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2 Analysis of causes and impact of variation order in the education building project in Gorontalo Province

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Abstract. In construction project work, inconsistencies sometimes occur in some or even all phases of the work. The inconsistency (variation order) has significant implications on the success of the project which can result in the work not being completed on time or even triggering cost overruns. The purpose of this study is to analyze the factors that cause the order of variation and to determine the effect of variations in the order of development projects in the Education Building in Gorontalo Province. This type of research is a descriptive study in which the method of analysis using SPSS program tools and analyzed by the Likert Scale method, the validity and reliability test, and the index of importance. The results of the analysis, there are six factors causing variation order: design changes, mismatches between drawings and field conditions, the addition of scope of work, unclear planning and specifications, changes in material specifications, changes in work methods. The impact caused by the addition of work volume and additional work time.

1. Introduction

Variation order or contract change order (CCO) is a common thing in the implementation of building construction projects and other civil works. Variation order is a form of design improvement that is stated in a work contract and is highly influential on delays or cost overruns. New problems will occur if this is not resolved as soon as possible.

Briefly, variation order is defined as modifications of the original contract [1]. Another definition of variation order is an official document signed by the owner and contractor to compensate the contractor for changes, additional work, delays or other consequences of the joint agreement written in the contract [2]. According to Schaufelberger, the purpose of variation orders are [3]:

- Changing the contract plan with a special method of payment.
- Changing job specifications, including changes in payments and contract times.
- Approvement for additional work, in this case including payment and changes in the contract.
- Administrative needs in determining extra work payment methods and additions.
- Following adjustments to the contract unit price if there is a change in specifications.
- Submitting a reduction in the cost of the proposal incentive if there is a change in the value engineering proposal.
- Adjusting the project schedule due to changes.
- Avoiding disputes between the contractor and the owner



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In variation orders or change orders, there are two basic types of changes, namely Direct Change and Constructive Change (Informal Change). The variation of orders in each project or each country will have different causes. The construction industry in Malaysia according to Rahman [4], poor time and cost performance is considered a critical problem. Then construction waste, poor productivity and too dependent on foreign workers. Research conducted in Malaysia by Sambasivan [5] found that the ten most important causes were improper contractor planning, poor site management, inadequate contractor experience, inadequate client finances and payments for work completed, problems with subcontractors, material shortages, labor supply, equipment availability and failure, lack of communication between parties, and errors during the construction phase.

In Turkey, Gündüz et.al. found that the six most significant factors were inadequate contractor experience [6], ineffective project planning and scheduling, poor site management and supervision, owner design changes, delays in material delivery, unreliable subcontractors. Success in managing variation orders results in uninterrupted construction operations and agreed project costs as well as duration [7].

Projects that experience variation orders cause a time delay of more than 58% and costs increase when compared to those who do not have variation orders [8]. This is what underlies this research. The purpose of this study is to analyze the factors that cause variation orders as well as analyze the effects that occurred due to variation orders in construction projects of Education buildings in Gorontalo.

2. Methods

This research is a descriptive qualitative study using a case study method or approach. Data collection was done by conducting the survey method using questionnaires and. Data processing was conducted using SPSS (Statistical Package for the social sciences) by determining the score using a Likert scale, testing the validity and reliability, and the index of importance.

With the Likert Scale the measured variable is translated into indicator variables which are then used as starting points for arranging instrument items for several questions or statements. Validity Test is carried out after the data collection process is a measure that shows the validity of an instrument. Reliability Test is a measurement of the stability and consistency of measurement tools.

3. Results and discussion

Respondents of this study were determined by the position of the respondent, work experience and level of education. The following is the percentage of respondents: Auditorium Building of Ministry of Health Polytechnic of Gorontalo 41%, SMAN 3 Gorontalo 28% and SMAN 5 Gorontalo Utara by 31%.

Project data is data that is processed and used to provide an explanation or description for the project which consists the type of project, the value of the project and whether there is a Variation Order in carrying out the project work. The validity and reliability tests are obtained by using the SPSS program for Windows 19. From the validity test results obtained from all question items based on the correlation coefficient (r count) is greater than r table, where the correlation coefficient (r count) between 0.915 - 0.391 while for the r table value 0.388 showed that all items of the question can be used or the question was declared Valid.

Reliability testing by calculating the Cronbach's alpha coefficient in the SPSS program, where a questionnaire is said to be reliable if the Cronbach's Alpha value is more than 0.6, showed the result that all question /variable items used were reliable/continuous because the Cronbach's Alpha value is 0.791 (> 0.6). This value indicated that the indicators used have high accuracy, accuracy, stability or consistency.

3.1. Analysis of interest index

Regarding the influence of the dominant factors with this importance index analysis, it can be seen that the ranking/ranking or any item that greatly influenced the factors that cause Variation orders in educational building construction projects (table 1).

Table 1. Analysis of Determination of Ranking Causes of Variation Orders in Gorontalo Education Building

No	Causes of Variation Order	Poltekkes		SMAN 3		SMAN 5 ²⁵	
		Mean	Rank	Mean	Rank	Mean	Rank
1	Design change	4.83	1	4.50	1	4.60	2
2	Termination of Temporary Contract	2.83	18	2.62	18	2.30	19
3	Discrepancy between images and field conditions	4.17	6	4.25	5	4.60	1
4	The contract is incomplete and unclear	4.25	2	4.25	6	4.20	6
5	Unclear planning and specifications	4.17	7	4.38	2	4.30	4
6	Change in work method/order of implementation	4.25	3	4.00	13	4.20	7
7	Poor document coordination	4.17	8	4.12	10	4.10	12
8	Changes in material specifications	4.17	9	4.38	3	4.30	5
9	Reduction in scope of work	4.25	4	4.25	7	4.20	8
10	Added scope of work	4.17	10	4.38	4	4.40	3
11	Job safety considerations in the field	3.67	15	3.38	16	3.40	16
12	Weather factor	2.17	21	2.38	20	2.30	20
13	Changes to work regulations	4.17	11	4.12	11	4.20	9
14	Regulations of the authorities making decisions	2.17	22	2.38	21	2.30	21
15	Change in ownership and testing commissioning	2.50	19	2.38	22	2.30	22
16	Application for the surrounding environment	4.17	12	4.12	12	4.10	13
17	Another unexpected factor	3.17	17	3.38	17	3.30	17
18	Lack of work experience	2.25	20	2.50	19	2.40	18
19	Lack of knowledge of workers	2.17	23	2.38	23	2.30	23
20	Incorrect consideration in the field	4.25	5	4.25	8	4.20	10
21	Inadequate equipment/supplies	4.08	13	4.25	9	4.20	11
22	Low skill of workers	2.17	24	2.38	24	2.30	24
23	Failure to supply skilled workers	2.17	25	2.38	25	2.30	25
24	Material that is not available on the market	3.67	16	3.62	15	3.60	15
25	Labor Disputes	2.17	26	2.38	26	2.30	26
26	Work acceleration	3.75	14	3.75	13	3.90	14

Based on table 1 the results of research on 12 respondents in the Gorontalo, DoH Polytechnic project, it is found that the 26 variables have an average value (mean) between 2.17 to 4.83. Of the 26 variables described as having a level of influence on the cause of Variation orders in construction projects, between never to very often. Respondents in the Gorontalo SMAN 3 project (9 respondents) showed that the 26 variables had an average value of 2.37 to 4.50. Of the 26 variables described as having a level of influence on the cause of Variation orders in construction projects between never to very often. For 10 respondents at SMAN 5 Gorontalo Utara it is indicated that the 26 variables have an average value (mean) between 2.30 to 4.60 or the 26 variables are described as having a level of influence on the cause of the Variation order in the interagency construction project until very often.

From the table 1, you can also see the ranking of the causes of variation orders. The Gorontalo Department of Health Polytechnic Project had 21 causes of variation orders out of 26 causes of variation orders, where design changes were the first range, the second was incomplete and unclear contracts, third were changes in work methods/order of implementation and followed by other factors. SMAN 3

Gorontalo had 17 causes for variation orders, where design changes were ranked first, second was unclear planning and specifications, third was changing material specifications, and was followed by other factors. In the SMAN 5 Gorontalo Utara project, there were 17 causes of variation orders. The design change was the first rank, the second was a mismatch of images and field conditions, the third was the addition of scope of work, and was followed by other factors.

3.2. Impact of variation order

To find out the impact of variation order distributed questionnaires at the same time conducting interviews directly with respondents about the effects caused. Based on the results of the research conducted, the impact of Variation orders on each project was different. The impacts that were reviewed were budget, volume and work time.

The Gorontalo Department of Health Polytechnic project is based on data obtained from respondents; Variation orders had an impact on the emergence of an additional 6% less work volume. Adding less volume, revisions to the work schedule were made by changes in work volume. The fixed budget value at the beginning of the contract was Rp 4,992,894,000.00. The impact of variation orders on the construction of the Poltekkes Kemenkes Gorontalo auditorium building did not result in an additional budget.

The SMAN 3 project based on data obtained from respondents contained no additional budget and working time. Variation orders only have an impact on adding less volume of work, which was architectural work. The SMAN 5 project did not include additional budget and volume changes. Variation order at SMAN 5 Gorontalo Utara had an impact on changes in work time where there was a mismatch between the pictures and field conditions and delayed completion of the work schedule. This resulted in the addition of work time that had been planned so that the work schedule was revised.

The results obtained are by previous studies that have been conducted. In research [9], it shows that delays in completion schedules, increased project costs, additional payments to contractors, effects on progress, and increased overhead costs are the main effects of order variations on public building projects. Meanwhile according to [10], the most significant effect of VO on projects is an increase in project costs, delays in completion and logistical delays. Likewise, research by Oyewobi, the results show the most frequent effect of variations in orders is the increase in construction costs, time, client dissatisfaction, increased reworking of project demolition and demolition and project neglect [11].

4. Conclusion

From the results of the study, concluded several things as follows:

- Factors that cause Variation Order in the implementation of Gorontalo education building construction projects in Gorontalo Province included: changes in design with a mean value of 4.83, mismatch of images and field conditions with a mean value of 4.60, additional work scope with a mean value 4.40, planning and specifications were less clear with a mean value of 4.38, changes in material specifications with a mean value of 4.30 and changes in work methods/sequence of implementers with a mean value of 4.25.
- The impact of variation orders on the implementation of Gorontalo education building construction projects in Gorontalo Province was the existence of change order work volume and additional work time.

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References

- [1] Barrie D S and Paulson BC 1992 *Professional Construction Management Third edition*. Singapore: Mc Graw-Hill p 456
- [2] Fisk Edward R 2006 *Construction Project Administration Eight edition* New Jersey: Prentice-

Hall p 470

- [3] Schaufelberger J E and Holm I 2002 *Management of Construction Project a Constructor's Perspective* New Jersey: Prentice-Hall p 10
- [4] Rahman I A, Memon A H and Karim, A T A 2013 Significant factors causing cost overruns in large construction projects in Malaysia *Journal of Applied Sciences* **13**(2) p286–293
- [5] Sambasivan M and Soon Y W 2007 Causes and effects of delays in Malaysian construction industry *International Journal of Project Management* **25**(5) p517–526
- [6] Gündüz M, Nielsen Y and Özdemir M 2013 Quantification of delay factors by using Relative Importance Index (RII) method for construction projects in Turkey *Journal of Management in Engineering* **29**(2) p133–139
- [7] Charoenngam C, Coquinco S T and Hadikusumo B H W 2003 Web-based application for managing change orders in construction projects *Construction Innovation* **3** pp197–215
- [8] Koushki P A, Al-Rashid K and Kartam N 2005 Delays and cost increases in the construction of private residential projects in Kuwait *Construction Management and Economics* **23** 3 pp285–294
- [9] Yadeta A E 2016 The Impact of Variation Orders on Public Building Projects *International Journal of Construction Engineering and Management* **5**(3) 86-91
- [10] Memon A H, Rahman I A and Hasan M F A 2014 Significant Causes and Effects of Variation Orders in Construction Projects *Research Journal of Applied Sciences Engineering and Technology* **7**(2) p4494-4502
- [11] Oyewobi L, Jimoh R, Ganiyu B O and Shittu A A 2016 Analysis of causes and impact of variation order on educational building projects *Journal of Facilities Management* **14**(2) p139-164

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