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Analysis of Contract Change Order (CCO) Factors, which Affect the Fly Over Work (Case Study of the Cisauk Fly Over Development Project)

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ABSTRACT

Every project can be guaranteed to experience change orders, which occur at the request of the contractor or owner. Change orders are governed by the terms of the contract. So the projects carried out are usually carried out with results that are not what was planned. This research aims to find out what factors cause Contract Change Orders (CCO), which influence the Cisauk flyover work, Tangerang Regency. This research was conducted by distributing questionnaires and respondents to the Cisauk flyover construction project, Tangerang Regency. The research method uses quantitative analysis and questionnaire data processing using the statistical program with the analysis method of questionnaire validity test, questionnaire reliability test, correlation test, factor analysis test, and Relative Important Index (RII). The results of the research obtained a ranking order for each factor and obtained the dominant factors that influence the occurrence of a Contract Change Order (CCO). There are 6 (six) research variables for problem formulation, namely contract documents (X1), planning and design (X2), owner involvement (X3), environmental or external conditions (X4), contractors (X5), and resources (X6), Factors that influence the occurrence of a Contract Change Order (CCO) for the Cisauk flyover work based on ranking order 1 to 5 are X.2.5 mismatch between design drawings and field conditions (RII: 0.814), X.2.1 Errors in planning drawings (RII: 0.745), The most dominant factor influencing the occurrence of a Contract Change Order (CCO) on the Cisauk fly over project is the indicator that comes from variable X2, namely planning and design.

Keywords: factor analysis; Relative Important Index (RII); contract change order; fly over; SPSS IBM.

INTRODUCTION

In the implementation of a construction project, change orders are governed by the terms of the contract. A contract is a legally binding agreement between the parties who sign it. To define and facilitate various construction project contract provisions, many industry organizations have introduced standard contract documents and agreements. Almost all projects carried out, both government projects and private projects, will experience change orders, which occur at the request of the contractor or owner (Mega Waty & Hendrik Sulistio, 2021). Meanwhile, according to (Tenno & Suroso, 2021) Contract Change Order (CCO) influences increasing costs due to various factors such as contract documents, stakeholders, design, and construction. For this reason, adjustments need to be made and this often has consequences for changes in costs and changes in project implementation time. In turn, the adjustments made must also be accommodated in the administrative and contractual aspects of the Contract Change Order (CCO).

Contract Change Order Factor Analysis is important to find out the dominant factors that can cause CCO, so that the parties involved concerned, Commitment Making Officials (PPK) / Service Users, service providers and parties involved in construction service work can take appropriate steps and solutions to overcome Contract Change Order (CCO) problems which often occur and result in inconsistent work results. according to what had been planned. The occurrence of changes in volume and costs in bore pile work items with the agreed terms and type of contract being the unit price with a balanced budget (no additional budget) Looking for impact factors, influences and dominant factors that cause contract change orders to occur on fly over work on the project Construction of

the Cisauk flyover. Figure 1 shows the initial condition of the work located in the Cisauk District area of Tangerang Regency. The Cisauk flyover construction project is a regional strategic project of Tangerang Regency which is expected to unravel congestion at that location.

Figure 1. Initial Conditions of Employment (Source: Project Processed Data, 2023)

Figure 2. Final Condition of Work (Source: Project Processed Data (2023)

Figure 2 above shows the flyover construction work that has been completed. Based on the background of the problem above, the following problem formulations are obtained: what factors resulted in the Contract Change Order on the Cisauk flyover construction project, what factors affect the Contract Change Order on the Cisauk flyover construction project, what is the most dominant factor in influencing the Contract Change Order on the Cisauk flyover construction project?

RESEARCH METHODS

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This research uses quantitative research methods. Quantitative research methods are a type of research carried out using scientific and statistical methods to collect and analyze data numerically. The stages in this research flow diagram are, the research flowchart can be seen in Figure 3 below.

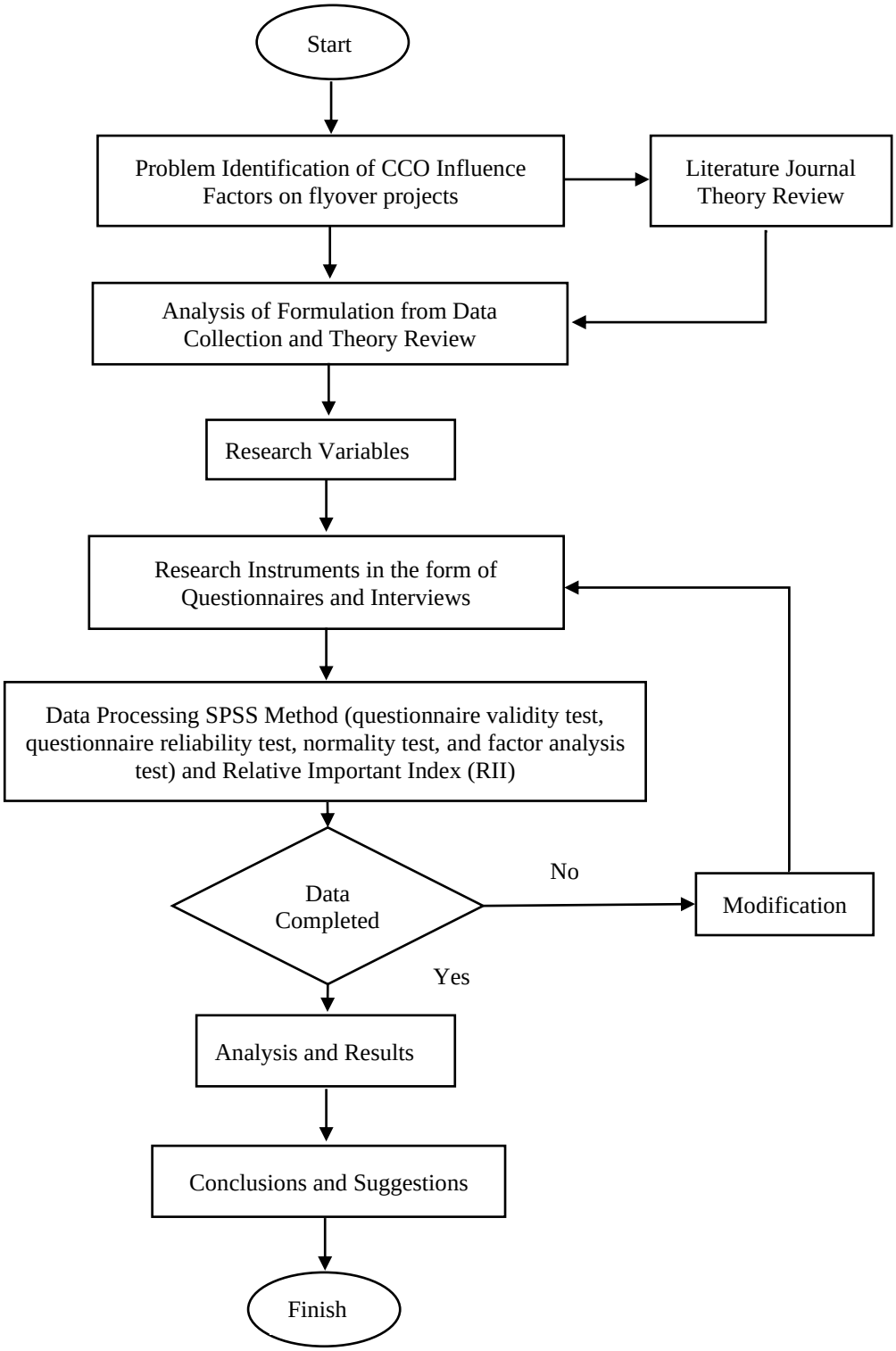

Figure 1. Flowchart of the research

According to (Biantoro & Kholil, 2020) in the book Research Statistics: Manual Analysis and IBM SPSS, this influencing variable in regression is referred to as the predictor variable, with the symbol X, while the affected variable is referred to as the dependent variable, or dependent variable, using the symbol Y. This regression is needed by scientists to find out the truth scientifically or based on science, because one of the functions of science is to predict, to describe, to control and to explain. Quantitative research aims to test hypotheses or theories that have been previously formulated, and to obtain information objectively and measurably. Quantitative research is usually carried out by collecting data through surveys, experiments, or secondary data analysis. The data collected was then processed using the Microsoft Excel & IBM SPSS programs using validity test analysis methods, reliability tests, normality tests and factor analysis tests to obtain reliable conclusions.

RESULT AND DISCUSSION

Variable Factor Analysis

Factor analysis is used to determine whether the six variables (X1, X2, X3, X4, X5 and X6) are factors that influence project performance. The requirement is that the MSA (Measures of Sampling Adequacy) value must be greater than 0.50. This result is proven by the fact that the six variables X can be reduced to one variable. The KMO MSA (Kaiser Meyer Olkin Measure of Sampling Adequacy) test results show a value of 0.807 with the Bartlet's test of Sphericity value having a sig value of 0.000. The KMO MSA value is 0.807 > 0.50, which means that factor analysis can be continued because it has fulfilled the first condition, as can be seen in Table 1 below.

Table 1. KMO and Bartlett's Test

No.	Variable	Factor Analysis		Info
		KMO MSA value	Criteria	
1.	X1. Contract Documents	0.915	> 0.50	worthy
2.	X2. Planning and Design	0.907	> 0.50	worthy
3.	X3. Owner Involvement	0.750	> 0.50	worthy
4.	X4. Environmental or External Conditions	0.729	> 0.50	worthy
5.	X5. Contractor	0.773	> 0.50	worthy
6.	X.6. Resource	0.823	> 0.50	worthy

(Source: Questionnaire Processed Data, 2023)

Correlation Analysis

The correlation test is a statistical method used to evaluate the strength and direction of the relationship between two variables. The following is an interpretation of the results of the correlation test. The following is the interpretation of the correlation which is expressed by value as follows, if a value of 0,000 to 0,199 is obtained, it can be called very weak, for a value of 0,200 to 0,399 is weak, while for a value of 0,400 to 0,599 it can be said to be quite strong, the value between 0,600 to 0,799 is called strong, and the value of 0,800 to 1,000 can be called very strong. The results of the correlation analysis connection can be seen in Table 2 below.

Table 2. Analysis Correlation Connection

No.	Correlation Analysis		Value	Connection
	variable 1	variable 2		

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1.	X1	Y	0.684	Strong
2.	X2	Y	0.738	Strong
3.	X3	Y	0.527	Strong enough
4.	X4	Y	0.489	Strong enough
5.	X5	Y	0.743	Strong
6.	X6	Y	0.786	Strong
7	X2	X1	0.605	Strong
8	X3	X1	0.568	Strong enough
9	X4	X1	0.478	Strong enough
10	X5	X1	0.720	Strong
11	X6	X1	0.643	Strong
12	X3	X2	0.588	Strong enough
13	X4	X2	0.479	Strong enough
14	X5	X2	0.728	Strong
15	X6	X2	0.662	Strong
16	**X4**	**X3**	**0.825**	**Very Strong**
17	X5	X3	0.639	Strong
18	X6	X3	0.655	Strong
19	X5	X4	0.612	Strong
20	X6	X4	0.553	Strong enough
21	**X5**	**X6**	**0.847**	**Very Strong**

(Source: Questionnaire Processed Data, 2023)

Relative Importance Index

Relative Importance Index (RII) is a method for analyzing the most influential factors in the research object. Whichever variable is the most dominant, the RII results will be sorted from largest to smallest. In this way, it can be seen which indicators are dominant which can be seen in Table 3.

Table 3. The most dominant indicator variable

Variable	**Indicator**		**RII**	
			Indicator	**Rank**
X2. Planning and Design	X.2.5	Incompatibility between design drawings and field conditions	0.814	1
X2. Planning and Design	X.2.6	Changes to the planning drawing.	0.791	2
X2. Planning and Design	X.2.1	Errors in drawing planning	0.745	3
X3. Owner Involvement	X.3.6	Further coordination that must be taken	0.736	4
X4. Environmental or External Conditions	X.4.6	Land acquisition issues	0.727	5
X2. Planning and Design	X.2.3	Incomplete planning	0.723	6
X2. Planning and Design	X.2.2	Errors in design.	0.718	7
X5. Contractors	X.5.8	Poor contractor cash flow arrangements	0.700	8

Variable	Indicator		RII	
			Indicator	Rank
X4. Environmental or External Conditions	X.4.2	Central/local government policies issued after contract signing that affect project objectives (cost, quality, and time)	0.691	9
X4. Environmental or External Conditions	X.4.7	Additional construction support facilities.	0.691	10

(Source: Questionnaire Processed Data, 2023)

Based on the RII ranking table, ranks 1 to 10 are occupied by indicators originating from variable X2. The results of this ranking show that variable X2 is the dominant variable in fly over project performance. These results are proven by the ranking which can be seen in Table 4 below.

Table 4. Ranking Relative Importance Index (RII)

Variable	RII Value	Rank
X2. Planning and Design	0.725	1
X4. Environmental or External Conditions	0.671	2
X1. Contract Documents	0.652	3
X3. Owner Involvement	0.640	4
X5. Contractor	0.638	5
X.6. Resource	0.586	6

(Source: Questionnaire Processed Data, 2023)

The following is a graph of the relative importance index which shows the highest to lowest value of the most dominant variable affecting the Contract Change Order shown in Figure 4 below.

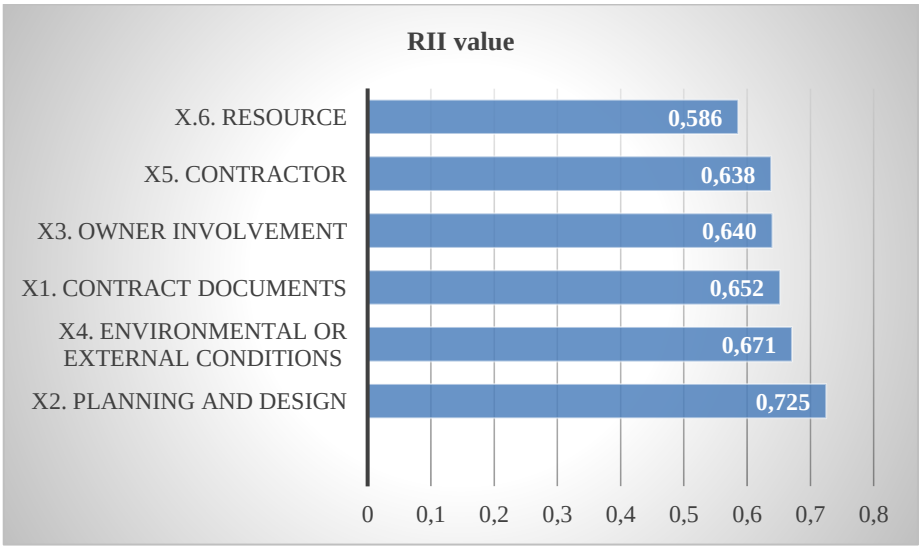

Figure 4. Relative Importance Index Value Graph

From the results of data processing and analysis that has been done, it can be discussed as follows. Based on the test results, factor analysis shows that variables X1 to X6 are factors that affect the occurrence of Contract Change Order (CCO) on performance in Cisauk fly over work. The results

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of the KMO MSA (Kaiser Meyer Olkin Measure of Sampling Adequacy) test showed a value of 0.807 with the value of Bartlet's test of Sphericity having a significant value of 0.000. KMO MSA value of 0.807 > 0.50 which means that factor analysis can be continued because it has met the first requirement, then based on the results of anti-image correlation it can be ascertained that variables X1 to X6 are suitable for use in factor analysis. so that this result proves that the six variables X can be reduced to one variable.

According to (Sudiarsa et al., 2021) the dominant factor of Variation Order is the recommendation or direct request from the Owner and Planning Consultant, namely there are 14 Site Instruction out of a total of 16 Site Instruction. While the results of (Shrestha & Fathi, 2019) are that Order Variation has a much lower effect on the cost performance of Design Build projects and has no effect on Design Build schedule performance, which is not the case in the DBB project. The research results of (Aslah et al., 2022) the project duration which initially after CCO lasted for 140 days, has become 90 working days after crashing the masonry and concrete work. Research conducted by (Earned et al., 2019) obtained changes in field conditions, non-conformity with the original contract design, there is a change in the price of materials globally and there is a policy from government institutions. While the results obtained by (Apriani et al., 2022) Factors causing CCO to the time of adding time to the work executor affect costs. Based on research by (Khamim & Harsanti, 2019) Technical factors, administrative factors and personnel factors that cause addendums have an influence on the effectiveness of achieving project goals. The conclusion of the results of research conducted by (Palilati et al., 2022) is that the effect of Variation Order is the increase and reduction of work volume according to the needs and field conditions, with a percentage value obtained of 29.72% and 30.05%. Research conducted by (Setyawan et al., 2020) Contract Change Order (CCO) occurs due to design changes caused by less detailed soil investigation and search for field suitability so that time and costs increase. According to the results of research from (Ma'rifah, 2020) the effect of contract change orders on supervision consultants is very detrimental to supervision consultants on cost and time. Operational costs incurred by supervision consultants become greater due to additional work time. From the research results of (Setiawan et al., 2019) change orders caused delays in project completion time from May 2017 to January 2018, The main design change is the design of the difference material for the canopy from concrete to perforated steel and aluminum sheets, which was initiated by the owner. From the results of the analysis conducted by (Ardine & Sulistio, 2020), two factors are obtained that have a significant influence on change orders, namely construction factors and administrative factors. In both cost and percentage terms, the sequence of changes in highway projects is significantly higher than the sequence of changes in water and wastewater projects, Design Build (DB) method yields various benefits based on project type. This type of detailed study with hard project cost, change order, and schedule data of DB highway, water and wastewater projects has not been done before (Fathi et al., 2020). There was no correlation between low bids and percentage of change orders. This study could not prove the hypothesis that contractors will make bid discrepancies with change orders during construction (Shrestha & Maharjan, 2019). Construction Safety is all engineering activities to support Construction Work in realizing the fulfillment of security, safety, health and sustainability standards that ensure the safety and health of labor, public safety, property, materials, equipment, construction and the environment (Biantoro, 2019).

Based on the RII ranking table, ranks 1 to 6 are occupied by indicators derived from variable X2, namely planning and design. The results of this rating show that variable X2 is the dominant variable that affects the occurrence of Contract Change Order (CCO) on the performance of the Cisauk fly over project. These results confirm the results of a study (Earned et al., 2019) which states that the main cause or dominant factor affecting the occurrence of Contract Change Order (CCO) is design incompatibility with field conditions. In addition, in research conducted (Palilati et al., 2022) also confirmed the same thing that the main cause of Contract Change Order (CCO) is the Variable (X1) design change, namely planning errors and volume estimation. (X1.2) with percentage values of 11.85% and 10.81%. The results of research conducted (Apriani et al., 2022) that affect the occurrence of Contract Change Order (CCO) are factors from project owners such as interference from the highest authority / Owner, design changes, delays in work for certain reasons, and addition and subtraction of work. And put the design change factor in the 2nd order, because the project that

is the object of research is a building. So good planning and optimal implementation of work are needed to be able to produce a job that is in accordance with what is expected.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the results and discussion, it can be concluded that the factors influencing the Contract Change Order (CCO) for the Cisauk flyover work are as follows: 1) that there are 6 (six) variables that cause a Contract Change Order (CCO), namely contract documents (X1), planning and design (X2), owner involvement (X3), environmental or external conditions (X4), contractor (X5), and resources (X6), and the test results show that variables X1 to X6 are Contract Change Order (CCO) factors that influence fly over work. This result is proven by the fact that the six variables X can be reduced to one variable, 2) based on the ranking order 1 to 5 of the indicators that influence the occurrence of CCO on Cisauk flyover work as follows, variable (X.2.5) Mismatch between design drawings and field conditions (RII: 0.814), X.2.6 Changes to planning drawings (RII : 0.791), variable (X.2.1) Error in image planning (RII : 0.745), variable (X.3.6) Further coordination that must be undertaken (RII: 0.736), and variable (X.4.6) Land acquisition problems (RII : 0.727), 3) the most dominant factor influencing the occurrence of a Contract Change Order (CCO) on the Cisauk fly over project is an indicator derived from variable X2, namely planning and design, with sub variable RII: 0.814).

Recommendation

a. The Tangerang Regency Bina Marga and Water Resources Agency can use the results of this research as input in planning and implementing road and bridge construction/improvement projects and can evaluate the dominant factors causing CCOs that might be a solution or minimize the risk of change orders in future projects,
b. The results of this study can be used as input for policy makers, technical directors and other parties to be more thorough in the planning process, implementation up to the work handover process so as to minimize the occurrence of Contract Change Order (CCO) and construction projects run as planned,
c. Further research needs to be carried out on other construction projects that have different field characteristics and different levels of difficulty to minimize the occurrence of Contract Change Order (CCO).

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