

Review analysis on Causes and Effects of Change orders on Construction Projects

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Abstract—In the last ten years there has been huge volume of work in construction industry. This is because of wealth created by the overall development of the country. In construction industry projects facing a problem due to variation or changes of order. The changes issued by owner, consultant's, site engineers, contractors. These changes lead to disputes among them which results in affecting construction projects. The changes always related to modification of work, design changes, material changes, and schedule change by owners. There for it is required to analysis of reasons and impact of change order to manage difficulty faced by issued change orders. Past research in this area provide lack of quantitative data

Therefore, the objective of this Paper is to identify and analyze the causes and effects of change orders on construction projects. A questionnaire surveys was prepared and circulated to various respondents to obtain the information regarding with various causes and effects of change orders and the collected information is analyzed by using Relative Importance Index Method.

Keywords-change order, construction projects causes and effects, disputes, project management, change management.

1. INTRODUCTION

In last fifteen to ten years huge volume of work in construction industry in developing countries. As the growth of industry is rapid the problem are relatively arises. In the trend of fast track construction there always some modification occurred in the design, some changes done at actual construction site. As the changes occurred on site there is possibility of dispute for the rework or avoid the change. Change order is defined as the any change or variation occurred in the prior condition. A change is any agreement based order provided to the contractor by the owner, owner's agent, or design engineer. Any activity on construction site which results in modification of original scope, execution time and cost of the project. Variation of orders is of same type in all type of construction projects. It is in the form of agreement or order from. As per the change in the specification of the project, schedule change, financial problem or as per site condition change order issued.

A change order is work that is added to or deleted from the original scope of work of a contract, which alters the original contract amount and/or completion date. A change order may fork a new project to handle significant changes to the current project. A Change Order represents the mutual consensus between the parties on a change to the work, the price, the schedule, or some other term of the contract. And, because it represents a mutual consensus, a Change Order is

usually the best, and least controversial, way to make changes.

Most of change orders received at the time of construction phase when multiple activities started which was impacted on time delay and cost increased. Large and critical projects has been built to attracting customers and clients, contractors but most of these contractor not capable of doing such big projects they are short in experience. This condition related to change scope of work which resulting in changes in plan.

2. LITERATURE REVIEW

2.1 Change Order

A change order is order which specifies the proper changes in the contract which alters the project duration and cost of the project. It is also stated as any guidance to the contractor which changes the specification of work by the owner, consultants. (Mokbel, 2003)

2.2 Reviews of Technical Papers

1. Alia Alaryan, Emadelbeltagi, Ashraf, Mahmoud (2014)

a..Changes on one project also affect other unrelated projects by tying up resources that are committed elsewhere.

Negative relation between the parties and are another by product of changes on a project.

b. This study advised that the most of the changes caused by owners. The most of common effect of change orders on cost and time of the projects. The control measure checking and reviewing contract document, review design before approval and the scope of change order must be clearly made.

c. The importance index, weighted average are used to rank causes and effects.

$$\text{Importance index} = \text{Weighted Average} \times 100/4$$

$$\text{Weighted Average} = (\sum W_i \times X_i) / N$$

Where W_i is option of cause, X_i is no. of respondent selected that cause and N is total no. of respondent.

2. Ojo Ayodeji Sunday (2010)

a. The study found that inadequate working drawing details, conflicts between contract documents are causes to change orders. Changes scope of project by owners is ranking second to cause change. In contractor side lack of experience, unskilled manpower, poor planning reasons for change orders.

b. He concluded at the end change order influencing strongly on the projects handled by consultants than site staff no matter of size and type of projects. It is necessary to management contribute to the project and operate in house staff and consultants.

3. Patrick Keane, Begum Sertyesilisik, Andrew David Ross (2010)

a. He used a questionnaire survey to know causes and effects of variation on construction projects and concluded how variation can be avoided in future projects. He grouped causes into three groups owner related variation, consultants related variations and contractor related variation.

b. Results of study found that causes of variation due to lack of coordination between client and design team, contractor not involve at the time of design stage. The most common effect variation increase the project cost. These are minimized through successful project management, maintaining good relation in parties and appointing qualified and experienced contractor.

4. Ali .S. Alnuaimi, Ramzi A. Taha, Mohammed Al Mohsin, Ali S. Al-Harathi (2010)

a. This paper discuss about variation in public construction projects in Oman investigating causes of variation. This research followed by field survey via questionnaire and actual case studies.

b. The contractor makes use rework and changes due to side of owner for earning extra profit .Owner modification rank the first cause for change order second modifications in design and third ranking nonavailability of construction manual and procedures for projects in Oman. The first benefiting parties due to change order is the contractor, second consultants and least party is client.

c. The corrective step for improve is use of standard manual with check list for design. A special team to evaluate overall projects in Oman, client hired well experienced and qualified staff And ensure capabilities of consulting team .

5. Ruben Ndhokubwayo , Theo Haupt (2009)

a. In this paper divide change order in two type beneficial and harmful, beneficial issued to improve quality standards, reduce cost, degree of difficulty in project. it remove unnecessary costs from the projects and optimize client benefit resources inputs. Harmful issued in the case where lack of data and knowledge about work.

b. Study shows that consultant agreed upon time given by the clients to complete design procedure which is resulted in changes at the time of actual construction phase. Time delay and cost is mostly impact on projects due to change orders.

3. PROBLEM STATEMENT AND OBJECTIVE

3.1 Problem Statement

A change order is a written order to the contractor, signed by the owner, and issued after execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time. Changes in drawings and contract documents usually lead to change in contract price or contract schedule. Changes also increase the possibility of contractual disputes. In general, changes present problems to all parties involved in the construction process.

There are many reasons for issuing construction change orders in large building construction contracts. It might be a result of further development of the owner's requirements. It can be a result of 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 therefore to study the causes and effects of construction change orders in large construction projects.

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

3.2 Objectives:

1. The comprehensive review on the literature related to change order data.
2. To summarize and know causes of construction change orders.
3. To know effects of change orders on construction projects.
4. To identify control measure for change orders in construction projects.
5. Provide solutions and recommendations to reduce the adverse effects of variation orders for construction projects.

3.3 Methodology:

- a. At the very first stage defining problem statement and fix the objectives by reviewing previous literature.
- b. By studying the previous literature which will helps to prepare questionnaire related to causes and effects of change orders in construction projects.
- c. At the same time discussion with actual field persons also helpful for preparation of questionnaire .with this questionnaire carried out survey for data collection.
- d. Also data collected from actual site case studies. Finding out importance index. And main causes and effects of change order.

4. DATA COLLECTION AND DATA ANALYSIS

Data were collected through a questionnaire survey collected from contractors, owners, engineers, consultants and site staff.

Based on the literature review. As per literature reviewed the mostly causes of change in history is owner, second main cause is consultants after that other.

The importance index, weighted average are used to rank causes and effects.

$$\text{Importance index} = \text{Weighted Average} \times 100/4$$

$$\text{Weighted Average} = (\sum W_i \times X_i) / N$$

Where W_i is option of cause, X_i is no. of respondent selected that cause and N is total no. of respondent.

Table No.1 causes of change Order.

Causes	Respondent RII	Rank
Owner instructs additional works	78.34	1
Owner instructs modification to design	74.69	2
Owner fails to make decisions	72.25	5
Obstinate nature of owner.	70.36	7
Owner's change of schedule due to financial problem.	72.53	3
The scope of work for the contractor is not well defined.	68.56	12
The required equipment and skilled labour are not available.	68.23	13
Poor project management and planning by contractor.	66.75	14
Lack of contractor's involvement in design.	69.11	11
Contractor's lack of judgment and experience.	65.32	15
Unrealistic design periods & Design errors.	72.33	4
Failure by consultant to perform design and supervision effectively.	69.89	9
Consultant's lack of judgment and experience.	72.16	6
Obstinate nature of consultant.	70.19	8
Failure by the consultant to provide adequate and clear information.	69.44	10
Delay in decision making process by site engineers.	64.37	16
Problems on Site, Unfamiliarity with local conditions and safety consideration.	60.86	19
Replacement of materials or procedures.	63.73	17
Demolition and re-work ,Quality improvement.	62.04	18
Unforeseen problems and weather conditions.	60.81	20

Table No.2 As per ranking order reasons for change order.

RII VALUE	REASONS
1-5	OWNER
5-10	CONSULTANTS
10-15	CONTRACTOR
15-20	OTHER

5. CONCLUSION

The review research on causes and effects of change orders in construction projects concluded that Changes in design plan and schedule by the owner is the main cause of change order, change in the procedure and errors and design

modification is the second causes. Changes in specification and scope of project mostly by clients and their consultants are the most sources of variation. The results of this study states that effects of variations are increase in project cost, additional payment for the contractor, increase in cost of the project, completion schedule delay and rework and demolition. The variation or changes increases disputes and claims in the work which will obstruct the continuousness in the work. The remedies to control the change order to review the capabilities of consultant's (RII=72.33) this cause s because do not get help from consultants at stage of preliminary design step. Owner must attain the qualified and experienced contractor to avid changes due to contractor. Also refer the manual and check list in that region before construction.

6. REFERENCES

- [1] Alia Alaryan, Emadelbeltagi, Ashraf Elshahat and Mahmoud Dawood (2014): Causes and Effects of Change Orders on Construction Projects in Kuwait, ISSN : 2248-9622, Vol. 4, Issue 7(Version 2),July2014.
- [2] Ijaola, I.A and Iyagba R.O (2012): A Comparative Study of Causes of Change Orders in Public Construction Project in Nigeria and Oman, (JETEMS) 3(5): 495-5012 (ISSN: 2141-7024)2012.
- [3] Zulkfili Osman, Abdelnaser Omran, Choo Kim Foo(2009): The potential effects of variation orders in construction projects, Tome VII (year 2009), Fascicule 2, (ISSN 1584 – 2665)
- [4] Ali S. Alnuaimi, Ramzi A. Taha, Mohammed Al Mohsin; and Ali S.Al-Harathi,(2010): Causes, Effects, Benefits, and Remedies of Change Orders on Public Construction Projects in Oman,Asce2010, J. Constr. Eng. Manage. 2010.136:615-622.
- [5] Ojo Ayodeji Sunday (2010): Impact of variation orders on public construction projects, In: egbu, c. (ed) procs 26th annual arcom conference, 6-8 September 2010, leeds, uk, association of researchers in construction management, 101-110.
- [6] Ruben Ndiokubwayo and Theo Haupt (2009), Variation orders on construction projects: value adding or waste? , IJCPM 2009 ISSN: 1944-1436 Volume 1, Issue # 2, pp.
- [7] Patrick Keane, Begum Sertyesilisik, Andrew David Ross,(2010) Variations and Change Orders on Construction Projects, J. Leg. Aff. Dispute Resolut. Eng. Constr. 2010.2:89-96.
- [8] Qi Hao, Weiming Shen, Joseph Neelamkavil, Russ Thomas(2008), Change management in construction projects CIB W78 2008
- [9] Awad S. Hanna, Richard Camli, Pehr A. Peterson and Erik V. Nordheim(2002), Quantitative Definition of Projects Impacted by Change Orders, J. Constr. Eng. Manage. 2002.128:57-64.
- [10] Awad S. Hanna, and Murat Gunduz(2004), Impact of Change Orders on Small Labor-Intensive Projects J. Constr. Eng. Manage. 2004.130:726-733.