Analysis of the category of variation order in x project at XYZ Ltd

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Abstract. The construction project is one of the jobs which has a high level of complexity, dynamic and high risk with various uncertainties. Uncertainty which often arises in construction projects of jobs procurement increases or decreases or often mentioned as variation orders. Variation order is considered difficult to be anticipated and have a large impact on construction projects related to the increase in achievement of work progress. Therefore the impact of variation order which is caused by construction costs is greater followed by the higher frequency variation orders will have an impact on the construction project. The purpose of this study was to determine the type of variation order and cost value on X project at XYZ Ltd. This research method was a qualitative study with a literature study to obtain research variables. Secondary data was obtained from the project documents in the form of contract instructions which contained the causes and impacts which were resulted from variation order. Furthermore, Data was classified based on variables from the literature review. The results showed that the percentage of preparing design aspect was 31.50% of the total cost of variation order, site condition was 17.62% of the total cost of variation order, client change was 2.8% of the total cost of variation order and the flexibility contract was 48.03% of the total cost of variation order. The frequency of variation orders occurrence due to preparing designs was 49% of the total frequency, site conditions was 25% of the total frequency, client change was 13% of the total frequency and flexibility contract was 13% of the total frequency.

1. Introduction

Variation order is the impact and risk of uncertainty of a work which experiences the addition or deletion from the original scope of work according to the contract so that it changes the entire contract value and even the time of work completion. [16] explains that construction projects often experience changes commonly called as variation order, even rarely construction projects do not change until the project is completed so that variation order constraints on a construction project process, especially shopping centers, are recommended to be minimized or even avoided because it causes losses to the project. Variation order in a project is generally caused by differences opinion or misunderstanding in communicating between service users and service providers. This misunderstanding can lead to disputes that have an impact on the obstruction of project implementation so that the project fails. Variation order is considered difficult to be anticipated and have a large impact on construction projects related to the increase in achievement of work progress, Therefore the impact of variation order which is caused by construction costs is greater followed by the higher frequency variation orders will have an impact on the construction project [13]. This research uses project X, project X is the construction of mall and apartments worked by XYZ Ltd, XYZ Ltd is a private company engaged in construction, as the object of research. The implementation of X project was assessed as having various obstacles that caused
changes in various conditions which are often called variation orders. Constraints in the form of variation order is one of the things that construction companies often experience in working on a project and variation order gives a significant impact related to changes in costs and time and even threaten project failure. Analysis of the main causes of variation order in a X project and similar projects needs to be done in order that the construction company and various other parties who are involved in doing the construction of a construction project know the main causes and are often experienced which become trigger the variation order occurrence. This selection of X project at XYZ Ltd. was caused by the number of variation orders is considered the most if it's compared to other types of projects which were undertaken by XYZ Ltd., X project often experienced problematic variation order such as price negotiations that were difficult to achieve, administrative processes that were convoluted to obstructed payment processes so that resulting project objectives were constrained. Variation order mapping was important to be found as an analysis of the causative factors of variation order occurrence in a construction project. Based on the various explanations have been described above, it is important to analyze the causes of variation order as one of the risks in the process of construction work in order to be able to be assessed and used as a consideration analysis in doing construction work for the actors who are involved in the construction work process both from the service users and service providers in construction field. The title of this research is Analysis of the Category of Variation Order in Project X at XYZ Ltd.

2. Literature

2.1. Variation order
Variation order is proposed of changes in writing between the owner and contractor to change some of the conditions of the initial contract documents, such as adding, reducing work, changes, this can change the specification of contract costs, payment schedules and project schedules. According to [3] variation order can be defined as a modification of the original contract whereas physically, the variation order is a work order letter to confirm revisions of the plan, and the amount of cost compensation to the contractor which occurs during construction implementation, after the signing of the contract between owner and contractor. Variation order is considered as official documents which is signed by both of parties to compensate the contractor for changes, additional work, delays or other consequences of the joint agreement that's written in the contract [12]. Variation orders can also be defined as an agreement signed by the contractor, architect and owner after the initial contract is made and then modified by some scope of work that adjusts to the cost and time [12]. Variation order is considered instructions from the owner or owner of agent which changes the terms and conditions of the contract. This is a written agreement between the contracting parties that represents the addition, deletion, or revision of contract documents, identifying changes in price and time, and describing the nature of the involved work. Variation order is changes in writing between the owner and the contractor to change the conditions of the initial contract documents, by adding or subtracting work. The existence of these changes can change contract costs and project implementation schedules. Variation order can be defined as modifications to the original contract [5]. Changes during the project implementation period often occur due to the wishes of the owners that arise during the implementation of the construction project, this is caused among others because of existence of changes in the scope of work, changes in specifications, changes in material types, changes in architectural planning, changes in work methods, and acceleration of work implementation. The purposes of the variation order are: (1) To change the contract plan in the presence of a special method of payment. (2) For administrative purposes, in determining the method of paying extra work or adding it. (3) To follow the adjustment to the unit price of the contract if there is a change in specifications. (4) For the submission of a reduction in the cost of the incentive proposal there is a change in the value engineering proposal. (5) To adjust the project schedule due to changes. (6) To avoid disputes between the contractor and the owner.

2.2. Causes of variation orders
Causes of Variation Order include the following:
### Table 1. Causes of variation order

| Variable                        | Source |
|--------------------------------|--------|
| **Rules and Regulation Change** |        |
| 1 Variation Order is caused by corrupt practices | [3]    |
| 2 Variation Order is caused by inconsistent government regulations | [4]    |
| 3 Variation Order is caused by ineffective coordination and integration | [4]    |
| 4 Procedural unavailability and manual rules for undertaken projects in accordance with government policy | [14]   |
| **Preparing Design**           |        |
| 5 Material that turns into a significant cause of Variation Order | [17]   |
| 6 The change of detail and pattern of the image becomes the causes of a significant Variation Order | [18]   |
| 7 Design is not construcible   | [2]    |
| 8 Understanding of the design that is not clear and not well understood | [4]    |
| **Flexibility Contract**       |        |
| 9 The problem of contract adjustment is the causes of the variation order | [8]    |
| 10 Poor contract management gives rise to variation order in project implementation | [3]    |
| 11 The contract is considered multiple interpretation, this triggers a variation order. | [1]    |
| **Contractor Initiated Change**|        |
| 12 Consultant costs tend to be minimal | [11]   |
| 13 Project designers have minimal experience | [5]    |
| 14 Contractors often instruct variation orders | [5]    |
| 15 The contractor’s supervisor has no experience of the undertaken construction project | [5]    |
| **Client Change**              |        |
| 16 The project owner instructs to modify the design | [18]   |
| 17 The project owner failed to make a decision in reviewing documents in a timely manner | [15]   |
| 18 Unavailability of licensed experts from the side of the project owner | [18]   |
| **Bad Contractoral Procedure** |        |
| 19 Budget contract problem becomes the cause of variation order | [8]    |
| 20 Unavailability of overall planning project | [15]   |
| 21 Failures of construction project contract consultants | [1]    |
| **Improper Coordination Contract** |      |
| 22 Failure to provide contract information related to project tenders | [19]   |
| 23 The decision regarding project contract are considered unsuitable with the initial agreement. | [19]   |
| 24 Incompatibility contract with environmental, technical, legal and project budget issues | [7]    |
3. Research method
This study uses a qualitative approach to determine category that cause variation orders. The discussion of this research is emphasized a case study [20] namely the analysis of the discussion related to the main problems that occur in construction projects related to variation orders, factors and cause sources of variation order. This research begins with the process of elaborating the background then looks for the formulation of the problem and objectives, then proceed by studying literatures to find the factors that cause variation orders, consisting of rules change, preparing design, flexibility contract, client change, contractor change, bad contractoral procedure and improper coordination contract. Factors that cause variation order in secondary data is in the form of contract instructions that contains the incurred causes and costs that are adjusted with the results of literature studies. The re-classification is continued based on the order variation sequence, which causes the greatest cost and the most common frequency. Secondary data in this study are in the form of X construction project data in Surabaya and the used data is contract instruction of X construction projects from the beginning of the project until May 2020.

4. Results and discussion
4.1 Classification of variation order
Various factors about the causes of variation orders are taken from journal, and then crosschecked with field data. Field data which is form of contract instruction was containing the causes of variation orders and costs incurred due to the variation order. So that known the factors which cause variation orders in journal and accordance with the construction project problems that occur in X project namely preparing design, flexibility contract and client change, while site condition was one of the aspects that causes variation order which were found in the field data but not in the journal. Then each cause of variation orders appears cost incurred due to the variation order is taken from contract instruction form. Total costs incurred due to the variation order amounting to Rp 4,636,219,709. While the project X contract value is IDR 261,000,000,000.

| No | Variables                        | Cost   | Frequency | Cost of overall VO / Per Variable | Cost of Contract/ Per Variable |
|----|----------------------------------|--------|-----------|----------------------------------|-------------------------------|
| 1  | Rules and Regulation Change      | Rp 1,460,536,494 | 49%       | 31.50%                           | 0.56%                         |
| 2  | Preparing Design                 | Rp 2,226,876,579 | 13%       | 48.03%                           | 0.85%                         |
| 3  | Flexibility Contract             | Rp 131,869,796  | 13%       | 2.84%                            | 0.051%                        |
| 4  | Contractor Initiated Change      | Rp 816,936,840  | 25%       | 17.62%                           | 0.31%                         |

Tabel 2. Classification of Variation Orders by Costs
Based on the table above, it is known that the percentage of each aspect of preparing design is 31.50% of the total cost of variation order, site condition is 17.62% of the total cost of variation order, client change is 2.8% of the total cost of variation order and flexibility contract is 48.03% of the total cost of variation order while the percentage value of variation order compared to the contract value is 1.776%. The frequency of occurrence of variation orders due to preparing designs is 49% of the total frequency, site condition is 25% of the total frequency, client change is 13% of the total frequency and flexibility contract is 13% of the total frequency. Aspects or factors that cause dominant order variations based on frequency are preparing designs while flexibility contracts are dominant in terms of the largest costs in causing variation order. This proves that the flexibility contract and preparing designs are as the cause of variation orders which cause the project is constrained thereby increasing construction costs.

Previous research often discusses government projects such as school buildings, roads, dams, public facilities. This study discusses private projects in the form of apartment buildings and shopping centers which show the causes of variation orders are dominated by flexibility contracts and preparing designs.

5. Conclusions

Based on the data analysis process, it can be concluded the results of the study are as follows:
The percentage of each aspect of preparing design is 31.50% of the total cost of the variation order, site condition is 17.62% of the total cost of the variation order, client change is 2.8% of the total cost of the variation order and the flexibility contract is 48.03 % of the total cost of the variation order. The frequency of occurrence of variation orders due to preparing design is 49% of the total frequency, site condition is 25% of the total frequency, client change is 13% of the total frequency and flexibility contract is 13% of the total frequency. Aspects or factors that cause dominant order variations based on frequency are preparing design while flexibility contracts are dominant in terms of the largest costs in causing variation order.

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