

Study on Causes and Effects of Change Orders in Construction Sites

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Abstract— Change orders are one of the major problems in construction projects. Change orders in construction projects are any occurrence in the project after the grant of the contract or bow of work on sites. Such changes may happen due to the needs to satisfy the new or modified demands specified by the owner, to reduce project cost, or to correct existing design mistake. To make things bad most of the changes were made during construction stage. These will cause change orders, contractual disputes, cost overrun, time delay and frustration. In addition to that parties which are involved in the procedure of making the changes into reality will need to submit fresh claims on the extra work done. Hence, proper analysis and actions are required to measure the causes and effects of change orders. The objectives of this study is the identification and evaluation of causes and effects of change orders in construction site which includes data collection by running questionnaires among the parties contributing to these changes, which is analyzed using Relative Importance Index method.

Index Terms—Change, Contract, Cost, Delay, Demolition, Dispute, Rework

1 INTRODUCTION

The construction industry is one of the largest industries in the world. Changes in planned design, construction method and contract terms during progress of work lead to the change order. Change, defined as any event that results in a modification of the original scope, execution time, or cost of work, happens on most projects due to the uniqueness of each project and the reduced resources of time and money available for planning. Change orders play a major role in construction because they have a larger impact on cost, schedule, quality, safety, and productivity. So, it is one of the main cause for project failure.

Change order is the most crucial part in any construction project, as they are caused by any parties which involved in it. Therefore, causes which influence change order and its effects on construction project are very crucial in any construction firms. So, effective management of change order is required to be done. It may change from project to project, place to place, time to time and also with respect to the type of work.

2 STATEMENT OF PROBLEM

Change order is a written order to the contractor, signed by the owner, and issued after award of the contract, implying a change in the work or an adjustment in the contract sum or the

contract time. Changes in drawings and contract documents generally lead to change in contract amount or contract schedule. Changes also increase the extremity of contractual disputes. In general, changes cause problems to all parties involved in the construction process. There are many causes for issuing construction change orders in large building construction contracts. It might be due to further development of the owner's requirements. It can also occur due to non-availability, slow delivery of required materials or correction of contract document errors and omissions. Identifying the causes of change orders is very important in order to avoid potential changes in future projects or minimize their effects. The aim of this research is to study the causes and effects of change orders in construction projects.

This study will help both owners and contractors to plan effectively before commencing a project and during the design phase to minimize and control changes and change effects. This study will also lay the foundation for further research on the topic

3 OBJECTIVES

The main objectives of this research study are to:

- Identify the main causes of change orders in construction sites.
- Identify the effects of those causes.
- To formulate results and recommendations

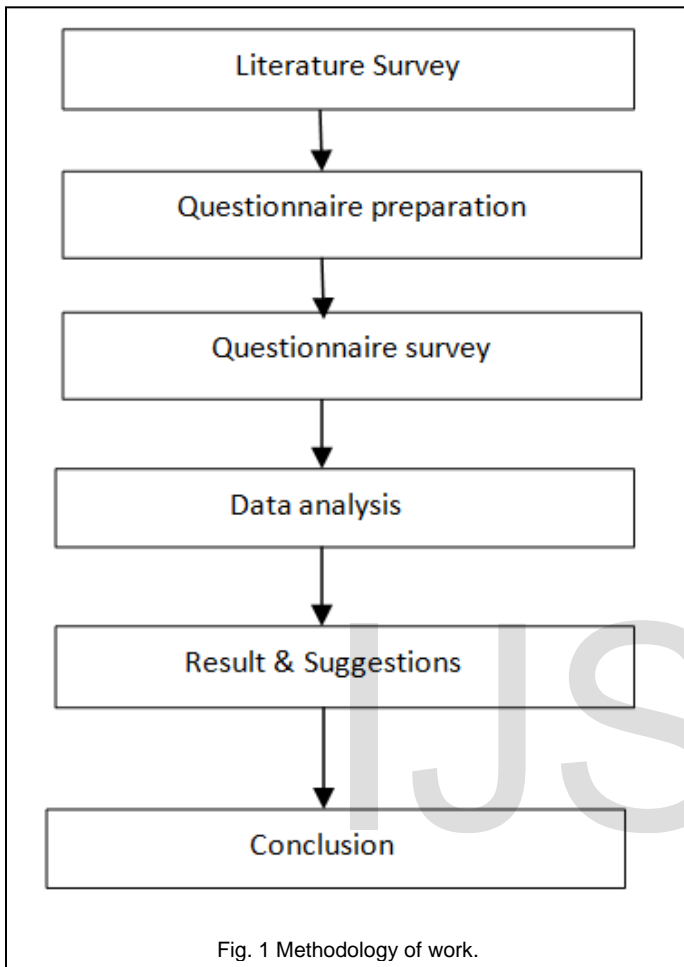
4 SCOPE

Change orders play a crucial role in construction industry. It has impact on construction cost, schedule etc .so it is necessary to identify/predict the causes and effects of change orders in advance in order to manage a change order situation.

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5 METHODOLOGY

The methodology adopted for the present survey is illustrated in Fig.1



6 LITERATURE SURVEY

Ibrahim Mahamid (2017) conducted studies to address the causes of change orders and rework in construction projects and to measure reworks cost. The objective of the study is to identify the main causes of change orders and its impact that leads to rework in highway projects in Palestine. The relationship between change order and rework is examined using regression analysis. Questionnaire survey was conducted in order to collect the data's and were analyzed using mean score method. The main causes for change order were found to be change of project scope by owner, lack of co-ordination between construction parties and owners financial difficulties.

Estrellita Y. V. Waney et.al (2017) investigated the change in the work construction contract which is commonly called work change order or Contract Change Order. The purposes of the study was to identify factors that cause contract change order and to design a model for controlling contract change order (CCO) in term of cost performance at the government

pier project implementation, particularly in North Sulawesi, Indonesia. The study methods were primary data collection by running questionnaires and secondary data from the office of the Department of Transportation and contractor company document. The results showed that partially Construction Factor, Administration Factor and Resources Factor significantly influenced the cost performance.

Mujahed Staiti et.al (2016) investigated the impact of change orders on project performance in the West Bank, in order to take proactive measures to minimize changes during construction. The main objectives of the paper are to identify the main causes of changes occur in construction projects in the West Bank and to highlight the potential effects of change orders on the Palestinian construction industry. Microsoft Office Excel and Statistical Package for Social Sciences (SPSS) were used in this research to analyze data. Financial problem, Impediment in prompt decision making process and Change in project scope were found to be the major causes of change orders and time overrun, Cost overrun and Disputes between parties to the contract were the major effects.

Ahmed Senouci et.al (2016) identified the main causes/factors that lead to change orders in Qatari construction projects. A total of 1122 change orders were collected from 22 Qatari residential and commercial construction projects. The collected data was analyzed using statistical methods such as Pearson correlation and analysis of variance (ANOVA). The analysis results were used to quantify the change order impacts on cost overruns in Qatari construction projects. Regression analysis models were also developed to predict change order cost overruns with respect to project size/contract value. Change of plans or scope by owner, differing site conditions and contractor's lack of judgment and experience were identified as the main causes.

7 CONDUCT OF SURVEY

Data is obtained through questionnaire survey. Owners, contractors and design consultants were requested to answer questions based on their experience in construction industry and their opinion about change orders.

The questionnaire is divided into four sections. The first section contains general information about the respondents such as email address, contact address, company name, contact address and type of work undertaken. Questions in the last two sections are in a multiple choice question format. The second section deals causes leading to change orders. A list of major causes of changes obtained from literatures is presented and the respondents are asked to put tick on the frequency of occurrence of these causes in his projects. Most frequent causes correspond to "very often" whereas the least frequent correspond to "never" which denies existence of the condition as a cause. The third section addresses the effects of changes in construction projects. This list was also based on the literature review. Most frequent effect correspond to "major impact"

whereas the least frequent correspond to "no impact".

The data for the work is collected from all over Kerala covering the construction sites. Data collection includes the causes and effects of changes in construction projects. The responses were collected from contractors, owners and design consultant.

8 STATISTICAL ANALYSIS OF THE SURVEY RESPONSES

The probability of occurrence for each change order factor in construction industry is ranked using 5 point Likert's scale as 1 for never, 2 seldom, 3 some times, 4 often and 5 for very often. It involves owner, design consultant and contractor for participation to get relevant feedback.

The evaluation of each element is conducted considering the weightage average of the responses. The Relative Importance index (RII) is used to get the weighted average to rank the causes and effects of change orders. Data analysis was carried out using Relative Importance Index (RII) method.

$$\text{Relative Importance Index} = \frac{\sum WA}{N} \quad (1)$$

Where W is the weighting as assigned on Likert's scale by each respondent in a range from 1 to 5; A is the highest weight and N is the total number in the sample.

9 RESULTS AND DISCUSSION

The causes for change order are varying with respect to each party involved in the project. It can also vary by different projects and its site locations. Change in project scope by owner and financial problem were found out as the main causes.

Increase in project cost and increase in project duration is found out as the major effect of variations. Any variation or addition is the design during execution of the project may results in demolition or rework which eventually increase the project cost.

10 CONCLUSION

From the studies it can be concluded that the two main causes for change orders in construction sites are

- Change in project scope by owner
- Financial problems.

The two main effects of change orders in construction sites are

- Cost overrun
- Increase in project duration

11 RECOMMENDATIONS

It is better to deal with the causes and find a solution so that severity of causes can be reduced. It can be concluded that the good performance and success of a building construction project, to a large extent, is determined by the ability and effectiveness of the project team to manage the unnecessary

changes during the project.

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