heteroscedasticity, the scatterplot between the predicted value of the dependent variable and the residual is examined. The Y axis of the scatterplot represents the expected Y, whereas the X axis represents the residual. If there is no pattern of dots above and below 0 on the Y axis, the distribution is considered to be heteroscedastic. Figure 3 illustrates the results of the heteroscedasticity test.

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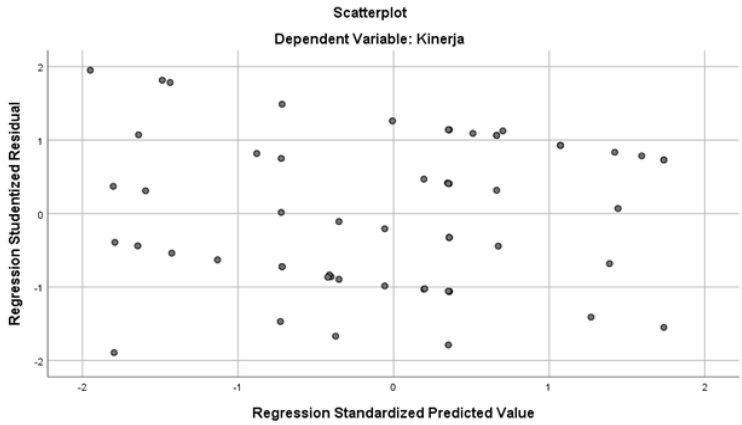

Fig. 2: Heteroscedasticity Test Results

The presence or lack of heteroscedasticity can be determined by examining the graph between the predicted value of the dependent variable (ZPRED) and the residuals (ZRESID). In the absence of a particular pattern and a dispersion of points above and below zero on the Y axis, it can be claimed that the test results lack heteroscedasticity.

Based on Figure 2 and the results of the heteroscedasticity assumption test, it is evident that the regression model does not exhibit heteroscedasticity. The points are randomly distributed above and below 0 on the Y axis and do not create a pattern, hence it can be argued that this regression model is devoid of heteroscedasticity.

D. Hypothesis Test

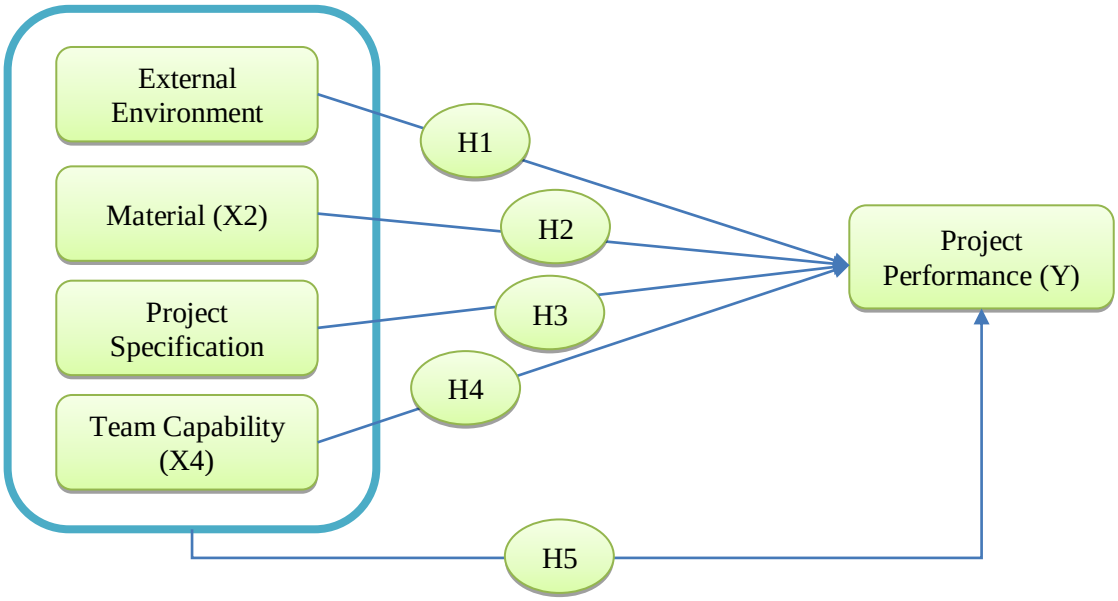

Fig. 4: Variable Relationship Diagram

No.	Research Hypothesis	Conclusion
1	H1 : External environment (X1) has an effect on project performance (Y)	received
2	H2 : Material factor (X2) has an effect on project performance (Y)	received
3	H3 : Project specifications (X3) affect project performance (Y)	received
4	H4 : Team Capability (X4) has an effect on project performance (Y)	rejected
5	H5 : External environment, material factors, project specifications and team capabilities (X5) affect project performance (Y)	received

Table 4: Hypothesis Test Results

Source: Data processed, 2022

The analysis of the research hypothesis testing includes the coefficient of determination test, T test and F test. The results of the coefficient of determination test (R2) show the Adjusted R Square (R2) value of 0.772. These results suggest that the dependent variable of company performance can be explained by the independent variables of internal environmental factors (X1), material factors (X2), project specifications (X3), team capabilities (X4) of 77.2% while 22.8% are influenced by other variables outside of this study. Calculated F value = 51,655> F table = 2,534 with Sig. F 0.000 < = 0.05, it can be concluded that the variables of internal environmental factors (X1), material factors (X2), project specifications (X3), team capabilities (X4) simultaneously have an effect on project performance (Y). The results of the t-test showed that from the four independent variables there were 3 independent variables that significantly affected the dependent variable with an error rate of less than 5%. The independent variables that have an effect are external environmental factor variables (Sig: 0.015), material factor variables (Sig: 0.000) and project specification variables (Sig: 0.000), while the team capability variable does not significantly affect project performance because the significance value is above a value (0 0.05) which is equal to 0.339.

V. EFFECT OF EXTERNAL ENVIRONMENT (X1) ON PROJECT PERFORMANCE (Y)

The investigation demonstrates that the external environment influences project performance. The sigh significance value of the external environment variable is 0.015, which is less than 0.05 with a coefficient value of 0.228, according to the findings of the t test. The impact of external environmental variables on project performance is positive. According to Alamri, Amoudi, and Njie (2017), the cause of project delays is determined by external environmental conditions, with weather being the most influential. The results of the current study are consistent with these findings. The internal environment questionnaire reveals the study's findings, namely weather variations and disturbances in the surrounding environment in the form of conflict. Climate/weather fluctuations can impede the efficiency of work. The weather, for instance, can affect the execution of planned labor operations. The occurrence of rain and storms might impede the distribution of materials, so delaying the completion of the project beyond the anticipated deadline. The organization is required to continue working under unfavorable weather circumstances, which will result in a reduction in project performance quality.

Community disturbances such as customary conflicts, land acquisition, etc. become one of the determining factors for the smooth operation of development operations, as there will be no development activities if disturbances occur. The process of resolving community disturbances takes a very long time and is extremely difficult because not all communities agree instantly, which causes delays in the implementation of the job. Community disturbances, a common occurrence in projects executed by PT. Adyawinsa, also increase expenditure costs. Typically, PT. Adyawinsa Telecommunication and Electrical can only address interference from mass groups if it can pay a particular amount of money to mass organizations or the neighboring community.

VI. EFFECT OF MATERIAL FACTORS (X2) ON PROJECT PERFORMANCE (Y)

Material variables have a favorable impact on the success of the project. It can be seen that the material variable's t value is 0.000, which is less than 0.05 with a coefficient value of 0.470. The findings of the analysis indicate that significant elements affect the performance of the project. According to study conducted by Durdyev, Omarov, and Ismail (2017), the causes of project delays are a lack of materials, the use of incorrect materials, and material delivery delays. The research indicates that material shortages, unsuitability, and delivery delays have an impact on project performance. Material aspects include objectives, requirements and results. The purpose is to determine the location of material procurement and delivery. Requirements, namely the acceptability of the requested and given materials. The outcome is the conformance of the goods' specifications with the requirements. The distribution procedure is one of the most significant operations, particularly for ensuring that the stock of materials distributed to the project site conforms to the agreement.

Checking site addresses, material receipts, and material inspections are all part of the material delivery procedures. If there is material that does not comply with the agreement, the delivery procedure will be delayed because the material will be sent back and replaced with material that is compliant with the requirements. This material delivery procedure influences the performance of the project because, if the material is not in compliance with the objectives, requirements, and results, it will be returned, so hindering the performance of the project.

The outcomes demonstrated that project specifications positively impacted project performance. With a coefficient value of 0.658, it can be seen that the t value of the material variable is 0.000, which is less than 0.05. This is consistent with the findings of Fissalam (2018), who found that the project specification factor had a considerable impact on project performance. Complexity and technical specifications are included in project specifications. The intricacy of the project, including the ease of getting the required materials, has a significant impact on the project's performance. Whether or not there is a stock of material availability, which is impacted by an imbalance between demand and supply, is the source of the project's limited material availability. This necessitates sourcing material sources from different regions. Different regions caused delays in the delivery of materials from other regions, so impeding project progress. The lack of available materials hinders project progress, delaying the project's completion. There will be an increase in the cost of working on the project due to a scarcity of materials, which will have a negative impact on the performance of the project. This circumstance decreases the performance quality of the project.

Projects involving telecommunications are dynamic, dangerous, and multi-complex endeavors with limited processing time that are tailored to the capacity of certain resources. Because each task and project activity has its own

characteristics, standards, and conditions, projects have unique qualities. The project work targets are typically extremely expensive and exceed the available budget, the project work time must adhere to the established timeline, and the project work outcomes must meet the conditions set in the specifications. If the specifications of the completed project work do not match the agreed specifications, it might have an effect on the performance of the project; therefore, it is essential to pay close attention to the agreed specifications.

VII. THE EFFECT OF TEAM CAPABILITY (X4) ON PROJECT PERFORMANCE (Y)

According to research, team capability has no bearing on project performance. Respondents to the study include project teams with a minimum education level of bachelor's degree and more than three years of work experience, indicating that the teams' competencies are of a high caliber. Individual knowledge and experience comprise the team's skills. Team members must be competent, and the team itself must have fundamental knowledge of what to do. The level of education and experience of a worker has little impact on the performance of a project. This is because an employee's level of education does not ensure his performance, since workers with varying levels of education and experience will continue to perform their work to the best of their ability so as to retain their performance. This contradicts the findings of Fadhillah, Abdullah, and Mubarak (2015), who concluded that the lack of experts and labor productivity are the primary causes of project delays; and Adnan (2009), who discovered that project delays were caused by a lack of project leader skills, inexperienced and qualified personnel.

VIII. EFFECT OF EXTERNAL ENVIRONMENT, MATERIAL FACTORS, PROJECT SPECIFICATIONS AND TEAM CAPABILITIES (X5) ON PROJECT PERFORMANCE(Y)

The results showed that the significance value of F was 0.000, greater than 0.05, meaning that the external environment variables, materials, project specifications and team capabilities had an effect on project performance. Hasyim and El Unas (2015) discovered that project performance was affected by a number of factors, including the availability of inappropriate materials, inadequate human resource capacity, irregular availability of construction equipment, changing work, and uncontrollable field conditions (weather, accidents). This is consistent with the findings of this study, which indicate that the external environment, materials, project parameters, and team's capabilities impact project performance. Inadequate material procurement in the conducted research is reflected in the material factor variable. Quantity, quality, and on-site delivery of the necessary supplies or equipment must correspond with the project's specifications. If the aforementioned conditions are not satisfied, it may be disrupted. The planning process for the procurement of materials or tools must include specific requirements, such as quality, quantity, and delivery date, that must be met. Insufficient resources in the conducted research include the team capability variable. To fulfill the project's assigned job, a team must possess the necessary abilities and capacity; if the team lacks the necessary competence and meets the criteria, its performance may be jeopardized. Individual capacity and knowledge criteria are frequently employed in gaining project team selection. The provision of irregular and haphazard construction tools and ongoing work has changed, as has the changing project specification. Untimely completion of project specifications planning can result in material shortages, modifications to project plans during the course of the project, delays, and cost overruns. The more the project's scale, the greater its complexity; hence, a lack of clarity in project work results in cost overruns. The scope of a project must be determined with greater attention and vigilance. To prevent enormous cost overruns, proactive measures must be devised and implemented. Field conditions are incorporated in this study's internal factor variables. Changes in climate/weather and the incidence of unanticipated natural disasters, environmental conditions of the surrounding community and sociocultural conditions, the occurrence of work accidents, accessibility of project sites, and environmental safety are internal issues. Evaluation of risk or anticipatory activities owing to the influence of weather should consider not only the extent of project cost overruns under certain conditions, but also the impact of weather on project success. As the majority of projects involve outside labor, the risk of weather changes is high, and vice versa.

IX. CONCLUSION

The external environment has a significant and favorable impact on the performance of the H3I project for the installation of BTS devices for cellular networks. The interior environment, including weather fluctuations and disturbances in the external world in the form of conflict. Unfavorable weather and environmental circumstances will affect the performance of the project. Material variables have a favorable and substantial impact on the performance of the H3I project for the installation of BTS devices for cellular networks. This material delivery procedure influences the performance of the project because, if the material is not in compliance with the objectives, requirements, and results, it will be returned, so hindering the performance of the project. The project specifications have a good and substantial effect on the performance of the H3I project for the installation of BTS devices for cellular networks. The resultant job requirements do not satisfy the agreed-upon specifications, which can negatively impact the execution of the project; therefore, it is essential to pay close attention to the agreed-upon specifications. Team capability has no effect on the performance of the H3I project for the installation of BTS devices for cellular networks. According to research, team capability has no bearing on project performance. The performance of a project is unaffected by a worker's level of education and experience. This is because an employee's level of education does not ensure his performance, since workers with varying levels of education and experience will continue to perform their work to the best of their ability so as to retain their performance. The performance of the H3I project for the installation of cellular network BTS devices is significantly impacted concurrently by the external environment, material variables, project criteria, and team capabilities. It is proposed that additional study be conducted to broaden the indicator variables and include the variables used. Changing

variables such as customer satisfaction and work safety, for instance, does not have a substantial impact on the execution of the project when team competence is altered.

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