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Analysis of the Influence of Contract Change Order on Cost Overrun on the Karanganyar Regency of APBD Road Projects in 2017 and 2018

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ABSTRACT
The abstract should summarize the content of the paper. Try to keep the abstract below 200 words. Do not make references nor display equations in the abstract. The journal will be printed from the same-sized copy prepared by you. Your manuscript should be printed on A4 paper (21.0 cm x 29.7 cm). It is imperative that the margins and style described below be adhered to carefully. This will enable us to keep uniformity in the final printed copies of the Journal. Please keep in mind that the manuscript you prepare will be photographed and printed as it is received. Readability of copy is of paramount importance.
Keywords - About five key words in alphabetical order, separated by comma

I. INTRODUCTION

Infrastructure development is currently very fast, along with the increasing need for the availability of residential space, businesses, diversity of roads, and government buildings. Construction activities start with planning, carried out by the planning consultant according to the request of the project owner and then carried out by the contractor during the construction process.

However, in its implementation in the field, problems often arise, which can result in overall delays in the project completion schedule and have an impact on the final project cost. In essence, the larger the size of a project, the greater the potential for cost overruns due to the unique, complex nature of the project and the involvement of various disciplines in its implementation. Poor performance in construction projects is a common problem worldwide, which results in cost overruns (Azis et al., 2013). According to Remi (2017), a cost overrun is the construction cost of a project which at the implementation stage exceeds the project budget set at the initial stage (estimated), causing significant losses for the contractor.

In a previous study that discussed cost overrun (CO) in Karanganyar Regency, written by Nur Sahid,

M., Ika Setianingsih., Mochamad Sholikhin., and Nia Widiana (2019), resulted in factors that resulted in cost overrun (CO) or cost overruns, namely the cost estimation factor, project finance, and implementation time. Therefore, the researcher wants to try to develop previous research about what the factors are causing the CCO (Contract Change Order) in the APBD road project in Karanganyar Regency for the 2017 and 2018 Fiscal Years. 16 of 2018 Article 54 and Attachment III B. SDP PK PerMen PUPR No. 14 of 2020 articles 36-41 regarding contract changes. So that the research title "Analysis of the Influence of Contract Change Orders on Cost Overrun on the Karanganyar Regency APBD Road Project in 2017 and 2018" is obtained. It is hoped that the writing of this research can control and minimize contract changes and the effects that are sustainable in the future. Through the writing of this research, it is hoped that contractors, consultants, owners, and parties involved in construction services can take appropriate decisions and solutions when contract

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changes are often experienced in construction projects, especially road construction

II. RESEARCH METHOD

This research was conducted using a survey method with the target of contractors who have handled road construction projects sourced from APBD funds in 2017 and 2018 in Karanganyar Regency, Central Java.

This research is a development of Niza Widiana's previous research entitled "Investigation of Cost Overrun Factors by Contractors in the Karanganyar Regency APBD Road Project in 2017 and 2018" by using research tools in the form of an old questionnaire, which was then converted into a new questionnaire with a Likert scale containing several the factors of the influence of the contract change order on the cost overrun to get some respondents' opinions so that the researcher can tabulate the results of the survey, which then performs data processing in several stages of the SPSS statistical test to obtain the research objective, namely, the factors causing the contract change order to the dominant cost overrun.

III. RESULTSANDDISCUSSION

Validity Test

The validity test is useful to determine the validity or suitability of the questionnaire used by researchers in measuring and obtaining research data from the respondents. The Pearson product moment validity test uses the principle of correlating each item score of the questionnaire with the total score of respondents' answers. A questionnaire is said to be valid if the questions on it are able to reveal something that will be measured by the questionnaire. For questionnaire items that are not valid, they are not included in the next test.

Table 1.3:Contract Change Order Validity Test Results

Variable	Value r_{count}	$Valuer_{table}$	Value Sig.	Conclusion
X1.1	1,000	0,3388	0,000	Valid
X1.2	0,433	0,3388	0,013	Valid
X2.1	1,000	0,3388	0,001	Valid
X2.2	0,372	0,3388	0,036	Valid
X3.1	1,000	0,3388	0,000	Valid
X4.1	1,000	0,3388	0,000	Valid
X4.2	0,315	0,3388	0,080	Invalid
X5.1	1,000	0,3388	0,000	Valid
X6.1	1,000	0,3388	0,000	Valid
X6.2	0,579	0,3388	0,001	Valid

Reliability Test

The reliability test was carried out after the questionnaire items were declared valid. The reliability test aims to see whether the questionnaire has consistency if the measurements are carried out using the questionnaire repeatedly. The reliability test can be carried out simultaneously on all questionnaire items in a research variable. From the output of the previous validity test, invalid/not meeting the requirements can be eliminated when conducting a reliability test

Table 1.4: Contract Change Order Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
0,766	9

The classic assumption test

A classical assumption test needs to be done because in the regression model it is necessary to pay attention to deviations from classical assumptions because, basically, if the classical assumptions are not met, then the explaining variables become inefficient. The classical assumption test has several tests, including the normality test, multicollinearity test, and heteroscedasticity test.

Normalcy Check

The normality test aims to test whether the data in the study is normally distributed or not. The test

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used in this study is to look at the normality histogram diagram, the normal graph pp plot of standardized regression and statistical tests with Kolmogorov-Smirnov. The basis for making decisions using the Kolmogorov-Smirnov test (1-Sample K-S) If the Asymp value Sig. (2-tailed) is greater than 0.05, then the research data is normally distributed. Conversely, if the value of Asymp. Sig. (2-tailed) is less than 0.05, then the research data is not normally distributed.

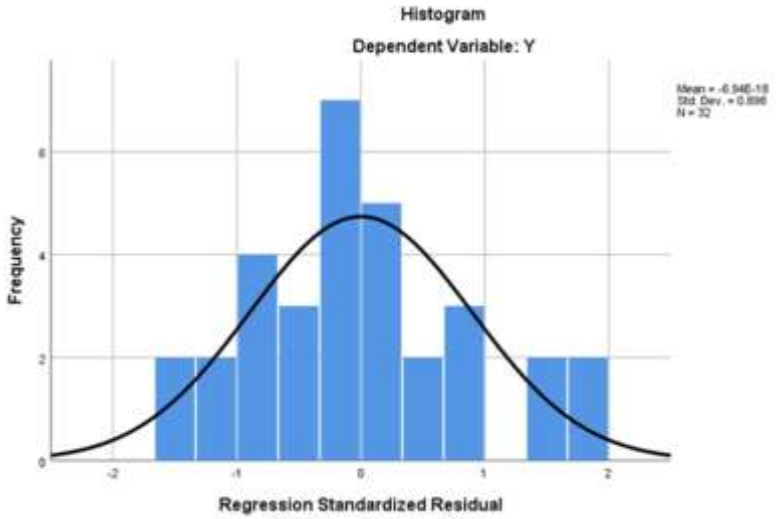

Figure 1.1: Normality Histogram Diagram

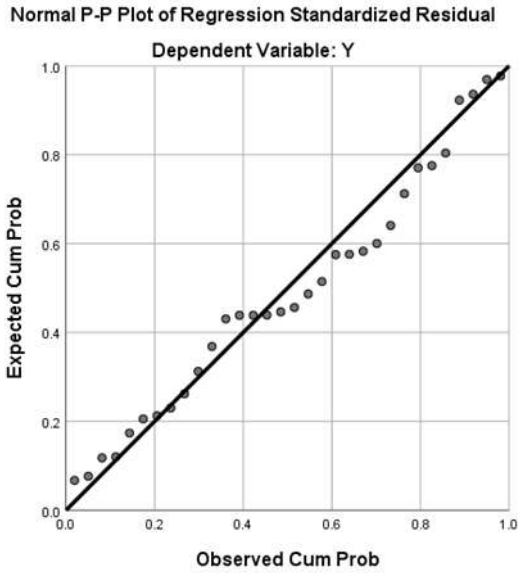

Figure 1.2: Normal PP Plot of Regression Standardized

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One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		32
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.53536297
Most Extreme Differences	Absolute	.107
	Positive	.107
	Negative	-.079
Test Statistic		.107
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Figure 1.3: One-Sample Kolmogorov-Smirnov Test

Multicollinearity Test

A good regression model should not have a correlation between the independent variables. (Ghozali, 2011). A regression model that is free from multicollinearity is a model that has a tolerance value of 0.01 or if the value of the variance inflation factor (VIF) 10.

Table 1.5: Multicollinearity Test Results

Variable	Variance Inflation Factor (VIF)	Tolerance	Conclusion
X1	1,911	0,523	Non Multicollinearity
X2	1,642	0,609	Non Multicollinearity
X3	1,191	0,839	Non Multicollinearity
X4	1,177	0,849	Non Multicollinearity
X5	1,875	0,533	Non Multicollinearity
X6	1,195	0,837	Non Multicollinearity

Heteroscedasticity Test

Heteroscedasticity test aims to assess whether there is an inequality of variance from the residuals for all observations in the linear regression model.

Table 1.6: Heteroscedasticity Test Results

Variable	Value Sig.	Conclusion
X1	0,134	Non Heteroscedasticity
X2	0,000	Heteroscedasticity occurs
X3	0,000	Heteroscedasticity occurs
X4	0,185	Non Heteroscedasticity
X5	0,136	Non Heteroscedasticity
X6	0,047	Non Heteroscedasticity

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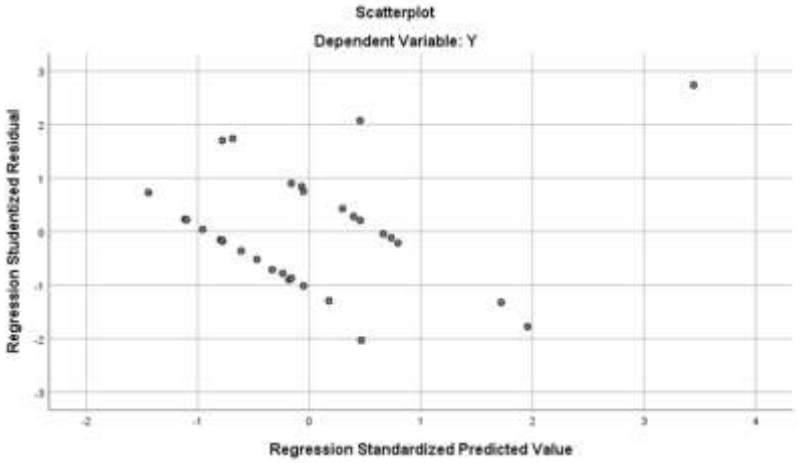

Figure 1.4 : Scatterplot Heteroscedasticity Test Error

Based on the table of heteroscedasticity test results above, it can be seen that the significance value (sig.) for the variables (X1), (X2), and (X3) is less than 0.05 and from the observation of the scatterplot error image that the data spreads above and below or above around the number 0, the dots form a certain pattern, namely parallel straight lines. So there is a symptom of heteroscedasticity.

As an alternative to find out whether the data has hoteroscedasticity or not, it can be done using the glejser test. The working principle of the glejser test is by regressing the independent variable to the absolute residual value or ABS_RES. After the glacier test has been carried out, the data spreads evenly above and below or around the number 0, the points do not collect only above and below and the spread of the dots does not form a certain pattern such as wavy/funnel, forming a wide and then narrowing or forming a line parallel. So it can be concluded that there are no symptoms of heteroscedasticity

Table 1.7: Glejser Test Results

Variable	Value Sig.	Conclusion
X1	0,172	Non Heteroscedasticity
X2	0,330	Non Heteroscedasticity
X3	0,129	Non Heteroscedasticity
X4	0,440	Non Heteroscedasticity
X5	0,471	Non Heteroscedasticity
X6	0,424	Non Heteroscedasticity

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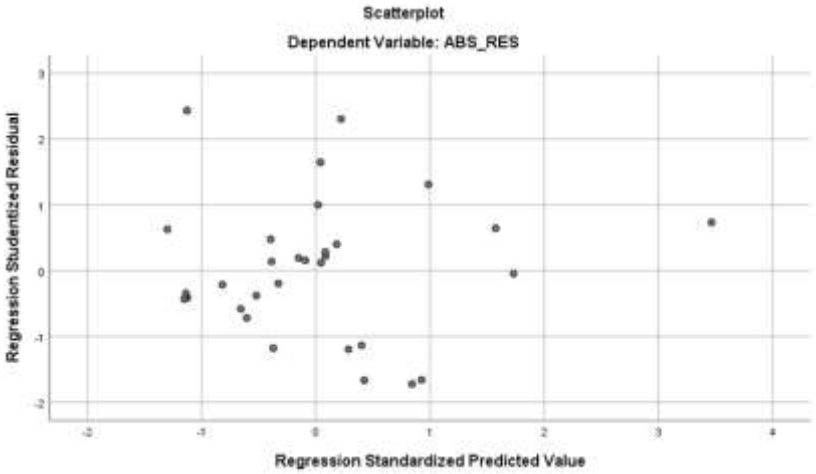

Figure 1.5 : Scatterplot Error Glejser Test

Multiple Linear Regression Analysis Test

Multiple linear regression analysis aims to determine the effect of two or more independent variables (X) on the dependent variable (Y). With this analysis we can predict the behavior of the dependent variable by using the independent variable data. Multiple linear regression analysis is formulated as follows:

Y = a + b1X1 + b2X2 + … bnXn (IV.4)

Description:

Y = estimated value (Y)

X = value of independent variable (X)

a = value at the intersection of the linear line with the vertical axis (Y)

b = the value of the regression coefficient associated with the variable (X)

Having previously tested the classical assumption, the research data has met the requirements of the normality test, multicollinearity test, and heteroscedasticity test. The results of the multiple linear regression analysis in this study are as follows:

Simultaneous Test (f test)

Simultaneous test (f test) was used to determine the effect of all independent/independent variables included in the regression model simultaneously (together) on the dependent/bound variable using a 95% confidence level (e = 5%) which was tested at a significance level of 0 ,05. The test was carried out using the F distribution test, namely by comparing the critical value of F (f table) with the calculated f value contained in the ANOVA table. By looking at the distribution table for the f value, the f table value is 2.47. Because f count = 6.018 > f table = 2.47, so there are independent variables that have a significant effect on cost overruns.

Table 1.8 : Simultaneous F Test Results of CCO Factors

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12,834	6	2,139	6,018	,001[b]
	Residual	8,885	25	0,335		
	Total	21,719	31			

Partial Test (t test)

Partial test (t test) was conducted to see whether each independent/independent variable partially (alone) had an effect on the dependent/bound variable by looking at the results of the data output in multiple linear regression analysis. The test is carried out using the T distribution test, namely by comparing the t table value with the calculated t value. By looking at the distribution table for the t value, the t table value is 2.06. If t count > t table then there are independent variables that have a significant effect on cost overruns

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Table 1.9: Partial T Test Results of CCO Factors

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0,166	0,712		0,233	0,818
X1	0,120	0,078	0,274	1,547	0,134
X2	-0,348	0,085	-0,668	-4,076	0,000
X3	0,485	0,117	0,578	4,138	0,000
X4	-0,196	0,144	-0,189	-1,364	0,185
X5	0,188	0,122	0,270	1,542	0,136
X6	0,149	0,071	0,293	2,091	0,047

Table 1.10: T-Test Results of CCO Factors

Variabel	α	p_{value}	t_{tabel}	t_{hitung}	Con.
X1 Estimating Cost	0,050	0,134	2,06	1,547	TBS
X2 Relationship & Work Implementation	0,050	0,000	2,06	-4,076	TBS
X3 Aspect Document	0,050	0,000	2,06	4,138	BS
X4 Material	0,050	0,185	2,06	-1,364	TBS
X5 Equipment	0,050	0,136	2,06	1,542	TBS
X6 Execution time	0,050	0,047	2,06	2,091	BS

Descriptipon:
TBS = No Significant Effect
BS = Significant Influence

Coefficient of Determination Test (R2)

Based on the R square value of 0.488, it means that the influence of the independent variable (X) on the dependent variable (Y) which can be explained by the regression is 59.1% and the remaining 40.9%
is an influence that cannot be explained by the regression. It could be due to other factors not included in this study.

Table 1.11: Coefficient of Determination of CCO Factors

Model Summary[b]

eModele	eRe	eReSquare	Adjusteds R Squared	Std.eError of the Estimated	Durbin-Watson
1	0,769[a]	0,591	0,493	0,596	1,726

Multiple Linear Regression Analysis Equation

The CCO factor regression model equation by looking at the constant and coefficient values can be obtained the following regression equation:

Y = a + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + e
Y = 0,166 + 0,120X1 – 0,348X2 + 0,485X3 - 0,196X4 + 0,188X5 + 0,140X6 + e

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Discussion of Multiple Linear Regression Analysis

Equations

Discussion of the linear regression equation model of CCO factors

A constant is a fixed value where the constant is a fixed or fixed value that arises due to the influence of the value of the independent variable (X) and the dependent variable (Y). The constant value is 0.166, which means that if all the independent variables from X1 to X8 are constant (zero), then the value of the additional cost (Y) is 0.166. If the constant value is negative, it generally occurs if there is a large enough range between the independent variable (X) and the dependent variable (Y). As long as the slope value is not zero, there is no need to pay attention to this negative constant.

The regression coefficient of the cost estimation variable (incomplete project data and information, errors in design and engineering calculations) (X1) shows a positive (+) value, so that the form of the relationship between cost estimates (X1) and cost overruns (Y) is directly proportional. This means that the addition of a cost estimation factor (X1) in the form of 1 unit will increase the value of cost overruns on road projects in Karanganyar Regency in 2017 and 2018 by 0.120.

The regression coefficient of the relationship and work implementation variable (not good at making schedules and resources, less precise in placing project personnel in the organizational structure) (X2) shows a negative value (–), so the form of the relationship between the relationship and work implementation (X2) and cost overruns (Y) is inversely proportional, which means that a decrease in the relationship and work implementation factor (X2) in the form of 1 unit will increase cost overruns in the APBD road project in Karanganyar Regency in 2017 and 2018 by -0.348.The regression coefficient of the variable aspect of the project document (there are differences in field conditions written in the contract) (X3) shows a positive value (+), so that the form of the relationship between

aspects of project documents (X3) and cost overruns (Y) is directly proportional, which means that the additional project document aspect factor (X3) in the form of 1 unit will increase the cost overrun on the APBD road project in Karanganyar Regency in 2017 and 2018 by 0.485.

The material variable regression coefficient (an increase in material prices, the use of imported materials) (X4) shows a negative value (–), so that the form of the relationship between material (X4) and cost overruns (Y) is inversely proportional, which means that a decrease in material factors (X4) in the form of 1 unit will increase the cost overrun for the APBD road project in Karanganyar Regency in 2017 and 2018 by -0.196.

Equipment variable regression coefficient (performance/capability of equipment is not maximal) (X5) shows a positive value (+), so that the relationship between equipment (X5) and cost overruns (Y) is directly proportional, which means that the addition of equipment factor (X6) in the form of 1 unit will increase the cost overrun on the APBD road project in Karanganyar Regency in 2017 and 2018 by 0.188.

The regression coefficient of the implementation time variable (there is a delay in the schedule due to the influence of weather and natural disasters) (X6) shows a positive value (+), so that the relationship between implementation time (X8) and cost overruns (Y) is directly proportional, which means that the addition of the implementation time factor (X8) in the form of 1 unit will increase the cost overrun on the APBD road project in Karanganyar Regency in 2017 and 2018 by 0.149.

The value of e is an error value, which means that there are variables or factors that have not been detected in this study.

Pearson's Correlation Multiple Linear Regression Analysis

From the Pearson Correlation Value table for the Contract Change Order factor, it can be concluded that 2 dominant factors from the 2 highest values are in the form of document aspects (X3), namely there are differences in field conditions written in the contract, and implementation time (X6), namely schedule delays due to the influence of weather and disasters. natural.

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Table 1.12: Pearson Correlation Factor CCO . value

Variable	Pearson Correlation
X1 EstimatingCost	0,214
X2 Relationship & Work Implementation	–0,168
X3 Aspect Document	0,447
X4 Material	–0,097
X5 Equipment	0,300
X6 Execution time	0,300

Determination of Contract Change Order (CCO) Dominant Factors

At this stage, 3 samples were taken with dominant values from several tests, except the t test. The test results are as follows:

Partial test of individual parameters (t test)

Based on the individual parameter t test, the dominant factors causing the contract change order (CCO) are the relationship and work implementation (X2), project document aspects (X3), and implementation time (X6).

Equation for linear regression

Based on the analysis of linear regression equations that has been carried out, the dominant factors are obtained, namely aspects of project documents (X3) and equipment (X5).

Pearson's correlation value

Based on the table of Pearson correlation values, the dominant aspects of the project document (X3) and implementation time (X6)

Based on the analysis of the results of the t-test, multiple linear regression equations, and the Pearson correlation value, the equation of the most dominant factor that resulted in the occurrence of Contract Change Order (CCO) against Cost Overrun (CO) on the APBD road project in Karanganyar Regency APBD in 2017 and 2018, namely Aspects Project Document (X3), can be seen in the image below:

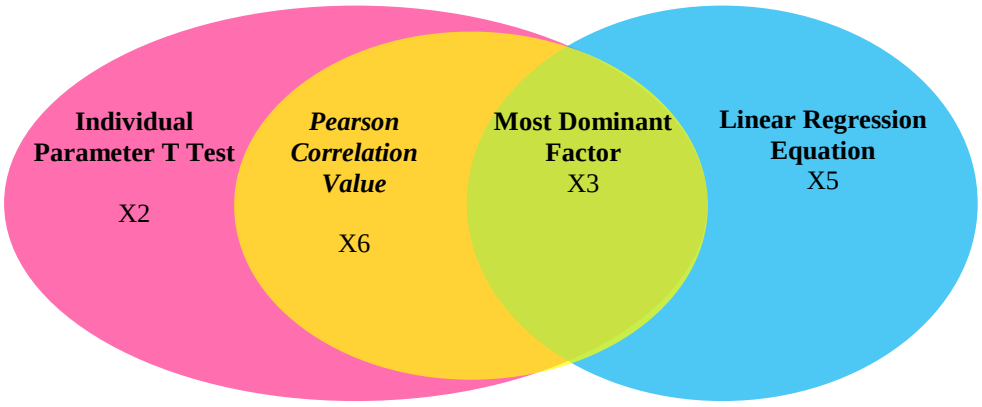

Figure 1.6: Dominant factor of Contract Change Order (CCO)

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Determination of the Influence of Contract Change Order (CCO) on Cost Overrun (CO)

The percentage of each variable is the dominant factor causing the Contract Change Order (CCO) as follows:

The formula for calculating the percentage of each variable is:

$$\text{Effective Contribution (SE)} = \frac{\text{Koefisien Regresi } (\beta)}{\text{Koefisien Korelasi}} \text{x} 100\%$$

t test results

X2 = Relationship & Work Implementation (X2) of 11.22%

X3 = Project Document Aspect (X3) of 25.84%

X6 = Implementation Time (X6) of 8.79%

the results of the multiple linear regression equation

X3 = Project Document Aspect (X3) of 25.84%

X5 = Equipment (X5) of 5.56%

Pearson correlation value

X3 = Project Document Aspect (X3) of 25.84%

X6 = Implementation Time (X6) of 8.79%

Of all the independent variables (X) the most dominant in influencing cost overruns on APBD road projects in Karanganyar Regency in 2017 and 2018 is the project document aspect (X3), namely there are differences in field conditions written in the contract by 25.84%.

IV. CONCLUSION

From the previous discussion, the following conclusions can be drawn:

The results of the test analysis in this study obtained the Contract Change Order (CCO) factors that affect the Cost Overrun (CO) on the Karanganyar Regency APBD road project in 2017 and 2018 as follows:

t test results

X2 = Relationship & Work Implementation (X2) of 11.22%

X3 = Project Document Aspect (X3) of 25.84%

X6 = Implementation Time (X6) of 8.79%

Result of multiple linear regression equation

X3 = Project Document Aspect (X3) of 25.84%

X6 = Equipment (X6) of 5.56%

Pearson correlation value

X3 = Project Document Aspect (X3) of 25.84%

X6 = Implementation Time (X6) of 8.79%

Through the analysis that has been carried out, the most dominant Contract Change Order (CCO) factor that affects Cost Overrun (CO) or cost overruns in the APBD road project in Karanganyar Regency in 2017 and 2018 is the Project Document Aspect (X3), namely there are differences in field conditions written in the contract.

Based on the coefficient of determination resulting from the R square value of 0.488. So, the magnitude of the influence of Contract Change Order (CCO) on Cost Overrun (CO) or cost overruns that can be explained by the regression is 59.1% and the remaining 40.9% is an influence that cannot be explained by the regression.

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