

Development in Design Stage Based on Risk to Reduce Variation Order in Building Construction Project at PT. XYZ

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ABSTRACT

The consultant planning is the key to create document design for project construction. In the world of construction, Variation order are frequent occurrence, many factors cause variation order is uncontrollable, the most common caused by consultant planning. The main task of consultant planning is to provide design architectural in drawing documentation and technical report document that enable contractor to make all of these idea into physical reality in the project. Design error, inadequate design, failure of design or lack of coordination area common cause of variation order by the consultant planning. For this reason, it needs a strategy in the design stage process in order to minimize the occurrence of variation orders. This study aims to identify the stage of design process, identify the risk that occur at the design stage that cause variation orders and the strategy to reduce variation orders caused by the consultant planning.

Keywords: Consultant Planning Company, Design Stage, Risk Management, Variation Order

JEL Classification: L23, Y90, N60

INTRODUCTION

(Majeed, Ali, Hassan, 2020) Building construction project involves various detailed activities and stakeholders, so the conditions are quite complex, and raise various problems. (Choudhry, Gabriel, 2017). (Elshaikh, Mahmoud, 2020) VO's depict any deviation from the agreed upon (scope, time, cost or quality) among the project's stakeholders. (Chakra, 2019) Change orders have long been an inherent part of the construction industry around the world, where construction projects suffer from variation orders. Every building construction project begins with the objective of completing the project in accordance with the details of the contract. The client, the consultant, and the contractor contribute their share to fulfil the requirements at the start of a project. One of the significant problems that occur during the construction process of a project is a variation order.

Figure 1. Types of variation order issued on construction projects

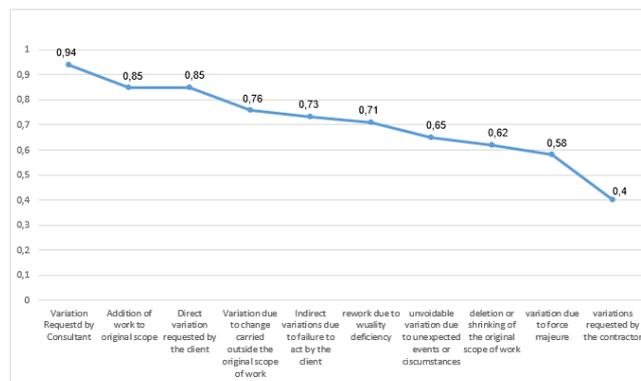


Figure 1 showed that Variation requested by consultant with a mean item score of 0.94 is the variation order that is highly issued on construction projects (Akinola, 2018). classified causes of variation orders into three groups; design changes, unforeseen conditions and design errors and omissions (Akinola, 2018). The first major cause of variation orders was change in design by the consultant. This could also be caused due to the client change of mind. Design change is indeed one of the most causes of variation orders and this fact is supported by the interviewees and the observations in the desk study, (Yadeta, 2017). The causes for the variation orders and their effects on the cost and schedule of the project are complex and influenced by several interrelated factors. The risks associated with project variation make it difficult to predict and plan for changes. The five most serious causes were found to be the economic conditions, the lack of coordination between the parties, the bad subcontractor or the vendor by the contractor, impeding the rapid decision-making process of the project owner and the contractor's financial difficulties (Balbaa et Al, 2019).

Investigated 90 cases of variation orders and obtained that the design errors and omissions are responsible of 65% of variation orders, 30% of variation orders related to design changes, and 5% due to unforeseen conditions[5]. The main causes of variation orders on construction projects are inadequate working drawing details, design discrepancies, conflicts between contract documents, the change of plans or scope by owner, impediment in prompt decision making process, inadequate project objectives, and replacement of materials or procedures, differing site conditions, shortage of skilled manpower, contractor's desired profitability and contractor's financial difficulties (Yadeta, 2016). There are 5 factor risk of cause variation order by consultant planning, there are: lack of coordination risk, errors and omission in design risk, poor design risk, inadequate working drawing details risk, and design complexity

risk (Balbaa et Al, 2019). Therefore, it is necessary to identify and further study the problem design caused by consultant planning based on risk to reduce variation order in construction building project.

LITERATURE REVIEW

a. Variation Orders

(Pokharel, Joshi, 2020) Variation Order consist of the additions, omissions, alterations, and substitution in term of quality, quantity and schedule of works. According to FIDIC (1999) conditions of contract, "variation" means any change to the works, which is instructed or approved as a variation. Various authors had identified different causes of variation orders in construction projects both on the private and public projects. Contractual clauses relating to variation allows parties involved in the contract to freely initiate variation orders within the ambit of the scope of the work without alteration of the original contract. (Adu, Ekung, Lashinde, 2020) variation order is a formal document that is used to modify the original contractual agreement which eventually becomes part of the project's documents. Similarly, Clough & Sears (1994) defined variation order as a written order issued to the contractor after execution of the contract by the owner, which authorizes a change in the work or an adjustment in the contract sum or even the contract time. (Yadeta, 2016) But variation orders are common in construction projects, and improved understanding would require identifying their causes. The works of many researchers show that that variation has come to stay as part of the construction projects and it cut across various stakeholders. (Yadeta, 2016) Causes of variation orders are classified into three main groups: client related factors, consultant related factors and other related factors. (Samer, 2018) There are Causes of variation order based on consultant related factors:

1. Error and omission: A project having problems with the design or inadequate details in the design would significantly affect the work progress and the project time schedule.
2. Design complexity: Design drawings can be often difficult to execute if the project is complex, therefore, a procurement method of Design-Build method should be chosen in order for the contractor to be involved during the design stage.
3. Change in design: occurrence of change orders in a project is highly possible due to projects starting before the completion of the final design.
4. Conflicting contract documents: A project having several contract documents may produce misunderstanding in conveying the project scope.
5. Insufficient design: Insufficient designs can be a common cause for change orders in a construction project, affecting time schedule and leading to a cost increase (Samer, 2018).

(Gobana, Thakur, 2017) The key reasons of variation orders are characterized beneath employer related, consultant related and contractor related and other related sources of change orders.

Risk Management

Risk Management is the process of identifying, analyzing, evaluating, controlling and trying to avoid, minimize or even eliminate unacceptable risks. The purpose of Risk Management in project appraisal is to evaluate the optimization process of the objectives of the project objectives. Some of these results may go against the original plan. The approach taken from project appraisal will assist the project manager in the decision-making process. (Smith, 1991; Sandyavitri, 2014; Ronald, 2004). Process Risk management will need to review the project life cycle, for example a major phase change or if there is a significant change in project scope, or if a subsequent risk management effectiveness review determines that the project risk management

process requires modification.

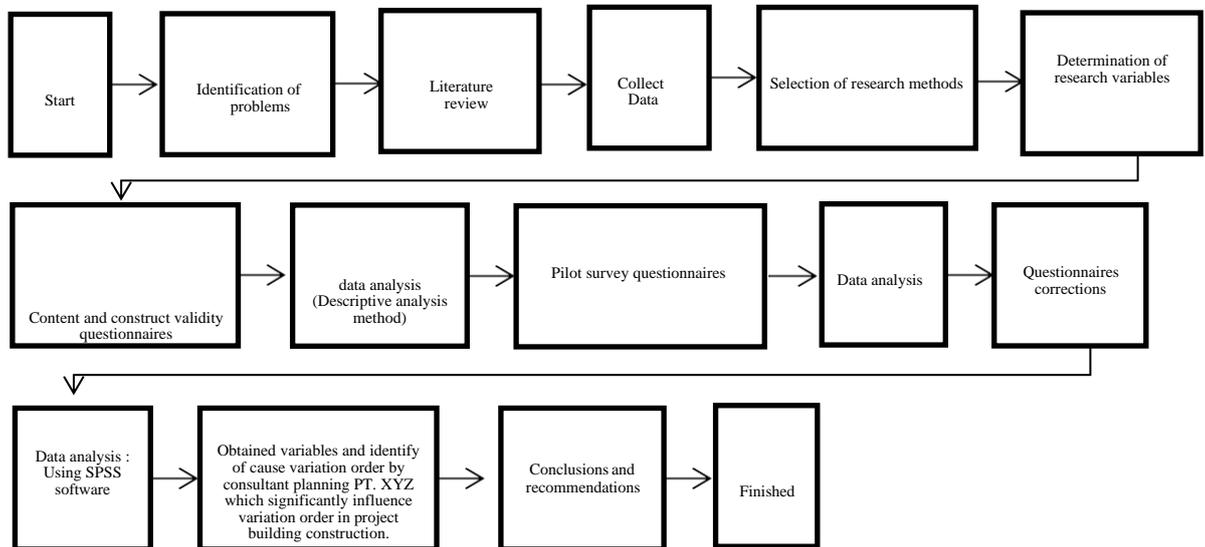
The process of identifying risks in a project by documenting the characteristics of each risk and integrating information so that the project team can respond appropriately in dealing with the identified risks. While the technique of identifying the risk of bias is using brainstorming, interviewing, with project stakeholders. In risk identification there is also the term Risk Breakdown Structure (RBS) which is useful for detailing risks in more detail. Qualitative analysis is an analysis carried out based on intuition, level of expertise in assessing the number of risks that may occur and the potential for damage. Quantitative Risk Analysis involves determining a specific numerical value for the risk of impact on a project, and this analysis can be used to manage risks and plan responses to risks. Plan Risk Response is the process of developing options, selecting strategies, and agreeing on actions to address overall project risk exposure, as well as to treat individual project risks. The key benefit of this process is that it identifies appropriate ways to address overall project risk and individual project risks. In general, five alternative strategies may be considered for dealing with threats, there are avoid risk, transfer risk, mitigation risk, accept risk. (PMBOK 6th Edition)

RESEARCH METHOD

a. Research Methodology

The object of this study is PT. XYZ Consultant Planning Company. Literature study and validation were carried out to determine the research variables. Obtained 8 experts with expert qualifications in the construction field who have a minimum of 10 years experience and a minimum bachelor's degree. The sample data test was carried out with 100 data, the data was tested using the SPSS software.

Figure 2. Research stages



b. Research Variables

In this study, the independent variables that cause of variation order by consultant planning are inadequate design; changes of design; errors and omissions in design; and lack of coordination. The dependent variable is time on delay in projects caused by variation order, (Balbaa et Al, 2019). The independent variables and dependent variables obtained have been described in other journals, but no one has analyzed the four independent variables based on risk findings in this study (Mohammad, 2010).

In the first stage of the questionnaire, the content and constructs of the variables were validated by conducting a descriptive analysis of the variables were validated by conducting a descriptive analysis of the variables and indicators of the cause of variation orders so that 4 independent variables and 15 indicators were validated as variables and had an effect in variation orders. The respondents rated the variables on a five-point Likert-scale from 1 (insignificant) to 5 (extremely significant). The effect of each factor on project performance was also measured on a five-point Likert-scale from 1 (not effective) to 5 (extremely effective). Data collected were processed using Statistics Package for Social Sciences (SPSS) version 17, to obtain the Mean Score (MS).

RESULTS AND DISCUSSION

There are several factors responsible for variation orders of construction projects. Based on the objectives of the study, 15 factors constituting causes of variation orders in the construction industry were identified through literature review and pilot survey conducted during the study, (Adu, 2018). The factors were concern in consultant related based on PT. XYZ. As presented, change of plan or scope of work, errors and omissions in design, change in specifications by client, client's financial difficulties and inadequate project objectives were the first five key important causes of variation orders in the construction projects based on the collective ranking of the respondents.

The change of plan or scope of work was the most highly ranked among these factors responsible for variation orders by the three groups of respondents with mean scores of 4.65, 4.61 and 4.70 for clients, consultants and contractors respectively. This implies that this factor is a predominant cause of variation orders of construction projects in the study area. The importance of the factor can be attributed to inadequate planning at the project definition stage (Arain et al., 2004). This result agrees with the findings of the Construction Industry Institute (CII) (1990) which identified change of plan or scope of project as one of the most significant causes of variation in construction project (Adu, 2018).

Errors and omissions in design were ranked second in the overall ranking as well as the ranking orders of consultants and contractors with mean scores of 4.62, 4.60 and 4.67 respectively. However, the clients group rather considered the factor as third at the same time having the same MS with the consultants group of 4.60. It is established in literature and practice that project with insufficient information at design stage or a situation whereby the designers are given inadequate time to translate client's brief into designs, amounts to errors and mistakes which are often discovered late at the construction stage. This is in agreement with the observation of Enshassi et al. (2010) who notes that if errors in design were not immediately rectified during the design phase it would eventually appear in a construction phase and may degenerate into issuance of variation order to implement the corrective measures. The result of findings of Ssegawa et al. (2002) pointed out that clients and architects are the major cause of omission which is attributed to financial issues and changes in designs (Adu, 2018).

Inadequate working drawing was ranked sixth in the overall ranking but the respondents did not agree on the ranking of the factor perhaps the priority they placed on it differs. The factor was ranked fifth by the clients, eighth by consultants and seventh by the contractors with the overall ranking of sixth position. These rankings show that the factor is among the top 10 factors, considered by the respondents that are responsible for variation orders in the study area (Adu, 2018).

In this study, there are two independent variables were produced which significantly

affected the binding variable as follows:

1. The Errors and omissions in design with 2 indicators, namely:
 - a. Design complexity with insufficient information at design stage that influence process of construction.
 - b. Clients and architects are the major cause of omission which is attributed to financial issues and change in design;
2. Inadequate working drawings with 3 indicators, namely:
 - a. The consultant planning didn't have enough experience in their capacity of work;
 - b. Working drawing and specification documents are not clearly.
 - c. Designer is haven't enough understood of technical drawings.

CONCLUSION

It can be concluded that there are 16 factors cause variation order by consultant planning. However, it is necessary to have a new model of process design to minimize the variation order with improving quality of work at PT. XYZ as a consultant planning.

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DECLARATION OF CONFLICTING INTERESTS

There are no conflicting interests.

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