

The Analysis of Factors Affecting Overdue Contract Period of Maloy Sea Port's Trestle Construction Project in East Kutai Regency, East Kalimantan

Andik Wahyudi, Subandiyah Aziz and Edy Hargono D. Putranto
Department of Civil Engineering, National Institute of Technology, Malang, East Java, Indonesia

Abstract: The Maloy sea port trestle construction project in East Kutai of East Kalimantan in 2014 has overdue on the average of 15% from the contract period. This study aims to find out the factors that influence the overtime contract period and to reveal the most dominant factor and strategies to overcome the problem. The methodology used here is factor analysis and multiple linear regression analysis toward questionnaires that were distributed to 56 respondents of owner, contractor and supervision consultant who were involved in the project. Based on the result of study with F-test, it is found that human resource (X_1), job implementation method (X_2), timeline (X_3), supervision (X_4), equipment (X_5), work environment (X_6), material (X_7) and finance (X_8) have mutual effect on overtime contract period on the Maloy sea port of trestle construction project in East Kutai of East Kalimantan, $F_{count} = 11.297 > F_{table} = 2.140$. However, based on t test partially, the factors that significantly influence the overtime contract period on the Maloy sea port of trestle construction project in East Kutai of East Kalimantan are human resources (X_1), material (X_7) and finance (X_8). The most dominant factor is shown by the highest standardized value of β that is human resources factor (X_1). The strategy to overcome the problem is that the contractor should assign some experts and hire the number of human resources to work based on the skills and needs in carrying out the work and the contractor must have good financial management, regular and timely payment of wages and contractors should send the materials on time, especially, local or non-local materials to the project site.

Key words: Contract period, trestle construction, Maloy, East Kalimantan, strategies, project

INTRODUCTION

The Maloy sea port of trestle construction project in East Kutai is one of the priority programs that has to be completed soon. It is functioned for loading and unloading of CPO (Crude Palm Oil) and as public port serving international loading and unloading activities. The Maloy sea port is provitable for East Kalimantan. It is supported by its position which lies in the archipelagic sea lane of Indonesia II (ALKI II). So, the existence of trestle operation is highly expected. Not only CPO Terminal Maloy sea port has but also coal, cargo, passenger terminal and fishery terminal, so that, continuity and harmony and the completion of the construction of Maloy sea port is important. East Kalimantan has many qualified construction service providers but they cannot guarantee the projects are completed on time. Based on the Province Office of Transportation data, there is a delayed project of Maloy seaport in East Kutai in 2014 which only reaches the progress about 85%.

Based on the observation, the failure of the completion of the Maloy sea port of trestle construction project in East Kutai affects the operational target of the Kawasan Ekonomi Khusus (KEK) of Maloy Batuta Trans Kalimantan, it is caused by the trestle construction of Maloy sea port which determines the plantation sector investment specifically, palm oil.

Most of the researcher articulates to study about the delay causes and factors that contribute to the construction sequence delay for the road infrastructure projects and how one can predict the impact of overdue project on environment (Sudarsana *et al.*, 2014; Ram and Pratheeba, 2015). Few of research on overdue construction time period has been done on port construction (Sukaarta *et al.*, 2012, Raymond *et al.*, 2012). First, Sukaarta *et al.* (2012) stated that there several factors that has a risk of causing delays in trestle construction projects: extreme weather (heavy rain, strong currents, strong winds, lightning), overdue completion of work by sub contractors, sanctions or fines due to delays, the increase of iron prices, concrete aggregate and cement.

While Raymond *et al.* (2012) found that the largest causative group of overdue factors lies in planning and scheduling. While the contribution simultaneously is among the factors of planning and scheduling, procurement, operational, maintenance, repair and external factor of equipment cost.

Based on the formulated problems, the objectives in this study are:

- To analyze the factors that affect the overtime contract period on the Maloy sea port of trestle construction project in East Kutai of East Kalimantan
- To analyze the most dominant factor that affects the overtime contract period on the Maloy sea port of trestle construction project in East Kutai of East Kalimantan
- To determine the strategy that the contractor have to do to overcome unattainable target

The project is a one-off activity with limited time and resources to achieve predetermined outcomes such as products or production facilities. Project activities can be interpreted as a temporary activity that lasts for a limited time by specific allocation of resources and intended to produce products or deliverables whose quality criteria have been clearly outlined (Soeharto, 2001).

MATERIALS AND METHODS

This research used interview survey method by collecting opinion, experience and respondent attitude regarding the problems that have occurred in Maloy sea port of trestle construction project in East Kutai of East Kalimantan. The primary data were taken through questionnaires and secondary data were taken from related institutions.

This study was conducted in Maloy sea port of trestle construction project in 2014. It is located at Teluk Golok Village, Sangkulirang, East Kutai Regency, East Kalimantan Province of Indonesia. The subjects of this study are owner, contractor and supervision consultant who directly involved in the Maloy sea port of trestle construction project in East Kutai of East Kalimantan in 2014, consisting of 65 respondents. The samples are taken randomly using disproportionate stratified random sampling that are as many as 56 samples.

The variables in this study consist of two variables. Independent variables (X) are human resources (X_1), job implementation method (X_2), timeline (X_3), supervision (X_4), equipment (X_5), work environment (X_6), material (X_7) and finance (X_8). The dependent variable (Y) is overtime contract period. Questionnaire results data of the range 1-4 of each variable are re-scored, so that, from each

variable containing several indicators will produce one score which is analyzed by using factor analysis and multiple linear regression analysis. Data processing is done by Statistical Package for Social Science (SPSS) program for windows.

The result of factor analysis to 8 variables suspected as the cause of overtime contract period that will be tested the feasibility of the variable to reveal the relation of the variable or indicator, if the value of MSA < 0.5 will be released then it will be recalculated until it has a value of MSA > 0.5 , so that, the value is feasible to be analyzed for further factor, then it will be extracted into several main factors dimension smaller than the total number of indicators (Ghozali, 2006).

RESULTS AND DISCUSSION

Validity and reliability: Based on the result of validity test by using corrected item-total correlation method that has been done, the result of total score value generated item X_1 , X_2 , X_3 , X_4 , X_5 , X_6 , X_7 , X_8 and Y have value > 0.03 , so, it can be concluded that the result of question is valid.

Based on the reliability test that has been done. It is obtained the value of reliability statistics for each variable: HR (X_1) = 0.682, implementation method (X_2) = 0.650, (X_6) = 0.637, equipment (X_5) = 0.652, work environment (X_6) = 0.630, material (X_7) = 0.684 and finance (X_8) = 0.623. The value of Cronbach's alpha fifth variable is entirely 0.6, so, it can be concluded that the measuring tool in this study is reliable.

Factor analysis: Based on the result of study that has been done to the respondents, it is obtained primary data of human resources, implementation method, timeline, supervision, equipment, work environment, materials and finance and overtime contract (Y).

Overtime contract period (Y): The respondents strongly influenced the overtime contract period in Maloy sea port of trestle construction project in East Kutai of East Kalimantan with the average score of 3.7500.

HR variable (X_1): Human resource factor on the overtime contract period in Maloy sea port of trestle construction project in East Kutai of East Kalimantan is included the category of strongly influential factor with the average score of 3.6250.

Implementation method variable (X_2): Implementation method influenced on the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan with the average score of 2.9166.

Table 1: Multiple linear regression

Models	Unstandardized coefficients (B)	SE	Standardized coefficients (β)	Collinearity statistics			
				Tolerance	VIF	t-values	Sig.
(Constant)	-4.333	1.150				-3.769	0.000
HR	0.685	0.160	0.425	0.739	1.353	4.282	0.000
Implementation method	0.167	0.076	0.198	0.916	1.092	2.216	0.032
Timeline	0.301	0.100	0.262	0.951	1.052	2.997	0.004
Supervision	0.244	0.106	0.207	0.912	1.097	2.311	0.025
Equipment	0.220	0.102	0.189	0.953	1.049	2.162	0.036
Work environment	0.279	0.094	0.280	0.812	1.231	2.962	0.005
Material	0.587	0.158	0.338	0.878	1.139	3.710	0.001
Finance	0.343	0.163	0.214	0.700	1.428	2.100	0.041

Table 2: Correlation coefficient (R) and determination (R²) (Model summary^b)

Model	R	R ²	Adjusted R ²	SE of the estimate	Change statistics					
					R ² change	F change	df1	df2	Sig. F change	Durbin-Watson
1	0.811 ^a	0.658	0.600	0.30165	0.658	11.297	8	47	0.000	1.985

^aPredictors: Constant, finance, supervision, timeline, material, implementation method, work environment, HR, Dependent variable, overtime contract period

Timeline variable (X₃): Timeline influenced on the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan with the average score of 2.9166.

Supervision variable (X₄): Supervision was very influential on the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan with the average score of 3.2634.

Equipment variable (X₅): Equipment was very influential on the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan with the average score of 3.364.

Environment variable (X₆): The respondents agreed that environment affected on the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan with the average score of 3.1027.

Material variable (X₇): The material influenced on the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan with the average score of 3.1027.

Finance variable (X₈): Financial factor was very influential against the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan with the average score of 3.6913.

Multiple linear regression analysis: Calculation of multiple linear regression analysis can be seen in Table 1, to find out the effect of free variable consisting of human resources (X₁), implementation method (X₂), timeline (X₃), supervision (X₄), equipment (X₅), work environment (X₆), material (X₇) and finance (X₈) towards the dependent

variable of overtime contract period of Maloy sea port of trestle construction project in East Kutai of East Kalimantan (Y).

Based on Table 1, the regression coefficients that have been standardized on each variable (β) are as follows:

- Konstanta (β) = -4.333
- HR (X₁) = 0.685
- Implementation method (X₂) = 0.167
- Timeline (X₃) = 0.301
- Supervision (X₄) = 0.244
- Equipment (X₅) = 0.220
- Work environment (X₆) = 0.279
- Material (X₇) = 0.587
- Finance (X₈) = 0.343

Based on the results of the analysis and calculation before, compiled equations or multiple linear regression formulation as follows:

$$Y = -4.333 + 0.685X_1 + 0.167X_2 + 0.301X_3 + 0.244X_4 + 0.220X_5 + 0.279X_6 + 0.587X_7 + 0.343X_8$$

The results showed that the most dominant regression coefficient is the human resource regression coefficient of 0.685.

The analysis used to identify the results of the correlation and determinant among human resources (X₁), implementation method (X₂), timeline (X₃), supervision (X₄), equipment (X₅), work environment (X₆), material (X₇) and finance (X₈) which simultaneously have significant effect of the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan as the summary model calculation in particular numbers R and R² in Table 2.

Table 3: Simultaneous effect testing of ANOVA (ANOVA^a)

Model (1)	Sum of squares	df	Mean square	F-value	Sig.
Regression	8.223	8	1.028	11.297	0.000 ^b
Residual	4.277	47	0.091		
Total	12.500	55			

^aDependent variable: Overtime contract periode; ^bPredictors: (Constant), finance, equipment, supervision, timeline, material, implementation method, work environment, HR

Table 4: Partial effect testing

Model (1)	Unstandardized coefficients (B)	SE	Standardized coefficients (β)	t-values	Sig.
Constant	-4.333	1.150		-3.769	0.000
Human resources	0.685	0.160	0.425	4.282	0.000
Material	0.587	0.158	0.338	3.710	0.001
Finance	0.343	0.163	0.214	2.100	0.041
Timeline	0.301	0.100	0.262	2.997	0.004
Work environment	0.279	0.094	0.280	2.962	0.005
Supervision	0.244	0.106	0.207	2.311	0.025
Equipment	0.220	0.102	0.189	2.162	0.036
Implementation method	0.167	0.076	0.198	2.216	0.032

Table 2 clearly figures out the value of R (correlation coefficient) or the level of relationship between variables is equal to 0.811 or equal to 81.10% which indicates a relatively strong relation with values that are on the scale criterion >0.75-0.99.

It also shows that human resources, implementation method, timeline, supervision, equipment, work environment, material and finance are strongly related to the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan.

However, the level of influence or number R square/R² (coefficient of determination) is equal to 0.658. It shows that the non-completion of the construction contract period in Maloy sea port of trestle construction project in East Kutai of East Kalimantan can be explained by using the variables of Job implementation method, timeline, supervision, equipment, work environment, material and finance 65.8% while 34.20% is caused by other variables outside the model and does not examined in this study as well as the error factor.

F-test (simultaneous): The effect of human resources, implementation methods, timelines, supervision, equipment, work environment, material and finance simultaneously towards the overtime contract period can be proved in two ways.

Comparing the number of F_{count} and F_{table} : Based on the calculation Table 3, it is obtained F_{count} of 11.297 > F_{table} 2.140, so, H_0 is rejected and H_1 is accepted. Therefore, there is linear relationship between human

resources, implementation methods, implementation timeline, supervision, equipment, work environment, material and finance towards the overtime contract period. Thus, the regression model has been feasible and correct.

The magnitude of influence is 65.80% and the influence of other variables of regression model and also the error factor is 24.20%. Comparing the level of significance level (Sig.) of study with a significance level of 0.05 ($\alpha = 5\%$).

Based on the calculation of significance, it is obtained $0.001 < 0.005$. So, H_0 is rejected and H_1 is accepted. It can be concluded that there is linear relationship between human resources, implementation method, implementation timeline, supervision, equipment, work environment, material and finance towards overtime contract.

Uji T (Parsial): To see the effect of implementation method, timeline, supervision, equipment, work environment, material and finance of overtime contract period partially or individually used t-test while to see the amount of influence used beta or standarized coefficient figure in Table 4.

Based on Table 4, it can be interpreted that among implementation method, timeline, supervision, equipment, work environment, material and finance have a significant effect on the non completion of contract time.

Based on the results of the calculation, it can be calculated t_{count} compared to t_{table} by significance level of α 0.05 ($\alpha = 5\%$). The conclusion and the dominant variables can be described in Table 5.

Based on the Table 5 interpretation, it can be concluded that partial or independent variables consisting

Tabel 5: Interpretation of partial effect testing

Variables	t-count	t-table (df = n-k-1)	Sig. t ($\sigma = 0.05$)	Standardized coefficients	Conclusion
Human resources	4.282	2,013	0.000	0.425	Significant
Implementation method	2.216	2,013	0.032	0.198	Significant
Timeline	2.997	2,013	0.004	0.262	Significant
Supervision	2.311	2,013	0.025	0.207	Significant
Equipment	2.162	2,013	0.036	0.189	Significant
Work environment	2.962	2,013	0.005	0.280	Significant
Material	3.710	2,013	0.001	0.338	Significant
Finance	2.100	2,013	0.041	0.214	Significant

of: implementation method, timeline, supervision, equipment, work environment, material and finance have proven significant effect on non-completion of contract time.

CONCLUSION

Based on the results discussed in the previous chapter, it can be concluded that: Based on the F-test it is found that the simultaneously factors (X_1)-(X_8) affect the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan by $F_{count} = 11.297 > F_{table} = 2.140$. However, based on partially t-test, the factors that significantly influence the Maloy sea port of trestle construction project in East Kutai of East Kalimantan are human resources (X_1) by $t_{count} = 4.282 > t_{table} = 2.013$, implementation method (X_2) by $t_{count} = 2.216 > t_{table} = 2.013$, timeline (X_3) by $t_{count} = 2.997 > t_{table} = 2.013$, supervision (X_4) by $t_{count} = 2.311 > t_{table} = 2.013$, equipment (X_5) by $t_{count} = 2.162 > t_{table} = 2.013$, work environment (X_6) by $t_{count} = 2.962 > t_{table} = 2.013$, material (X_7) by $t_{count} = 3.710 > t_{table} = 2.013$ and finance (X_8) by $t_{count} = 2.100 > t_{table} = 2.013$.

The most dominant factor affecting the overtime contract period on Maloy sea port of trestle construction project in East Kutai of East Kalimantan is human resource factor (X_1) by the value of β coefficient of 0.425.

The strategy to overcome the overtime contract period in Maloy sea port of trestle construction project in East Kutai of East Kalimantan:

Human resources:

- The contractor must hire qualified human resources who have great responsibility to complete the work
- The contractor must hire skilled human resources and provide training and direction regularly
- The contractor must hire the number of human resources to work based on the skills and needs in carrying out the work

Material:

- Contractor must send the materials soon, especially, local and non-local materials to the project site

- The Contractor must plan for the provision of materials as required
- The contractor must take samples and check the quality of the materials before it is sent

Work environment:

- The contractor must control the condition of project location and quarry associated with the location of the materials
- Contractor and workers must pay attention to the weather or they may have coordination to the weather information provider (BMKG) and make accelerations work when the weather is good
- Contractor has to be able to balance the field activities by considering the social condition of the surrounding community

Based on the results of the analysis, the researchers suggest to the relevant parties (owner, contractor and supervision consultant) to pay attention to the following matters:

- To conduct analysis of the needs of experts who are assigned in the field of the specifications and responsibilities
- To evaluate the material and immediately send the material (stock material), so that, work performance can run well
- To balance and synergize the implementation of the project's keenness with the orientation of local communities to avoid conflict
- Contractor should pay attention to work procedures, so that, the work can be done efficiently and effectively

REFERENCES

- Ghozali, I., 2006. Application of Multivariate Analysis with SPSS Program. Badan Penerbit Universitas Diponegoro, Semarang, Indonesia,.
- Ram, A. and P. Pratheeba, 2015. Study on construction sequence delay for road infrastructure projects. IOSR. J. Mech. Civ. Eng., 12: 15-21.

- Raymond, P.D., F.S. Bonny and T. Huibert, 2012. Factor analysis causes equipment cost overrun on dock construction project in North Sulawesi. *Media Eng.*, 2: 153-162.
- Soeharto, I., 2001. *Construction Project Management*. Penerbit Erlangga, East Jakarta, Indonesia,.
- Sudarsana, D.K., H. Sulistio, A. Wicaksono and L. Djakfar, 2014. A study of safe and green infrastructure on road reconstruction project. *Adv. Environ. Biol.*, 1: 616-621.
- Sukaarta, I.W., S.F. Bonny and T. Huibert, 2012. Risk analysis of trestle dock project. *Media Eng. J.*, 2: 257-266.