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Factors Of Affecting The Occurrence Of Cost Overruns In Construction Projects During COVID-19 Pandemic

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ABSTRACT

Construction project is a design and specification process that involves coordinating all project resources such as labor, equipment, materials, fund, and technology, to complete the project on time, according to budget and standards. But since 2020 due to the COVID-19 pandemic, many construction projects have experienced Cost Overruns, especially in the jabodetabek area. Cost Overrun is very influential on the success of a construction. Therefore, research is needed on ranking factors that influence the occurrence of Cost overruns on a construction project during the COVID-19 pandemic. In this study, data will be collected through literature studies, then surveyed using questionnaires a Likert scale, a scale of 1-5 then given to each construction service provider to measure the level of influence of factors and by Relative Importance Index (RII) method will find the ranking of factors that influence the occurrence of cost overruns. Of the 20 factors obtained after the validity and reliability test, 13 factors were obtained. Using the RII method sought rankings from the 13^{th} of such factors. The result obtained is the lack of preparation for unexpected costs has the highest influence of 0.811.

KEYWORDS: Construction Project, Cost Overrun, COVID-19, RII

INTRODUCTION

A construction project is a design and specification process that is transformed into physical structures and facilities. This process involves the organization and coordination of all project resources such as labor, equipment, materials, supply, facilities, funds, and technology, to complete the project on time, according to budget, quality and performance standards specified by the planner. The success of implementing construction projects on time with a cost budget as planned is the main key to the goals and expectations of project owners and contractors[1]

During the development of the times, construction projects are developing rapidly due to the emergence of technologies that help make it easier to improve the quality of construction. However, since 2020 due to the COVID- 19 pandemic that has emerged globally, construction projects are starting to experience changes. The impact of COVID-19 on building construction is very large because part of the entire cost and time of the project during construction has experienced many obstacles[2]. Therefore, every construction project implementation requires good project management, which aims to avoid or minimize project

risks that may occur including the risk of cost overrun and delays in the implementation of work.[3]

The cost overrun factor is part of cost control practices, therefore understanding cost estimates is very important because cost estimates are the basis for calculating Cost Overrun[4]. In the same line, directed a study in Malaysia considered that cost overrun is positioned at number two in the broad effects of delays. Some of the things that cause cost overruns are incomplete project information, incorrect planning of material and wage cost estimates, and errors in controlling project costs, as well as due to the status of social distancing in many regions in Indonesia, and the lack of availability of construction service resources[6] Based on the existing problems, this research was conducted to determine the ranking of factors that influence the occurrence of Cost Overrun during the COVID-19 pandemic.

The research was conducted on the construction of buildings in Jabodetabek during the COVID-19 Pandemic. Respondents sought are people who carry out construction activities in the he Jabodetabek area. The research was conducted through a field survey, namely by distributing questionnaires using google forms.

DEFINITION

Cost Overrun In Construction Project During COVID-19 Pandemic

Cost overruns are the construction cost of a project, that at the implementation stage, exceeds the project budget set at the initial stage (cost estimation), thus causing significant losses to the contractor.[7] Cost Overrun that occurs in a construction project can be caused by internal and external factors of the construction project itself. During the COVID-19 pandemic cost overrun became greater than before. Almost all of supply chain has been disrupted, which made various construction material could not reach the construction site, transport has been disrupted as a result of lockdown, the shortage of larbor is because labor cannot reach their place to work and many labor are unwilling to come to work, company has financial problems, and the party also has problems of contractual implications [2]. If the project is bigger than usual, so there wll be more problems to deal with it and the greater posibility of cost overruns.

RESEARCH METHODOLOGY

Initial Identification of The Problem That Causes Cost Overrun

This research uses references from several journals to find several factors that affect cost overun in construction projects which will be used as the initial factor of the research. The results of the initial identification tabulation can be seen in **Table 1**

Table 1 Identify factors for cost overrun

No.	Causative Factors	Source
1	Incorrect calculations resulted in repeatable project	[8][6][9][10][4]
2	Lack of information on equipment cost	[2][8][11][9]
3	Lack of preparation for unxpected expenses	[2][8][6][9][4]
4	Cash flow error	[12][8][9][4]
5	Equipment delivery problems	[2][11][9][4]
6	Construction projects delays due to repetition of work	[2][8][6][11][9]
7	Lack of contractor experience	[8][11][9][4]

8	Incorrect planning and scheduling	[2][8][6][11][9][
9	Increased worker wage cost	[2][8][6][11][9][
10	Inadequate equipment and technology	[8][6][9][4]
11	Lack of control in the field during the construction	[2][6][11][9]
12	Late delivery of materials	[2][6][11][9][4]
13	Shortage of materials	[2][6][11][9][4]
14	Poor quality of materials	[2][6][11][9]
15	Lack of worker productivity	[2][8][11][9]
16	Labor shortage	[2][8][11][9][4]
17	Additional costs for occupational safety equipment	[2][8][11][9][4]
18	Lack of labor experience	[8][11][9][4]
19	Lack of coordination between contractors and clients in the project	[2][6][11][9]
20	The high cost of machinery and equipment	[8]l[6][9][4]

Data collection methods

The data obtained from the tabulation results will be made into a statement which will later be shared by distributing online / google form which will be filled in by construction project workers in Jabodetabek and its surroundings during the pandemic. The questionnaire data needed is the respondent's data, and data on the answer to

the statements that have been given. The answer data that has been obtained from respondents group will later be tested for feasibility using SPSS Software and tabulated in the Microsoft Excel program

Methods of analysis and data processing

The data analysis method carried out to determine the ranking is by using the Relative Importance Index (RII), using data from the identification of initial factors that have been obtained through literature studies. The RII method is used to measure the relative importance of the causes of the change sequence factor. These results show the rating of factors and groups according to their level of importance in relation to the causes of the order of change[13]. Before processing data to find the level of importance, the data must first be followed for feasibility using validity tests and reliability tests. The validity test is carried out using the bivariate method. Significant testing was tried with criteria using r tables at a significance level of 5%. The calculated variable will be declared valid if the calculated R-value or the Pearson Correlation variable calculated is greater than the r-value of the product moment from the table. After the validity test is carried out, the reliability test is then carried out using Cronbach's Alpha with a limit requirement of

- If the variable data on the Cronbach's Alpha value obtained is less than 0.6, then the data is said to be unreliable and will be categorized as reliable if the variable data on Cronbach's' Alpha is more than 0.6. After the processed data is deemed feasible, it can be analyzed using the Relative Importance Index method [6]

Relative Importance Index Method Formula[6]:

$$RII = \frac{\Sigma W}{\cancel{AXN}} = \frac{5n5+4n4+3n3+2n2+1n1}{x(n1 + n2 + n3 + n4 + n5)}$$

Information:
W: Weighting factors by scale (1-5)
A: Tert weight
n1: Number of respondents on a scale of 1 n2: Number of respondents on a scale of 2 n3: Number of respondents on a scale of 3 n4: Number of respondents on a scale of 4 n5: Number of respondents on a scale of 5

RESULTS AND DISCUSSION

Questionnaire Data from Respondents

The results of the questionnaire that have been distributed to 36 respondents who work as actors in the field of high-rise builidng construction projects during the COVID-19 pandemic are ongoing. The following is the data on the results of the respondents' answers and the characteristics of the position obtained:

Table 2 Questionnaire Result Data

Variable	Statement	Scal				
		1	2	3	4	5
X1	Incorrect calculations resulted in repeatable project	5	0	3	1	1
X2	Lack of information on equipment cost	3	9	3	7	1
X3	Lack of preparation for unxpected expenses	0	3	4	1	1
X4	Cash flow error	3	7	11	1	5
X5	Equipment delivery problems	4	5	3	1	9
X6	Construction projects delays due to repetition of work	1	3	6	1	1
X7	Lack of contractor experience	1	3	4	1	1
X8	Incorrect planning and scheduling	0	2	1	1	1
X9	Increased worker wage cost	5	8	8	1	3
X10	Inadequate equipment and technology	4	9	12	4	7

Continue of **Table 2** Questionnaire Result Data

Variable	Statement	Scal				
		1	2	3	4	5
X11	Lack of control in the field during the construction	5	1	7	1	1
X12	Late delivery of materials	1	3	7	1	1
X13	Shortage of materials	1	6	8	1	1
X14	Poor quality of materials	3	8	6	9	1
X15	Lack of worker productivity	0	2	4	1	1
X16	Labor shortage	1	1	1	5	4
X17	Additional costs for occupational safety equipment	3	8	9	1	5
X18	Lack of labor experience	2	3	10	1	8
X19	Lack of coordination between contractors and clients in the project	1	3	8	1	1
					1	3
X20	The high cost of machinery and equipment	0	6	3	2	7

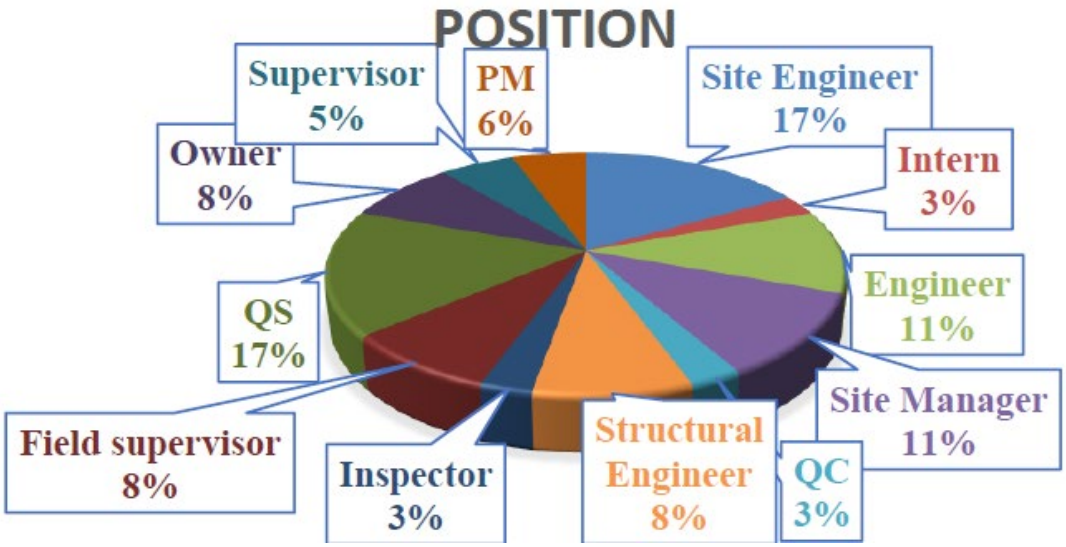

Figure 1 Respondent Position

Validity Test

This test is carried out using the bivariate method. The calculated variable will be declared valid if the calculated R-value or the Pearson Correlation variable calculated is greater than the r-value of the product moment from the table. The sample data obtained were 36 pieces with a significant level used, which was 5%. The calculated r-value is obtained by IBM SPSS application, then for r product moment obtained through table 4, the validity distribution is obtained the tabler-value of 0.329. The following are the bivariate output results can be seen in Table 4 which is the final result after a validity test twice.

Table 3 Bivariate Output Validity Test Results

Variable	Parson Correlation	R table	Information
X1	0,646	0,329	VALID
X2	0,648	0,329	VALID
X3	0,663	0,329	VALID
X4	0,682	0,329	VALID
X5	0,643	0,329	VALID
X6	0,372	0,329	VALID
X7	0,526	0,329	VALID
X9	0,649	0,329	VALID
X10	0,685	0,329	VALID

Continue of Table 3 Bivariate Output Validity Test Results

Variable	Parson Correlation	R table	Information
X11	0,597	0,329	VALID
X12	0,545	0,329	VALID
X13	0,824	0,329	VALID
X14	0,696	0,329	VALID
X16	0,444	0,329	VALID
X18	0,515	0,329	VALID
X19	0,634	0,329	VALID
X20	0,440	0,329	VALID

Of the 20 variable data that have been obtained, after validity tests, 17 data have been declared valid because they have a Pearson Correlation value that is more than the R-value of the table.

Reliability Test

After being validated, a reliability test is then carried out to find out whether the data we calculate is reliable or not. Pengujian reliability was performed using Cronbach's Alpha with the condition that the number limit was 0.6. If the variable data on the Cronbach's Alpha value obtained is less than 0.6, then the data is said to be unreliable. To get more precise reliable results, we will group the existing validation data again based on the existing categories. The following is a tabulated table of the categories of validated variables.

Table 4 Questionnaire data tabulation by category

Category	Factor	Symb	Variab
Estimated Cost	Lack of information on equipment cost	X1.1	X.2
	Lack of preparation for unxpected expenses	X1.2	X.3
	Cash flow error	X1.3	X.4
Equipment	Equipment delivery problems	X2.1	X.5
	Inadequate equipment and technology	X2.2	X.10
	The high cost of machinery and equipment	X2.3	X.20
Material	Late delivery of materials	X3.1	X.12
	Shortage of materials	X3.2	X.13
	Poor quality of materials	X3.3	X.14
Workforce	Lack of contractor experience	X4.1	X.7
	Increased worker wage cost	X4.2	X.9
	Labor shortage	X4.3	X.16
	Lack of labor experience	X4.4	X.18
Miscellaneous	Incorrect calculations resulted in repeatable project	X5.1	X.1
	Construction projects delays due to repetition of work	X5.2	X.6
	Lack of control in the field during the construction	X5.3	X.11
	Lack of coordination between contractors and clients in the project	X5.4	X.19

From the results of the categories above, it can be seen that 5 categories are obtained based on previously tabulated data. The following are the results of reliability tests by category.

Table 5 Category Reliability Test Results

Category	*Cronbach's Alpha*	*N of items*
Estimated Cost	0,672	3
Equipment	0,627	3
Material	0,807	3
Workforce	0,501	4
Miscellaneous	0,701	4

From Table 5 we can see the results of the reliability test, the category of work is not reliable because the value of *Cronbach's Alpha* is less than 0.6. So that there are 13 factors left that can be used for calculations to find the level of importance using the *Relative Importance Index* method.

Relative Importance Index

After all the data has been tested through the validity test and reliability test, and the data has been declared valid and reliable. So now we can use these data to rank each factor that affects the occurrence of cost overruns in construction projects during the COVID-19 pandemic using the relative importance index (RII) method. With the RII method, we will look for the ranking of the 13 factors that we have tested and obtain the highest factor rating that is the most influential.

The following is a table of importance levels of RII values according to Simton T.Kometa [10]

Table 6 RII Importance Levels

RII Value	Importance Level
0,0 – 0,2	Very Low
0,2 – 0,4	Low
0.4 – 0,6	Normal
0,6 – 0,8	High
0,8 - 1	Very High

Table 7 RII Calculation and Ranking Results

Variable	Statement	RII	Rank	Importance
X1	Incorrect calculations resulted in repeatable project	0,778	4	High
X2	Lack of information on equipment cost	0,672	10	High
X3	Lack of preparation for unxpected expenses	0,811	1	Very High
X4	Cash flow error	0,639	11	High
X5	Equipment delivery problems	0,711	8	High
X6	Construction projects delays due to repetition of work	0,806	2	Very High
X10	Inadequate equipment and technology	0,606	12	High
X11	Lack of control in the field during the construction	0,561	14	Normal

X12	Late delivery of materials	0,783	3	High
X13	Shortage of materials	0,733	6	High
X14	Poor quality of materials	0,683	9	High
X19	Lack of coordination between contractors and clients in the project	0,778	4	High
X20	The high cost of machinery and equipment	0,756	5	High

Table 8 RII Calculation Ranking Order

Rank	Statement	RII	Variable	Importance
1	Lack of preparation for unxpected expenses	0,81	X3	Very High
2	Construction projects delays due to repetition of work	0,80	X6	Very High
3	Late delivery of material materials	0,78	X12	High
4	Incorrect calculations resulted in repeatable project	0,77	X1	High
4	Lack of coordination between contractors and clients in the project	0,778	X19	High
5	The high cost of machinery and equipment	0,75	X20	High
6	Shortage of materials	0,733	X13	High

Continue of **Table 8** RII Calculation Ranking Order

Rank	Statement	RII	Variable	Importance
7	Equipment delivery problems	0,71	X5	High
8	Poor quality of material materials	0,68	X14	High
9	Lack of information on equipment cost	0,67	X2	High
10	Cash flow error	0,63	X4	High
11	Inadequate equipment and technology	0,60	X10	High
12	Lack of control in the field during the construction	0,56	X11	Normal

Table 8 obtained the highest to lowest rank order results of each variable. From the results of the ranking sequence above, a ranking with the same order X1 and X19 was obtained with a RII value of 0,778. It happens and means that the variable values on X1 and X19 have the same level of importance and have the same influence on the problem at hand. The highest rating is found in variable X3 with a RII value of 0,811 in the cost estimation category and the lowest rating is found in variable X11 with a RII value of 0,561 from the material category. So we can conclude that the variable X3 has the greatest impact and influence in the case of the cause of cost overrun on construction projects during the COVID-19 pandemic.

CONCLUSION

Based on the results of the analysis and discussion that has been carried out, the following conclusions can be obtained:

- Obtained the highest rank from 5 categories that affect the occurrence *of Cost Overrun* in construction projects during the COVID-19 pandemic based on categories is The Estimated Cost with a RII value of 0.811 and the smallest is Others with a RII value of 0.561
- From a total of 20 factors that have been compiled during the study, the results of 13 factors can be used because they passed the validation and reliability tests.

From the results of the RII calculation, 2 factors were obtained that have a very high level of importance that affect the occurence of cost overrun in construction projects during the COVID-19 pandemic, namely:

1 Lack of preparation for unxpected expenses (RII = 0.811)
2 Construction projects delays due to repetition of work (RII = 0.806)

The two factors above were identified as factors with a very high influence on the occurrence of cost overruns on development projects during the COVID-19 pandemic based on the results of testing with the relative importance index (RII) method

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