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Effect of Change Contract Order, Labor, Material, Tools to Time Delayu of Low-Rise State Building Project

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ABSTRACT

Construction of state low-rise buildings in Pangkalpinang city is a common project that usually built by The Public Works Department of Pangkalpinang. The problem often faced by construction of state low-rise buildings projects at Pangkalpinang is the low performance of time (Delay). This condition be expected caused by Change Contract Order (CCO), man power, materials, and machine, This research aims to analyze the influence of those factors on delay time in state low-rise building construction projects. The analysis used in this research is multiple regression with SPSS. This research find that both and parsially the 4 (four) factors influence the time-performance (delay) of low-rise state building construction. Based on data analysis, the equation Y = 3.887+ 0.390 X1 + 0,278 X2 + 0,265 X3 + 0,341 X4. Based on the results of the Coefficient of Determination Test, simultaneously CCO Factors (X1), Manpower Factors (X2), Materials Factors (X3) and Machines Factors (X4) have an influence contribution of 74.0 % of Time Performance (Y). Meanwhile, for the results of the most dominant factor analysis using Beta Standardized x Zero-Order, it was found that the CCO Factor (X2) was the most dominant factor that could influence time performance with an influence value of 23.99%. Considerations in determining alternative solutions to control time performance in state low-rise building construction projects are carried out on the most dominant factor, namely the CCO Factor (X1).

Keywords: Change Contract Order (CCO), man power, material, machine, performance of time, SPSS.

INTRODUCTION

Time Performance in the construction of low-rise state buildings in Pangkalpinang City is influenced by several factors. These factors can be divided into 2 (two) parts, namely: Technical and Non-Technical Factors. Technical factors include Change Contract Orders, labor, materials and equipment. While non-technical factors are environmental factors. As an archipelago, Pangkalpinang City relies heavily on the transportation sector, both land transportation, sea transportation and air transportation to meet the needs of materials, equipment and labor. This means that Pangkalpinang City in particular and Bangka Island in general, have a very large dependence on outsiders, namely Sumatra and Java. These geographical factors affect the availability of labor, materials and construction equipment in Pangkalpinang City. The problem often faced by low-rise state building construction projects in Pangkal Pinang City is the delay in project completion. Changes in the scope of work (CCO), Labor, Materials and Equipment are suspected to be the factors causing the delay. Researchers conducted a review of construction management performance on 5 low-rise state building developments in Pangkalpinang City for the period 2021-2023, with a description of the time performance achievement still not optimal according to plan, from the 5 projects, an average delay of 27.02% of the total planning time was obtained, with the following details:

1. Construction of the Depati Hamzah Hospital Polyclinic in 2021 experienced a delay of 34.75%
2. Construction of the Kubah Timah Mosque in 2022 experienced a delay of 7.69%
3. Construction of the Kejari Office in 2023 experienced a delay of 8.33%.
4. Construction of the Satpas Polresta in 2023 experienced a delay of 41.62%.
5. Construction of the Gabek I Village Head Office in 2021 experienced a delay of 42.73%.

During construction, there was a process of changing the scope of work (CCO), a shortage of skilled workers, limited stock, delivery of materials and scarcity of equipment. One of the causes of CCO is the user's request to change the scope of work during the construction period. This condition causes the contractor's performance to decline and ultimately results in the failure to achieve the planned time performance. The impact caused by the failure to achieve time performance in the construction of low-rise state buildings for the service user is the delay in the planned operational schedule of the building, while for the service provider (contractor), the delay in completion of construction results in a fine of 0.1% per day and a maximum of 5% of the work contract value. Based on the identification of the problem and the causes and impacts, there is a problem phenomenon that triggers the author to conduct a the research by creating an analysis theme of factors that can affect time performance in the construction of low-rise state buildings. The problem is formulated based on the existing problem phenomenon, as a research question, including:

1. What factors can affect time performance in low-rise state building construction projects?
2. What is the most dominant factor that affects time performance in low-rise state building construction projects?
3. How do the results of this study compare to the results of previous studies?
4. What is the alternative solution to the most dominant factor in delaying the implementation of low-rise state building construction projects?

The limitations of the problem in this study include:

1. The research objects reviewed are 5 low-rise state building construction projects in Pangkal Pinang City for the period 2021 - 2023.
2. The study focuses on time performance in the implementation of low-rise state building construction projects.
3. The factors studied are the dominant factors that influence time performance in the implementation of low-rise state building construction projects.

The objectives of this study are:

1. Obtain and analyze the factors that influence time performance in the implementation of low-rise state building construction projects.
2. Obtain and analyze the most dominant factors that influence time performance in the implementation of low-rise state building construction projects.
3. Obtain and analyze a comparison of the results of this study with the results of previous studies.
4. Obtain and analyze alternative solutions from the most dominant factors that influence time performance in the implementation of low-rise state building construction projects.

The benefits of this study are:

1. Increase insight for readers/students about the factors that influence time performance in the implementation of low-rise state building construction projects.
2. As a reference regarding the factors that can influence time performance in the implementation of projects

Definition of Construction Projects

A construction project is a series of activities that are only carried out once and are generally short-term. In the series of activities, there is a process that processes project resources into an activity result in the form of a building. The process that occurs in the series of activities certainly involves related parties, both directly and indirectly. Each project is unique, in fact no two projects are exactly the same. A project is a temporary activity of personnel, materials, and facilities to make/realize project goals within a certain period of time which then ends. A construction project is a series of interrelated activities to achieve certain goals (buildings/constructions) within certain time, cost and quality limits. Construction projects always require resources, namely man, material, machine, method, money, environment, and change [1].

In a construction project, there are three important things that must be considered, namely time, cost and quality. In general, construction quality is a basic element that must be maintained to always be

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in accordance with the planning. However, in reality, cost overruns often occur as well as delays in implementation time. Thus, the expected work efficiency and effectiveness are often not achieved. This results in developers losing competitive value and market opportunities.

Construction Project Management

A project is defined as a series of unique activities that are interdependent to achieve certain results and are completed within a certain period of time. Each project produces a unique product, service, or result that may be goods or services. Project activities can be repeated, but this repetition does not change the characteristics inherent in the project. For example, an office building may be built with the same materials and the same team, but each building in the project remains unique and has a different location, design, conditions, etc [2].
Project management is a system control method that contains parameters in its application, namely: Manpower (labor), Machiners (tools and equipment), Material (building materials), Money (money), Environment (environment) and Method (method) to build a construction project. The work of a construction project always begins with three things, namely planning, scheduling, and supervision to achieve the planned results [3].
Construction management is how a project manager can utilize the resources involved in a construction project properly. The resources of a construction project can be grouped into manpower, material, machines, money, method [1].
According to [4], in the construction implementation stage there are three stages of implementation, namely: the planning stage, the implementation stage and the completion stage, the maintenance stage and the project handover. Project benchmarking always shows that a project when implemented must meet three criteria, namely:

1. Project Cost: Does not exceed the project cost limit that has been agreed upon previously or in accordance with the construction work contract document.
2. Project Quality: The final result of the work must meet the standards in accordance with the mutual agreement and in accordance with the construction work contract documents.
3. Project time: Must complete the work according to the deadline agreed in the construction work contract documents.

Construction Project Delays

Delays are part of the implementation time that cannot be utilized optimally, causing several activities to be delayed or even unable to be completed on time according to the planned schedule [1]. There are 4 (Four) categories of delays in the construction industry, namely:

1. Critical or non-critical
    a. Critical delays are types of delays that affect the completion time of the work. In some cases, critical delays can affect the milestone date.
    b. Non-critical delays are types of delays that do not occur during critical activities, so they do not affect the duration of the work completion time.
2. Excusable or non-excusable
    a. Excusable is a type of delay that occurs due to factors beyond the contractor's control.
    b. Non-Excusable is a type of delay that occurs due to factors that are within the contractor's control or can be predicted in advance by the contractor.
3. Compensable or non-compensable
    a. Compensable Delays is a type of delay where the contractor is entitled to compensation in the form of an extension of the work completion time and reimbursement of costs.
    b. Non-Compensable Delays is a type of delay where the contractor is not entitled to compensation in the form of an extension of the work completion time and reimbursement of costs.
4. Concurrent or single (Concurrent or Non-Concurrent)

Concurrent Delays refers to a delay situation where two or more delays occur at the same time or overlap. Single (Non-Concurrent Delays) is a type of delay that is independent and does not occur simultaneously with other delays.

Causes of Construction Project Delays

Conducted a study on factors causing construction project delays reviewed from three main components, namely [5], [6]:

1. The main factors causing construction project delays related to contractors, especially the flow of funds from contractors, weak management capacity, and lack of experience of contractors and subcontractors.
2. The main factors causing construction project delays related to consultants, namely the completeness and timeliness of project information, accuracy of building design, communication management, work experience, priorities during construction, ignoring some details in the design, and not fully understanding the needs of the project owner.
3. External factors causing construction project delays include the authorities (owner/government), applicable regulations, weather conditions, natural disasters, rain, changes in government regulations and legislation, and the impact of land conditions.

Impact of Construction Project Delays

Project delays will cause losses to the contractor, consultant, and owner, with the following description:

1. For the contractor, delays in completing the project result in an increase in overall costs due to the increase in implementation time. Overhead costs include costs for the company as a whole, regardless of whether or not there is a contract.being handled.
   For the consultant, if the project implementation is delayed in completion, the consultant will experience a loss of time, which will have an impact on the delay in the design of other projects.
2. For the owner, with the delay in the project on the part, it means the loss of income from buildings that should be used or rented. If the owner is the government, a public facility building such as a hospital, of course the delay will harm public health services or health service programs that have been prepared [7].

How to Control Delays in Construction Projects

In the construction process, there is always a shortage of raw materials and finished product processing materials, both domestic and imported production. How to handle it depends on the project requirements, from direct handling by special staff in the organization, to the division of responsibilities between clients, contractors, and subcontractors to win the main project tender [8]. There are various ways to do this. All subcontractors, suppliers or agents, importers, manufacturers or industries are bound by the planning documents and technical specifications specified.

Low-Rise State Buildings

Based on the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia [9] Concerning the Construction of State Buildings in Article 1 paragraph 1 explains the definition of State Buildings, namely Buildings for official purposes that are state or regional property and are procured with funding sources originating from the APBN, APBD, and/or other legitimate acquisitions. Pangkal Pinang City Regional Regulation [10] Concerning Buildings in Article 8 paragraph 8 explains the classification based on the height of buildings in Pangkal Pinang City.

Research Sampling Method

Suggestions regarding the size of the sample for research are:

1. The right sample size for research is between 30 and 500.
2. If the sample is divided into several categories, then the minimum number of sample members in each category is 30.
3. If your research involves multivariate analysis such as correlation analysis or multiple regression, the number of sample members is at least 10 times the number of variables studied.
4. In a simple experimental study with experimental and control groups, the number of sample members is 10 to 20 people each. Validity Test [11].

In general, what is measured is what should be measured. According to [12], [13], validity comes from the word validity and refers to the degree of accuracy and precision of a measuring instrument

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(test) in carrying out its measurement function. A test is said to have high validity if it fulfills its measurement function or provides precise and accurate measurements according to the purpose of the test. A test that provides data that is not relevant to the purpose of the measurement is called a low validity test.

Reliability Test

The reliability of an assessment tool is the accuracy or consistency of the tool in assessing what is being assessed. This means that you will get relatively the same results every time you use this assessment tool. Reliability is translated as dependability [11]. Reliable measurement is measurement that can produce reliable data. Reliability has many other names, including: The main idea behind the concept of reliability, such as reliability, dependability, firmness, consistency, and stability, is how reliable a measurement result is [13]. A measurement result is said to be reliable if the same relative results are achieved several times with the same group of subjects and the aspects measured in the subjects do not change.

Multiple Linear Regression Analysis

Multiple linear regression analysis examines how the condition of a dependent variable (criterion) increases or decreases when the value of two or more independent variables as predictors increases or decreases (manipulated). to predict what will happen [11].
The general form of the multiple linear regression model with p independent variables is as in the following equation:
Y = α + b1X1 + b2X2 + b3X3 + ….. + βnXn + e
Where:
Y: Dependent Variable
α: Intercept (constant value)
X1, X2, X3, ..., Xn: Independent Variables
b1, b2, b3, ..., bn: Regression Direction Coefficient Value on Independent Variables

Application and Use of Statistical Product and Service Solutions (SPSS)

SPSS is a computer program specifically designed to process data using certain statistical methods. SPSS is an application program with fairly sophisticated statistical analysis capabilities and a data management system in a graphical environment with descriptive menus and simple dialog boxes to facilitate operational understanding. Some activities are very easy to do just by using a mouse on a computer device. SPSS is widely used in various marketing research, quality control and improvement, and scientific research.

RESEARCH METHODS

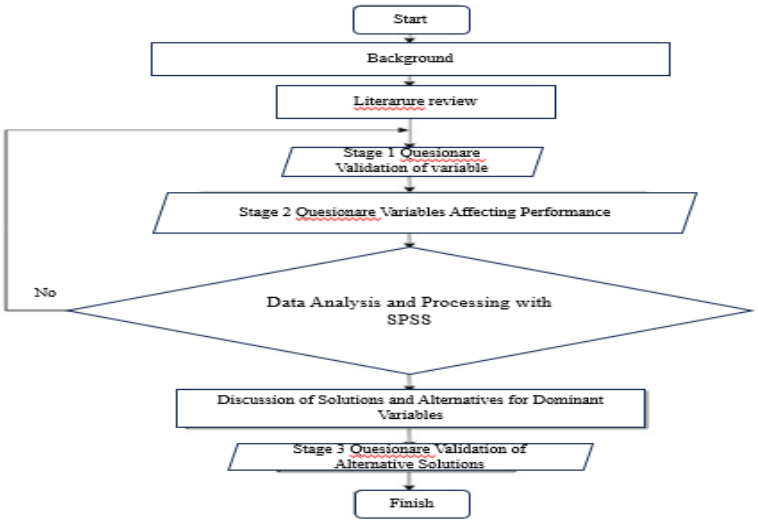

Figure 1. Research flowchart

Data Collection Technique

The data collection technique used in this study is a questionnaire survey targeting respondents with an academic background in SMA/SMK Building, civil engineering, Architectural Engineering, Environmental Engineering or practitioners in the field of building construction who are directly involved and experienced in project implementation activities. The data studied and analyzed in this study consisted of secondary data obtained from previous journal references to determine the initial research variables and primary data obtained by conducting field research. Field research is a method of collecting data obtained from the opinions of respondents when filling out the questionnaire. To obtain primary data for this study, a survey will be conducted on stakeholders who are directly involved in the low-rise state building construction project.

Population & Sampling Method

Determining the general population is based on objects or subjects that have certain characteristics and characteristics determined by the researcher to study them and draw conclusions from them [11].

Research Variables and Research Hypotheses

Research variables are symptoms that are the focus of the researcher's observations. Variables are characteristics of a group of people or things that are different from each other. In this study, the variables used consist of two variables, namely dependent variables and independent variables. Research variables include factors that play a role in the events or symptoms being studied. In this case, there is a relationship between the two variables [13]. For example, there is a relationship between variable Y and variable X. If variable Y is caused by variable X, then variable Y is called the dependent variable and variable X is called the independent variable. variables. In this study, time performance becomes the dependent variable (Y) because it is the object that is affected. While the influencing/causing variable is the independent variable (X), namely the factors that affect time performance in low-rise state building projects.

Modeling of research variables

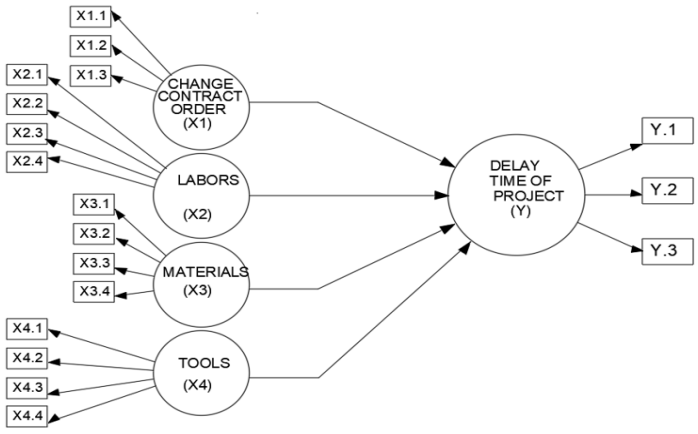

Figure 2. Modeling of research variables

From Figure 2 above, the research hypothesis can be made, with the following description:

1. CCO factor (X1) affects time performance (Y) in low-rise state building construction projects.
2. Labor factor (X2) affects time performance (Y) in low-rise state building construction projects.
3. Material factor (X3) affects time performance (Y) in low-rise state building construction projects
4. Equipment factor (X4) affects time performance (Y) in low-rise state building construction projects
5. CCO, Labor, Material and Equipment factors simultaneously affect time performance (Y) in low-rise state building construction projects.

The time performance referred to in this study is the delay in completion of work. The initial research variables were obtained through a literature study process, then expert verification and clarification were carried out.

Data Analysis Method

The analysis method is very important to identify relevant variables so that the research results are consistent with the objectives. Data and information from the respondent questionnaire are used as input for conducting this analysis.

After the data is collected, the data is then analyzed statistically using the SPSS (Statistical Product and Service Solutions) program to determine validity, reliability, and multiple linear regression analysis. Multiple linear regression analysis is used to obtain a comprehensive picture of the influence between independent variables (Xi) on the dependent variable (Y). Validity Test Validity is the accuracy or precision of an instrument in measuring what it measures. This validity test measures the accuracy of survey items, namely whether or not the survey items are accurate in measuring what is to be measured. Item validity is indicated by the presence of correlation or support between items (total score). The calculation is done by correlating the item score with the overall item score. The correlation coefficient is obtained from the results of the correlation calculation and is used to measure item validity, measure the degree of item validity, and determine whether the item is suitable for use [13]. The requirements for the validity test are as follows:

1. Based on rhitung (Pearson Correlation)
   a. $r_{test} > r_{table}$; means the questionnaire results are valid.
   b. $r_{test} < r_{table}$; means the questionnaire results are invalid. Find the r_{table} value from the r_{table} value distribution table of significance α.
2. Based on Significant Correlation Values
   a. Sig (2-tailed) < 0.05 and positive Pearson Correlation; means the questionnaire results are valid.
   b. Sig (2-tailed) < 0.05 and negative Pearson Correlation; means the questionnaire results are invalid.
   c. Sig (2-tailed) > 0.05; means the questionnaire results are invalid.

Reliability Test

Reliability testing determines the consistency of a measuring instrument, namely whether the measuring instrument used is reliable and remains consistent in repeated measurements. There are various ways to test this reliability. This study uses the Cronbach's alpha method. In this method, the results of the reliability test are displayed in the reliability statistics output, so you can determine whether the measurement device is reliable or not. According to [14], a questionnaire is said to be reliable if the Cronbach's alpha value is > 0.6. Reliability Test can show accuracy and consistency including:

1. If Cronbach's alpha (a) is 0.00 to 0.20, then it is less reliable
2. If Cronbach's alpha (a) is 0.21 to 0.40, then it is somewhat reliable
3. If Cronbach's alpha (a) is 0.40 to 0.60, then it is quite reliable
4. If Cronbach's alpha (a) is 0.61 to 0.80, then it is reliable
5. If Cronbach's alpha (a) is 0.80 to 1.00, then it is very reliable

Classical Assumption Test

To obtain a good regression equation, a classical assumption test is carried out which includes:

Residual Normality Test

This test aims to determine whether the residual value is normally distributed. A good regression model has a normally distributed residual value. The way to see it is to look at the data distribution on the diagonal source on the Normal P-P Plot of regression standardized graph as the basis for decision making. If it extends around the line and follows the diagonal, then the regression model is normal and suitable for predicting independent variables. The same thing also applies vice versa.

Another way to test normality is by the One Sample Kolmogorov Smirnov test method. The test criteria are as follows:

1. If the Significance value (Asym Sig 2 tailed) > 0.05, then the data is normally distributed.
2. If the Significance value (Asym Sig 2 tailed) < 0.05, then the data is not normally distributed.

Multicollinearity Test

Multicollinearity is a condition where there is a perfect or almost linear relationship between independent variables in a regression model. A regression model is said to be multicollinear if there is a perfect linear function for some or all of the independent variables in the linear function. Symptoms of multicollinearity can be analyzed by checking the Variance Inflation Factor (VIF) and Tolerance values. If the VIF value <10 and Tolerance> 0.1, it is stated that there is no multicollinearity.

Heteroscedasticity Test

Heteroscedasticity is a condition where the variance of the residuals for all observations in a regression model is not the same. The test method is with the Park Test. The test is carried out by regressing the independent variable against the absolute residual. "Remainder" is the difference between the value of the Y variable and the predicted value of the Y variable, and "absolute" is the absolute value (all positive values). If the significance value between the independent variable and the absolute residual is> 0.05, then there is no heteroscedasticity. According to [14], another possibility is if the scatterplots image does not have a clear pattern (wavy, widening then narrowing) and the points are spread above and below the number 0 on the Y axis, which means that there is no heteroscedasticity.

Multiple Linear Regression Analysis

Multiple linear regression analysis examines how the condition of a dependent variable (criterion) increases or decreases when the value of two or more independent variables as predictors increases or decreases (manipulated). to predict what will happen [11].
Multiple linear regression analysis is used to determine the direction and extent of influence of independent variables on dependent variables [14].

F Test

This test is to determine whether the independent variables together have a significant influence on the dependent variable. The hypotheses in this study are as follows:

1. Ho: Together, CCO Factor (X1), Labor Factor (X2), Material Factor (X3), Equipment Factor (X4), do not have a significant effect on Time Performance (Y).
2. Ha: Together, CCO Factor (X1), Labor (X2), Material Factor (X3), Equipment Factor (X4), have a significant effect on Time Performance (Y).

Decision-making criteria:

1. o0 is accepted and Ha is rejected, if Significance> 0.05 (no significant effect).
2. Ha is accepted and Ho is rejected if Significance <0.05 (significant effect).

Determination Analysis (R Square)

Determination analysis is a measure of how much contribution variable X has to variable Y. This analysis is used to determine the magnitude of the contribution of the simultaneous influence of independent variables on the dependent variable.
Determining the Ranking of the Influence of Independent Variables (X) on Dependent Variables (Y)
The dominance variable test is used to determine how much influence the independent variables have on the dependent variable. Use the beta coefficient to determine which independent variable has the greatest influence (dominates) on the value of the dependent variable [14]. The beta coefficient is also called the standardized coefficient, an independent variable can be said to have a dominant influence on the dependent variable (Y) if it has a larger standardized coefficient value compared to other independent variables.

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RESULT AND DISCUSSION

Questionnaire Stage 1 (Expert Validation)

The first stage questionnaire by experts to validate the variable indicators. The variable indicators that have been approved by experts are analyzed using descriptive analysis to obtain the variable indicators that will be used in further research. namely by distributing the second stage questionnaire to the research respondents. Based on the data collection from the literature that has been described previously, there are 18 indicators of the Analysis of the Influence of CCO, Labor, Materials and Tools on the Performance of the Implementation Time of Low-Rise State Building Projects [15].

Table 1. Expert respondent data

No.	Expert name	Gender	Position	Title	Job Title Experience (years)	Education
P.1	Ir. Ilpandari, S.T., M.T.	Male	Academic	Dean of FT and Science UNMUH Babel	15	S.2
P.2	Yayuk Apriyanti, S.T., M.T.	Female	Academic	Lecturer of Civil Engineering UBB	20	S.2
P.3	Ir. Ormuz Firdaus, S.T., M.T.	Male	DED Consultant	Team Leader	20	S.2
P.4	H. Heriady, S.T.	Male	MK Consultant	Site Manager	25	S.1
P.5	M. Agus Salim, ST	Male	Owner	Head of PUPR Office of Pangkalpinang City	20	S.1

Source: Researcher Processing (2024)

Table 2. Recapitulation of Expert Validation Results on Research Variables (X1)

No	Variable research	Code Indicator	Statement	Expert Perception of Assessment variable statements/indicators					Assessment		Conclusion
				P1	P2	P3	P4	P5	Agree	Disagree	
1	CCO (Change Contract Order)	X.1.1	Miscalculation in Planning (Consultant DED Review) can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree
	X.1	X.1.2	Existing conditions in the field that have not been taken into account in the DED result in changes in volume in the field which can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree
		X.1.3	Requests from Building Owners/Users/Regional Leaders/Institutional Leaders (User Request) to add/change/reduce the scope of work while construction is underway or has been running can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree

Source: Researcher Processing (2024)

Table 3. Recapitulation of Expert Validation Results on Research Variables (X2)

No	Variable research	Code Indicator	Statement	Expert Perception of Assessment variable statements/indicators					Assessment		Conclusion
				P1	P2	P3	P4	P5	Agree	Disagree	
		X.2.1									

2	Labor X.2		Lack of Labor Skills can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree
		X.2.2	Labor Does Not Have a Skill Certificate can affect the performance of the implementation time	v	v	x	x	x	2	3	Disagree
		X.2.3	Poor coordination between workers can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree
		X.2.4	Lack of Number of Workers can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree

Source: Researcher Processing (2024)

Table 4. Recapitulation of Expert Validation Results on Research Variables (X3)

No	Variable research	Code Indicator	Statement	Expert Perception of Assessment variable statements/indicators					Assessment		Conclusion
				P1	P2	P3	P4	P5	Agree	Disagree	
3	Material X.3	X.3.1	Lack of Material Quantity/Scarcity of certain materials can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree
		X.3.2	Delay in Material Procurement can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree
		X.3.3	Poor quality of materials can affect the performance of the implementation time	x	v	x	v	x	2	3	Disagree
		X.3.4	Damage to materials in the field can affect the performance of the implementation time	v	v	v	v	x	4	1	Agree

Source: Researcher Processing (2024)

Table 5. Recapitulation of Expert Validation Results on Research Variables (X4)

No	Variable research	Code Indicator	Statement	Expert Perception of Assessment variable statements/indicators					Assessment		Conclusion
				P1	P2	P3	P4	P5	Agree	Disagree	
4	Equipment X.4	X.4.1	Delays in the mobilization process of equipment/machines can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree
		X.4.2	Damage to equipment/machines can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree
		X.4.3	Equipment/machines that are not used according to specifications/functions can affect the performance of the implementation time	v	v	x	x	x	2	3	Disagree
		X.4.4	Limited number of equipment/machines can affect the performance of the implementation time	v	v	v	v	v	5	0	Agree

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Source: Researcher Processing (2024)

Table 6. Recapitulation of Expert Validation Results on Research Variables (Y)

No	Variable research	Code Indicator	Statement	Expert Perception of Assessment variable statements/indicators					Assessment		Conclusion
				P1	P2	P3	P4	P5	Agree	Disagree	
5	Time performance Y	Y.1	Planning Quality (Time Schedule) can affect the performance of implementation time	v	v	v	v	v	5	0	Agree
		Y.2	The suitability of the Time Schedule with field implementation can affect the performance of implementation time	v	v	v	v	v	5	0	Agree
		Y.3	The accuracy of the completion time between sub-activities can affect the performance of implementation time	v	v	v	v	v	5	0	Agree

Source: Researcher Processing (2024)

Table 7. Proposed Additional Variables According to Experts

No	Expert	Additional Variable Suggestions	Conclusion
1	P1	-	No additional variable proposals
2	P2	-	No additional variable proposals
3	P3	-	No additional variable proposals
4	P4	-	No additional variable proposals
5	P5	-	No additional variable proposals

Source: Research Processing (2024)

The results of the first stage questionnaire concluded that according to experts, there were several variable indicators that did not have an effect on time performance in the implementation of low-rise state building construction projects.

Table 8. Research Variables Expert Validation Results

No	Variable research	Indicator code	Variable Indicator
1	CCO X.1	X.1.1	Miscalculation in Planning (Consultant DED Review)
		X.1.2	Field Requirement Engineering (Site Engineering)
		X.1.3	Request from Owner/Building User/Regional Leader/Institution Leader during construction in progress or already underway (User Request)
2	Labor X.2	X.2.1	Lack of Labor Expertise
		X.2.2	Poor coordination between workers
		X.2.3	Lack of Labor
3	Material X.3	X.3.1	Lack of Material/Scarcity of certain materials
		X.3.2	Delay in Delivery/Procurement of Materials
		X.3.3	Damage to materials in the field
4	Equipment X.4	X.4.1	Hindered mobilization process of equipment/machines
		X.4.2	Damage to equipment/machines
		X.4.3	Limited number of equipment/machines
5	Performance Time Y	Y.1	Planning Quality (Time Schedule)
		Y.2	Suitability of Time Schedule with field implementation
		Y.3	Timeliness of completion between sub-activities

Source: Researcher Processing (2024)

Questionnaire Stage 2 (Variable Indicator Assessment)

Questionnaire stage 2 is the process of filling in assessment data on variables generated from questionnaire data stage 1 using a Likert scale. The results of this questionnaire stage 2 are primary data in the form of assessments of variable indicators that affect time performance in the implementation of low-rise state building construction projects.

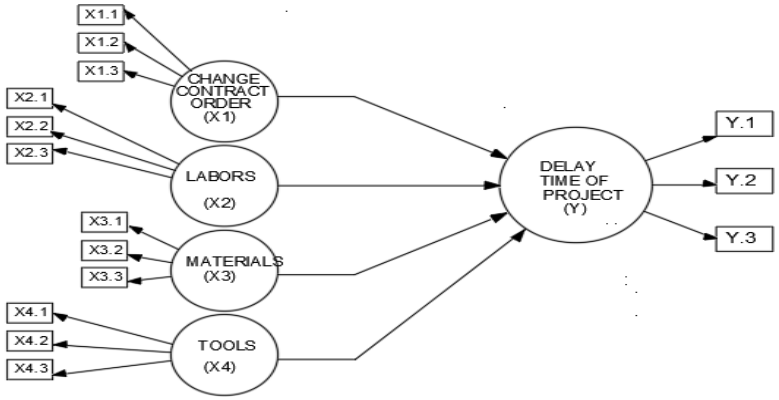

Figure 3. Relationship between Variable X and Variable Y Source: Researcher Processing (2024)

Respondent Overview

The researcher provided several questions in the questionnaire that could provide information about the respondent profile. The respondent profile from a total of 44 samples was grouped into 3 (three) groups based on job title, work experience (in years) and last education. The profile and number of respondents in the group can be seen in the table below:

Table 10. Profile and Number of Respondents

No	Description	Total (person)	Presentage
	Profile based on Job Title		
	Owner/Service User	5	11.36 %
	Site Manager -Contractor	4	9.09 %
1	Team Leader-Consultant	6	13.64 %
	Expert-Consultant	10	22.73 %
	Field Supervisor-PUPR Engineering Staff	19	43.18 %
	Total	**44**	**100 %**
	Profile based on Work Experience		
	More than 20 years	9	20.45 %
2	16 to 20 years	5	11.36 %
	11 to 15 years	11	25 %
	5 to 10 years	19	43.18 %
	Total	**44**	**100 %**
	Profile based on Last Education		
	S2	7	15.91 %
3	S1	30	68.18 %
	D3	3	6.82 %
	SMA/SMK	4	9.09 %
	Total	**44**	**100 %**

The existing respondents are categorized into 3 (three) groups with the percentage of each group can be seen below.

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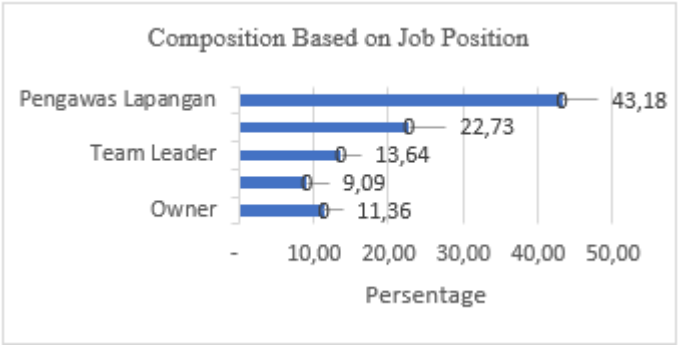

Figure 4. Composition based on job position Source: Researcher Processing (2024)

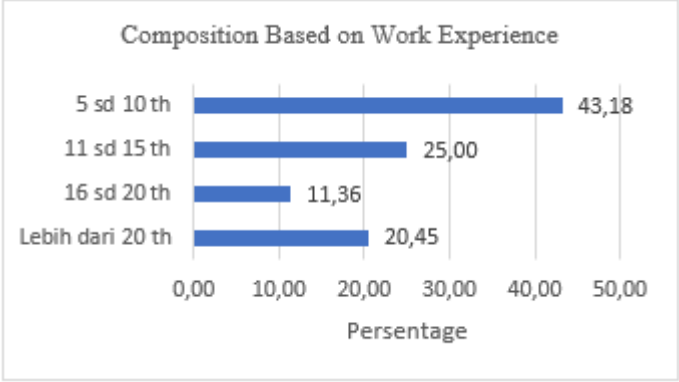

Figure 5. Composition based on work experience Source: Researcher Processing (2024)

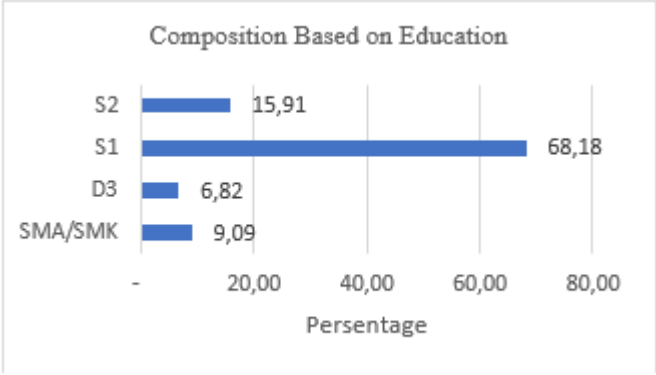

Figure 6. Composition based on education Source: Researcher Processing (2024)

Multiple Linear Regression Analysis

Multiple linear regression analysis is used to determine the direction and influence of independent variables on dependent variables [14]. The stages of testing multiple regression analysis in this study are as follows.

T Test Results

The T test is used to test the level of significance of the influence of each independent variable (X) on the dependent variable Y partially. Based on the Sig value in the table, a test of the influence of each Factor (X) on Time Performance (Y) is carried out. The T test calculation is carried out with df = n - k, where n = number of questionnaire respondents and k is the number of variables, then df = 44 - 5 = 39, with a Sig value. 0.05, the T table value is 2,708. The following are the results of the T Test.

DISTRIBUSI NILAI t_{tabel}

d.f	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$	d.f	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$
1	3.078	6.314	12.71	31.82	63.66	61	1.296	1.671	2.000	2.390	2.659
2	1.886	2.920	4.303	6.965	9.925	62	1.296	1.671	1.999	2.389	2.659
3	1.638	2.353	3.182	4.541	5.841	63	1.296	1.670	1.999	2.389	2.658
4	1.533	2.132	2.776	3.747	4.604	64	1.296	1.670	1.999	2.388	2.657
5	1.476	2.015	2.571	3.365	4.032	65	1.296	1.670	1.998	2.388	2.657
6	1.440	1.943	2.447	3.143	3.707	66	1.295	1.670	1.998	2.387	2.656
7	1.415	1.895	2.365	2.998	3.499	67	1.295	1.670	1.998	2.387	2.655
8	1.397	1.860	2.306	2.896	3.355	68	1.295	1.670	1.997	2.386	2.655
9	1.383	1.833	2.262	2.821	3.250	69	1.295	1.669	1.997	2.386	2.654
10	1.372	1.812	2.228	2.764	3.169	70	1.295	1.669	1.997	2.385	2.653
11	1.363	1.796	2.201	2.718	3.106	71	1.295	1.669	1.996	2.385	2.653
12	1.356	1.782	2.179	2.681	3.055	72	1.295	1.669	1.996	2.384	2.652
13	1.350	1.771	2.160	2.650	3.012	73	1.295	1.669	1.996	2.384	2.651
14	1.345	1.761	2.145	2.624	2.977	74	1.295	1.668	1.995	2.383	2.651
15	1.341	1.753	2.131	2.602	2.947	75	1.295	1.668	1.995	2.383	2.650
16	1.337	1.746	2.120	2.583	2.921	76	1.294	1.668	1.995	2.382	2.649
17	1.333	1.740	2.110	2.567	2.898	77	1.294	1.668	1.994	2.382	2.649
18	1.330	1.734	2.101	2.552	2.878	78	1.294	1.668	1.994	2.381	2.648
19	1.328	1.729	2.093	2.539	2.861	79	1.294	1.668	1.994	2.381	2.647
20	1.325	1.725	2.086	2.528	2.845	80	1.294	1.667	1.993	2.380	2.647
21	1.323	1.721	2.080	2.518	2.831	81	1.294	1.667	1.993	2.380	2.646
22	1.321	1.717	2.074	2.508	2.819	82	1.294	1.667	1.993	2.379	2.645
23	1.319	1.714	2.069	2.500	2.807	83	1.294	1.667	1.992	2.379	2.645
24	1.318	1.711	2.064	2.492	2.797	84	1.294	1.667	1.992	2.378	2.644
25	1.316	1.708	2.060	2.485	2.787	85	1.294	1.666	1.992	2.378	2.643
26	1.315	1.706	2.056	2.479	2.779	86	1.293	1.666	1.991	2.377	2.643
27	1.314	1.703	2.052	2.473	2.771	87	1.293	1.666	1.991	2.377	2.642
28	1.313	1.701	2.048	2.467	2.763	88	1.293	1.666	1.991	2.376	2.641
29	1.311	1.699	2.045	2.462	2.756	89	1.293	1.666	1.990	2.376	2.641
30	1.310	1.697	2.042	2.457	2.750	90	1.293	1.666	1.990	2.375	2.640
31	1.309	1.696	2.040	2.453	2.744	91	1.293	1.665	1.990	2.374	2.639
32	1.309	1.694	2.037	2.449	2.738	92	1.293	1.665	1.989	2.374	2.639
33	1.308	1.692	2.035	2.445	2.733	93	1.293	1.665	1.989	2.373	2.638
34	1.307	1.691	2.032	2.441	2.728	94	1.293	1.665	1.989	2.373	2.637
35	1.306	1.690	2.030	2.438	2.724	95	1.293	1.665	1.988	2.372	2.637
36	1.306	1.688	2.028	2.434	2.719	96	1.292	1.664	1.988	2.372	2.636
37	1.305	1.687	2.026	2.431	2.715	97	1.292	1.664	1.988	2.371	2.635
38	1.304	1.686	2.024	2.429	2.712	98	1.292	1.664	1.987	2.371	2.635
39	1.304	1.685	2.023	2.426	2.708	99	1.292	1.664	1.987	2.370	2.634
40	1.303	1.684	2.021	2.423	2.704	100	1.292	1.664	1.987	2.370	2.633
41	1.303	1.683	2.020	2.421	2.701	101	1.292	1.663	1.986	2.369	2.633
42	1.302	1.682	2.018	2.418	2.698	102	1.292	1.663	1.986	2.369	2.632
43	1.302	1.681	2.017	2.416	2.695	103	1.292	1.663	1.986	2.368	2.631
44	1.301	1.680	2.015	2.414	2.692	104	1.292	1.663	1.985	2.368	2.631
45	1.301	1.679	2.014	2.412	2.690	105	1.292	1.663	1.985	2.367	2.630

Figure 7. Distribution of t-table values

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.887	1.021		3.808	.000
	CCO	.390	.098	.356	3.159	.000
	Material	.265	.081	.366	3.278	.004
	Peralatan	.341	.096	.424	3.555	.002
	Tenaga Kerja	.278	.064	.410	4.321	.003

a. Dependent Variable: Kinerja Waktu

Figure 8. T-Test Coefficientsa Table. Source: Researcher Processing (2024)

In the CCO Factor variable (X1), the calculated T value = 3.159> t table 2.708 with a significance of 0.000 <0.05. So Ha is accepted and Ho is rejected, meaning that the CCO Factor (X1) has a partial significant effect on Time Performance (Y).
In the Labor Factor variable (X2), the calculated T value = 4.321> t table 2.708 with a significance of 0.003 <0.05. So Ha is accepted and H0 is rejected, meaning that the Labor Factor (X2) has a partial significant effect on Time Performance (Y).

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In the Material Factor variable (X3), the calculated T value = 3.278> t table 2.708 with a significance of 0.004> 0.05. So Ha is accepted and Ho is rejected, meaning that the Material Factor (X3) has a partial significant effect on Time Performance (Y).
In the Tool Factor variable (X4), the calculated T value = 3.555> t table 2.708 with a significance of 0.002 <0.05. So Ha is accepted and H0 is rejected, meaning that the Tool Factor (X4) has a partial significant effect on Time Performance (Y).
The largest B value is in the CCO variable (X.1) which is 0.390 with a significance of 0.000, this means that the CCO variable (X.1) has the strongest influence among other independent variables.

F Test

The F test is used to test the level of significance of the influence of all independent variables (X) on the dependent variable Y together. The F test calculation determines N2 using the formula N2 = n - k, where n is the number of questionnaire respondents and k is the number of variables used, then N2 = 44 - 5 = 39, while for N1 = k - 1, then N1 = 5 - 1 = 4, with a Sig. value of 0.05, the F Table value is 2.612.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	58.731	4	14.683	3.082	.027[b]
	Residual	185.815	39	4.764		
	Total	244.545	43			

a. Dependent Variable: Kinerja Waktu

b. Predictors: (Constant), Peralatan, Tenaga Kerja, Material, CCO

Figure 9. ANOVAa Table F Test Source: Researcher Processing (2024)

Based on the table above, it can be seen that the calculated F value = 3.082> F table 2.612 with a significance value of 0.027 <0.05. So Ha is accepted and Ho is rejected, meaning that, together, the CCO Factor (X1), Labor Factor (X2), Material Factor (X3), Equipment Factor (X4) have a significant effect on Time Performance (Y). It can be concluded that the regression equation is good (goodness of fit) and its predicted value can explain the actual situation.

Multiple Linear Regression Equation

Conceptually, regression analysis is a simple method for testing the relationship between variables. The relationship between the variables of interest is described in the form of an equation or model that connects the dependent variable (Y) and one or more independent variables (X).
Multiple linear regression equation:
$Y = \alpha + b1X1 + b2X2 + b3X3 + ….. + bnXn$
Description:
Y is the dependent variable
α is a constant
b1, b2, b3, …, bn are regression coefficients
X1, X2, X3,…, Xn are independent variables
Based on the Unstandardized Coefficients column B value in figure 7. (T-Test Coefficient figure) above, the multiple linear regression equation is written as follows:
$Y = 3.887 + 0.390\ X1 + 0.278\ X2 + 0.265\ X3 + 0.341\ X4$
The equation explains that the CCO Factor (X1), Labor Factor (X2), Material Factor (X3) and Equipment Factor (X4) have a significant effect on the performance of the implementation time (Y) in the low-rise state building construction project. The time performance referred to here is the delay in completing the work.
The equation explains that:

1. CCO Factor (X1), Labor Factor (X2), Material Factor (X3) and Equipment Factor (X4) have a significant effect on the Delay in Project Completion (Y) of low-rise state building construction.
2. If CCO Factor (X1), Labor Factor (X2), Material Factor (X3) and Equipment Factor (X4) are assumed to be 0 (zero), then the Project Completion Delay Value (Y) that occurs is 3.887.
3. If CCO Factor (X1) increases by 1 (one) unit and the other factors are assumed to be 0 (zero), then the Project Completion Delay Value (Y) increases by 0.390 units.
4. If Labor Factor (X2) increases by 1 (one) unit and the other factors are assumed to be 0 (zero), then the Project Completion Delay Value (Y) increases by 0.278 units.
5. If the Material Factor (X3) increases by 1 (one) unit and the other factors are assumed to be 0 (zero), then the Project Completion Delay Value (Y) increases by 0.265 units.
6. If the Equipment Factor (X4) increases by 1 (one) unit and the other factors are assumed to be 0 (zero), then the Project Completion Delay Value (Y) increases by 0.341 units.
7. If the CCO Factor (X1), Labor Factor (X2), Material Factor (X3) and Equipment Factor (X4) increase by 1 (one) unit, then the Project Completion Delay Value (Y) that occurs is 3,887 + 0.390 + 0.278 + 0.265 + 0.341.

Determination Coefficient Test

The determination coefficient aims to see how much partial influence an independent variable has on the dependent variable. The coefficient of determination is the square of the correlation coefficient as a measure of the ability of each variable used. The coefficient of determination has a value between 0 and 1. A value close to 1 means that the independent variable provides almost all the information needed to predict the dependent variable [14], [16].
Based on the results of the analysis of the coefficient of determination test which can be seen in the table above. The table explains the value of R Square which is 0.740, then the influence of the independent variables (CCO Factor, Labor Factor, Material Factor and Equipment Factor) on the dependent variable (performance of the implementation time of the construction of low-rise state buildings) is 74.0% the remaining (100 - 74.0% = 26.0%) of 26.0% is influenced by other factors outside this study.

Ranking and Determination of Dominant Variables

The dominance variable test is used to determine how much influence the independent variables have on the dependent variable. Use the beta coefficient (Beta Coefficient) to determine which independent variable has the greatest influence (dominates) on the value of the dependent variable [14], [17].
Beta Coefficient is also called Standardized Coefficient, an independent variable can be stated to have a dominant influence on the dependent variable (Y) if it has a Standardized Coefficient value that is greater than other independent variables. The standardized coefficient based on the results of the analysis in this study can be seen as follows:

Table 12. Dominant Variable Ranking.

No	Variable research	Beta Standarized	Zero-Order	Beta Standarized x Zero-Order	% Dominant
1	CCO Factor (X1)	**0.356**	**0.674**	**0.240**	**23.99**
2	Labor Factor (X2)	0.366	0.422	0.154	15.45
3	Material Factor (X3)	0.424	0.471	0.200	19.97
4	Equipment Factor (X4)	0.410	0.356	0.146	14.60
a. Dependent Variable: Time			∑	0.740	74.0 %

Source: Researcher Processing (2024)

Based on the analysis of the research that has been conducted, it can be concluded that the CCO Factor, Labor Factor, Material Factor, Equipment Factor, can affect the performance of the implementation time of the construction of low-rise state buildings by 74.0%

Based on the analysis of the research that has been conducted, it can be concluded that the CCO Factor variable (X1) as the dominant factor in influencing the performance of the implementation time of the low-rise state building construction project is 23.99%.
Based on the analysis, the ranking of the variables that most influence the performance of the implementation time of the low-rise state building construction project is obtained, namely as follows:
Rank 1 CCO Factor (X1) with an influence of 23.99%
Rank 2 Material Factor (X3) with an influence of 19.97%
Rank 3 Labor Factor (X2) with an influence of 15.45%
Rank 4 Equipment Factor (X4) with an influence of 14.60%.

Discussion of Research Findings

The research that has been conducted states that all research variables, namely the CCO Factor (X1), Labor Factor (X2), Material Factor (X3) and Equipment Factor (X4), can affect the performance of the implementation time of the low-rise state building construction project. This is almost in line with previous research [17] entitled "Analysis of the Influence of Manpower, Material, Machine, Method, Money & Environment on the Performance of the Cold Storage Building Construction Project Implementation Time" which observed the performance of construction management in terms of time in the implementation of the Cold Storage Building construction project, the results of the study showed that the Manpower Factor, Material Factor, Machine Factor, Method Factor, Money Factor and Environment Factor influenced the performance of the time in the implementation of the Cold Storage Building construction project, with the material factor being the dominant factor. The difference between this study and previous research is that this study took the object of the Low-Rise State Building in Pangkal Pinang City, added the Change Contract Order (CCO) Factor and did not analyze the Method, Money and Environment Factors [18]-[20].

Discussion of Change Contract Order (CCO) Factors

Table 13. Discussion of Alternative Solutions for Variable X1

No	Indicator code	Indicator Variable	Solution Alternative
1	X1.1	Miscalculation in Planning (Consultant DED Review)	Contractors are required to observe the volume in the bill of quantity (BQ) uploaded in the auction and compare it with the plan drawings. All components of the work must be present with reasonable volume calculations. If you find components or planning volumes that are unreasonable, you can ask in the aanwidjing or work explanation meeting with the owner and DED consultant.
2	X1.2	Field Requirement Engineering (Site Engineering)	The contractor is required to conduct an initial mutual check (MC-0), which is a recalculation of all components of the work to obtain the actual field work volume. This is to ensure alignment between the bill of quantity calculation against the working drawings and the actual field conditions.
3	X1.3	Request from Building Owner/User/Regional Leader/Institution Leader during construction in progress or already underway (User Request)	If there are field requirements that differ from the planning, the contractor must immediately prepare a CCO and submit an administrative Contract Addendum so that changes in volume that occur in the field can immediately be included in the scope of the contract.

Source: Researcher Processing (2024)

Labor Factors

Human factors can affect the performance time of the construction project, this is proven by the findings of field observations, discussions with related stakeholders & research results. The following are alternative solutions that can be applied to the low-rise state building project:

Table 14. Discussion of Alternative Solutions Variable X.2

No	Indicator code	Indicator Variable	Solution Alternative
1	X2.1	Lack of Skills Workforce	Organizing certification training of work skills for low state buildings. The most needed skill qualifications in improving project time performance are reinforced concrete work qualifications and brick wall work qualifications and ceramic floor work.
2	X2.2	Poor Coordination Between Workforce	Implementing a good project communication management system & knowing the flow of communication between workers.
3	X2.3	Lack of Number of Workforce	Lack of workers results in work items that should be able to be done in parallel not being able to be done. Parallel work items if they can be done well can improve project implementation time performance, for this a good analysis of labor needs is needed.

Source: Researcher Processing (2024)

Material Factors

Material factors can affect the performance time of construction projects, this is proven by findings from field observations, discussions with related stakeholders & research results. The following are alternative solutions that can be applied to low-rise state building projects.

Table 15. Discussion of Alternative Solutions Variable X3

No	Indicator code	Indicator Variable	Solution Alternative
1	X.3.1	Shortage of Material Quantity/Scarcity of certain materials	MC-0 calculation to obtain the actual field work volume so that there are no errors in the quantity of material provision. Conducting an MOU / ordering agreement with the batching plant / ready mix to ensure the availability of concrete and concrete pump cars. In terms of ensuring the adequacy of continuous concrete casting needs, you can use a practical self-loading concrete mixer with a capacity of 5.5m3.
2	X.3.2	Delay in Delivery/ Procurement of Materials	Accelerating the material approval process, in order to accelerate the pre-order process for construction materials to the project location. The ideal material availability time is at least H-2 before the material is used, the material has arrived at the location. Materials that have not arrived until the time they are used will make the existing workforce unable to work according to the physical progress plan that has been set.
3	X.3.3	Material Damage in the Field.	Implementing a systematic method of housekeeping practices in the material storage warehouse area with the 5S method. Strict inspection of incoming material quality according to technical specifications. Material damage in the field can affect time performance because damaged or poor quality materials if still used can damage the structure and architecture of the building so that additional time is needed to dismantle and repair them. Meanwhile, if it is not used, the provider must order and resend new material which will require additional time.

Source: Researcher Processing (2024)

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Machine/Tool Factors

Machine/tool factors can affect time performance on construction projects, this is evidenced by findings from field observations, discussions with related stakeholders & research results. The following are alternative solutions that can be applied to low-rise state building projects.

Table 16. Discussion of Alternative Solutions Variable X4

No	Indicator code	Indicator Variable	Solution Alternative
1	X.4.1	Obstruction of Mobilization Process Machine/Equipment.	Conduct analysis of equipment mobilization & demobilization implementation during the planning process. Must show access to the project location. The ideal machine/equipment availability time is at least H-2 before the tool is used, the tool has arrived at the location.
2	X.4.2	Machine/Equipment Damage.	Periodic equipment inspections & material repairs need to be carried out. The implementing contractor is required to provide mechanical personnel to be on standby if necessary to repair equipment. Damage to equipment in the field can affect time performance because equipment that is damaged or does not work properly according to its function requires additional time to repair it..
3	X.4.3	Limited Number of Machines/Equipment.	When conducting an AHSP analysis, it is necessary to calculate the material requirements for each job in detail so that there is no shortage of equipment quantity..

Source: Researcher Processing (2024)

Discussion of the Most Dominant Variable (X1) CCO Factor

Based on the research results, it was found that the most dominant factor affecting the performance of the implementation time of the low-rise state building construction project is the CCO factor. Based on interviews with related stakeholders & field observations, on several indicators that affect time performance, with the following description:

1. Miscalculation in planning (Consultant DED review) (X1.1)
   In the planning process, DED consultants often make mistakes in calculating the volume of work. For example, in the construction of the Pangkal Pinang District Attorney's Office Building, there was an error in calculating the volume of the pile foundation structure, the number of piles calculated in the DED did not match the needs in the field. So that a recalculation and CCO contract must be carried out to meet the volume requirements.
2. Field engineering needs (site engineering) (X1.2)
   In the implementation of work in the field, things often happen that must be done outside the initial plan in order to facilitate the main work to be carried out. For example, in the construction of the Pangkal Pinang District Attorney's Office Building, before starting work, the contractor must clear the location (landclearing) by cutting down several large trees, demolishing the food stall building rented by residents, cut and fill land with a fairly extreme slope, and moving 28 units of scrap vehicles used by the Pangkal Pinang City Government that were stored at the location. This certainly requires engineering of field needs related to additional costs outside the initial contract Budget Plan.
3. Requests from building owners/users/regional leaders/institution leaders during construction or already underway (user request) (X1.3)
   When construction work is underway, building owners/users often review the location and request or order changes to the scope of work, this is common in terms of changes to spatial planning, facades, interior work and mechanical-electrical. Users make requests outside the original plan with all the side effects that result. For example, in the 5th case, the building that is the topic of this research experienced this. Especially in the Construction of the Tin Dome Mosque which experienced significant changes due to requests for changes to the interior design of the ceiling and walls of the mosque from the user. These changes must first be

justified by the owner and MK consultant so that they require a process that takes a limited implementation time.

4. Impact of All Types of Contract Changes on Work Implementation Time
   In this study, the CCO indicators taken were Review DED, Site Engineering and User Request. These three indicators are one type of contract change, which is often called "Additional Work" or changes in the scope and volume of the contract. Other types of contract changes, such as changes to the Payment Clause, changes to the name of the contractor's team leader and/or assigned consultant, changes to the Fine Clause and others, are not discussed in this study so that the impacts they cause cannot be proven in this study.
5. Impact of Contract Changes on Project Frequency and Finance
   In this study, the dependent variable taken is Project Implementation Time Performance. The dependent variables of quality performance and cost performance are not discussed in this study so that the impact of contract changes on frequency and finance cannot be proven in this study.

Alternative Solutions to Improve Performance Time for Implementation of Low-rise State Building Construction Projects

Based on the results of the study, it is known that the most dominant factor affecting the performance time for implementing low-rise state building construction projects is the CCO factor. In order to significantly improve time performance in implementing low-rise state building construction projects, alternative solutions are needed for the indicators contained in these dominant factors. Alternative solutions are obtained through literature review & focus group discussions, with the following results:

1. Miscalculation in planning (Consultant DED review) (X1.1)
   According to [21], an alternative solution that can be done to deal with this problem is that the contractor is required to carry out an initial mutual check (MC-0), namely a recalculation of all components of the work in order to obtain the actual field work volume. This is to ensure alignment between the bill of quantity calculation against the working drawings and the actual field conditions. Prospective contractors in participating in the tender must pay close attention to the DED document uploaded in the tender document so that they can ask in the aanwidjing if there is something that is not right in the planning document (DED). Based on the results of the MC-0 calculation, it will be known how much deviation there is between the volume in the bill of quantity and the actual field volume. So that adjustments to the volume of work can be made so that there are no errors in ordering the amount of material which results in shortages and excesses of material when the construction phase is underway.
2. Field needs engineering (site engineering) (X1.2)
   The alternative solution is that the contractor is required to carry out an initial mutual check (MC-0), namely a recalculation of all components of the work in order to obtain the actual field work volume. This is to ensure alignment between the bill of quantity calculation against the working drawings and the actual field conditions. If there is a field requirement that is different from the planning, the contractor must immediately prepare a CCO and submit an administrative Contract Addendum so that changes in volume that occur in the field can immediately be included in the scope of the contract.
3. Request from the owner/user of the building/regional leader/leader of the institution when construction is underway or has been running (user request) (X1.3)
   The alternative solution is that the contractor must immediately confirm officially and in writing to the work owner about the owner/user's request if it is submitted to the contractor, then immediately calculate the CCO and its technical justification as a discussion material in a technical coordination meeting with the owner/technical director team. The results of the minutes of this meeting will be the basis for making a contract addendum to legalize the owner's request as the scope of work. If the User Request requires special materials or special workers, then to anticipate delays in the schedule, the contractor must immediately send an early warning letter about the possibility of a contract time addendum related to the User Request, then start sending a time addendum request letter so that the time addendum process can be processed immediately according to applicable regulations.

Questionnaire Stage 3 (Expert Validation of Research Results)

The research results that have been obtained are then validated to experts/specialists through the stage 3-questionnaire, the expert profile can be seen in table 17. Validation data that has been obtained from the questionnaire results in the form of statements of agreement or disagreement from experts regarding alternative research solutions. The following is a table of expert validation results that have been carried out on the stage 3 (three) questionnaire.

Table 17. Results of the Stage 3 Questionnaire, Alternative Solutions to Research Results

Research Variables	Indicator	Alternative Solution	Expert Perception of Alternative Solutions					Assessment		Conclusion
			P1	P2	P3	P4	P5	Agree	Disagree	
CCO (Change Contract Order)	Errors in Calculation in Planning (Consultant DED Review) can affect the performance of implementation time	Contractors are required to observe the volume in the bill of quantity (BQ) uploaded in the auction and compare it with the plan drawings. All components of the work must be present with reasonable volume calculations. If you find components or planning volumes that are unreasonable, you can ask in the aanwidjing or work explanation meeting with the owner and DED consultant.	v	v	v	v	v	5	0	Agree
	Existing conditions in the field that have not been taken into account in the DED result in changes in volume in the field which can affect the performance of implementation time	Contractors are required to conduct an initial mutual check (MC-0), which is a recalculation of all components of the work to obtain the actual field work volume. This is to ensure alignment between the bill of quantity calculation against the work drawings and the actual field conditions.	v	v	v	v	v	5	0	Agree
	Requests from Building Owners/Users/Regional Leaders/Institution Leaders (User Request) to add/change/reduce the scope of work while construction is underway or has been underway can affect the performance of implementation time	Contractors are required to immediately confirm officially and in writing to the work owner regarding the owner/user's request if it is submitted to the contractor, then immediately calculate the CCO and its technical justification as a discussion material in the technical coordination meeting with the owner/technical director team. The results of the minutes of this meeting will be the basis for making a contract addendum to legalize the owner's request as the scope of work. If the User Request requires special materials or special workers, then to anticipate delays in the schedule, the contractor must immediately send an early warning letter regarding the possibility of a time addendum to the contract related to the User Request, then start sending a time addendum request letter so that the time addendum process can be processed	v	v	v	v	v	5	0	Agree

	immediately according to applicable regulations.

Source: Researcher Processing (2024)

CONCLUSION

The conclusion of the study entitled Analysis of the Influence of Change Contract Order, Labor, Materials and Equipment on the Performance of Low-Rise State Building Project Implementation Time that has been carried out is as follows: 1) based on the results of the T-Test analysis, F-Test and Determination Coefficient Test, it was obtained partially and simultaneously that the CCO Factor (X1), Labor Factor (X2), Material Factor (X3), and Equipment Factor (X4) had a significant effect and had a contribution of 74.0% on the performance of the implementation time of the low-rise state building construction project, 2) based on the results of the variable ranking analysis using multiple linear regression equations & beta coefficient values, it can be concluded that the CCO Factor variable (X1) is the dominant factor in influencing the performance of the implementation time of the low-rise state building construction project, which is 23.99%, 3) all research variables, namely the CCO Factor (X1), Labor Factor (X2), Material Factor (X3), and Equipment Factor (X4), can affect the performance of the implementation time of the high-rise state building construction project low. The difference between this study and previous studies is that this study took the object of Low-Rise State Buildings in Pangkal Pinang City, this study also added the Change Contract Order (CCO) Factor and did not analyze the Method, Money and Environment Factors, 4) alternative solutions to significantly improve time performance in the implementation of low-rise state building construction projects are carried out on the variable indicators contained in the CCO Factor (X1) as the most dominant factor. Alternative solutions that can be done include: a) Calculation Errors in Planning (Consultant DED Review). Contractors are required to observe the volume in the bill of quantity (BQ) uploaded in the auction and compare it with the plan drawings. All components of the work must be present with reasonable volume calculations. If you find components or planning volumes that are unreasonable, you can ask in the aanwidjing or work explanation meeting to the owner and DED consultant. Existing conditions in the field that have not been calculated in the DED result in changes in volume in the field so that they can affect the performance of the implementation time. The contractor is required to conduct an initial mutual check (MC-0), namely a recalculation of all components of the work to obtain the actual volume of work in the field. This is to ensure alignment between the calculation of the bill of quantity against the working drawings and the actual conditions in the field.

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