

Critical Review on Causes and Effects of Variation Order on Construction Project

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Abstract - The greatest inevitable situation in construction projects is variation. This variation orders are available in all kind of construction projects and acting a significant part in defining the ultimate budget and duration of the projects. Variation Order is a common occurrence in construction projects. It includes a modification of the prior scope of tasks as in the contract. Change order of scope of work is caused from various issues. The origins of variation orders are characterized under employer related, consultant related, building executor related and other related causes. The down side of this variation order was it brought cost and schedule overrun and causes disagreement and claims among the contract parties. Thus, this paper is an effort to define variation order, causes and effect of variation order, waste related with change orders and different literature reviews are discussed.

Key Words: variation order, causes, effects, construction projects.

1. INTRODUCTION

The charge of a construction project is one of the greatest important factors in the construction manufacturing. Because of different reasons, the budget of a project can suggestively differ from the first valued price. Their sources might be alterations in scope of task, specifications, or any other agreement form. In the construction business, variation orders are made after changes occur. It covers a set of orders which permits alterations or alterations to be done to an earlier consent in case of capacity or nature of work to be carried out. When a variation order is created, it brings several undesirable effects to both the employer and the construction executors. For completion of large construction projects we have to complete small construction tasks in regular manner. For that lot of exertions are taken. The variation orders are unlucky causes to interrupt the movement of construction procedure instantaneously stay the construction project. They involved alteration, extra work, deleting, and exchanging in terms of quality, quantity and duration of work. When extra work, subtraction, or any other revision had done project goalmouths and scope of project are considered to be variation, whether they accelerate or deduct the project budget or schedule. Changes in construction projects means to an modification to design, construction tasks, project sequencers or project characteristics produced by adjustments of previous situations, assumptions, or requirements. Variation orders

have effect on complete project routine because changes are able to bring considerable alteration to the agreement period, total direct and indirect cost, or both. [10]

The tackling of these variations needs sufficient skill; in what manner we manage that change without affecting our final achievement. Monitoring change order is the greatest importance to the achievement of construction project. These variations sometimes occur after the grant of the preliminary agreement or after work might have started at the construction sites. The key reasons of variation orders are characterized beneath employer related, consultant related and contractor related and other related sources of change orders. When the number of change order on a project rises, in the similar way the likelihood of misinterpretation between the agreement teams. Such a misinterpretation may happen due to one of the parties has no talent of the variation order procedure itself, the budget included in executing changes, or the postponements, disagreements, and interruption of the construction sequence and calendar which can unfavourably impact project management. [4]

1.1 Variation order in construction project

A construction contract is a business agreement that is subject to variability. Contractual articles relating to variations allow contractual teams involved in the tender to easily motivate change orders within the influence of the scope of the works without altering the original contract. Change orders involve extra work, subtraction, alterations and replacements in terms of quality, quantity and duration of works. Without contractual Clauses, the contractors who were licensed on building should have to decide to upright the building as per the design and represented in the agreement forms. Any insignificant alteration that the employer needs to prepare far along mean that the contract must be removed and a fresh added was drawn up. [5]

Variation order is the eccentricity practiced in some scheme from base agreement or task scope equally agreed at contracting duration. It is written contract among the construction parties that symbolize extra work, omission, or reconsideration to the agreement documents, identifies the alteration in price and time and describes the nature of the task involved. Change orders increases for altered sources of which certain reasons are predictable and the left one are not predicted. [11]

1.2 Causes of variation orders.

Many papers had identified that different origin of variation orders in construction project. The enormity of the many origins of change order were listed before this time by different researchers reveals that changes has become one of the construction project factors that weakens construction projects and it focuses many stakeholders. This variation has been characterized into consultant related, employer related, building executor related and other related change order and the other variation is listed as force majeure. The origins of project change in project may originate from either external or internal pressures that are being applied to the project. External causes may be due to of technological changes, changes in the customer expectations and tastes, alterations in competitor’s activities, modifications in government and policies, adjustments in the economy and finally demographic amendments in the society. Internal causes may emanate as of changes in management policy, changes in organizational objectives and changes in the long-term survival strategy of the organizations involved. [1]

The foremost origin of change orders on construction projects are inadequate working drawing, design inconsistencies, disagreement between contract sum, the alteration of plans by employers, impairment in rapid decision making procedure, insufficient project aim and objectives, and replacement of materials or procedures, location of site, lack of expert manpower, building executor anticipation on profit and contractor’s financial difficulties. As a results of literature reviews, origins of change orders were listed out such as: Alteration of schedule, differences in scope, employers financial difficulties, Weakness to quick decision-making process, stubborn nature of the employer, Change in specifications by the employers, Alteration in design by the consultant, disagreement among contract documents, Design complexity, Insufficient working drawing, Alteration in specification by the consultant, Unobtainability of equipment, lack of well-trained manpower, Contractor’s monetary problems and Poor workmanship. [1, 3]

Below figure reveals that origin of change order in many construction projects using a survey study analysis focused on the amount of incidences and percentage. [9]

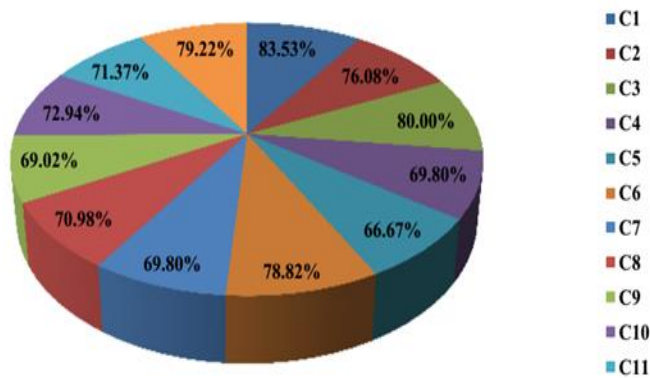


Fig 1. Causes of variation order, Adopted from [9]

1.3 Effects of Variation Orders

Variation orders exert various effects on the projects. Numerous researchers have emphasized the effect of change order. Impact is the pressure of hollow of one thing on another. In construction, extra work or omission of scope of activities of the project can bring effect on the portions of the project directly or indirectly. Therefore, it is always a specific issue as the contractor feels that the disadvantage due to change order is the burden of the designers and owners. Conversely, employers characteristically claim that the slowdown of outcome is because of poor monitoring due to building executors. However, not every variation order will impact the consequence of the project. Changes in any prearranged activity will bring a disorder and needs the rearrangement or rechecking of the existing plan under the recent developments. It was found that variation orders issued during many stages of construction projects adversely exaggerated equally budget and calendar of projects. [10]

1.4 Waste associated with variation orders

The origin of variation orders can be strong-minded by referring to both the reasons for their incidence and following effects. Variation orders cab be classified as, beneficial and detrimental change orders. A beneficial change order is one delivered to increase the quality standard, decrease price, calendar, or grade of effort in a project. A beneficial variation order abolishes needless prices from a project; and hence, it improves the employer welfares contrary to the reserve input by abolishing needless prices. While most construction industry stakeholders are debatably interested in the lessening of overall production prices, they are not always mindful of the extent of non-value providing extra tasks on construction projects. Accordingly, there is a lack of knowledge about valueless costs related with change orders. The realistic quantification of such costs is sticky because of shortage of suitable techniques for their measurement. In common practice, non-value-adding prices ascending from change orders that are typically transported to be miscalculated. For instance, one may capable to compute the prices of terminated works, but valueless price arising from non-productive period; redesign and expenditures are not credited to such an action. Very often these prices are unwittingly relocated beneath the version of contingencies. [10]

2. LITERATURE REVIEWS

OjoAyodeji, Sunday (2010), published a paper on impact of variation orders on public construction projects. The investigation proves that insufficient workings drawing details, design inconsistencies, and disagreement between contract parties are the most predominant sources of changes due to consultants, alteration of plans by employers, impairment in quick decision making process, and insufficient project objectives contributed mostly to variations by the employers. Contractors’ predominant reasons for variations are opposing site situations, lack of

skilled manpower, and contractor's desired cost-effectiveness. There is a connection among the assessments by the respondent concerning the consultant related variations and the projects fingered by the consultants. The investigation has shown that effect of variation has superior important effect on the projects held by the consultants than the in-house project staff regardless of the kind and scope of the projects. It is expected that these will support the administration to recheck the conditions at which the consultant and the in-house staff operate to better understand the usefulness of the consultant and the in-house construction professional staff.

R.U.Halwatura and N.P.N.P.Ranasinghe, (2013), have published a paper on causes of change order in road construction Projects. The study concluded that the consultants do not take about satisfactory investigations at the initial investigation and design phase. Therefore, several site conditions rise in the construction stage. Additionally, employers do not have talented professional staff to prepare inquiries and estimates, which are prepared by consultants and are not precise in most situations. Therefore, several needless variations happen during the construction phase. Apart from this most of the time the foremost reasons were, the fault of the client is not pointed out and not documented. According to the survey results, a political force during construction phase is listed out as a leading factor.

A.A. Oladapo, (2007), has studied a paper on assessment of the cost and time impact of variation orders on construction projects. The study has discovered that alterations in specifications and scope, initiated mostly by project owners and their consultants, are the maximum predominant sources of variation. This results mainly from changes in owners' income/financial ability, changes in owners' interests/requirements, design errors and insufficient time for preparation of agreement forms. The study concludes that variation had a significant impact on project budget and schedule invades and that project size and type did not significantly affect the project prices and calendar. The expectation of this study was that to enable project clients, consultants, contractors and other stakeholders to realize and appreciate the real effect of variation on project routine. Amiruddin, Ismail, Towhid and Pourrostam, (2012), published paper on factors causing variation orders and their effects in roadway construction projects. This study which was held on an estate in the southern part of Iran has been capable to separate origins and impacts of variation orders in construction projects. It was observed that alteration of plans or scope by employer, errors and omissions in design and clients' financial difficulties were the serious factors that cause the existence variation orders in roadway construction projects. In addition, the consequences prove that schedule and budget overruns and disagreement had great important effects on project routine. It is to the advantage of this study that its applications are very relevant not only in Iran's roadway construction system but also in other developing countries construction industries.

Alia Alaryan, Emadelbeltagi, Ashraf Elshahat and Mahmoud Dawood,(2014), published a paper on change orders on construction Projects. The investigation found that the most five common causes of change orders can be listed out as: alteration of plans by client, alteration of project scope by client, difficulties on site, errors and omission in design, insufficient design and inadequate working drawing details. The most five common effects of change order are increasing the project's budget, accelerate the duration of individual events, postponing in completion schedule, additional money for contractor, and delaying in payment. Finally, the most six common control actions are: inspecting and reviewing the contract documents, reviewing design before change approval, the change order must be negotiated by educated persons, the scope of change orders must be precisely done, careful checking in writing must be handed, and the respectable utensils to control the incidence of change including the areas of concern in monthly reports and meetings.

Ijaola, I.A and Iyagba R.O, (2012), published paper on comparative study of causes of change orders in construction project. This study investigated the causes, effect, advantage and solutions of variation order in Nigeria and compare it with that of Oman. It was concluded that the major causes of change orders in Nigeria and Oman are those related to employers and the major reason is that owner request for additional works. The impact of these changes has leads to claims and disputes, time overrun and cost inflation in both Nigeria and Oman. The study also identified the contractor as the most helping parties of change order in Nigeria as most respondents believed that the building executor uses suitable areas in general conditions and asks extra payment to be paid for them. The contractor was also ranked as most beneficiary of variation order in Oman.

Noraziah Mohammad, Adi Irfan Che Ani , Riza Atiq O.K. Rakmat (2017), published paper on causes and effects of variation orders in the construction of terrace housing Projects. The 18 causes of changes that are identified through a literature review were used as a guide or foundation in collecting information to know the sources of changes in working in strip Selangor, found that only 10 causes of employment changes are related to changes in work for the terrace houses in the district of Selangor. From the consequences of case studies there are five main causes that led to the introduction of changes in the housing projects in the state. The causes are as follows:

- ✓ Changes in the scope of the work by the client.
- ✓ Exchange of construction materials by the client.
- ✓ Specification changes by the client.
- ✓ Changes in building design by the consultant.
- ✓ Differences between the contract forms and drawings.

Among the main effects were identified and investigated in joining with variation order are as follows:

- Increase project time
- The increase in the project cost.
- delay logistics
- The impact on the quality of the project
- Destruction and reconstruction

M.Gokulkarthi, K.S. Gowrishankar (2015), published a paper on a study on impacts of change order in construction projects. Based on the field survey conducted and the consequences were achieved, the following as can be determined and outlined:

- Changing the plans by the owners is the main source of change orders. This is because shortage of participation in the design growth and incapability to imagine it while not appreciating the undesirable impact on it.
- Because of new materials are becoming available in the market or change in mind, substituting materials and/or procedures is the second source of change orders.
- Consultants are the second major contributor to changes by generating conflicting design documents or through alteration in design afterwards.
- Rise in project price and duration are the main two effects being noted for change orders.
- Clarity of scope of change orders ranked the first among controls adopted.

Onkar U. Jadhav , Prof. Abhijit N. Bhirud (2015), published paper on an analysis of causes and effects of change orders on construction Projects. As per survey carried out get different kinds of answers and responses from the construction place .The root sources of variation order in construction projects in is client alterations, extra activities and adjustment to prior work. Another key reason is lack of building executor participation in design phase. It may indicate absence of thoughtful design at the period of actual construction. The other causes are unrealistic design periods, the absence of information between contractor and the consultants.

The effects are the most important change orders increases the cost of the projects. Probably increase the period of individual activates that effect on completion timetable of the projects. Paying extra money for the contractor is the mostly effects caused on different construction sites.

Ruben Ndiokubwayo, Theo Haupt (2009), published paper on Variation orders on construction projects: value adding or waste? Study found that consultants accepted time frames proposed by clients instead of proposing realistic

timeframes to accomplish the design. As a result they embarked on tendering whether the design was completed or not because they knew other required changes would be permissible under the conditions of contract. It was therefore determined that the employer was the furthestmost leading source agent of variation orders. Most variation orders added value to the project. However, waste was still a consequence of them. It was investigated that change orders were not persuasively estimated resulting in increased construction budget. Time and cost escalation and disputes had foremost effects on project routine. There were no standard methods for recording and administering variation orders. While respondents suggested that change order must be reduced, they acknowledged that clients had the right to initiate changes provided they were contractually permissible and were prepared to remunerate the associated costs.

Aftab Hameed Memon, Ismail AbdulRahman and Mohamad Faris AbulHasan (2014), published a paper on Significant Causes and Effects of Variation Orders in Construction Projects. The investigation was attempting to list out the foremost sources and impacts of changes in construction projects. Average index analysis of the collected information through survey shows that:

- In Malaysian construction projects, variations are often experienced in JKR projects.
- Five most important causes are absence of apparatus, poor workmanship, design difficulty, alteration of schedule and impairment to quick decision making procedure.
- Logistic delays, postponement in conclusion and increase project budget are important impact of variations confronted in construction projects.

3. CONCLUSION

Based on various literature reviews the causes and effect of variation orders were categorized under employer related, consultant related, contractors related and other related grounded on type of the task. The employer related causes were change of plans, alteration of project scope, extra tasks and adjustment to previous work and financial difficulties, The consultant related causes were; insufficient workings drawing details, design inconsistencies, and disagreement among contract documents are the most predominant origins of variations, Contractors' prevalent reasons for variations were differing site conditions, lack of trained manpower, and contractor's desired profitability. The impact of change order within construction project were resulted in claims and disputes, time overrun and cost overrun, delay logistics, impact on the quality of the project, and demolition and rebuilding. Yet, no unique method is available for minimizing variation orders effectively. However, their effect can be minimized with an appropriate study about the causes. The consultants' and the contractors' response

argued on the strategy that states adequate planning in advance is required by all involved parties before works start on site to minimize variation orders. This was because a well-planned project can eliminate change that will increase because of shortage of prior project development.

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