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ANALYSIS OF THE RELATIONSHIP BETWEEN INDIRECT COSTS, BID PRICES AND TIME TAKEN BY SMALL CONTRACTORS IN SIDOARJO DISTRICT

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Abstract

In each construction project, there are numerous essential project parameters, with cost being identified as the most critical factor due to its direct or indirect implications on every decision made. Cost holds significant importance for contractors, especially small contractors, who must strive to submit competitive bid prices while ensuring good construction quality and optimal time management. Therefore, it is imperative for small contractors to carefully evaluate indirect cost expenditures in order to achieve minimal costs without compromising on quality or project duration. This research delves into the correlation between indirect costs, bid prices, and time performance among small contractors in Sidoarjo. The study involves primary data processing and employs analytical methods, including multiple linear regression statistical analysis. The findings suggest that both indirect costs and bid prices have a notable impact on project duration, accounting for 52.4% of the variance in time performance.

Keywords: *Indirect Cost, Project, Linier Regression, Direct Cost, Bid Prices*

1. INTRODUCTION

The construction cost part is made up of two types of costs: direct costs and indirect costs. Direct costs are the expenses that are directly connected to the amount of work being done, like wages for labor, costs for materials, and expenses for equipment. On the other hand, indirect costs are the expenses that don't have a direct connection to the workload but still play a big role in completing the project, such as overhead costs, profits, and unexpected expenses (AACE, 1992).

In general, contractors who are able to estimate costs more accurately will be more successful in dealing with construction cost uncertainty. By minimizing the risk of changes in construction costs, the costs that will be incurred to handle the risk can be reduced so that the bid price becomes more competitive. This tender is one of the important aspects in the business cycle and construction industry to keep the company afloat (Soemardi & Kusumawardani, 2010).

In every Construction project there are several crucial project parameters and cost is ranked as the most crucial parameter. because every decision has implications for cost directly and indirectly. cost is important for contractors (Saini et al., 2021). Indirect costs are part of construction project financing that are not directly related to the volume of the physical components of the final project result, but have a contribution to project completion. Estimating indirect costs is not easy to do when compared to estimating direct costs by referring to drawings and technical specifications. The practice generally

practiced by contractors in Indonesia in determining the amount of indirect costs is weighted in the form of a percentage of direct costs based on previous project experience.

The estimation of indirect cost determination carried out by each contractor in a construction project cost budget design is believed to have no accurate mechanism in determining the amount of each indirect cost variable. Each contractor has its own percentage allocation of indirect costs, which varies depending on the experience of each contractor. Moving on from this study, the idea arose to analyze the factors that influence contractors in determining indirect cost estimates in a construction project cost budget plan (hereinafter referred to as RAB) (Salim & mughni, 2020).

In Indonesia, studies on the calculation of indirect costs in construction activities, especially related to their influence factors, are still very rare (Howay et al., 2022). Among the previous studies conducted by researchers as follows Soemardi & Kusumawardani (2010), Nurdiana (2015), Firdasari et al (2021), Lim et al (2022), Salim & mughni (2020). This study continues the previous research and takes the relationship with the direct cost price of the bid price to the time calculated by the contractor.

One of the efforts that need to be made by contractors, especially small contractors, in obtaining projects is to submit competitive bid prices and good construction quality and optimal time. Therefore, small contractors must examine indirect cost expenditures in order to get minimal costs with maximum quality and optimal time. This study aims to reveal the relationship between indirect costs, bid prices and time performance carried out by small contractors in Sidoarjo.

2. RESEARCH METHODS

The data collected for this research includes information on small contractors in Sidoarjo who are members of the Gapeksindo association. Sampling was the method used to gather this data. The focus of the study is on the indirect cost components utilized by these small contractors in Sidoarjo. The research was conducted in the Sidoarjo district. Data collection techniques involved questionnaires and direct question and answer sessions with individuals who have direct involvement. Data analysis techniques included classical assumption test analysis. For the linear regression test, SPSS software was utilized by the researchers to enhance efficiency and accuracy. Prior to using SPSS, data was organized using Microsoft Office Excel.

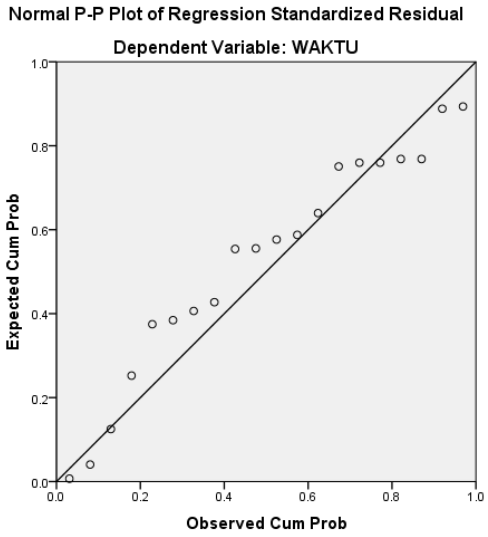
3. RESULTS AND DISCUSSION

3.1. Research Results

3.1.1. Classical Assumption Test and Linear Regression Analysis

This test is intended to analyze several estimates of the resulting valid regression equation. Regression analysis there are several estimates that must be met so that the regression equation obtained will be valid when used to predict (Hajarisman et al., 2023). The discussion of the assumptions in regression analysis is as follows:

a. Normality Test



Source: SPSS Analysis Output, 2023

Figure 1. Normal P-Plot Linear Regression Picture

Table 1. Kolmogorov-Smirnov Test Result

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		20
Normal Parameters[a,b]	Mean	-.0483568
	Std. Deviation	1.05272537
Most Extreme Differences	Absolute	.128
	Positive	.104
	Negative	-.128
Test Statistic		.128
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.

Based on the Kolmogorov-smirnov sample test, the significant value of 0.2 is greater than 0.05, it can be concluded that the data is normally distributed.

b. Multicollinearity Test

Tabel 2. Multicollinearity Test Result

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.251	4.733		.053	.958		
	Indirect Costs	.456	.153	.534	2.975	.008	.871	1.148
	Bidding Price	.513	.276	.333	1.859	.080	.871	1.148

a. Dependent Variable: TIME

The multicollinearity test aims to test whether the regression model finds a correlation between independent variables (independent) to detect the presence or absence of multicollinearity in the regression model if the tolerance is below 0.01 or VIF is above 10, there is multicollinearity based on the table below:

Table 3. Multicollinearity Conclusion

Variable	Tolerance	VIF	Criteria
X1(Indirect Cost)	871	1.148	No multicollinearity
X2 (bidding price)	871	1.148	No multicollinearity

c. Heteroscedasticity Test

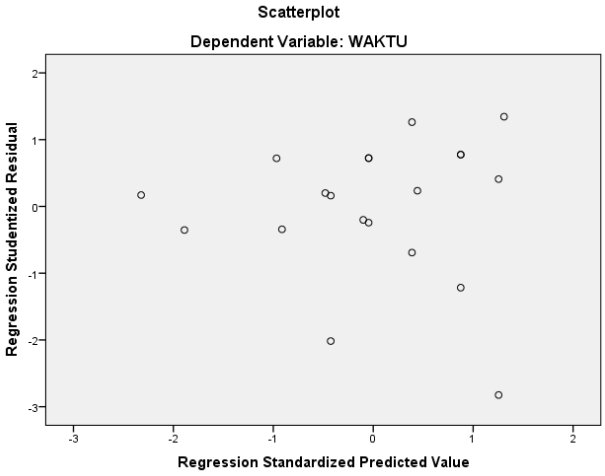


Figure 3. Scatter Plot Results

The picture above shows the distribution of points does not form a certain pattern / groove, so it can be concluded that there is no heteroscedasticity or in other words homoscedasticity occurs.

d. Data Analysis

a) F test

Table 7. F test Result

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.045	2	10.522	9.338	.002[b]
	Residual	19.155	17	1.127		
	Total	40.200	19			

a. Dependent Variable: Time

b. Predictors: (Constant), Bid Price, Indirect Costs

F statistic> F table (there is influence) = 9.338> 3.55

Judging from the sig value of 0.00 <0.05, it shows that each independent variable together has a significant effect on Y. That indirect costs and bid prices affect the project work time.

b) T Test

Table 8. T Test Coefficient Table

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.251	4.733		.053	.958		
	Indirect Costs	.456	.153	.534	2.975	.008	.871	1.148
	Bidding Price	.513	.276	.333	1.859	.080	.871	1.148

a. Dependent Variable: time

Table 9. Conclusion of T Test

Variable	T Value	T Table	Criteria
X1(Indirect Cost)	2.975	2.110	Influence on Y
X2(bidding price)	1.859	2.110	Influence on Y

The regression coefficient value of the indirect cost variable (t statistic) is 2.2975 with a t table of 2.110, the significance of the indirect cost variable on the related variable, namely the work time, is 0.008 or smaller than the alpha value of 0.05. The conclusion is that the value of t statistic > t table and the significance of 0.008 < 0.05 means that the indirect cost variable has a significant effect on time or H1 is accepted and H2 is rejected. While the value of the bid price variable regression coefficient is (t statistic) of 1.859,

with t table 2.110, the significance of the bid price variable on the related variable, namely the work time of 0.080. or greater than the alpha value of 0.05. So it can be said that the value of t statistic < t table and the significance of 0.08 < 0.05 means that the bid price variable has no effect on job time or H1 is accepted and H0 is rejected. So it can be concluded that:

1. Indirect costs affect the project work time
2. Bid price has no effect on project work time
3. Indirect costs and bid prices simultaneously affect project work time.

c) Coefficient of Determination

Table 10. Model Summary[b]

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.724[a]	.524	.467	1.061	2.137

a. Predictors: (Constant), BID PRICE, INDIRECT COSTS

b. Dependent Variable: time

KD = r2 52.4 % influential

Based on the SPSS Output table "Model Summary" above, it is known that the coefficient of determination or R Square is 0.524, the value of R Square 0.524 is derived from the quadratic value of the correlation coefficient or "R", namely 0.724 x 0.724 = 0.524. the magnitude of the coefficient of determination (R Square) is 0.524 or equal to 52.4%. This figure means that the indirect cost variable (X1) and the bid price variable (X2) together affect the Time variable (Y) by 52.4%. while the rest (100-52.4=47.6%) is influenced by other variables outside this regression equation.

The magnitude of the influence of other variables is also called error (e). to calculate the error value we can use the formula e =1-R2. The value of the coefficient of determination or R Square generally ranges from 0-1. However, if in a study we find that R Square is minus or negative, it can be said that there is no influence of variable X on Y. Furthermore, the smaller the coefficient of determination (R Square), it means that the influence of the independent variable (X) on the variable (Y) is weaker. Conversely, if R Square is closer to 1, then the influence will be stronger.

Table 11. Table of Coefficient of Determination

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.251	4.733		.053	.958		

Indirect Costs	.456	.153	.534	2.975	.008	.871	1.148
Bidding Price	.513	.276	.333	1.859	.080	.871	1.148

a. Dependent Variable: TIME

From the SPSS output (Coefficient Determination table) above, the multiple regression equation can be obtained as follows:

$$Y = \alpha + \beta 1\ X2 + \beta 2\ X2$$
$$Y = 251 + 0.456X1 + 0.513X2$$

From the above equation it can be concluded that:

1. Constant a = 256. This means that this number is a constant number which means that if the variable amount of indirect costs (X1) and the bid price (X2) is 0, the time variable (Y) is 256.
2. The regression coefficient value of the variable amount of indirect costs (X1) is positive at 0.456. this figure means that every additional value of 1 unit on the indirect cost variable (X1), the value of the time variable will increase by 0.456 units assuming other independent variables remain.
3. The regression coefficient value of the bid price variable (X2) is positive and equal to 0.513. This figure means that every additional value of 1 unit in the bid price variable (X2), the value of the time variable will increase by 0.513 units, assuming other independent variables are constant.

3.2. Discussion

Based on the regression analysis mentioned earlier, it can be concluded that the impact of indirect costs and bid prices on time performance is relatively small, accounting for only 52.4%. The researcher's observations indicate that indirect costs have minimal influence on the duration of a project. To enhance the time performance of a project, it is crucial to conduct a thorough and separate calculation of indirect costs. The more detailed the calculation of these costs, the more efficient the time performance will be. Therefore, it is essential for the contractor involved in this project to meticulously calculate indirect costs in the future.

On the other hand, the second analysis reveals that bid prices directly affect the project's time performance. This is because bid prices do not consider other costs that could potentially expedite the completion of the project. Additionally, the third analysis demonstrates that both indirect costs and bid prices have an impact on the project's work time. However, it is important to note that the effect of these factors on time performance is relatively small, amounting to 52.4%.

4. CONCLUSION

Based on the analysis and discussion presented earlier, it is evident that the duration of project work is influenced by both indirect costs and bid prices. The impact of these factors on time performance is determined to be 52.4%. By utilizing the model, one can accurately predict the value of Y at alpha (±) 0.05, given the known values of x1 and x2. The regression equation model indicates that for every additional unit of the independent

variable, the dependent variable will increase by 0.524. Furthermore, the hypothesis test (F and T tests) reveals the following: the first indirect cost significantly affects the duration of project work, the second bid price has no impact on the project's timeline, and finally, both indirect costs and bid prices collectively influence the duration of project work.

After sharing the findings from the study, the researcher suggests that future research could explore different statistical methods. Additionally, it is advised to investigate how indirect costs are related to other variables in future studies.

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