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Research Paper

The Analysis of Influential Factors on the Delay of Dredging Work at Rebaq Rinding River Line in Kutai Kertanegara Regency, Indonesia

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ABSTRACT: *Along with fast progress of industrial world, particularly in the building construction project which also increasing rapidly, the difficulty level in managing and implementing construction projects also rising where the higher the difficulty the longer the time required to complete the project. A delay in work implementation is evident from the work package of Dredging Work Project for Rebaq Rinding River at Muara Muntai District of Kutai Kertanegara Regency. Thus, this research was performed to determine factors that influence project delays. The selected data analysis method was a factor analysis and multiple linear regression analysis from the questionnaire answers that distributed to 45 respondents ranging from the service users, contractors, and consultants involved in the Dredging Work Project in Rebaq Rinding River at Muara Muntai District of Kutai Kertanegara Regency which experienced delays. According to the result of this research, factor that has significant influence to project delays is factor of Work Implementation Method with value of* $t_{count} = 3.162 >$ *from* $t_{table} = 2.028$*, and based on T test, it was found that the most dominant factor is the factor of Work Implementation Method with ß value = 0.646. The strategy used in dealing with project delays are: prior to the beginning of work implementation, implementation schedule must be prepared in accordance with the rational work stages and the work stages implementation must follow the planned method.*

KEYWORDS: *Project Delay, Project Implementation, Project Scheduling and Project Strategy*

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I. INTRODUCTION

According to Presidential Decree No.102 of 2022, transportation defines as a sector which plays essential role in supporting any regional development in aspects of political, economy, social and cultural growth, also defense and security. Transportation is very necessary for public because mobilization of people and materials or goods from one place to another requires transportation infrastructure and transportation vehicles whether private or public transportation, so, it is important to create available transportation services which meet the transportation demand with an orderly, comfortable and high-speed services that organized in an integrated manner at the national level. [1,2]

Kutai Kertanegara Regency is an area where at its territory lies Hulu Mahakam district that has river area which gave way to river transportation as a very dominant transportation means. Shipping way/shipping channel is the part of waters that seen from its depth, width, and situation is free from any shipping obstacles and considered as safe and secure for navigation. Meanwhile, dredging is taking the soil or materials out from the bottom of waters, or from shallow waters such as lake, river, estuary or shallow sea and moving or throwing these materials to another location.

Dredging project for this research was taken from the Work Implementation of Rebaq Rinding River Dredging project at Muara Muntai District of Kutai Kertanegara Regency. The Rebaq Rinding River is a watershed area from Mahakam River that becomes one of the main transportation routes from people in Semayang Lake and Melintang Lake to destination of economic center located in Muara Muntai District. The river extends in total length of 5,500 meters and right now it is experiencing shallowing at the river mouth area (in particular) that leads to Melintang Lake, so BWS Kalimantan IV Samarinda of East Kalimantan Province as the authority holder for the Mahakam River working area is carrying out a dredging work in Rebaq Rinding River channel of Kutai Kertanegara Regency.

So far, discussions related to the analysis of influential factors to delays in Dredging Work at Rebaq Rinding River channel of Kutai Kertanegara Regency have not been carried out by many researchers, therefore the study problems raised in this study are 1) What are factors that influence delay of dredging work in Rebaq Rinding River Channel of Kutai Kertanegara Regency?; 2) What is the most dominant factor that influence delay in dredging work in Rebaq Rinding River Channel of Kutai Kertanegara Regency?; 3) What strategies will be implemented to deal with delay of dredging work in Rebaq Rinding River Line of Kutai Kertanegara Regency?

II. LITERATURE REVIEW

2.1. A Construction Management

The success of a project requires careful planning, coordination and detailed supervision since a project is filled with various work activities. A project itself is defined as a complex system involving many coordination of numbers of separate parts from the organization, where there are schedules and conditions that must be carried out within a predetermined implementation time. Thus, the success of a project really depends on the leader as the project manager also the works of its members (project team).

From the above explanation, management is a crucial matter as effort to achieve success, especially the project management. A project management defines as the planning and organizing a project in which there is an organizational structure existing, consisted of a manager as the project leader who controls the resources and supervises the work of its members, also the members of the project who maintain mutual coordination among each other, and altogether are working hard to achieve the desired goals within appointed working time for the project.

A Project management is an effort or activities of planning, organizing, leading and controlling company resources to achieve predetermined short-term goals as efficient and effective as possible, in which, the activities flow of project management can run in vertical and horizontal ways by using a system approach. [3]

Furthermore, a project management concept contains several main points as described below:

1. Uses definition of management based on its function such as planning, organizing, directing, and controlling company resources in forms of employees, funds/finance and materials.
2. Uses an approach (System Approach Management).
3. The flow of activities has a horizontal and a vertical hierarchy.
4. Work activities are managed in short term of time with targets that have been outlined in specific way. It needs specific method together with management method especially in planning and controlling aspect.

From the explanation above, it shows that the project management does not intend to eliminate vertical activity flow or create a total change to the classical management system, conversely, it wants to include specific approaches, techniques and methods in responding any demands and challenges which are also specific in nature in the field of project activities. Management as a special process that moves an organization has an important role, because without effective management in the company, there will be no successful business that able to strive for a long time. Management is a matter that related to efforts in achieve certain goals by utilizing existing resources in the best possible way.

2.2. A Management Process

According to A.D Austen and R.H Neale, a management process is a process held for utilizing human resources and other resources to achieve certain purposes. Management relies on clear communication, ability to convey thoughts, ideas, information and instructions quickly and effectively among people with different technical skills and interests. The management process or frequently called as Management function within one unit are: 1) Goal Setting; 2) Planning; and 3) Controlling.

2.3. The Cause of Project Delay

In a construction project, many things can happen and resulted in an increase time demand for an activity or a delay of completion time of a project. Some of the most frequent causes of project delay are changes in field condition, in work design, in specification, and in weather, or lack or unavailability of labor, materials or unsupportive work equipment.

2.4. The Impact of Delay

Delays in a construction project will prolong the project duration or increase the cost incurred or both, while the owner will get impact of delays by the loss of potential income from facilities built not according to the specified time, and the contractor will get loss of opportunity to allocate resources to other projects, increase indirect costs due to increased expenditure on employee salaries and equipment rental, also reduce profits.

2.5. A Factor Analysis

From conceptual perspective, a factor is an uncertain condition with a probability of a certain event in which, if the event occurs, will have unfavorable or negative consequences. Concept of factor is determined to be free or becomes independent variables (X1, X2, X3, ….etc.). In broader definition, independent variable is the variable that able to be the cause of the change or emergence of the dependent variable. [5]

A factor analysis is a general analysis which given at multivariate statistical method classes whose main goal is to reduce data and summarize the data. The main goal is analyzing any reciprocal relationships between large variables (test, scores, test item, and questionnaire) which later explains these variables according to the size of the factors. Moreover, factor analysis is a technique or method that connects dependency aspect of all simultaneous variables.

From mathematic perspective, factor analysis has several similarities with multiple regression analysis, where each variable describes something like a linear combination of main factors. Among the covariant variables, there is a term derivative from factor with small number added by factor from other variables. Stages of factor analysis can be described as follows:

1. Create a correlation matrix table to find out the relationship between variables.
2. Determine the factor which will be analyzed, number of factors that will be put into analysis are selected based on Eigenvalue and the percentage of total variance for all variables calculated by the factors.
3. Make a rotation. Rotation is carried out on selected factors with aims to facilitate data interpretation.

Conduct an analysis to the dominant factor. Factor analysis is an analysis for reducing or summarizing so many factors into one or only few factors that are the most dominant or most influential.

The model of factor analysis can be put into the following formulation [6]:

$$Xi = A_{ij}F_1 + Ai2F2 + A13 + F3... + AimFm + ViUi \;................. \;(1)$$

Where:

Xi	: standardized variable number... i
Aij	: regression coefficient of i to common factor of j
F	: common factor
Vi	: standardized regression coefficient from variable of i to unique factor of -i
Ui	: unique factor for variable of i
M	: amount of common factor

A factor analysis is an extension of the Principal Component Analysis. Factor analysis is used to describe a correlation between several variables in a small number of factors. These variables are grouped into several factors where variables within one factor will have a high correlation value, and its correlation with variables in other factors will have relatively low correlation value.

A factor analysis in basic understanding aims to obtain certain factors that have the following characteristics:

1. Able to present a maximum explanation from data diversity as possible as it can.
2. Factors that have independent characteristic.
3. All factors are able to be interpreted.

So, factor analysis has an aim to find a way for summarizing information conveyed in the original variables (initial) into a set of new dimension or variate (factor). It is done by determining the structure through data summarizing or through data reduction. The factor analysis will identify structure of the relationship between variables or respondents by looking at the correlations between variables or between respondents.

The vector from the observed random X with p number of component variables, from linear perspective is dependent to several random variables that able to be observed as stated into F_1, F_2, F_q and ε_1, ε_2............. ε_q, therefore in broader sense can be written in observed random vector formula below:

$$X_1 = L_{11}.F_1 + L_{12}.F_2 + ... + L_{1q}.F_q + \mathcal{E}_1$$

$$X_2 = L_{21}.F_1 + L_{22}.F_2 + ... + L_{2q}.F_q + \mathcal{E}_2$$

$$X_p = L_{p1}.F_1 + L_{p2}.F_2 + ... + L_{pq}.F_q + \mathcal{E}_p .... \;(2)$$

Where:

Fj	: Common factor of j
Lij	: Loading variable of i at factor of j
Ei	: Specific factor of i, i = 1,2,........, p and j = 1,2,........, q

The matrix equation above also can be written as:

$X_{(pxl)} = L_{(pxq)}. F_{(pxl)} + \varepsilon_{(pxl)}$ .... *(3)*

Under assumption of:
F and ε are free/independent, to make Cov (F, ε) = $O_{(pxq)}$
E (F) = $O_{(qxl)}$, Cov (F) = (FF") = $I_{(qxq)+}$
E (ε ') = O(pxl), Cov (ε) = E (εε') = $Y_{(pxp)}$ = Diagonal Matrix

In general, the factors obtained from Principal Component Analysis are still difficult to be interpreted. Therefore, a transformation must be carried out on the loading matrix to increase the factor interpretability. Transformation of loading matrix is executed by rotating the matrix using varimax perpendicular rotation method. Result of this rotation will make each original variable having a high correlation value with certain factors only, and have a relatively low correlation value with other factors, in this way, each factor will be easier to be interpreted.

The intended transformation is the loading matrix L into L*, where L* = L.T, and T T' = T' T = 1. The T transformation matrix is determined in such a way to make the variance of the new matrix has maximum value.

$$V = \frac{1}{p} \cdot \sum_{i=1}^{\omega} \cdot \left[\sum_{i=1}^{p} (1^{*}{}_{Y})^{1} - \frac{1}{p} \left(\sum_{i=1}^{p} (1^{*}{}_{Y}) \right) \right] \text{.................. } (4)$$

For classification purpose, score of factors from all observations in this study were searched by fulfilled the following matrix equation:

$$F = Z_{(n\times p)} . R^{-1}{}_{(p\times q)} . L_{(p\times q)} \text{.. } (5)$$

Where:

Z : Matrix and the initial standardization
R^{-1} : Invers from correlation matrix
L : Matrix of Loading
F : Matrix score factor for all observations

To allow data interpretation run easier, a transformation with varimax rotation mode was conducted where the L* = L. T where L * is the result of transformation from loading matrix L and T' T = 1.

2.6. Criteria of Appropriateness Use of Factor Analysis

For testing the accuracy of factor analysis, there are several criteria to be used such as:

1. Keiser Meyer Olkin (KMO)

Measure of sampling by Keiser Meyer Olkin is a distance comparison index between correlation coefficient with the partial correlation coefficient. KMO value ranges from 0 to 1 and if the sum of squares from partial correlation coefficients between all pairs of variables have small value when compared to the sum of the squares of the correlation coefficients, it will produce a KMO value close to 1. KMO value indicates appropriateness or suitability in using the factor analysis. KMO value is considered as sufficient when the result has greater value than 0.5. A small KMO value indicates that the use of factor analysis must be reconsidered because the correlation between variables cannot be explained by the other variables. Here, the KMO test assessment of the matrix between variables explained as follow [7]:

- 0,9 < KMO ≤ 1,0 meaning the data is very good to be used for factor analysis
- 0,8 < KMO ≤ 0,9 meaning the data is good to be used for factor analysis
- 0,7 < KMO ≤ 0,8 meaning the data is good enough to be used for factor analysis
- 0,6 < KMO ≤ 0,7 meaning the data is more than sufficient to be used for factor analysis
- 0,5 < KMO ≤ 0,6 meaning the data is sufficient to be used for factor analysis
- KMO ≤ 0,5 meaning the data is not sufficient / not good to be used for factor analysis

2. Criteria of Sample Adequacy

The selected criteria for determine sample adequacy is Measure of Sampling Adequacy or abbreviated as MSA. As a rule of thumb, MSA is the KMO for each variable and total MSA will be the KMO value. MSA can be used as a determinant for including certain variables in the model because these variables have a high correlation value, whereas criteria for including variables in the model are the same as the requirements criteria for KMO. The value of MSA ranges between 0 and 1 [7].

- MSA = 1, meaning the variable still able to be predicted and be analyzed further.
- MSA > 0,5 meaning the variable is able to be predicted and further analyzed.
- MSA < 0,5 meaning the variable cannot be predicted and cannot be analyzed further, or excluded from other variables.

III. RESEARCH METHOD

3.1. Location of the Research

Location of this research is in *Rebaq Rinding* River at Rebaq Rinding Village of Muara Muntai District, Kutai Kertanegara Regency, East Kalimantan Province.

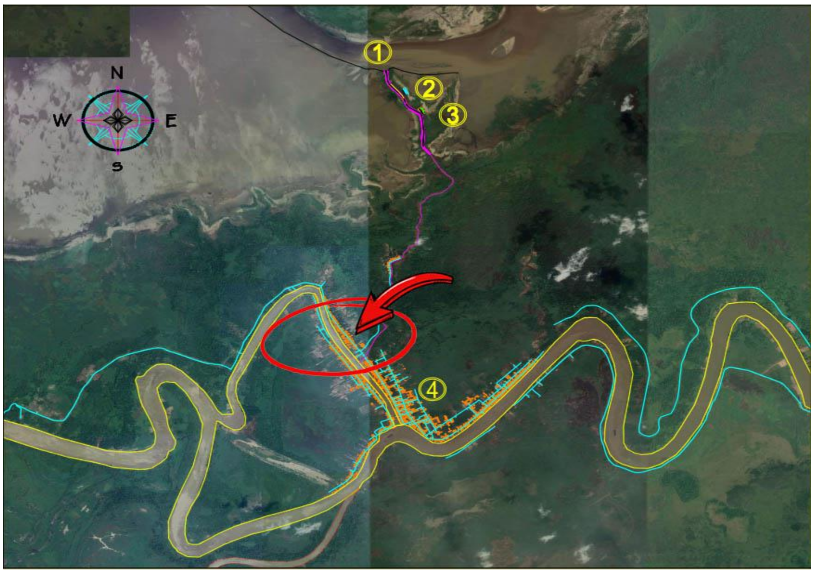

Figure 1: The map of dredging work project in Rebaq Rinding River at Muara Muntai District of Kutai Kertanegara Regency.

3.2. Population of the Research

Population of this research were individuals who understand the real condition and directly involved in the work implementation of River Dredging project in East Kalimantan Province which experienced project delay. There were 45 respondents consisted of 14 local government apparatus/project owner (as taken from Budget division: 1 respondent, Committee making officer: 1 respondent, Acting Officer of Technical Activities: 1 respondent, Field Director: 4 respondents and Technical assistant and technical administration staff: 7 respondents), and 22 respondents from the contractor (as taken from Person in Charge of the project: 1 respondent, Person in Charge of Engineering Work Activities: 8 respondents and Field Implementer: 13 respondents).

In addition, there were also 9 respondents from the Supervisory Consultant (as taken from the Team Leader: 1 respondent, Architect Expert: 1 respondent, Structural Expert: 1 respondent, Mechanical Expert: 1 respondent, OSH/K3 Construction Expert and Field Inspector: 3 respondents).

3.3. Sample of the Research

A sampling technique is employed to provide an equal opportunity for each member of the population to be selected as a member of the sample. In this study, the selected sampling technique was probability sampling method as explained below:

1. Simple Random Sampling, said as a simple way because the sampling of population member is done in random without paying attention to the existing strata. This method is used when the members of population are considered to be homogeneous.
2. Proportionate Stratified Random Sampling. This technique is used if the population consisted of not homogenous members or elements and has a proportionally stratified.
3. Disproportionate Stratified Random Sampling. This technique is used if the population has members or elements that are not homogenous and disproportionately stratified.

In this research, samples were taken in random by Disproportionate Stratified Random Sampling with a formula conforming to Slovin in Husein Umar (2007) as the following [5]:

$$n = \frac{N}{1+Ne^2} \qquad (6)$$

Where:
n : Number of samples
N : Total population = 45
E : Percent of Allowance = 0,05

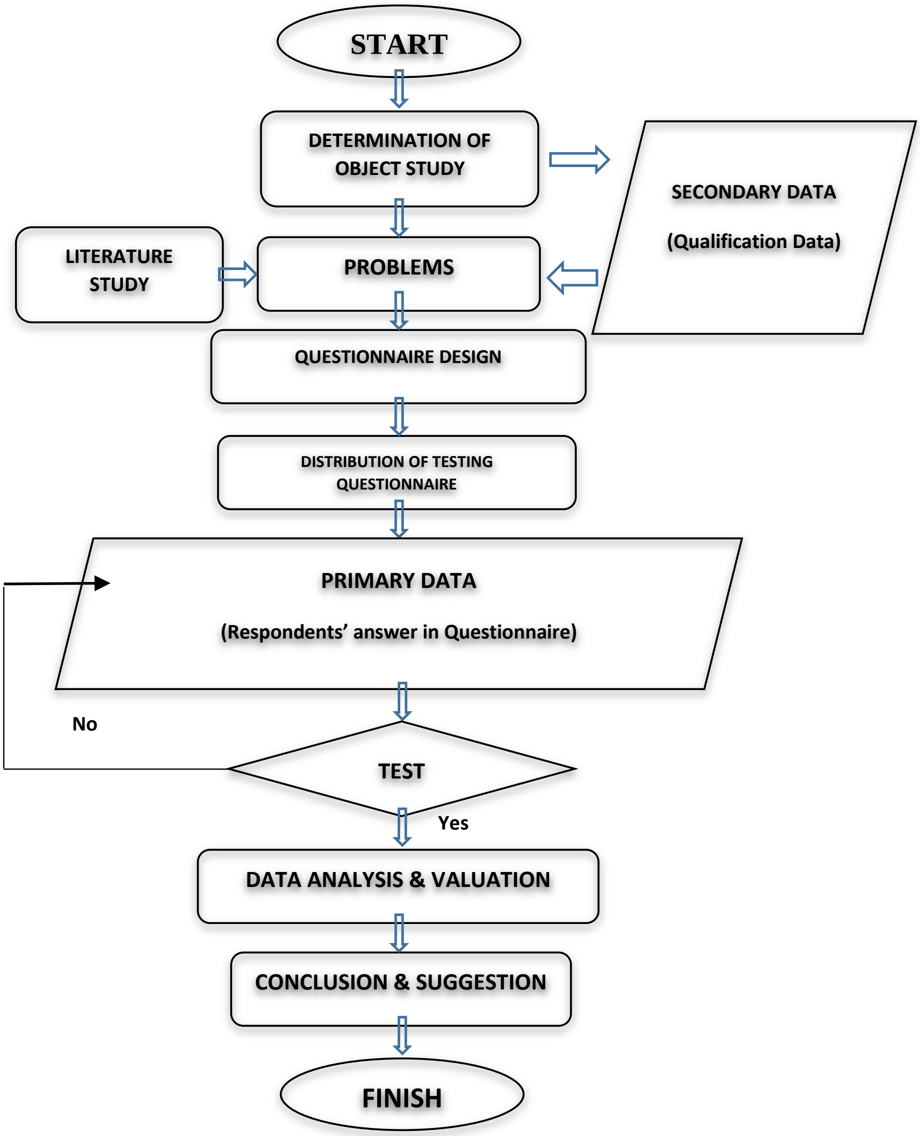

Figure 2: Research procedure

IV. RESULT AND DISCUSSION

4.1. Test of Research Instruments

4.1.1. Validity test

Table 1. Result of validity test

Factors	Indicator	Correlation Coefficient	Value of r_{table}	P-Value	Result
Finance (X1)	X1.1	0,787	0,294	0.000	Valid
	X1.2	0,753	0,294	0.000	Valid
	X1.3	0,550	0,294	0.000	Valid
Human Resource (X2)	X2.1	0,807	0,294	0.000	Valid
	X2.2	0,682	0,294	0.000	Valid

Factors	Indicator	Correlation Coefficient	Value of r_{table}	P-Value	Result
	X2.3	0,790	0,294	0.000	Valid
	X2.4	0,756	0,294	0.000	Valid
	X2.5	0,507	0,294	0.000	Valid
Work Scheduling Method (X3)	X3.1	0,627	0,294	0.000	Valid
	X3.2	0,714	0,294	0.000	Valid
	X3.3	0,664	0,294	0.000	Valid
Work Implementation Method (X4)	X4.1	0,632	0,294	0.000	Valid
	X4.2	0,646	0,294	0.000	Valid
	X4.3	0,676	0,294	0.000	Valid
Design Changes (X5)	X5.1	0,641	0,294	0.000	Valid
	X5.2	0,723	0,294	0.000	Valid
	X5.3	0,679	0,294	0.000	Valid
	X6.1	0,830	0,294	0.000	Valid
Material (X6)	X6.2	0,700	0,294	0.000	Valid
	X6.3	0,800	0,294	0.000	Valid
	X6.4	0,769	0,294	0.000	Valid
	X6.5	0,546	0,294	0.000	Valid
Equipment (X7)	X7.1	0,764	0,294	0.000	Valid
	X7.2	0,753	0,294	0.000	Valid
	X7.3	0,691	0,294	0.000	Valid
	X7.4	0,753	0,294	0.000	Valid
	X7.5	0,510	0,294	0.000	Valid
OSH/K3 Construction Control (X8)	X8.1	0,641	0,294	0.000	Valid
	X8.2	0,759	0,294	0.000	Valid
	X8.3	0,659	0,294	0.000	Valid
	X8.4	0,756	0,294	0.000	Valid
	X8.5	0,523	0,294	0.000	Valid

The result of validity test based on Table 1 explains that variables of Finance (X1), Human Resources (X2), Work Scheduling Method (X3), Work Implementation Method (X4), Design Changes (X5), Materials (X6), Equipment (X7) and OSH/K3 Construction Control (X8) with a significance level of $(a) = 0,05$ obtained a critical r_{table} value of 0.312 (Appendix 3) where each factor having a correlation coefficient value greater than the r_{table} and the p-value of each factor has smaller value than a = 0.05. It is visible that all items of questions are valid because they have significant value smaller than α (0,05) so, all items can be included into the research analysis.

4.1.2. Reliability Test

Table 2. Result of Reliability Test

Variables	Cronbach's Alpha	Result
Finance (X1)	0,697	Reliable
Human Resource (X2)	0,823	Reliable
Work Scheduling Method (X3)	0,686	Reliable
Work Implementation Method (X4)	0,619	Reliable
Design Changes (X5)	0,738	Reliable
Material (X6)	0,841	Reliable

Variables	Cronbach's Alpha	Result
Equipment (X7)	0,814	Reliable
OSH/K3 Construction Control (X8)	0,787	Reliable

As the result from Table 2, it shows the Cronbach's Alpha coefficient can be obtained for variables of: Financial (X1), Human Resources (X2), Work Scheduling Method (X3), Work Implementation Method (X4), Design Changes (X5), Materials (X6), Equipment (X7), and OSH/K3 Construction Control (X8) with a value greater than 0.6. So, it can be concluded that indicators for measuring these variables are valid and reliable.

4.2. Data Analysis and Discussion

4.2.1. The Factor Analysis

A set variable is said to be sufficient and suitable for using a factor analysis when these variables have a fairly high level of dependency (interrelationship). The indication of relationship level is determined by KMO (Kaiser Meyer Olkin) and MSA (Measures Sampling Adequacy) values [8]. The following explanation are resulting selection of indicators that able to influence delay with selection was carried out on the MSA value. The variables with lowest MSA value (less than 0.50) will be excluded and later be recalculated until all items have MSA value more than 0.50. Result analysis in this research revealed that out of 7 variables tested, there were items must be excluded since their MSA value were less than 0.50.

1. Financial latent variable (X1)

Table 3. Result of factor analysis for finance latent variable

Variables	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X1.1	0,697	0,872	0,598	0,565	0,000
X1.2	0,823	0,798		0,593	
X1.3	0,686	0,688		0,683	
Eigen Value		1,870			
Total Diversity		62,330			
Cumulative of Total Diversity		62,330			

Table 3 shows all manifest variables that create financial latent variable (X1) have factor loading values above 0.5, so all manifest variables are included into further analysis as predicted as the original estimation (3 manifest variables consisted of Lack of Capital for the Project (X1.1), Late Payment from Contractor to Supplier (X1.2) and Late Payment by Government/Project Owner to the Contractor (X1.3).

2. Human resource latent variable (X2)

Table 4. Result of factor analysis for human resources latent variable

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X2.1	0,823	0,907	0,680	0,764	0,000
X2.2	0,492	0,702		0,714	
X2.3	0,686	0,828		0,634	
X2.4	0,664	0,815		0,720	
X2.5	0,313	0,560		0,514	
Eigen Value		2,978			

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
Total Diversity		59,565			
Cumulative of Total Diversity		59,565			

Table 4 shows all manifest variables that create the human resource latent variable have factor loading values above 0.5 so all manifest variables are included into further analysis as predicted as the original estimation (5 manifest variables consisted of Shortage of Human resource workers (X2.1), Many workers (human resources) do not have expertise/ skill certification (X2.2), Difficulty in finding workers (human resources) (X2.3), Lack of good coordination in Human Resources (X2.4), Lack of Sense of Responsibility in Human Resources (X2.5).

3. Work scheduling method latent variable (X3)

Table 5. Result of factor analysis for work scheduling method latent variable

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X3.1	0,819	0,905	0,563	0,541	0,000
X3.2	0,303	0,550		0,874	
X3.3	0,829	0,910		0,540	
Eigen Value		1,950			
Total Diversity		65,001			
Cumulative of Total Diversity		65,001			

Table 5 shows all manifest variables that create the Work Scheduling Method Latent Variable (X3) have factor loading values above 0.5. so, all manifest variables are included into further analysis as predicted as the original estimation (3 manifest variables consisted of Not ideal or Unsuitable Work Scheduling Method (X3.1), Work Scheduling Method is not in accordance with the Provisions (X3.2) and Waiting for Approval of Shop Drawing from PPK (X3.3).

4. Work implementation method latent variable (X4)

Table 6. Result of factor analysis for work implementation method latent variable

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X4.1	0,300	0,548	0,547	0,586	0,000
X4.2	0,521	0,722		0,535	
X4.3	0,458	0,676		0,542	
Eigen Value		1.279			
Total Diversity		42,641			
Cumulative of Total Diversity		42,641			

Table 6 shows all manifest variables that create the Work Scheduling Method latent variable have factor loading values above 0.5, so all manifest variables are included into further analysis as predicted as the original estimation (3 manifest variables of Implementation Stage is not according to the Provision (X4.1), Work Implementation is near the end year (X4.2), and Work Implementation is not according to the Technical Specification (X4.3).

5. Design changes latent variable (X5)

Table 7. Result of factor analysis for design changes latent variable

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X5.1	0,837	0,915	0,572	0,547	0,000
X5.2	0,361	0,601		0,865	
X5.3	0,864	0,930		0,544	
Eigen Value		2,063			
Total Diversity		68,756			
Cumulative of Total Diversity		68,756			

Table 7 shows all manifest variables that create the Design Changes Latent Variable have factor loading values above 0.5, so all manifest variables are included into further analysis as predicted as the original estimation (3 manifest variables consisted of Design Changes Existence by the Owner (X5.1), Delay in Changing Process of Planning (X5.2), and Failure in Fulfilling the Initial Planning (X5.3).

6. Material latent variable (X6)

Table 8. Result of factor analysis for material latent variable

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X6.1	0,924	0,924	0,681	0,763	0,000
X6.2	0,720	0,720		0,693	
X6.3	0,835	0,835		0,648	
X6.4	0,823	0,823		0,708	
X6.5	0,601	0,601		0,535	
Eigen Value		3,109			
Total Diversity		62,179			
Cumulative of Total Diversity		62,179			

table 8 shows all the manifest variables that create material latent variable have factor loading values above 0.5, so all manifest variables are included into further analysis as predicted as the original estimation (5 manifest variables consisted of material shortage (x6.1), late in delivery material (x6.2), changes existence in material specification (x6.3), damage to material in storage (x6.4), and frequent material scarcity on the market (x6.5).

7. Equipment latent variable (X7)

Table 9. Result of factor analysis for equipment latent variable

Variable	Communication Value	Loading Factor 1	Loading Factor 2	KMO	MSA	Bartlett's Statistic Significance
X7.1	0,816	0,413	0,804	0,725	0,670	0,000
X7.2	0,964	0,972	0,139		0,635	
X7.3	0,488	0,518	0,469		0,638	

Variable	Communication Value	Loading Factor 1	Loading Factor 2	KMO	MSA	Bartlett's Statistic Significance
X7.4	0,964	0,972	0,139		0,661	
X7.5	0,849	-0,020	0,921		0,691	
Eigen Value		2,916	1,167			
Total Diversity		58,317	23,331			
Cumulative of Total Diversity		58,317	23,331			

Table 10. Result of factor analysis for equipment latent variable

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X7.3	0,681	0,825	0,568	0,546	0,005
X7.4	0,590	0,768		0,558	
X7.5	0,343	0,586		0,662	
Eigen Value		1,615			
Total Diversity		53,822			
Cumulative of Total Diversity		53,822			

table 9 and 10 showed all manifest variables that create the equipment latent variable have factor loading values above 0.5, so all manifest variables are included into further analysis as predicted as the original estimation (5 manifest variables consisted of poor condition of equipment (x7.1), equipment is not used according to its function (x7.2), equipment not according to specification (x7.3), late delivery of equipment (x7.4) and limited number of equipment (x7.5).

8. OSH/K3 construction control latent variable (X8)

Table 11. Result of factor analysis for osh/k3 construction control latent variable

Variable	Communication Value	Loading Factor 1	Loading Factor 2	KMO	MSA	Bartlett's Statistic Significance
X8.1	0,717	0,233	0,814	0,681	0,763	0,000
X8.2	0,980	0,975	0,171		0,693	
X8.3	0,440	0,413	0,519		0,648	
X8.4	0,980	0,975	0,171		0,708	
X8.5	0,771	0,026	0,878		0,535	
Eigen Value		2,916	2,726			
Total Diversity		58,317	54,517			
Cumulative of Total Diversity		58,317	54,517			

Table 12. Result of factor analysis for OSH/K3 construction control latent variable

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X8.3	0,637	0,798	0,605	0,546	0,002

Variable	Communication Value	Loading Factor	KMO	MSA	Bartlett's Statistic Significance
X8.4	0,546	0,739		0,558	
X8.5	0,444	0,667		0,662	
Eigen Value		1,627			
Total Diversity		54,248			
Cumulative of Total Diversity		54,248			

Table 11 and 12 shows all manifest variables that create OSH/K3 Construction Control have factor loading values above 0.5, so all manifest variables are included into further analysis (5 manifest variables consisted of Not conforming K3 Construction Supervision in each Work Stage (X8.1), Not controlling the K3 Construction Supervision for each work stage (X8.2), Unavailability of supporting facilities and infrastructure of K3 Construction Provision (X8.3), Lack of awareness among construction service workers about the important role of K3 Construction (X8.4), and Many service doers do not understand the K3 Provision in the work environment (X8.5).

The result of factor extraction which followed by factor loading interpretation from each item is assuring that several latent variables of: Finance (X1), Human Resource (X2), Work Scheduling Method (X3), Work Implementation Method (X4), Design Changes (X5) Material (X6), Equipment (X7), and OSH/Construction K3 Control (X8) can be formed by grouping the manifest variables, as summarized in the following explanation:

- Variable of Finance (X1) consisted of manifest variables of Lack of Capital for the Project (X1.1), Late Payment from Contractor to Supplier (X1.2) and Late Payment by Government/Project Owner to the Contractor (X1.3).
- Variable of Human Resource (X2) consisted of manifest variables of Shortage of Human resource workers (X2.1), Many workers (human resources) do not have expertise/ skill certification (X2.2), Difficulty in finding workers (human resources) (X2.3), Lack of good coordination in Human Resources (X2.4), Lack of Sense of Responsibility in Human Resources (X2.5).
- Variable of Work Scheduling Method (X3) consisted of manifest variables of Not ideal or Unsuitable Work Scheduling Method (X3.1), Work Scheduling Method is not in accordance with the Provisions (X3.2) and Waiting for Approval of Shop Drawing from PPK (X3.3).
- Variable of Work Implementation Method (X4) consisted of manifest variables of Implementation Stage is not according to the Provision (X4.1), Work Implementation is near the end year (X4.2), and Work Implementation is not according to the Technical Specification (X4.3).
- Variable of Design Changes (X5) consisted of manifest variables of Design Changes Existence by the Owner (X5.1), Delay in Changing Process of Planning (X5.2), and Failure in Fulfilling the Initial Planning (X5.3).
- Variable of Materials (X6) consisted of manifest variables of Material Shortage (X6.1), Late in Delivery Material (X6.2), Changes existence in Material Specification (X6.3), Damage to Material in Storage (X6.4), and Frequent Material Scarcity on the Market (X6.5).
- Variable of Equipment (X7) consisted of manifest variables of Poor Condition of Equipment (X7.1), Equipment is not used according to its function (X7.2), Equipment not according to specification (X7.3), Late Delivery of Equipment (X7.4) and Limited number of Equipment (X7.5).
- Variable of OSH/K3 Construction Control (X8) consisted of manifest variables of Not conforming K3 Construction Supervision in each Work Stage (X8.1), Not controlling the K3 Construction Supervision for each work stage (X8.2), Unavailability of supporting facilities and infrastructure of K3 Construction Provision (X8.3), Lack of awareness among construction service workers about the important role of K3 Construction (X8.4), and Many service doers do not understand the K3 Provision in the work environment (X8.5).

4.2.2. Assumption test of regression model

Testing assumption of regression model in this study includes test of normality assumption, non-multicollinearity assumption, homoscedasticity assumption and non-autocorrelation assumption and the description of calculation performed for testing assumptions of the regression model can be seen as follows:

1. Test of normality assumption

A regression model is said to meet the normality assumption, if errors or residual caused by the regression model is normally distributed. For testing this assumption, a Kolmogorov-Smirnov method was applied as shown in the following table (Table 13).

Table 13. Normality assumption test

Statistic Test	Value	Description
Kolmogorov-Smirnov Z	0,720	Normal Distribution
P-value	1,000	

According to the Kolmogorov-Smirnov Z test above, a p-value of 1.000 was obtained as a value greater than $\alpha = 0.05$. This test revealed the error or residual value has a normal distribution, so it can be concluded that assumption of normality of error has been met.

2. Test of non-multicollinearity assumption

For detecting the existence of a multicollinearity, it can be seen from the Variance Inflation Factor (VIF). If the VIF value is > 10, it indicates there is a presence of multicollinearity, whereas VIF value is < 10 indicates no presence of multicollinearity as shown in the following table (Table 14).

Table 14. Multicollinearity assumption test

Statistic Test	Value	Description
Finance (X1)	6,099	Non Multicollinearity
Human Resource (X2)	1,674	Non Multicollinearity
Work Scheduling Method (X3)	2,361	Non Multicollinearity
Work Implementation Method (X4)	1,179	Non Multicollinearity
Design Changes (X5)	3,017	Non Multicollinearity
Material (X6)	7,715	Non Multicollinearity
Equipment (X7))	8,701	Non Multicollinearity
OSH/K3 Construction Control (X8)	7.023	Non Multicollinearity

The result calculation presented in Table 14 showed that each independent variable has VIF value of less than 10, so the assumption of no multicollinearity occurrence has been met.

3. Test of homoscedasticity assumption

This test aims to find out whether the regression model has the same variance or not. A good regression model is a model with same variance (homoscedasticity). Assumption checking can be conducted by Spearman Rank Correlation Test for testing the correlation between the estimated value and the absolute error. The test result by Spearman Rank method is presented in the following table (Table 15).

Table 15. Homoscedasticity Assumption Test

Statistic Test	Value	Description
Correlation of Rank Spearman	0,000	Homoscedasticity
p-value	1,000	

As mentioned in Table 15, this assumption testing showed the p-value for all variables have bigger value than $\alpha = 0.05$, so it can be concluded that the homoscedasticity assumption has been met.

4. Test of non-autocorrelation assumption

To test a presence of autocorrelation, the researchers applying the Durbin Watson Test (dW) under a condition of non-autocorrelation assumption is met if the value of dU<dW(4-dU) as mentioned in the following table (Table 16).

Table 16. Non-autocorrelation assumption test

Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.550[a]	.303	.148	.825	2.057

a. Predictors: (Constant), Equipment, Finance, Work Scheduling Method, Human Resources, Work Implementation Method, Design Changes, Material and OSH/K3 Construction Control
b. Dependent Variable: Project Delay

Table 16 showed the statistic value of Durbin Watson (dW) as stated to be 2.215 (between dU = 1.776 and 4-dU = 2.224), so it can be concluded that there is no autocorrection present, meaning the non-autocorrection assumption in the regression model has been met.

4.2.3. Multiple linear regression analysis

Table 17. Result summary of multiple linear regression analysis

Variables	β Coefficient	t_{count}	P-Value	Description
Constant	1,351	1,816	0,078	Not Significant
Finance (X1)	0,148	0,451	0,655	Not Significant
Human Resource (X2)	0,102	0,219	0,828	Not Significant
Work Scheduling Method (X3)	-0,368	-0,730	0,470	Not Significant
Work Implementation Method (X4)	0,646	3,162	0,003	Significant
Design Changes (X5)	0,325	0,695	0,491	Not Significant
Material (X6)	0,001	0,001	0,999	Not Significant
Equipment (X7)	-0,125	-0,277	0,783	Not Significant
OSH/K3 Construction Control (X8)	0,006	0,013	0,990	Not Significant
α = 0.05 R^2 = 0.303 R = 0.550 F-count = 2,954 F-table (0.05,8,36) = 2.210 p-value = 0.081 t-table (0.05,36) = 2.028				

Table 17 showed not all independent variables have significant value. The independent variables that have significant value or having a significant effect on the delays are the work scheduling method (X3) and the work implementation method (X4). Meanwhile, variables that do not have a significant value or having not significant influence to the delay are financial (X1), human resources (X2), design changes (X5), material (X6), equipment, (X7) and OSH/construction K3 control (X8). While the data interpretation of the regression model obtained based on Table 18 is presented in the following equation:

$$Y = 1{,}351 + 0{,}148\ X1 + 0.102\ X2 - 0.368\ X3 + 0.646\ X4 + 0.325\ X5 + 0.001\ X6 - 0.125\ X7 + 0.060\ X8 + £$$

Where:

Y : Delays in Project
X1 : Factor of Finance
X2 : Factor of Human Resources
X3 : Factor of Work Scheduling Method
X4 : Factor of Work Implementation Method
X5 : Factor of Design Changes
X6 : Factor of Material
X7 : Factor of Equipment
X8 : Factor of OSH/K3 Construction Control

Based on Table 17, factor of Work Scheduling Method is the variable which sought the biggest β coefficient value in this study, meanwhile, the factor with the most dominant influence on delays is factor of Work Implementation Method. Delays are affected mostly by work implementation method and a positive β coefficient value indicates the better the work scheduling method than the bigger the possibility of the project implementation can be completed on time.

4.2.4. Hypothesis test of regression model coefficient

1. A simultaneous test to the regression model

Simultaneous testing was conducted to show whether all used factors within regression model brought significant influence to the delay of the project. All factors were tested at once by employing F test or ANOVA, aided by SPSS software for obtaining result of F test as presented in following table (Table 18).

Table 18. Simultaneous test to regression model

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig.
1. Regression	10.658	8	1.332	2.954	.081[a]
Residual	24.542	36	0.682		
Total	35.200	44			

a. Predictors : (Constants), Equipment, Finance, Work Scheduling Method, Human Resources, Work Implementation Method, Design Changes, Material, and OSH/K3 Construction Control.
b. Dependent variable : Delays in Project

The hypotheses used in testing the coefficient of regression model simultaneously are listed in the following table (Table 19).

Table 19. A simultaneous hypothesis test of the regression model

Hypothesis	Value	Decision
$H_0 : \beta_i = 0$ (there is no significant influence from X1, X2, X3, X4, X5, X6, X7 and X8 to delays of project) $H_a : \beta_i \neq 0$ (there is a significant influence from X1, X2, X3, X4, X5, X6, X7 and X8 to delays of project) $\alpha = 0.05$	F = 2,954 *p-value* = 0.081 F_{table} = 2,210	H_0 is rejected

Based on Table 19, the researchers tested the hypothesis of the regression model simultaneously by employing the F test. In the F distribution table, F_{table} value with degrees of freedom (df) n1 = 8 and n2 = 36 obtained values of 2,210. If the F value from result calculation in table 20 is compared with F_{table}, then the F value of calculation result is greater than F_{table} (2,954 > 2,210). Apart from it, Table 20 also presented an obtained p-value of 0.081. If the p-value is compared with a = 0.05, then the p-value is less than a = 0.05. From both comparisons, it can be concluded that Ho is rejected at the level a = 0.05, meaning there is a significant influence in simultaneous way between X1, X2, X3, X4, X5, X6, X7 and X8 on project delays.

2. Test of partial regression model

Test of partial regression model is used to determine whether each independent variable that forming the regression model as individual variable has a significant influence to the delay of the project or not. For testing the relationship, T-test is used by comparing values of t_{count} with t_{table}. The independent variables as creator of regression model are said to have a significant effect if $t_{count} > t_{table}$ or p-value < a = 0.05.

4.3. Discussion of Strategy as Effort in Dealing with Delays

From the results of regression analysis in this study, factors of Work Scheduling Method and Work Implementation Method were found as factors with significant influence to the delay according to Table 20. Whereas factors of Financial, Human Resource, Design Changes, Material, OSH/K3 Construction Control, and Equipment were factors that had insignificant influence to the delay of a project. Furthermore, the factor with significant influence on delays is Work Implementation method as reduction result of manifest variables consisted of Implementation Stages not in accordance with provision (X4.1), work implementation is near the end of year (X4.2), and Implementation work does not comply with technical specification (X4.3).

The factor as the second largest β coefficient value is the Work Implementation Method, meaning that delays on project also influenced by Work Implementation method factor and the sequence of indicators that have most influence on delays from the factor of Work Implementation Method are listed in the following table (Table 20).

Table 20. Communality test on factors of work implementation method

Manifest Variables	Description	Communality Value
X4.1	Work stage is not accordance to the provision	0,300
X4.2	Work Implementation is not according to technical specification	0,521
X4.3	Work implementation time is near the end of year	0,458

Table 20 shows the indicator from Work Implementation Method that has the most dominant influence to delay is 'Work Implementation does not comply with technical specification' (X4.2) with a communality value of 0.521, so, the selected strategy for dealing with this problem is technical director, supervisory consultant, and quality control must be careful in every stage of work implementation by ensuring that it run with correct administrative procedures by asking the contractor to use requests in every work stage.

Table 21. Summary of Strategy for dealing with Project Delay

Factor	Problem	Strategy
Work Implementation Method	Implementation Stage is not accordance to the Provision	Work implementation stages must conform to the planned schedule to make no excessive or underload of work, also must continue to control the progress of work planned in the implementation schedule.
	Work Implementation time is near the end of year	Before announcing a work package, government should calculate the time period for the work implementation that will be carried out in careful and measured manner, so there are no delays because implementation time is adjusted to the remaining time until the final budget deadline.
	Work Implementation is not conforming the technical specification	Contractors in general are seeking for big profit which make them often ignore about the work quality, so technical director, supervisory consultant, and quality control must be careful in every stage of work implementation by conforming with correct administrative procedures, and contractors must use requests at every stage of work progress.

IV. CONCLUSION

According to result of analysis and discussion which has been elaborated in the previous section, the researchers are able to withdraw conclusion as stated as follows:

1. As the result of F_{test}, the factor that has a simultaneous influence on delay in the implementation of Dredging Work project in the Rebaq Rinding River, Muara Muntai District of Kutai Kertanegara Regency was found with value of $F_{count} = 2.954 > F_{table} = 2.028$. However, from the result of Partial T test, factors that influence delay in work implementation of Dredging Work in Rebaq Rinding River at Muara Muntai District of Kutai Kertanegara Regency is the Work Implementation Method with a calculated coefficient value of $t = 3.162 > t_{table} = 2.028$.
2. The most dominant factor that influences delay in Dredging work implementation in Rebaq Rinding River at Muara Muntai District of Kutai Kertanegara Regency is the factor of Work Implementation Method with a β coefficient value of 0.646.
3. The selected strategy for dealing with delays in Dredging Work Implementation in Rebaq Rinding River at Muara Muntai District of Kutai Kertanegara Regency are:

- Implementation of work stages must conform to the planned schedule to make sure no excessive work or no underload of work happen, and control continuity to the work progress as according to the planned implementation schedule.
- Technical director, supervisory consultant and quality control must work in careful way for each implementation stage with correct administrative procedures, and the contractor must use requests for each work stage.
- Before announcing a work package, government should calculate the implementation period in prior time through a careful and measurable planning so there will be no delays because implementation time is adjusted to the remaining time until the final budget deadline.

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