Analysis of Factors Causing Contract Change Orders in the Implementation of Provincial Road Construction Projects in Central Sulawesi

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Abstract: In carrying out construction work in the field, changes often occur in order to adapt to the location of the project implementation. The term change is better known as contract change order (CCO). However, it should be noted that CCO can be detrimental to a construction project. The aim of this research is to find out the dominant factors that cause *contract change orders* (CCO), to know the influence of *contract change orders* (CCO) on contractor performance and to know strategies for preventing *contract change orders* (CCO) in the implementation of provincial road construction projects in Central Sulawesi. The 35 respondents in this study included work *owners* within the scope of the Central Sulawesi Province Department of Highways and Spatial Planning, consultants and contractors. Data collection techniques through questionnaire surveys, interviews and documentation. Data analysis uses descriptive statistics, RRI, and multiple linear regression. From the results of the data analysis, it was found that there are 5 dominant factors that influence CCO, namely CCO occurs due to design changes , CCO occurs due to differences between specifications, drawings and BOQ in planning , CCO occurs due to design errors , CCO occurs due to a mismatch between technical specifications and requirements in field , and CCO occurs because of the socio- cultural conditions of the community around the project. The CCO that has the greatest influence on contractor performance is design problems.

Keywords: *Road Construction Project, Contract Change Order.*

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I. INTRODUCTION

In carrying out construction work in the field, changes often occur in order to adapt to the location of the project implementation.[1] In ventures organized by the Government, variety orders or more commonly known as Contract Alter Orders (CCO) have been directed in Presidential Control Number 12 of 2021 concerning Corrections to Presidential Control Number 16 of 2018 concerning Acquirement of Government Goods/Services Article 54 section (1) which peruses "within the occasion that there's a contrast between conditions, field at the time of implementation with drawings and/or specialized specifications/TOR specified within the Contract Archive, owner in conjunction with the Provider can make changes to the contract.

The term change order is more commonly called a variaton order, but in government-organized projects the term change is better known as a contract change order.[2] In construction projects, changes to work orders (variaton orders or change orders), in fact often occur because the application of project planning methods does not always work well. Many factors can influence why a CCO is needed. However, it should be noted that CCO can be detrimental to a

construction project. Therefore, efforts are needed to minimize changes and the impact of CCO, namely through the most effective and targeted management so that the objectives of the construction project can be achieved. Based on the description above, the author wants to analyze the factors that cause CCO and its impact on the performance of contractors as parties who are very risky in bearing losses on construction projects.

The targets of this investigate are to discover out the prevailing variables causing contract alter orders (CCO) in common street development ventures in Central Sulawesi, to know the impact of contract alter orders (CCO) on temporary worker execution in actualizing common street development ventures in Central Sulawesi, and to know anticipation procedures. the event of a contract alter arrange (CCO) within the usage of a common street development venture in Central Sulawesi.

II. LITERATURE REVIEW

Several concepts and literature studies that are related to and support the research object are as follows:

➤ *Procurement and Contract Management:*

Project Management is the management of procurement and contracts covering activities related to efforts to obtain goods and/or services from outside parties for projects. If the main contractor functions as executor, then the external parties may consist of subcontractors, partners, consultants, and others. For this purpose, agreements are entered into such as service contracts, purchases, technical assistance, etc.

Venture administration is concerned with overseeing extend exercises successfully and proficiently through the application of information, aptitudes, instruments, and a number of strategies to meet extend prerequisites.[3] The venture administration prepare comprises of five stages, specifically: (1) starting the venture , (2) arranging , (3) executing , (4) observing and controlling , and (5) closing (closing).

The extend administration handle comprises of three stages, specifically: (1) Arranging organize, (2) Execution organize, and (3) Control organize. The extend administration handle continuously starts with arranging exercises, at that point proceeds with usage, taken after by control steps, some time recently at last being completed with remedial or remedial activities in the event that fundamental.[4]

➤ *Contract Change Order (CCO):*

Common problems faced in project implementation except *change orders* are *back chard* and claims. The similarity between claims and *change orders* is that both occur after the contract is signed. The difference is, in claims the subject at issue has occurred (*after the fact*), whereas in *change orders,* although the scope is known, it has not yet occurred. What is meant by *change order* (CO) is changes to the project scope after the contract is signed. This indicates that there is a lack of good planning and a lack of precise efforts to anticipate various technical and commercial factors and problems.[5]

➤ *Provincial Road Construction Project:*

Streets are a arrive transportation foundation framework that incorporates all parts of the street, counting interfacing buildings, complementary buildings and hardware planning for activity, which are on the ground, over the ground, underground, and/or water, as well as over the surface. water, but railroads, truck streets and cable streets. Based on their work, open streets are assembled into blood vessel streets, collector streets, neighborhood streets and natural streets. Alluding to the Republic of Indonesia Government Direction Number 34 of 2006 concerning streets, street capacities can be categorized as auxiliary neighborhood streets and auxiliary natural streets.

More particularly, the common streets alluded to in this inquire about are common streets which are essential collector streets that interface the common capital with area or city capitals, essential collector streets that interface locale or city capitals, vital common streets, and streets in uncommon zones of the capital. Jakarta. Common street areas are decided by the Senator with a Governor's Declare (SK). For the area of Central Sulawesi, it is stipulated within the Declare of the Representative of Central Sulawesi Area Number: 620/299/DIS.BMPR-G.ST/2017 concerning Deciding Street Segments Agreeing to Their Status as Common Streets.

➤ *Factors Causing Contract Change Orders (CCO):*

Contract Change Order is a change in the scope of the contract, confirmation of scheduling revisions, a collection of other modifications and in the form of a standard form which includes a summary of the description of the changes and the impact of these changes on the contract, both time and project costs. The cause of a contract change order can be caused by many factors.[7]

In every construction project, the causes of *contract change orders* are never the same. These factors can be caused by service users and providers. Case study of road construction in Kirkuk Governorate in Iraq cost addition of 28.8% due to adding concrete work for support walls to provide low and high areas on both sides of the new road due to exposing the road. Based on previous research, it was revealed that researchers examined data on 161 completed transportation developments, the results obtained ranged from 95% to 100% of road and railway construction, having a cost increase of 50%. A Joint Authoritative Review and Survey Commission (JLARC) consider of 300 street development ventures in Virginia uncovered that the normal venture turnaround was more than 11%.

➤ *Factors Causing Contract Change Orders (CCO) on Contractor Performance in Implementing Provincial Road Construction Projects in Central Sulawesi:*

Factors that cause contract change orders (CCO) on contractor performance in implementing provincial road construction projects in Central Sulawesi include:

• *Design Problem Factors:*

The impact of poor planning, which predisposes management to cost overruns and business delays, creates negative effects on project duration and completion. Especially in the good design stage, it must meet the criteria.[8] Plan blunders have been the root cause of numerous mishaps that have come about within the passings and wounds of laborers and individuals of the open.

• *Contract Document Factors:*

Contract documents in construction work are elements of an agreement and are attached to a business/work relationship, both large and small scale, both domestic and international. Its function is very important in order to provide legal certainty for the parties, both regulating the rights and obligations of the parties. An bona fide deed may be a deed whose arrangement is decided by law (welke in de ettelijke vorm is verleden) and made by or within the nearness of open authorities (entryway of ten overstaan van openbare ambtenaren) who have the control to do so (daartoe bevoegd)

at the put where the deed was made.

- *Technical Specification Factors:*

In the world of construction and other projects, technical specifications are key documents that guide the course of work.[10] This document describes in detail the requirements for materials, products, construction, or services required in a project. More than just a list of requirements, technical specifications describe the quality standards that must be met, the test methods that will be used, and other technical requirements that are essential to ensuring the success of the project.

- *Work Environment Factors:*

The work environment is the condition around the work environment, both physical and non-physical, which can deliver a charming, secure, consoling impression, and the impression of feeling at domestic at work, and so on.[11] Moreover, destitute working situations can request more labor and time and don't bolster the accomplishment of an productive work framework plan.

- *Policy Factors:*

In implementing construction projects, problems are often faced, one of which is the occurrence of changes.[12] These changes can happen within the early stages, center stages, or last stages of the venture. A alter or alter arrange (CO) on a development venture is an occasion that comes about in adjustments to the scope of work, usage time or costs.[13] Typically unavoidable on most ventures due to the uniqueness of each project and restricted time and cash within the arranging handle. The unavoidable results of CO. CO is an indivisible portion of the development industry.

The occurrence of change orders on construction projects can have direct and indirect negative impacts, both for the contractor and the owner. The coordinate affect of alter orders is an increment within the fetched of work things due to extra volume and fabric, execution plan clashes, adjust, expanded overhead and expanded labor costs. The backhanded affect of alter orders is the rise of debate between the proprietor and the temporary worker.

The existence of a Contract Change Order (CCO) has a big impact on the implementation of construction contracts, especially government projects in the water resources sector, such as project budgets being larger than planned, implementation times being extended, new designs or work items emerging. not originally planned, and so on.[15]

- *Contractor Performance:*

Contractor performance management is not just about monitoring performance, but also about taking the necessary actions to improve it. With the development of appropriate performance metrics, regular reporting, and effective corrective actions, a company can increase its chances of project success. With this approach, contractor performance management is no longer just a responsibility, but also a tool for achieving overall project success.

III. RESEARCH METHODS

The inquire about strategy is one of a arrangement of investigate carried out, which is able portray the inquire about strategies or procedures that will be utilized to compile the inquire about.Types of Research this inquire about could be a sort of Quantitative Investigate since it collects organized information through estimation disobedient such as surveys or precise perceptions. The information collected is at that point analyzed utilizing factual strategies to create figures and generalizations.

➢ *Research Location*

This research is located in Central Sulawesi Province, specifically 4 (four) sections as case studies. These are the Reconstruction of the Mepanga – Pasir Putih Road, the Reconstruction of the Sangginora Kasiguncu Road, the Reconstruction of the Tayawa – Malino Road, and the Reconstruction of the Banggai – Lokotoy Road.

➢ *Stages of Research Implementation*

Research carried out on 4 (four) roads in the handling area of Central Sulawesi Province. The conditions for the four packages are as follows:

Fig1 Condition 100% Mepanga – Pasir Putih Section

Fig 2 100% condition of the Banggai – Lokotoy section

➤ *Data Analysis:*

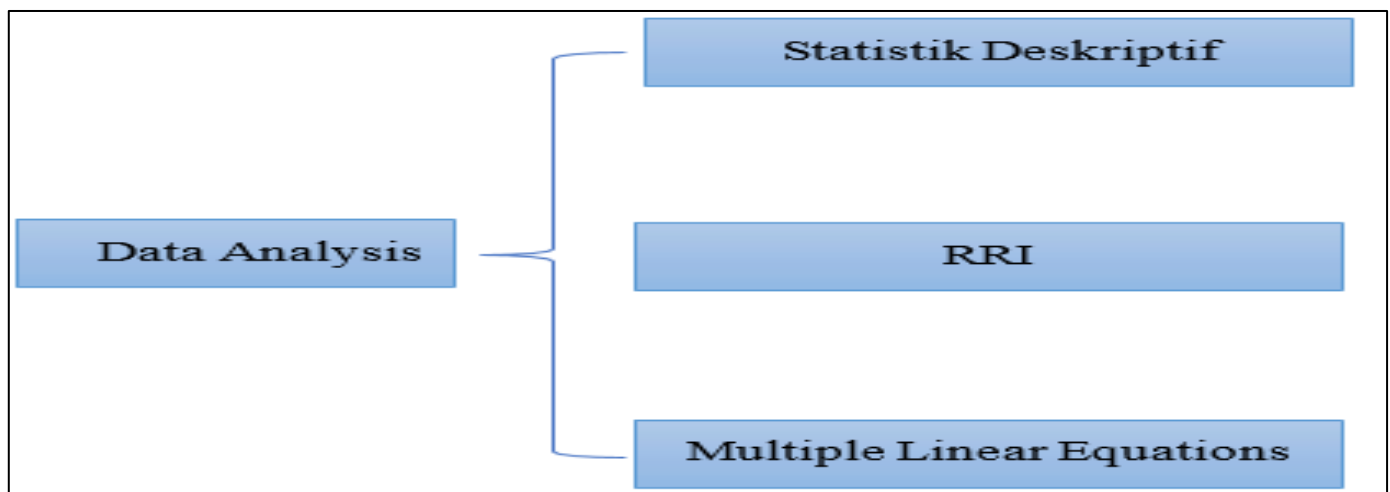The techniques or steps in carrying out data analysis are:

Fig4 Data Analysis Method

IV. RESULTS AND DISCUSSION

➤ *General:*

The construction projects for research used in writing this thesis are road reconstruction projects located in Central Sulawesi Province, especially the Mepanga – Pasir Putih Road Reconstruction, the Sangginora Kasiguncu Road Reconstruction, the Tayawa – Malino Road Reconstruction, and the Banggai – Lokotoy Road Reconstruction. In this research, the author used data management techniques using validation tests and reliability tests for data analysis methods using descriptive statistical methods, relative rank index (RRI) and multiple linear regression using the SPSS 24.0 for Windows statistical program.

In this research, the writing used a data collection method using a questionnaire. Where this questionnaire was distributed to the work *owners* within the scope of the Central Sulawesi Provincial Highways and Spatial Planning Service, contractors and consultants working on the road reconstruction project. From the results of distributing questionnaires to all respondents, it is now known that there are several factors that cause CCO that influence contractor performance, namely design problem factors, contract document factors, technical specification factors, work environment factors, and policy factors.

➤ *Descriptive Statistics*:

Section contains the results of the questionnaire distributed along with a description and simple analysis of existing trends including the educational background and work experience of the respondents. The discussion will discuss each question assisted by *statistical analysis* and graphs.

Fig 3 Characteristics of Work Experience

Work Experience Percentage Diagram a from Fig 4 of the Work Experience Percentage. Diagram above, the work experience percentage value for workers with < 5 years of experience is 0%, for 5 - 10 years it is 18%, for 10 -20 years it is 61% and > 20 years is 21 %. It can be concluded that more workers have work experience of 10 - 20 years. This can be seen with a percentage of 61% from the results in the diagram.
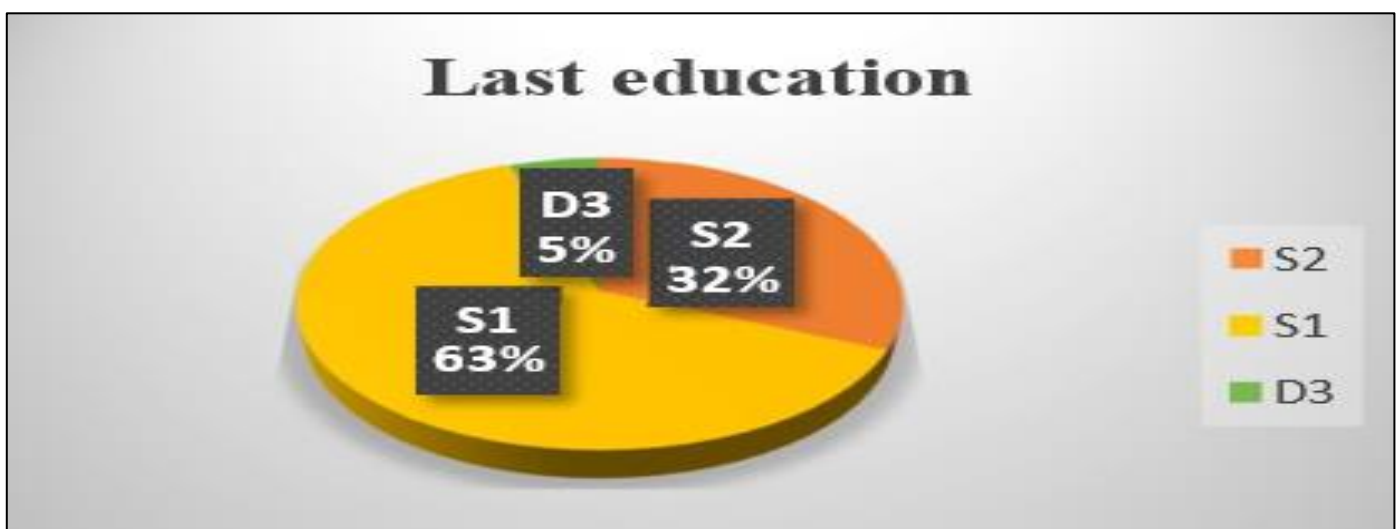

Fig 4 Respondent's Last Education

In the diagram of the Respondent's Last Education, we can see that the respondent's last education in this study was a Master's degree with a percentage of 32%, a Bachelor's degree with a percentage of 63%, and a D3 with a percentage of 5%.

➤ *Validation Test Results*:
The validity test results for each variable question item in this research can be seen in Table 1.

Table 1 Pearson Correlation

Correlations			
	r count	r table	Information
X1.1	,874**	0.312	Valid
X1.2	,846**	0.312	Valid
X1.3	.743**	0,312	Valid
X2.1	.612**	0,312	Valid
X2.2	.627**	0,312	Valid
X2.3	.733**	0,312	Valid

X3.1	.754**	0,312	Valid
X3.2	.853**	0,312	Valid
X3.3	.791**	0,312	Valid
X4.1	.692**	0,312	Valid
X4.2	,791**	0.312	Valid
X4.3	,674**	0.312	Valid
X5.1	,627**	0.312	Valid
X5.2	,610**	0.312	Valid
X5.3	,617**	0.312	Valid

From the Pearson Relationship table it can be concluded that all address things are significant with calculated r > r table with the criteria for interpreting the relationship list (r) between 0.800 to 1.000, which recommends the relationship record is tall so that the data on each marker can be analyzed help.

➢ *Reliability Test Results:*
The reliability test results for each variable question item in this research can be seen in Table 2.

Table 2**.** Reliability Statistics

Number of Question Items	Cronbach's Alpha SPSS Test Value	Minimum Cronbach's Alpha Test Value	Information
15	0.876	0.600	Very Reliable

From the comes almost of the unflinching quality test, a Cronbach's Alpha regard was gotten of 0.876 with a include up to of15 data or address things. Since the Cronbach's regard gotten was 0.8 76 > r table (0.312), it was said to be solid (tried and true) and the Cronbach's regard was included inside the Cronbach's regard run of 0.81 – 1.00 which proposes uncommonly strong, it is concluded that the answers given by the respondents are outstandingly agreeable, so that development data examination can be continued.

➢ *Relative Rank Index (RRI) Analysis Results:*
From the comes about of inquire about on a few common street development ventures in Central Sulawesi, there are 5 overwhelming inspiration variables that impact temporary worker execution. From the comes about of respondents' answers to the survey, the information was at that point prepared by searching for the Relative Rank Record (RRI) esteem for each reply for all inquire about factors to recognize the variables causing CCO that impact temporary worker execution. is an case of a relative rank file (RRI) calculation equation, to be specific:

• *Example of calculation in questionnaire number 1*:

n = 5

N = 38

i = 1, 2, 3 …… n

II = 5 = 38

(Number of respondents' answers on each interval scale)

$x_i = i = 1\ to\ 5$

• Solution:

$$nN = 5 \times 38 = 190$$
$$Ii \times x_i = 5 \times 38 = 190$$
$$It's\ there.\ x_i = 190$$
$$RRI = \frac{1}{nN} \left(\sum_{i=1}^{i} \Box_i \Box_i \right)$$
$$= \frac{1}{190} (190)$$
$$= 1$$

To get the Relative Rank File (RRI) esteem for each variable, the number of survey answers is separated by duplicating the number of respondents with the most noteworthy esteem of the reply choices within the survey, at that point the RRI values are orchestrated from biggest to littlest esteem. The variables causing CCO that impact the execution of contractors who are within the beat 5 within the generally positioning can be seen in Table 3. Overwhelming variables.

Table 3 Dominant Factors

Question No	Question	RRI	Rank
X1.1	CCO occurs Because exists change design is influence performance contractor ?	1,000	1
X3.2	CCO occurs Because difference between specifications , drawings , and BOQ in planning is influence performance contractor ?	0.985	2
X1.2	CCO occurs Because exists error design is influence performance contractor ?	0.980	3

X3.3	CCO occurs Because nonconformity specification technical with needs in the field is influence performance contractor ?	0.980	3
X4.2	CCO occurs Because Condition social culture surrounding community project is influence performance contractor ?	0.980	3

➢ *Multiple Linear Regression Analysis:*

Different straight relapse is utilized to analyze the impact and anticipate autonomous factors, to be specific the variables causing CCO with one subordinate variable, specifically temporary worker execution. The condition utilized to calculate numerous direct relapse employments the condition:

$$Y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + e$$

• *Simultaneous Test (F Test):*

The F test could be a importance test of the condition which is utilized to decide how much impact the causal components together have on contactor execution. Given that the sig esteem is $< 0>$ F table. The comes about of the synchronous test (F test) for each variable address thing in this investigate can be seen in Table 4.

Table 4 Simultaneous Test (F Test)

ANOVAª						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.622	5	2.724	20.813	.000ᵇ
	Residual	8.089	32	1.503		
	Total	1.711	37			
a. Dependent Variable: Kinerja Kontraktor						
b. Predictors: (Constant), Faktor Kebijakan, Faktor Lingkungan Kerja, Faktor Perubahan Desain, Faktor Spesifikasi Teknis, Faktor Dokumen Kontrak						

From the comes about of the F test, the sig esteem is gotten. $0.000 < 0> 2.460$, which suggests that the components causing CCO together impact the contractor's execution.

• *Partial Test (T Test):*

The T Test or Partial Test is carried out on the influence of each independent variable (design change factors, contract document factors, technical specification factors, work environment factors and policy factors) individually on the dependent variable (contractor performance). This test can be carried out by comparing T count and T table so that the sig value is < 0.05 or the T count value is $>$ T table. The partial test results (T test) for each variable question item in this study can be seen in Table 5.

Table 5 Partial Test (T Test)

Coefficientsª						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.404	2.754		.255	.875
	Faktor Permasalahan Desain	.993	.271	.893	9.191	.000
	Faktor Dokumen Kontrak	.682	.056	.560	3.765	.002
	Faktor Spesifikasi Teknis	.974	.245	.853	8.234	.000
	Faktor Lingkungan Kerja	.830	.115	.621	5.108	.001
	Faktor Kebijakan	.585	.087	.533	3.123	.002
a. Dependent Variable: Kinerja Kontraktor						

From the results of the T test, the sig value was obtained. $0.000 < 0.05$ and the design problem factor value is T calculated $9.191 > 2.460$, the contract document factor value is T calculated $3.765 > 2.460$, the technical specification factor value is T calculated $8.234 > 2.460$, the work environment factor value T calculated $5.108 > 2.460$, and the policy factor namely T count $3,123 > 2,460$ meaning that individually the independent variables are design problem factors, contract document factors, technical specification factors, work environment factors, and policy factors have an influence on the dependent variable of contractor performance.

• *Coefficient of Determination (R²):*

The Coefficient of Assurance (R^2) appears the degree of the commitment of the autonomous variable to the subordinate variable. The R-Square (R^2) esteem can be seen within the show outline table, the Coefficient of Assurance (R^2) esteem is between and 1. In the event that the esteem is near to 1, it implies that the free variable gives nearly all the data required to foresee the subordinate variable. In the event that the R^2 esteem is getting littler , it implies that the capacity of the autonomous variable to clarify the subordinate variable is very constrained.

Table 6 Model Summary Test Result

Model Summary								
Model R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
				R Square Change	F Change	df1	df2	Sig. F Change
1	,970 ª	,899	,821	31,226	,621	20,812	5	32	,000

From the Show Rundown test comes about table, the R-Square (R²) esteem is 0.899 or 89.9%, which appears that the components causing CCO to impact temporary worker execution are 89.9% or solid, whereas the remaining 9.9% is clarified by factors other than free factors exterior the investigate.

➢ *Multiple Linear Equations:*

Different direct relapse investigation is utilized to demonstrate the degree of impact of CCO variables on temporary worker execution with the condition:

$$Y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + e$$

$$Y = 0.404 + 0.993 (x1) + 0.682 (x2) + 0.974 (x3) + 0.830 (x4) + 0.585 (x5) + 0.05$$

➢ *Information:*

a: constant

X1: design problems

X2: contract documents

X3: technical specifications

X4: work environment

X5: policy

The comes about of the relapse condition and translation of the numerous relapse investigation are that the consistent esteem (contains a positive sign, specifically 0.404, which implies it shows a unidirectional impact between the variables causing CCO and temporary worker execution. Which suggests that the components causing CCO impact the increment or diminish in temporary worker execution. The relapse coefficient esteem of plan issues is 0.993, meaning that plan issues have a positive impact on temporary worker execution, the relapse coefficient esteem of work contract archives is 0.682, meaning that contract records have a positive impact on temporary worker execution, the relapse coefficient esteem of specialized determinations is 0.974, meaning that specialized determinations have a positive effect on temporary worker execution, the esteem The work environment relapse coefficient is 0.830, meaning the work environment contains a positive impact on temporary worker execution, and the approach relapse coefficient esteem is 0.585, meaning arrangement features a positive impact on temporary worker execution.

The research results show the design problem regression coefficient value (0.993), the work contract document regression coefficient value (0.682), the technical specification regression coefficient value (0.974), the work environment regression coefficient value (0.830) and the policy regression coefficient value (0.585). Because 0.993 > 0.682, 0.974, 0.830 and 0.585, it can be concluded that design problems are the variables that have a greater influence on contractor performance.

➢ *Strategy to prevent the occurrence of Contract Change Orders (CCO) in Implementation of Provincial Road Construction Projects in Central Sulawesi:*

• Conduct field surveys with a complete and clear inventory of the required data.

• In the planning stage, data synchronization is carried out for each document, so that the specifications, BOQ and Drawings do not work independently.

• During a field survey, you must identify what problems and needs exist in the field in detail per 100 m.

• Regular rechecking is carried out by the consultant team and coordinated with the owner activities to ensure the drawings are complete and specifications are clear.

• The planning that will be carried out should first carry out outreach with the community through local government officials.

V. CONCLUSION

Based on the research results that have been discussed systematically in the previous chapters, it can be concluded that:

• From the results of the Relative Rank Index analysis, it was found that the dominant factors causing CCO that influence contractor performance are the first dominant factor, namely CCO, which occurs due to design changes with an RRI value of 1,000, the second dominant factor, namely CCO, occurs due to differences between specifications, drawings and BOQ in planning. with an RRI value of 0.985, the third dominant factor, CCO, occurs due to a design error with an RRI value of 0.980, the fourth dominant factor, namely CCO, occurs due to a mismatch between technical specifications and needs in the field with an RRI value of 0.980, and the fifth dominant factor, namely CCO, occurs due to the socio-cultural conditions of the community. around the project with an RRI value of 0.980.

• The results of the regression equation and interpretation of the multiple regression analysis are that the constant value (a) has a positive sign, namely 0.404, which means it shows a unidirectional influence between the factors causing CCO and contractor performance. Which means that the factors causing CCO influence the increase or decrease in contractor performance. The regression coefficient value of design problems is 0.993, meaning that design problems have a positive effect on contractor performance, the regression coefficient value of work contract documents is 0.682, meaning that contract documents have a positive effect on contractor performance, the regression coefficient value of technical specifications is 0.974, meaning that technical specifications have a positive effect on contractor performance, the value The work environment regression coefficient is 0.830, meaning the work environment has a positive effect on contractor performance, and the policy regression coefficient value is 0.585, meaning policy has a positive effect on contractor performance.

- The strategy to prevent the occurrence of CCO is to carry out a field survey with a complete and clear inventory of the required data. During the planning stage, data synchronization for each document is carried out, so that the specifications, BOQ, and drawings do not work independently. During the field survey, identification must be carried out. what problems and needs exist in the field in detail per 100 m. Regular re-checks are carried out by the consultant team and coordinated with the owner for activities to ensure complete drawings and clear specifications. Planning that will be carried out should first hold socialization with the community through the authorities. local government.

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