Cost Risk Analysis Method for Construction Project in Kuala Tanjung

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Abstract.
The complexity of the project, the severe natural conditions of the oceans, the management of material resources, equipment, labor and costs are risks that must be considered in the process of implementing construction. The Multi Purpose Terminal and Supporting Facility Development Project in Kuala Tanjung in the stage of sea side construction work was experiencing delays and claims for added costs. Inaccurate project cost management will negatively impact the project implementation process. Therefore a risk analysis of project implementation costs is needed so that it can be used as a basis for risk mitigation. The objectives of this research are to identify risks and analyze cost risks in influencing project performance. By using a quantitative method of analysis conducted on 31 cost risk variables by distributing questionnaires to 43 respondents. Based on the results of the analysis and discussion by using of a statistical software program, it was found that the five most dominant risk cost variables affected the project performance of the Construction of the Multi Purpose Terminal and Supporting Facilities in Kuala Tanjung, namely: the mismatch of planning drawings and field conditions, redesign , miss projecting cost flows, material selection is not right and temporary termination of work. Recommendations for improvement of the 5 variables that affect project performance are by comprehensively anticipating tender documents and field conditions.

Key Words: Risk cost, project implementation, identification of risk, Performance

1. Introduction
In accordance with the national development plan, one of the Kuala Tanjung ports is included in the National Strategic Project. The development of the Kuala Tanjung port includes plans to develop multi-purpose terminals and container terminals (international hubs). The Multi Purpose Terminal Development Project and Supporting Facilities in Kuala Tanjung is an open port development project that is used as an export and import infrastructure between countries, but also functions as an inter-island port connecting the islands with the surrounding ports [16]. The complexity of the project, the severe natural conditions of the oceans, the management of material resources, equipment, labor and costs are risks that must be considered in the process of implementing construction. In the implementation of the construction of this port from the results of the November 2018 monthly report, there were delays and claims for adding cost from Contractor to owner. These delays and claims result in additional costs from what was budgeted. Therefore, researchers are interested in analyzing the risk of implementing the Multi Purpose Terminal and Supporting Facilities construction project in Kuala Tanjung. The objective of this study is to identify risks and analyze cost risks
in influencing project performance and also provide recommendations for improvement to contractor for implementing similar projects.

2. Research Methodology
The research methodology is taken after the researcher knows the issues and problems that arise. The method used to identify, analyze and handle the risk of development costs is obtained from primary and secondary data taken from various sources, namely: literature study, journal studies, literature studies. Primary data was collected by distributing questionnaires to 43 respondents from the background of consultants and assigners. Secondary data obtained several variables and after reviewing obtained 31 independent variables related to cost risk and 1 dependent variable related to project implementation performance. [5], [6], [7], [9], [10], [11], [13], [14]; [15] The use of this data is to find out how the relationship of cost risk to the performance of project implementation. The results of respondents' answers were collected, tabulated and analyzed using the SPSS statistical software program.

This research process can be seen from the flow chart below [2], [12]:

3. Discussion
Based on the problem to be solved, an analysis and discussion of the results of the study is carried out as follows: Validation and reliability test, Pearson product moment correlation test and multiple linear regression test with the stepwise method. [3], [12]

3.1. Validity and Reliability Test
Data of the 43 respondents who filled out and returned the questionnaire, they were tabulated as preliminary data. As many as 31 variables X and 1 variable Y, before analyzing the regression data, the validity and reliability tests were first performed using SPSS software. If r count ≥ r table, the question items correlate significantly to the total score (declared valid). The value of r table obtained by knowing the number of respondents used is n = 43 so the r table value of n = 43 is 0.607. Based on the results of the analysis all indicators have r count greater than r table 0.3008. So it can be concluded that all indicators in this study were declared valid. Reliability test is the extent to which the results of measurements using the same object will produce the same data [17]. Based on these definitions, reliability can be concluded reliability as a characteristic associated with accuracy, accuracy, and consistency.
Table 1. Reliability Test Results

| Reliability Statistics |
|------------------------|
| **Cronbach's Alpha**   |
| **N of Items**         |

| .909 | 32 |

Based on the table above, the Cronbach alpha value of the reliability test results is 0.909 meaning that the measurement instruments used in this study are declared reliable because $r = 0.909 > 0.7$, it can be concluded that the 32 valid variables include high reliability.

3.2. Correlation and Interrelation Test

This partial correlation analysis is used to determine the strength of the relationship between the correlation of the two variables where the other variables that are considered influential are controlled or made fixed (as a control variable). The correlation test is used to test whether there is a relationship between variables and other variables. The following is a table of variables that passed the correlation test

| No. | Variabel | Uraian                                               | Nilai r |
|-----|----------|------------------------------------------------------|---------|
| 1   | X9       | Unrealistic project schedule                         | .547**  |
| 2   | X10      | Unprofessional Estimator                             | .551**  |
| 3   | X14      | Productivity low labor                               | .566**  |
| 4   | X15      | limited warehouse storage / stoke material.          | .669**  |
| 5   | X17      | Delays in sub contractor work                        | .574**  |
| 6   | X18      | Delay in the delivery of materials and equipment to the field | .470**  |
| 7   | X19      | redesign                                             | .724**  |
| 8   | X20      | Poor coordination between personnel, as well as between contractors and sub-contractors. | .432**  |
| 9   | X21      | Joint venture contractors lack good coordination and communication | .432**  |
| 10  | X22      | Changes in weather and extraordinary events          | .338*   |
| 11  | X25      | miss projecting cost flows                           | .678**  |
| 12  | X26      | Temporary termination of work                        | .412**  |
| 13  | X29      | Material selection is not right                      | .405**  |

From the table above the independent variables that passed the correlation test there were 13 variables out of 31 independent variables, then the variables that did not pass were 18 independent variables which were not significant. The intercorrelation analysis was performed using the correlation analysis data above which has a coefficient of $r > 0.4$ which results are 13 variables. The results of the intercorrelation analysis of 13 variables included in the research
criteria which means that all the results of the previous correlation test are included in the criteria. Of the 13 variables, the next analysis will be done.

3.3. Regression Analysis
This analysis is used to determine the effect of each independent variable (X) on the dependent variable (Y). The stages of this analysis consist of choosing the regression method, assuming the requirements of the regression analysis and testing the regression model which includes the t test and the F test. At the stage of the regression analysis the first stage is the selection of the regression model using the stepwise method. Stepwise regression involves two types of processes: forward selection and backward elimination. At each stage, the process of deciding which variable is the best predictor is included in the model. This is determined based on a partial F test. If the F-partial value of the variable entered is smaller than the F value of the specified table, the variable is omitted. This process is carried out continuously until there are no more variables that meet the criteria to be added or removed. With the help of SPSS, the following is the result of regression analysis using the stepwise method.

Table 3. Summary model of regression analysis results using the Stepwise method

| Model | R       | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | Durbin-Watson | F Change | df1 | df2 | Sig. F Change |
|-------|---------|----------|-------------------|-----------------------------|-------------------|---------------|----------|-----|-----|---------------|
| 1     | .724a   | .525     | .513              | .409                        | 45.293            |               |          |     |     | .000            |
| 2     | .807b   | .651     | .634              | .355                        | 14.489            |               |          |     |     | .000            |
| 3     | .882c   | .778     | .761              | .287                        | 22.173            |               |          |     |     | .000            |
| 4     | .903d   | .816     | .796              | .265                        | 7.825             |               |          |     |     | .008            |
| 5     | .914e   | .835     | .813              | .254                        | 4.362             |               |          |     |     | .044            |

a. Predictors: (Constant), X19
b. Predictors: (Constant), X19, X25
c. Predictors: (Constant), X19, X25, X29
d. Predictors: (Constant), X19, X25, X29, X26
e. Predictors: (Constant), X19, X25, X29, X26, X12
f. Dependent Variable: Y

Based on the table above, the number of regressions formed is 5 variables forming the model. The model forming variable I can contribute change to Y by 52.5%, the model forming variable II can contribute to change to Y by 12.6%, the model forming variable III can contribute to the change to Y by 12.6%, the forming variable model IV can contribute changes to Y by 3.8%, and the forming variables of model V can contribute changes to Y by 1.9%. The statistical test F (F-Test) basically shows that all independent or independent variables entered in the model have an influence together on the dependent variable [18]. Based on the SPSS application calculation, the calculated F value and the significance value of the F test can be obtained from the ANOVA output table. From the ANOVA output table,
the calculated f test value was 37.464. When compared with the f table value of 2.32, it can be concluded that the f count is greater than the f table 37.464 > 2.32. Thus, the hypothesis can be accepted that cost risk can affect performance. T statistical test in this study was conducted to see how far the influence of one explanatory variable (independent) individually in explaining the variation of the dependent variable. From the results of the t test of the five variables, namely: X19 (redesign), X25 (miss projecting cost flows), X29 (material selection is not right), X26 (temporary termination of work), X12 (not according to planning drawings and field conditions) From the coefficient values of these variables, the regression equation is obtained as follows: 

\[ Y = -1,194 + 0,343X19 + 0,382X25 + 0,437X29 + 0,226X26 + -0,147X12 \]

4. Conclusions

The risk of implementation costs that most influences the cost performance is the mismatch of planning drawings and field conditions, redesign, miss projecting cost flows, material selection is not right, temporary termination of work. Regression test results get results that together have a positive and significant effect on the performance of construction implementation contained in model no. 5 which influences the performance of construction implementation. From this equation can explain Y (project implementation performance) of 83.5% while the remaining 16.5% is explained outside the variables of this research.

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