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Stakeholder Risk Analysis Based on PMBOK to Improve Time Performance of Grand Batavia Tangerang Project

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ABSTRACT: A construction project is a series of activities limited by resources and time to achieve construction results with good quality standards. Each project stage is inseparable from various risks and uncertainties that affect quality and quantity. Construction projects do not always run smoothly and often face problems related to the stakeholders' influence. The Grand Batavia project has numerous internal and external stakeholders involved, and the project has experienced delays in project completion. Researchers take parameters in time performance by analyzing the stakeholder risks in a project. Therefore, the project time can be properly achieved. This study aims to determine the risk factors and steps or appropriate actions for stakeholder risks based on PMBOK 2013 to improve project time performance on subsequent projects.

KEYWORDS: Risk Analysis, Stakeholder Analysis, Time Performance, Grand Batavia Project PMBOK.

I. INTRODUCTION

A construction project is a series of activities limited by resources and time to achieve construction results with good quality standards. Achieving good construction results must be supported by careful planning and effective resources [1]. The parties (stakeholders) directly and indirectly involved in the construction project must have competitive services through creative, innovative, and efficient efforts so that all understand the needs and expectations of the project quality at present and in the future [2]. Each project stage is inseparable from various risks and uncertainties that affect quality and quantity. Construction risks, in general, are events that affect the project's objectives, cost, time, and quality [3]. Various tendencies in the field seem to be a gap between the current conditions and the ideal conditions that should occur. Construction projects do not always run smoothly and often face problems related to stakeholder influence. Stakeholders are likely to usually not be optimal in supporting the project's success or may even hinder the project's objectives. Conditions should be created where stakeholders are expected to support the project's success [4]. Knowing the impact, binding, and psychological empowerment of project stakeholders is expected to improve the condition of stakeholders in the project's success, making predictions and early warnings of things that stakeholders can cause [5], [6].

II. LITERATURE REVIEW

A. Project Risk Management based on PMBOK 2013

Project risk management includes conducting risk management planning, identification, analysis, response planning, and controlling risks on a project. Project risk management aims to increase the probability and impact of positive events and reduce the probability and impact of negative events in the project. Project risk is an uncertain event or condition that, if any, has a positive or negative effect on one or more project objectives, such as scope, schedule, cost, and quality [7]. A risk may have one or more causes, and if any, it may have one or more impacts. Causes may be given or potential requirements, assumptions, constraints, or conditions that create the possibility of a negative or positive outcome. Project risks originate from the uncertainty present in all projects. Known risks have been identified and analyzed, making it possible to plan a response to the risk [8]. Known risks that cannot be managed proactively should be assigned a contingency reserve. Unknown risks cannot be managed proactively and may be assigned a management reserve. An occurring negative project risk is considered a problem [9].

B. Stakeholder Definition

According to PMBOK 2013, stakeholders are individuals, groups, or organizations that can influence, be influenced by, or consider themselves influenced by a project's decisions, activities, or outcomes. They consist of people and organizations such as customers, sponsors, performing organizations, and communities that are actively involved in the project, or whose interests can be positively or negatively affected by the project execution or completion. They can also influence the project and its deliverables.

Stakeholders are groups of people (individuals, organizations, associations, and/or other smaller parts) that are attached to the project and contribute to and impact the final results of the project. Stakeholders of construction projects can include the Government, Project Team, and community. (Hakim, 2010)

C. Project Time Performance

Performance is the work results in terms of quality and quantity achieved by an employee in conducting his duties conforming to the responsibilities given to him [10].

Time performance is related to the time management required to complete the project according to the specified time. The selection of the right and effective tools will affect the speed of the construction process and the material transfer or distribution quickly, both horizontally and vertically [11].

III. RESEARCH METHOD

A. Research Variables

Research variables are attributes or properties or values of people, objects, or activities whose certain variations are determined by researchers to be studied and conclusions can be drawn [12].

In terms of their relationship with other variables, research variables can be divided into the following:

a. Independent variables: variables referring to independent if the variable acts as a stimulus, input, predictor, or antecedent variable The independent variables are also called free variables or variables that cause the emergence or change of dependent variables. So, the independent variable is a variable that influences.

b. Dependent variables: variables referring to dependent if the variable is influenced or becomes a result of the existence of independent variables

From the definition above, the variables used in this study are independent and dependent variables, where the independent variable (X) in this study is stakeholder based on PMBOK 2013, and the dependent variable (Y) is time performance.

The following are the research variables of stakeholder analysis based on PMBOK 2013 to improve time performance on the Grand Batavia project in Tangerang:

Risk scores help guide risk responses. For example, risks that negatively impact objectives, known as threats if any, and those in the matrix's high-risk (dark grey) zone may require priority action and an aggressive response strategy. Threats in the low-risk (medium grey) zone may not require proactive management action beyond being placed on the risk register as part of a watch list or adding to a contingency reserve. Similarly, opportunities, those in the high-risk (dark grey) zone that can be most easily acquired and offer the greatest benefits should be targeted first. Opportunities in the low-risk (medium grey) zone should be monitored [13].

Quantitative risk analysis is analyzing the impact of a risk event and assigning a numerical rating to a list of identified risks on the overall project objective (PMBOK, 2013). Quantitative risk analysis uses a model that can translate specific details of project uncertainties into the potential impact of the uncertainty (PMBOK, 2013).

B. Validity Test

Validity is a property that indicates the ability of a measurement tool to reveal something that is the subject of the research. The higher the validity of a measuring instrument, the higher the possibility of hitting its target. Validity testing is conducted using a correlation technique, namely correlating the score of each item with the total of the variable using the Product Moment correlation technique with the formula as follows [14]:

$$\text{r hitung} = \frac{n(\sum XY)-(\sum X).(\sum Y)}{\sqrt{\{N.\sum X^2-(\sum X)^2\}.\{N.\sum Y^2-(\sum Y)^2\}}} \quad (3.1)$$

Where:

r count = correlation coefficient
X = independent variable
Y = dependent variable
n = number of respondents

The basis for decision-making in the validity test is:

- If the r count value> r table, then the question item or statement in the questionnaire is significantly correlated with the total score (meaning the questionnaire item is declared valid)
- If the r count value <r table, then the question item or statement in the questionnaire is not significantly correlated with the total score (meaning the questionnaire item is declared invalid)

C. Reliability Test

This analysis is used to show the extent to which a measurement result is relatively consistent when the measurement is repeated two or more times.

The reliability test is conducted using the Cronbach Alpha test with the following formula:

$$r = \left(\frac{k}{k-1}\right)\left(1-\frac{\sum \sigma_b^2}{\sigma_1^2}\right) \quad (3.2)$$

r = instrument reliability
k = number of questions
$\sum \sigma_b^2$ = number of item variants
σ_1^2 = total variance

The significance test is conducted at a significance level of 0.01, meaning the instrument can be reliable if the alpha value exceeds the critical r product moment. If testing reliability is achieved using the SPSS computer program, if alpha is more than 60% (0.6), then the questionnaire as a measuring tool for this research can be declared reliable. The level of realism used is 1%. (Azwar, 2001).

D. Regression Analysis

Regression analysis is conducted to study how closely the relationship between one or more independent variables and a dependent variable. Regression is a tool used to measure the effect of each change in the independent variable on the dependent variable.

$$Y = a + b1X1+b2X2+\ldots+bnXn \quad (3.3)$$

Where:
Y = dependent variable
a = constant
b1,b2 = regression coefficient
X1, X2 = independent variables

IV. RESULT AND DISCUSSION

A. First Stage Analysis

In the first stage of filling out the questionnaire, the respondents were academics in civil engineering and professionals who have been involved in construction projects for over ten (10) years. The purpose of implementing the first stage of the questionnaire was to see the experts' responses regarding the variables found by researchers through literature studies. Experts can provide comments and input on variables from the literature to become relevant and usable for the research. Therefore, sampling was conducted on three (3) people, namely two (2) experts from academics and one (1) expert with a background as a professional in the Grand Batavia project.

Table 1. Expert Data

No	Expert	Profession	Education	Experience
1	Expert 1	Academic	Bachelor Degree (S1)	35 years
2	Expert 2	Contractor	Master Degree (S2)	10 years
3	Expert 3	Academic	Master Degree (S2)	8 years

Source: Result processed by Author, 2024

In this stage, the experts provide responses, improvements, and input on the 42 research variables proposed by the author. After the questionnaires were collected from 2 experts, improvements were made to the variables; namely, those the experts did not approve would be discarded and not used in the second stage of data. The following are the results of expert validation of risk factors that affect the completion time performance of the Grand Batavia project.

In choosing "yes" and (x) "no", there are 42 proposed variables to be 35 variables used, and 5 variables unused. The 35 variables were used in the second stage questionnaire (pilot survey).

B. Second Stage Analysis

After obtaining the risk variables from expert validation results, data collection was conducted with a second-stage questionnaire. The second stage of the collection is a pilot survey to receive opinions on whether the variables are easy to understand or need simplification. In addition, the pilot survey is also a trial for respondents to obtain improvements before the questionnaire is given to actual respondents.

Table 2. Respondent Data of the Second Stage Questionnaire

No	Respondent	Profession	Education	Experience
1	R1	Owner	S1	5-10 years
2	R2	Owner	S2	0-5 years
3	R3	Contractor	S1	5-10 years

From the pilot survey results, several respondents improved the sentence structure of several risk variables and variables requiring improvements. The final results of the pilot survey are presented in the following table:

The results of this pilot survey have been improved so that the variables are easy for respondents to understand or comprehend for use in the third stage questionnaire.

C. Third Stage Analysis

The questionnaire distributed in the third stage questionnaire is the result of the pilot survey questionnaire that has been improved so that the variables in the questionnaire are easy to understand. Respondents in the third stage are actors interested in implementing the project. The following is the respondent profile:

1. Respondent Sample

This study was conducted on 35 respondents in the Grand Batavia development project. The number of samples from a certain population with a 10% error rate is from 35 respondents used to be 31 respondents. The general description of 31 respondents in the study detail is grouped based on job position, work experience, and education.

2. Respondent Profile Based on Job Position

From the grouping and the recapitulation of respondents filling out the questionnaire, data shows the job positions: supervisor (52%), engineer positions (26%), quantity surveyor (10%), project admin (7%), SPV coordinator (3%), and building manager (2%).

3. Respondent Profile based on Education Level

From the grouping and the data recapitulation of respondents filling out the questionnaire, data shows their education level: S1 (97%) and S2 (3%).

4. Respondent Profile based on Work Experience

From the grouping and the recapitulation of respondent filling out the questionnaire, data shows the work experience: 0-5 years of experience (84%), 5-10 years of experience (10%) and > 10 years of experience (6%).

D. Validity Test

The validity test is useful to determine the validity or suitability of the items to be used, so it is necessary to conduct a significant test or real level of 0.05 (5%) or 0.01 (1%), namely the research variable is considered valid if the item correlates with the total score. (Aslan, 2014)

The validity is also determined by comparing the r count of the Pearson Correlation method with the r Table value. If the correlation coefficient of the item to the total r count> r Table by taking a significant level of 0.01 (1%) with the number of

respondents (N) and degree of freedom (df) = N - 2 = 31 -2 = 29 is 0.470. The following are the results of data processing with the statistical programs.

Based on the validity test results, the 5 variables are removed/unused because they do not meet the significance level of 0.01 (1%) or r count < r Table, namely X1, X16, X19, X32, and X35. Therefore, the used variable is 30 variables.

E. Correlation Test

Correlation with the Spearman method was used because the data were nonparametric with an ordinal scale type. The previous test, namely the validity test with the Pearson Correlation method, had numerous significant variables. By this, the researcher will conduct a correlation test using the Spearman method to determine whether there is a relationship between the independent and dependent variables on variables that have been previously validated using the Pearson Correlation method. In this correlation test, the data refers to the correlation coefficient value column (r count), compared with the r Table value. The r Table value for a 2-sided test with a 99% confidence level or 1% significance with 30 respondents is 0.463 for the Spearman correlation. For statistical decision-making, the variable has a correlation coefficient> 0.463.

The following table shows the output of the statistical program for the results of the correlation test of variable X (risk factor) against variable Y (time performance):

The results of the correlation test of the relationship between X and Y for time performance, the variables with a high level of significant correlation are X2, X4, X6, X12, X13, X14, X15, X23, X24, X26, X27, X29, X31 and X34. The total variables with a significant level of 0.01 (1%) are 14 variables.

F. Reliability Test

Reliability determination refers to the measurement results with an instrument being the same if the measurement is by the same person at different times (same conditions). An instrument is reliable if it produces consistent results for repeated measurements. So to determine the consistency of the measuring instrument, namely according to Alsan (2014), a reliability test is used using the Cronbachs' alpha method as follows:

- Cronbach Alpha value ≥ 0.6 indicates that the research questionnaire is reliable.
- Cronbach Alpha value ≤ 0.6 indicates that the research questionnaire is not reliable.

For the reliability test, Crobach's value obtained is 0.930 (more than 0.6). Therefore, this research questionnaire is reliable and consistent with N of items that are the variables used or valid from previous testing, namely 14 variables.

G. Multiple Linear Regression Analysis

The following are the results of data processing using a statistical program for multiple linear regression analysis:

$$Y = -0.501 + 0.625X_2 + 0.186X4 - 0.358X_6 - 0.440X_{12} + 0.504X_{13} - 0.294X_{14} + 0.184X_{15} - 0.282X_{23} - 0.004X_{24} + 0.652X_{26} + 0.187X_{27} + 0.065X_{29} + 0.004X_{31} + 0.091X_{34}$$

The description of the linear regression equation above is as follows:

1. Constant of -0.501, meaning if all independent variables (X2, X4, X6, X12, X13, X14, X15, X23, X24, X26, X27, X29, X31, X34) have a value of zero (0) then the value of the dependent variable Y (project delay) is 0.501%.
2. The regression coefficient X2 is positive, meaning that the stakeholder owner at the time of the design change during the work in progress experienced an increase of 1%, then the time performance will increase by 0.625%.
3. The regression coefficient X4 is positive, meaning that the stakeholder owner at the time of inadequate/poor supervision experienced an increase of 1%, then the time performance will increase by 0.186%.
4. The regression coefficient X6 is negative, meaning that the stakeholder owner at the time the project location conditions improved by 1%, then the time performance will decrease by 0.358%.
5. The regression coefficient X12 is negative, meaning that the contractor stakeholder at the time when the workforce skills were inadequate experienced an increase of 1%, then the time performance will decrease by 0.440%.
6. The regression coefficient X13 has a positive value, meaning that contractor stakeholders when the availability of equipment at the location increases by 1%, then time performance will increase by 0.504%.
7. The regression coefficient X14 has a negative value, meaning that contractor stakeholders when the experience of the field manager/supervisor increases by 1%, then time performance will decrease by 0.294%.
8. The regression coefficient X15 has a positive value, meaning that contractor stakeholders when labor discipline increases by 1%, then time performance will increase by 0.184%.
9. The regression coefficient X23 has a negative value, meaning that subcontractor stakeholders, when adequate labor skills increase by 1%, will decrease time performance by 0.282%.
10. The regression coefficient X24 has a negative value, meaning that for subcontractor stakeholders, when the availability of equipment increases by 1%, time performance will decrease by 0.004%.
11. The regression coefficient X26 has a positive value, meaning that subcontractor stakeholders at the time of access to mobilization and demobilization of people/materials at the location experience an increase of 1%, then time performance will experience an increase of 0.652%.
12. The regression coefficient X27 has a positive value, meaning that supplier stakeholders at the time of

procurement of supplier materials experience an increase of 1%, then time performance will experience an increase of 0.187.

13. The regression coefficient X29 has a positive value, meaning that supplier stakeholders at the time of material mobilization access from and to the location increased by 1%, then time performance will increase by 0.065%.
14. The regression coefficient X31 has a positive value, meaning that government stakeholders at the time of changes in development regulations such as taxes increased by 1%, then time performance will increase by 0.004%.
15. The regression coefficient X34 has a positive value, meaning that if stakeholders who interfere with project security increase by 1%, then time performance will increase by 0.091%.

H. Partial Significance Test (t-test)

Based on the partial significance test (t-test) above can be concluded as the t-count and significance of each risk factor variable. The following are the recapitulation results.

Of the 14 independent variables, 3 independent variables affect the dependent variable, namely the significance value <0.05 or the T count value> T Table, namely, according to Sugiyono (2009), the T Table value = 2.145. Thus, it can be concluded that the Y variable (time performance) is greatly influenced by the X2 variable (Design changes during work in progress) from the owner stakeholder, X13 (Availability of equipment at the location) from the contractor stakeholder, and X26 (Access to mobilization and demobilization of people/materials at the location) from the subcontractor stakeholder. So, the 3 variables that greatly influence the time performance of the Grand Batavia construction project will be analyzed in the discussion on stakeholders.

I. Data Collection and Analysis Stage 4 (Final Expert Validation)

Data collection at this stage is conducted by distributing advanced risk response questionnaires and using the same interview method to the Expert as the Expert in the initial data collection stage. Expert validation at this stage is conducted to determine whether the Expert agrees with the risk factors identified in Table 4.10. In addition, the Expert is also requested to identify the causes and sources of each identified risk factor and the risk response to these risk factors, both preventive and corrective actions that can be used as strategies to improve time performance on the Grand Batavia construction project.

J. Stakeholder Risk Analysis

The variables tested for the relationship between X and Y and obtained the 3 risk factors with risk ranking analysis.

The risk factors' on-time performance ranking can be conducted by entering the scale value and weight of each element from the impact and probability matrix from PMBOK 2013.

From the value of the risk factors influence, the impact and probability matrix can be done with the results after testing validity, reliability, and regression. The following is a table of impact and probability values:

The results obtained are X2, X13, and X26, with the impact and probability matrix zone having a high-risk rating that must require priority actions and strategies with an aggressive response

The most influential risk factors are obtained based on the multiple linear regression equation from the t-test. Then, the impact and probability matrix also has a high-risk rating on-time performance, which are risk factors related to the influence on this project. A comprehensive discussion is conducted on the 3 dominant risk factors. It requires prioritized actions or strategies with aggressive responses that affect the time performance of implementing the Grand Batavia development project. Tabulation of the impact and causes of risk factors, along with preventive and corrective actions, are described in Tables and flowcharts to see the interrelationships.

a. Design changes during work in progress at the stakeholder owner

Causes:

1. The design on the working drawings is incomplete.
2. There are differences in the floor plan, elevation, and details.

Impacts:

1. Work is delayed while waiting for a decision.
2. There is a demolition of work.

Preventive Actions:

1. Control during the design process
2. Evaluation after the design is complete
3. Meeting with related stakeholders before work begins

Corrective Actions:

1. Accelerate the decision-making process
2. Hold a meeting with related stakeholders to get results approved by the relevant stakeholders

The risk factor for design changes during work in progress caused by the design on the working drawings being incomplete and there are differences in the floor plan, elevation, or details; the preventive actions taken are to control during the process of designing construction drawings, evaluate them after the design is complete to minimize errors and hold a pre-construction meeting with the contractor or related stakeholders before starting construction work. The impact is that work is delayed due to waiting for a decision from the owner and dismantling of work that has been completed, so the corrective action is to speed up the decision-making process by holding a meeting of related stakeholders so that the results can be decided immediately and quickly.

b. Equipment availability at the contractor stakeholder's location

Cause:
1. Location and condition of the project
2. Use of tools unzuitable to their function

Impact:
1. Improperly-functioning tools
2. Easily damaged equipment

Preventive Actions:
1. Information about the location and condition of the project
2. Procurement and use of equipment suitable to the function and capacity of the tool.

Corrective Actions:
1. Tool maintenance
2. Having spare equipment

The risk factor for the tool availability at the project location is caused by the location and condition of the project that allows for the tool used and can also be due to the tool used unsuitable to their function, so the preventive action taken is to find out information about the location or condition of the project and the procurement of tool used suitable to their function and capacity. The impact is that the tool does not function properly and is easily damaged, so the corrective action is to have routine tool maintenance and spare equipment.

c. Mobilization and demobilization access of people/materials in the location of subcontractor stakeholders

Causes:
1. Damaged conditions of project location
2. Extreme natural conditions

Impacts:
1. Mobilization and demobilization of people/materials are hampered
2. Unable to mobilize and demobilize people/materials

Preventive Actions:
1. Site survey
2. Repair of road access at the project location by related stakeholders

Corrective Actions:
1. Coordination with related stakeholders
2. Arranging strategies in proper management

V. CONCLUSION

From the results of the analysis of stage I (Expert validation), analysis of stage II (pilot survey), analysis of stage III (respondents) and analysis of stage IV (final Expert validation), 3 variables were obtained that had the most influence on the performance of the implementation time in the Grand Batavia project. Then, a risk analysis can be conducted on stakeholders based on PMBOK 2013 to improve time performance by knowing the relationship patterns between causes, impacts, and preventive and corrective actions. The following are corrective actions for the risks in the Grand Batavia project:

1. The design changes during the work at the stakeholder owner, then accelerate the decision-making process by meeting related stakeholders so that the results can be decided immediately and quickly.
2. Tool availability at the project location in the contractor stakeholder, then by routine equipment maintenance and spare equipment.
3. Access to mobilization and demobilization of people/materials at the subcontractor stakeholder, then coordination with related stakeholders regarding damaged locations and arranging strategies in proper management for mobilization and demobilization.

A. Suggestions

1. The research result obtained can be a reference for stakeholders related to making improvements to the Grand Batavia project in improving time performance.
2. Further research should be able to conduct research involving a larger number of samples using more complete data analysis and increasing the sources so that the research is more valid.

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