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Evaluation of change management efficiency of construction contractors

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Abstract In construction projects, changes are very common and likely to occur at any stage of the project.

Most changes, if not managed properly through a formalized change management process will have considerable impact as they disrupt work and affect its orderly sequence, adversely impacting productivity and accordingly causing schedule delays and cost overruns.

Managing changes effectively is crucial to the success of a construction project.

This research is targeted at providing a deeper insight into the change order (CO) in the large building construction projects according to the different parties involved (owner, designer, consultant and contractor) with respect to the Egyptian industrial construction sector. A questionnaire survey discussing all persistent aspects of change order with a selected sample of Egyptian construction contractors companies was conducted in order to have a good representation for all the entities working in the construction industries. The Questionnaire was sent to consultants, designers and others working in the field. Results revealed the main causes, effects and controls of the change orders in large building projects. The study also evaluates the change orders control of a selective sample of contractors and investigates their change management efficiency by applying an evaluation check list based on most of the evaluation criteria recognized.

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Introduction

Decisions are made every day in construction processes based on incomplete information, assumptions and the personal experience of the construction professionals that might lead to change and/or rework. Both change and rework are done in the form of either 'adding', 'deleting' or 'replacement'. However, given the same problem, they have different behavioral patterns. In construction, change option is the more general

one. Since construction has a physical manifestation, construction rework is usually accompanied with the demolition of what has been already built, which normally has a bigger direct impact on the construction performance than the change option [4].

A degree of change should be expected since it is difficult for the clients to visualize the end product they requested. These changes are commonly referred to as change orders [2]. Critical change may cause consecutive delays in project schedule, re-estimation of the work statement, and extra demands of equipment, materials, labor, and overtime. Changes, if not resolved through a formalized change management process, can lead to big number of claims and disputes. Studies revealed that improving the administrative process of change orders is beneficial in reducing the cost and risk for all the project participants and encouraging a more trustful relationship [1]. There have been numerous articles written on changes, change orders and change management in construction. Most of the written articles discuss the legal aspects of changes such as claims and disputes. Many other articles were devoted to the discussion of the effects of changes on labor productivity [3,4].

Objectives

This Study has the following three main objectives:

- To identify the most important causes of change in construction projects.
- To determine the effects of change on construction projects.
- To evaluate the efficiency of the change management process through the organization of construction contractors.

Methodology

To achieve the research objectives, a questionnaire [2,3,4,5,6] survey was conducted on a selected sample of construction experts. In order to have a good representation for all the entities working in the construction industries, the Questionnaires were sent to consultants, designers and others working in the field (e.g. project management firms). The respondents are divided into four groups; contractors, consultants, designers and others as project managers and investors. The returns from the four groups are shown in Table 1. Table 1 shows an average response rate of 81%. Twenty seven responses from 35 contractors, 21 responses from 30 consultants, fifteen respondents from seventeen designers and seven responses from eight others were received.

The distribution of the level of experience for contractors, consultants, designers and others is shown in Table 2. From the table, we can notice that almost all the respondents had either experience between 10 and 20 years and more than 20 years which strengthens the result obtained as their responses were based on sufficient years of experience that allowed them to digest the question well and give a precise answer.

Results obtained from the questionnaire fulfilled the first two objectives. The third objective was accomplished by preparing an evaluation check list and applying it over selected

Table 1 Questionnaire Return Rate.

Group	Questionnaire sent	Responses received	Response rate (%)	Proportion (%)
Contractors	35	27	78	39
Consultants	30	21	70	30
Designer	17	15	88	21
Others	8	7	87.5	10
Total	90	70	80.9	100

projects. Four projects were selected from the 27 contractors to be evaluated regarding the management efficiency of the change management process. The selection of these projects was based on the following criteria in order to cover all the project types; one project at least from each project type. Second, the project construction type should be new (not addition, extension or renovation) as it represents the majority of the projects collected (around 80%). Third, the owner type should be private which represent 83% of total project owner type. Fourth, the contract type should be unit price as it is the most popular and common contract type used.

Change order data

The questionnaire was structured in three sections (A, B and C). The first section of questionnaire (A) provides data regarding the personal information of the surveyed respondents. The second section (B) consists of four parts, first part discusses the results on general information about project data, project types, type of construction, project size, owner type and contract type. These features are thought to have a bearing on the change orders' magnitude and consequences. The rest of the section highlighted some of the main procedures of CO. Among these procedures are change initiation, compensation method, change approval and change driving factors. A careful analysis of these data showed some important findings. For instance, the average percentage of change order initiated categorized by parties is shown in Fig 1. From the figure we can notice that the owner is considered to be the highest change initiator (48%), followed by the contractor (36%) and the lowest number of change orders initiated by the consultant (16%).

The compensation method for the change order is shown on Fig. 2. From Fig. 2, we can notice that the most common method for compensation is the negotiated fixed price (Lump sum) at 49%percentage. .

On the other side, fixed unit price, adjusted unit price and actual cost plus margin were ranked at percentages of 26%, 11% and 14% respectively.

The percentages for change order proceeds without written approval are shown in Fig. 3. From Fig. 3, we can notice that the majority (73% of the respondents) said that the only way to proceed with the change order is the written approval. These results emphasize that the verbal instruction is not accepted and if so it will be for urgent changes only and done by the employer only under specific conditions.

The percentage of how many approvals are required for change orders is shown in Fig. 4. From the previous figure, we can notice that most of the respondents, about 93% said

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