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Analysis of the Factors Causing Delay in Pile Foundation Work for Medium-Story Building Project

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Abstract

Pile work in building construction is generally the first substructure/lower structure construction to be carried out. This is very important to note because delays in execution time at the beginning of the work will have a domino effect on increasing project costs. This study aims to analyze factors that cause delays in pile work (Xi) and on-time performance (Y) in constructing medium-rise buildings in the Jabodetabek area. This study uses the Multiple Linear Regression Analysis Method, with the data and information used are respondents' perceptions through questionnaires and statistically analyzed using the SPSS version 25 program. Simultaneously/together, Design/Planning Factors (X1), Work Implementation Factors (X2), Material Factor (X3), Equipment Factor (X4), and Soil Condition Factor (X8) have an influence contribution of 69% to the Time Performance of pile work in medium-rise building construction projects (Y). While the most dominant factor influencing the cause of delays in pile work in medium-rise building construction projects (Y) is the Soil Condition Factor (X8).

Keywords: delay, pile work, medium-rise building

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1. Introduction

Piles are widely used in Indonesia as building foundations, such as bridges, high-rise buildings, factories or industrial buildings, towers, docks, heavy machinery buildings, etc. All of them are constructions that have and receive relatively heavy loads. The use of piles for construction is usually used when the subgrade under the building does not have the bearing capacity to carry the weight of the building and the load on it, and also when the hard soil is located which has sufficient bearing capacity to carry the weight of the building load on it. Above it lies an intense position.

Construction Substructure/ lower structure work is generally the first structural work to be carried out, for example, excavation, foundation, and so on. This is very important to note because the Delay in the initial execution of the work will have a domino effect on increasing project costs. Likewise, if there is a delay in pile foundation work on a building construction project, it will impact the next series of work. Delays in construction projects will significantly impact the final project objectives, namely the desired cost, time, and quality (Kazaz, Ulubeyli, & Tuncbilekli, 2012).

In previous studies, it knew that the pile foundation work on high-rise building construction projects experienced delays. According to Budi Witjaksana & Achmad Imron (2012), their research found that delays occurred in the implementation of pile foundation work by 125% of the planned schedule. Anjas Handayani & Abid Nur Affani's (2021) study explains that pile foundation work on construction projects has been delayed for + 6 months (Handayani & Affani, 2021). Pile foundation work on the construction of the building is planned for two weeks, experiencing a delay of 5 weeks from the scheduled time (Utomo & Al Qurina, 2020). Other research shows that pile foundation work on building construction projects has been delayed from the planned schedule (Ariyanto, Kamila, Supriyadi, Utomo, & Mahmudi, 2019). This project was postponed due to the delayed procurement of piles, so other activities were delayed. One way to anticipate this Delay is to accelerate (Fazil, Afifuddin, & Abd Rani, 2015).

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In other studies that examine the causes of delays in projects, it is found that the factors that affect time performance include: Improper schedule planning, Errors in planning and specifications, Errors in interpreting drawings or specifications, Poor execution of work stages, Volume of materials sent to the location is not sufficient, Subgrade conditions are different from expected (Caesaron & Thio, 2017), Design errors by planners (Musa & Obaju, 2016), Delays due to change (Kazaz et al., 2012) (Oshungade, 2016), Delay in delivery of materials, Limited availability of materials in the market (Kazaz et al., 2012), Piling tools or piles are not perpendicular, Incompatibility of hammer distance and driving speed for banks, Collapse of pile heads due to not using bearings to absorb driving energy, Poor arrangement for pile execution, Using inappropriate tools, Differences in ground drill data with field conditions, which causes the need for pile connections or completion of driving (Ahmad, Issa, Farag, & Abdelhafez, 2013), Delays due to equipment (equipment), Number of equipment less used (Oshungade, 2016), and abnormal soil conditions (Ghozali, 2018), Poor site layout (Durdyev & Hosseini, 2019).

This study will be known and then analyse the dominant factors directly related to the causes of work delays, especially in pile foundation work for the construction of medium-rise buildings. This is expected to support decision-making that makes it easier for stakeholders to map problems, prioritize constraints, find out the impact of obstacles and find out alternative actions to resolve them. By identifying the dominant factors that are directly related to the causes of work delays, especially in the pile foundation work, the project implementation becomes more controlled.

2. Materials and Methods

The data collection technique in this study was conducted by means of a survey conducted using a questionnaire to respondents with a civil engineering education background who had been directly involved in project implementation activities.

The population of this research data collection is limited to respondents who are directly related to the pile foundation work of the medium-rise building construction project. Respondents who are part of the population in this study can be seen in table 1.

Table 1. Research Respondents

Based on Education	Based on Position	Based on Experience
D3	Owner/Director	Less than 5 years
S1	Project Manager	5 to 10 years
S2/S3	Engineer	11 to 20 years
	Tool Operator	More than 20 years

In this study, samples were taken using a random method so that each element had an equal chance of being selected as a sample member.

This study uses time performance as the dependent variable (Y) because it is the object to be affected. In contrast, the influence/cause variable is the independent/independent variable (X), namely the factors that influence and cause delays in the implementation stage of the pile foundation work. It took the independent variable (X) based on the literature study by taking data from journals or books and the results of field research that had been carried out previously, then validated by experts. The independent variable (X) obtained can be seen in Table 2 below.

Distributing questionnaires to respondents was carried out directly by visiting several construction projects and construction companies in the Greater Jakarta area.

This study uses the Multiple Linear Regression Analysis Method to obtain a comprehensive picture of the effect of the independent/independent variable (X_i) on the dependent/dependent variable (Y). As input for conducting the analysis, the data and information used are the results of the respondents' questionnaires. After the data is collected, the data is analysed statistically using the SPSS version 25 program to determine validity, reliability, classical assumption test, and multiple linear regression analysis.

This study used ordinal data to measure the attitudes or perceptions of respondents about the factors causing delays in the implementation of pile foundations. Respondents' perceptions can be seen in table 3 and table 4.

Table 2. Independent Variables and Indicators Indicator

Variables	Factors Causing Delays
Design/Planning Factors (X1)	Errors in planning and specifications (X1.2) Design errors by planners (X1.3) Delays due to (X1.4)
Factors Work Execution (X2)	Error in interpreting drawings or specifications (X2.1) execution of work stages (X2.2) tool or pile not perpendicular (X2.3) Incompatibility of hammer spacing and driving speed for piles (X2.4) Collapse of the pile head due to not using bearings to absorb driving energy (X2.5) Poor setup for pile execution (X2.6) Poor site layout (X2.7)
Material factor (X3)	Volume of material delivered to site is not sufficient (X3.1) Late delivery of materials (X3.2) Limited availability of materials in the market (X3.3)
Equipment factor (X4)	Delays due to equipment(X4.1) Using inappropriate tools (X4.2) The number of equipment used is less (X4.3)
Soil Condition Factor (X8)	Abnormal soil conditions (X8.1) Differences in ground drill data with field conditions, which causes the need for pile connections or finished driving (X8.2)

Table 3. Ordinal data of respondents' perceptions of the independent/independent variable (X)

Value	Respondents' Perception of Independent/Independent Variable (X)
1	Not influential
2	Less influential
3	Influential
4	Moderately influential
5	Very influential

Table 4. Ordinal data on respondents' perceptions of the Bound/Dependent Variable (Y)

Value	Respondents' Perception of Independent/Independent Variable (X)	If the percentage of delays in piling work in the construction of medium-rise buildings is in the range (Percentage of time performance)
1	Very Bad	More than 15%
2	Not Good	5.1% to 15%
3	Good	1.1% to 5%
4	Fairly Good	0.01% to 1.0%
5	Very Good	0%

3. Results and Discussion

3.1. Descriptive Statistical Analysis

This Research take respondents who are experienced in construction work, so that the answer is expected to be more actual. For this reason, the questionnaires were distributed to contractors/consultants who were carrying out project development. The reality in the field is that it is still during the COVID-19 pandemic, so it is quite difficult to find ongoing projects, so to complete the adequacy of data, we also ask the owner/director, project manager, *engineer*, and tool operator based on project experience that has been handled. The distribution of questionnaires was carried out through *google forms* and some were done manually, so that in general they could be fulfilled. From the implementation of the questionnaire, it was obtained that 30 of the 38 questionnaires were collected, of which 8 of them did not meet the criteria, due to educational reasons and inappropriate positions. The results of collecting questionnaires based on respondents' criteria can be seen in table 5.

3.2. Test Parametric

Test Non-parametric test was conducted to determine the level of differences in understanding based on existing respondent profile data using the SPSS 25 program. The type of test carried out was using the Kruskal Wallis H test, the results of which are shown in table 6.

From the results of the Kruskal Wallis H test above, the p-value > level of significance (α) is 0.05, so it can be concluded that there is no difference in opinion/perception of respondents based on their last education, position and work experience on the research variables.

Table 5. Profile and Number of Respondents

No	Description	Percentage	Amount
1.	Profile based on Last Education		
	DIII	3%	1
	S1	87%	26
	S2/S3	10%	3
	Total	100%	30
2.	Profile based on Position		
	Owner/Director	20%	6
	Project Manager	17%	5
	Engineer	60 %	18
	Equipment Operator	3%	1
	Total	100%	30
3.	Profile based on Work Experience		
	<5 years	10%	3
	5-10 years	50%	15
	11-20 years	23%	7
	>20 years	17%	5
	Total	100%	30

3.3. Reliability test Reliability

Results in the validity test to measure the validity or validity of a questionnaire. The results of the validity test can be seen in table 7.

Coefficient Cronbach's alpha. An instrument can be said to have been reliable in retrieving the desired data if the Cronbach's alpha coefficient value derived from data is greater than 0.6.coefficient Cronbach alpha was calculated using the SPSS 25 program. The results of the reliability test can be seen in table 8.

Table 6. Kruskal Wallis H test results

Variable	Kruskal Wallis H value (p-value)		
	Latest Education	Position	Work experience
X1	1.511	3.503	5.046
X2	4.189	6.575	3.106
X3	3.662	3.238	3.592
X4	2.511	1.057	1.320
X8	2.851	0.490	Questionnaire
Y	1.850	1.366	Data

Table 7. Validity Test Results (SPSS 25)

Var	Description	Value to Total	Value rCount	Value of Sig
X1	Pearson Correlation	.617**	> 0.3494 ; Valid	Sig (2-tailed) < 0.05 and Pearson Correlation positive means that the questionnaire results are valid
	Sig.(2-tailed)	.000		
X2	Pearson Correlation	.752**	> 0.3494 ; Valid	Sig (2-tailed) < 0.05 and Pearson Correlation positive means that the questionnaire results are valid
	Sig.(2-tailed)	.000		
X3	Pearson Correlation	.782**	> 0.3494 ; Valid	Sig (2-tailed) < 0.05 and Pearson Correlation positive means that the questionnaire results are valid
	Sig.(2-tailed)	.000		
X4	Pearson Correlation	.691**	> 0.3494 ; Valid	Sig (2-tailed) < 0.05 and Pearson Correlation positive means that the questionnaire results are valid
	Sig.(2-tailed)	.000		
X8	Pearson Correlation	.626**	> 0.3494 ; Valid	Sig (2-tailed) < 0.05 and Pearson Correlation positive means that the questionnaire results are valid
	Sig.(2-tailed)	.000		

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3.4. Classical Assumption Test

According to (Ghozali, 2018), the classical assumption test on the linear regression model used is carried out in order to know whether the regression model is good or not. The purpose of classical assumption testing is to provide certainty that the regression equation obtained has accuracy in estimation, is unbiased, and is consistent. Before performing the regression analysis, the assumptions were tested first. The assumptions that must be met in the regression analysis include: normality, homoscedasticity, non-autocorrelation, non-multicollinearity, and linearity.

3.4.1. Linearity Test

According to (Sugiyono & Susanto, 2015), the linearity test can be used to determine whether the dependent variable and the independent variable have a significant linear relationship or not. Linearity test can be done through a test of linearity using Curve Estimation. The result is generally obtained that the relationship between X and Y looks linear in Figure 1.

Table 8. Reliability Test Results (SPSS 25)

	Scale Mean if Item Deleted	Cronbach's Alpha if Item Deleted	Decision Reliable if Cronbach's alpha > 0.6
X1.2	64.03333	.893	Realiabel
X1.3	64.00000	.895	Realiabel
X1.4	64.40000	.892	Realiabel
X2.1	64.66667	.894	Realiabel
X2.2	64.63333	.888	Realiabel
X2.3	64.63333	.893	Realiabel
X2.4	64.70000	.889	Realiabel
X2.5	64.63333	.893	Realiabel
X2.6	64.43333	.889	Realiabel
X2.7	64.56667	.893	Realiabel
X3.1	64.36667	.887	Realiabel
X3.2	64.03333	.888	Realiabel
X3.3	64.23333	.885	Realiabel
X4.1	64.20000	.892	Realiabel
X4.2	64.36667	.888	Realiabel
X4.3	64.20000	.892	Realiabel
X8.2	64.66667	.891	Realiabel
X8.3	64.63333	.892	Realiabel

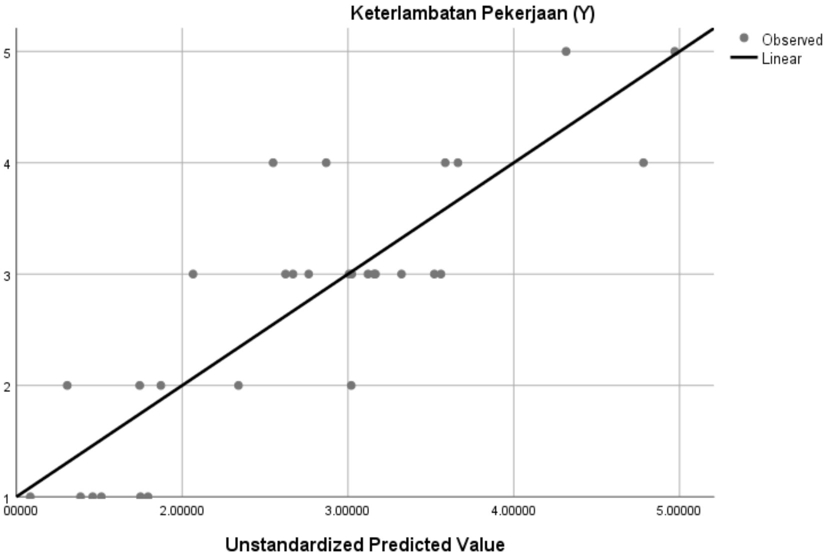

Figure 1. Test of linearity using Curve Estimation

3.4.2. Normality Test

A regression model is said to be normally distributed if the plotting data (dots) that describe the actual data follow a diagonal line (Ghozali, 2018). Figure Normal PP plot of regression standardized residual can be seen in 2. Normality test is used to see the pattern of the error distribution. This test can be done by looking at the error histogram graph in the form of a bell (normal distribution) and the PP-plot (Santosa, 2005). The result of the error histogram graph in the form of a bell can be seen in Figure 3. From Figure 2 and Figure 3 it can be concluded that the Normality Test is fulfilled, where the data is normally distributed.

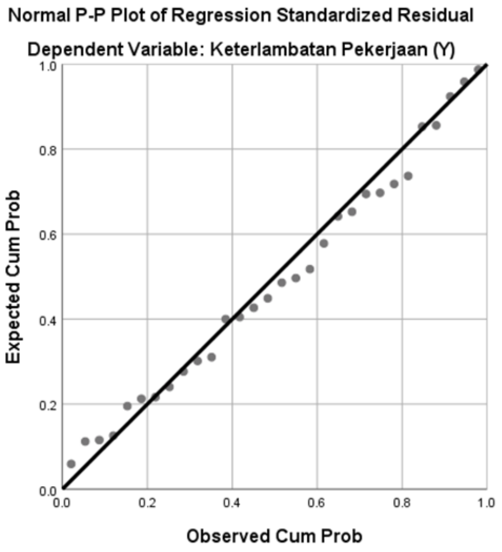

Figure 2. Normal PP plot of regression standardized residual

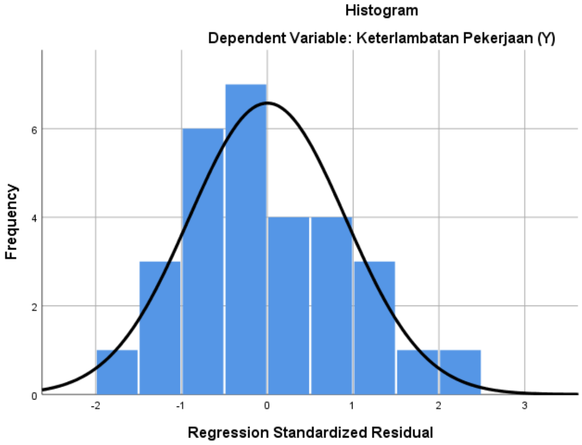

Figure 3. Error histogram graphic

3.4.3. Multicollinearity Test

There is no symptom of multicollinearity, if the tolerance value is > 0.100 and the VIF value is < 10.00 (Ghozali, 2018). The results of the multicollinearity test can be seen in Table 9.

Multicollinearity test results show a *tolerance* > 0.100 and a VIF value < 10.00, it can be concluded that there is no multicollinearity symptom.

3.4.4. Heteroscedasticity Test

There is no heteroscedasticity, if there is no clear pattern (wavy, widening and then narrowing) in the *scatterplots*, and the points spread above and below the number 0 on the Y axis (Ghozali, 2018). The test results show that there is no heteroscedasticity, this can be seen in Figure 4.

Table 9. Multicollinearity Test Results (SPSS 25)

Variable	Collinearity Statistics	
	Tolerance	VIF
Design/Planning Factors (X1)	.741	1.350
Work Implementation Factors (X2)	.830	1.205
Material Factors (X3)	.507	1.971
Equipment Factor (X4)	.497	2.010
Soil Condition Factor (X8)	.517	1.934

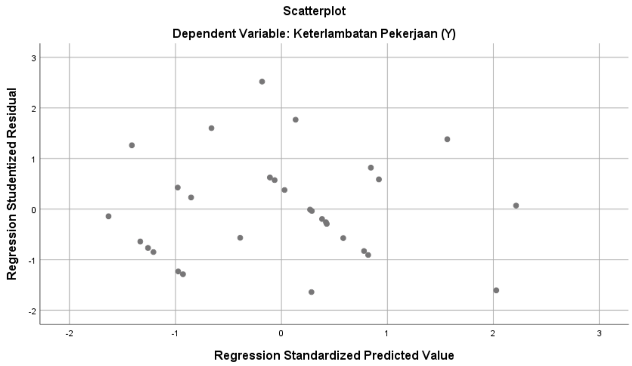

Figure 4. Scatterplots

3.4.5. Autocorrelation Test (Durbin Watson)

There is no autocorrelation symptom, if the Durbin Watson lies between du and (4-du) (Ghozali, 2018). The value of du is searched for the distribution of the values of the Durbin Watson based on the values of k and N with a significance of 5%. Obtained the value of k = 5 (SPSS 25), the value of N = 30 and = 5%.score Durbin Watson 1.777 (SPSS 25), while from the Durbin Watson the values for du = 1.833 and dl = 1.071, because the Durbin Watson is between dl < Durbin Watson < du, the RUNS Test. results RUNS Test obtained Unstandardized Residual Asymp. Sig. (2-tailed) 0.853, where this value is > 0.05, so it can be concluded that there is no autocorrelation symptom.

3.5. Multiple Regression Equation Analysis Multiple

Linear regression analysis was used to determine the direction and how much influence the Design/Planning Factor (X1), Work Implementation Factor (X2), Material Factor (X3), Equipment Factor (X4), and Soil Condition Factor (X8) were used. , to Work Delay/Time Performance (Y). The results of multiple linear regression can be seen in table 10.

Based on the value of the Unstandardized Coefficients column B in **table 10**, the multiple linear regression equation can be written as follows:

$$\mathbf{Y = 3.047 - 0.045\ X_1 + 0.141\ X_2 - 0.053\ X_3 + 0.045\ X_4 - 0.451 X_8}$$

Based on the multiple linear regression equation above, the interpretation can be explained as follows:

a) A positive value indicates a unidirectional effect between the independent variable (X_i) on the dependent variable (Y).

b) These result shows that every time there is a change in the value of the Design/Planning Factor (X1), it will result in the Time Performance (Y) changing by 0.045. Negative values indicate the opposite effect between Design/Planning Factors (X1) with Time Performance (Y).

c) These results show that every time there is a change in the value of the Work Implementation Factor (X2), it will result in Time Performance (Y) changing by 0.141. A positive value indicates a unidirectional influence between Work Implementation Factors (X2) with Time Performance (Y).

d) These results show that every time there is a change in the value of the Material Factor (X3), it will result in the Time Performance (Y) changing by 0.053. Negative values indicate the opposite effect between Material Factors (X3) with Time Performance (Y).

e) These results show that if there is a change in the value of the Equipment Factor (X4), it will result in the Time Performance (Y) changing by 0.045. A positive value indicates a unidirectional influence between Equipment Factors (X4) with Time Performance (Y).

f) This result shows that every time there is a change in the value of the Soil Condition Factor (X8), it will result in the Time Performance (Y) changing by 0.451. A negative value indicates the opposite effect between the Soil Condition Factor (X8) with Time Performance (Y).

Table 10. Linear Regression Test Results Multiple

Model	Unstandardized Coefficients		Sig.
	B	Std. Error	
(Constant)	3.047	.800	.001
Design/Planning Factors (X1)	-.045	.054	.409
Work Implementation Factors (X2)	.141	.026	.000
Material Factors (X3)	-.053	.063	.411
Equipment Factors (X4)	.045	.063	.486
Soil Condition Factor (X8)	-.451	.087	.000

3.6. Coefficient of Multiple Determination (R^2)

From analysis, it is obtained how the independent variable (Xi) can affect the dependent variable (Y). How is the influence and solution of the factors causing delays in pile work on medium-rise building construction projects can be explained based on the multiple linear regression equation above, which simultaneously/together with Design/Planning Factors (X1), Work Implementation Factors (X2). Material Factor (X3), Equipment Factor (X4), and Soil Condition Factor (X8) have an influence contribution of 69% to Work Delay/Time Performance (Y). It can be seen the value of Adjusted R Square = 0.69 in table 11.

Table 11. Results of Coefficient of Determination Test Results

R	R Square	Adjusted R Square	Std. Error of the Estimate
.862^a	.743	.690,653	Hypothesis

3.7. Testing

3.7.1. T-test

Test this test in multiple regression is used to determine whether the regression model of the independent variable partially has a significant effect on the dependent variable. The hypotheses used are:

- H0: Partially insignificant effect on Design/Planning Factors (X1), Work Implementation Factors (X2), Material Factors (X3), Equipment Factors (X4), and Soil Condition Factors (X8) on Work Delay/ Performance Time (Y).

- Ha : Partially significant influence on Design/Planning Factors (X1), Work Implementation Factors (X2), Material Factors (X3), Equipment Factors (X4), and Soil Condition Factors (X8) on Work Delay/Time Performance (Y) .

Decision criteria:

- H0 is accepted and Ha is rejected, if the significance is > 0.05 (not significant).
- H0 is rejected and Ha is accepted, if the significance is < 0.05 (significant effect).

Based on the Sig value in table 10, it can be explained that:

1) Design/Planning Factor (X1), the Sig value is greater than the level of = 5% (0.409 > 0.05), this means that H0 is accepted and Ha is rejected.
2) Work Implementation Factor (X2), the value of Sig is smaller than the level of = 1% (0.000 < 0.01), this means that Ha is accepted and H0 is rejected.
3) Material Factor (X3), Sig value which is smaller than the level of = 5% (0.411 > 0.05), this means that H0 is accepted and Ha is rejected.
4) Equipment factor (X4), the value of Sig is smaller than the level of = 1% (0.486 > 0.05), this means that H0 is accepted and Ha is rejected.
5) Soil Condition Factor (X8), the Sig value is greater than the level of = 1% (0.000 < 0.01), this means that Ha is accepted and H0 is rejected.

3.7.2. F-test

This test is used to determine whether the independent variables together have a significant effect on the dependent variable. The hypotheses used are:

- H0: Taken together, Design/Planning Factors (X1), Work Implementation Factors (X2), Material Factors (X3), Equipment Factors (X4), and Soil Condition Factors (X8) have no significant effect on Work Delay/Time Performance (Y).
- Ha : Taken together, Design/Planning Factors (X1), Work Implementation Factors (X2), Material Factors (X3), Equipment Factors (X4), and Soil Condition Factors (X8) have a significant effect on Work Delay/Time Performance (Y).

Decision criteria:

- H0 is accepted and Ha is rejected, if the significance is > 0.05 (no significant effect).
- Ha is accepted and H0 is rejected if Significance <0.05 (significant effect).

Table 12. Results

Test	Sum of Squares	df	Mean Square	F	Sig.
Regression	29,636	5	5.927	13.905	.000^b
Residual	10,231	24	.426		
Total	39,867	29			

From table 12 obtained the value of sig F-count is (0.000) which is smaller than = 1% (0.01), it means Ha is accepted and H0 is rejected.

3.8. Discussion

Based on the results of the analysis, it can be interpreted:

- Based on the results of the T test, it can be explained that:
  1) Design/Planning Factors (X1) have no significant effect on Work Delay/Time Performance (Y), with a negative coefficient value (-) 0.045.
  2) The Work Implementation Factor (X2) has a significant effect on Work Delay/Time Performance (Y), with a coefficient value of 0.141.
  3) Material factor (X3) has no significant effect on Work Delay/Time Performance (Y), with a negative coefficient value (-) 0.053.
  4) Equipment factor (X4) has no significant effect on Work Delay/Time Performance (Y), with a coefficient value of 0.045.
  5) Soil Condition Factor (X8) has a significant effect on Work Delay/Time Performance (Y), with a negative coefficient value (-) of 0.451.
- Based on the results of the F test, it can be concluded that, together the Design/Planning Factor (X1), Work Implementation Factor (X2), Material Factor (X3), Equipment Factor (X4), and Soil Condition Factor (X8) have a significant effect on delays. Work/Performance Time (Y). Or it can be concluded that the regression equation is good (good of fit) and the predicted value is able to describe the real condition.
- Simultaneously/together Design/Planning Factors (X1), Work Implementation Factors (X2), Material Factors (X3), Equipment Factors (X4), and Soil Condition Factors (X8) have an influence contribution of 69% to work delays /Time Performance (Y).
- Based on the magnitude of its influence on Work Delay/Dependent Variable (Y) seen from the B Value (Unstandardized Coefficients) and the significance value of the Regression Equation (Sig) in **table 10** above, it is obtained that the most dominant factor is the Soil Condition Factor (X8). With the value of Sig. = 0.000 (< 0.01; = 1%) and the value of B (Unstandardized Coefficients) = -0.451.
- From the linear regression equation obtained, the interpretation influence of Factors (Xi) on the Delay in Work/Time Performance Factor (Y) is:
  1) The smaller the value of the Design/Planning Factor (X1), the greater the value of the Time Performance Factor (Y).). This means that the smaller the value of the Design/Planning Factor (X1), the better the project time performance (Y).
  2) The smaller the value of the Work Implementation Factor (X2), the smaller the value of the Time Performance Factor (Y). This shows that the smaller the value of the Work Implementation Factor (X2), the less good the project time performance (Y).
  3) The smaller the value of the Material Factor (X3), it will increase the value of the Time Performance Factor (Y). It means: The smaller the value of the Material Factor (X3), the better the project time performance (Y).
  4) The smaller the value of the Equipment Factor (X4), it will cause a decrease in the value of the Time Performance Factor (Y). Meaning**:** The smaller the value on the Equipment Factor (X4), the less good the project time performance (Y).
  5) The smaller the value of the Soil Condition Factor (X8), it will increase the value of the Time Performance Factor (Y). It means: The smaller the value of the Soil Condition Factor (X8), the better the project time performance (Y).

4. Conclusion

Based on the results of the existing research and discussion, the conclusions that can be drawn are as follows:

a. The factors that influence the performance of the pile work time on a medium-rise building construction project (Y) are Design/Planning Factors (X1) that have no significant effect, Implementation Factors Work (X2) has a significant effect, Material Factor (X3) has no significant effect, Equipment Factor (X4) has no significant effect and Soil Condition Factor (X8) has a significant effect.

b. Simultaneously/together Design/-Planning Factors (X1), Work Implementation Factors (X2), Material Factors (X3), Equipment Factors (X4), and Soil Condition Factors (X8) have an influence contribution of 69% on Time Performance pile work on a medium-rise building construction project (Y).
c. The most dominant factor influencing the cause of delays in pile work in medium-rise building construction projects (Y) is the Soil Condition Factor (X8).

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