

## Improvement and Innovation in the Management of Change Orders

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**Abstract:** Project changes affect the cost, scheduling and the duration of projects, both directly and indirectly. Despite many studies and much discussion in practice and academic literature, there is a lack of information about systematic approaches to manage project's changes. In this study researcher tried to find and improvement a methodology to manage change order's effects and put it as a first point toward the innovation in this field. She determined the causes of the most frequent changes in building projects in Syria, analysed their impact on the indicators of the project (cost, time) then painted a flow chart for the implementation of change orders in order to identify steps and control measures can implement, researcher also explained the owner role in the improvement and innovation because of his role in the project and his big responsibility of change order causes as shown in this study and put some suggestions and recommendations with aim of improvement and innovation in this field.

**Key words:** Building, change order, improvement, innovation, management, project

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### INTRODUCTION

Changes and conflicts in projects, at work and even in our daily lives are very common (Pinto and Kharbanda, 1995). Any additions, deletions or other revision to project goals and scope are considered to be changes, whether they increase or decrease the project cost or schedule. Most commonly, lack of timely and effective communication, late in decision making, uncertainty and increasing project complexity are the drivers of project change (Ahmed *et al.*, 2016). In project management, changes in projects can cause substantial adjustment to the contract duration time, total direct and indirect cost or both (Tiong, 1990). Therefore, project management teams must have the ability to respond to change effectively in order to minimize the impact to the project. Common project planning tools can be used to reduce the destructive consequences of change because they give insights and predictions to identify possible conflicts (Mallak *et al.*, 1997).

Researcher established the project change management to find a method to avoid or minimize delays inflated cost, general claims and even costly litigation associated with project change. The researcher hypothesized that significant savings in the total installed cost and schedule of any construction project were achievable by improving the management of changes (Ahmed *et al.*, 2016). The results are coming of the analyzes of 40 building projects in Syria. Discussed the

reasons for change orders in the building projects there which have been identified through access to the files of these projects and study and determine the degree of importance according to how frequently they occur, according to the party that causes it. Also, calculated the impact of the change on the contractual cost and contractual duration of projects with the knowledge that it has been found that some change orders are necessary and carry a positive aspect of the project. By applying this project change management system, project participants can minimize deleterious change and promote beneficial change. Ahmed *et al.* (2016) has suggested that good communication can lead to changes that have a positive effect on the project. Development and implementation of a project change management system before the project commences is a good, proactive step toward constructively managing change and toward the innovation in this filed of project management, since, by definition the innovation is a qualitative change. Innovation begins with the recognition of a problem or finding an idea, extends over the problem-solving and the creation of productive capacity to the introduction of the new product or service to the market. Sometimes classification is used to define innovation. According to scope classification common types are (Vacek, 2009): incremental innovation, product innovations (good or service), process innovations, marketing innovations and Structural innovations. The aim of this study is to:

- Determination the causes of the most frequent change in building projects in Syria
- Analyze their impact on the indicators of the project achievement (cost, time)
- Develop approach to control the management of necessary change orders and to avoid the negative ones

Suggestions and recommendations with aim of improvement and innovation in this field.

### MATERIALS AND METHODS

Research approach, field, statistical, analytic and will be according to the following stages:

- Study of research and references conducted in many countries of the world
- The archival survey for projects executed
- Field survey: Interviews with project managers experienced in public sector projects
- Analysis of the data that have been obtained using the program Excel
- Develop a methodology help in determination and management the changes

### RESULTS AND DISCUSSION

**The archival study; Project information:** Containing some contractual information (name of the project, the value contractual, duration contractual, delays, changes value and duration required to accomplish it).

**The field survey:** This stage has been done in order to enrich and develop the data has been obtained from the scanning archival stage. The causes of the change has been classified as follows:

**Causes of the change resulting from the owner:** Was reached to the most important reasons for the change caused by management within the research sample are shown in Fig. 1 and 2 according to their recurrence decreasing order.

**Causes of the change resulting from the designer**  
**Classification of change orders according to the party causes it:** By taking a percentage of total frequencies (287) to the number of projects studied (41 projects) that the recurrence average of change is a (7 times) within a single project and this result shows and confirms the existence of disable within the projects which affected by the changes. Also, shown that the owner took proportion

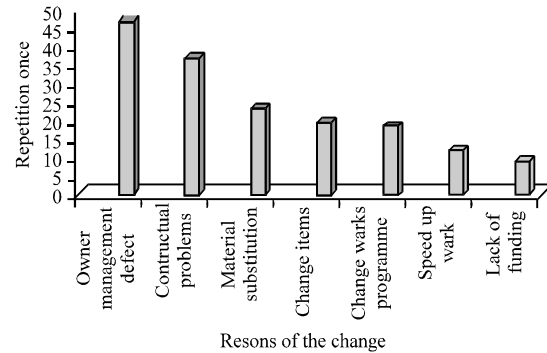


Fig. 1: The reasons of the change resulting from the owner. Resource researcher calculation in 2013

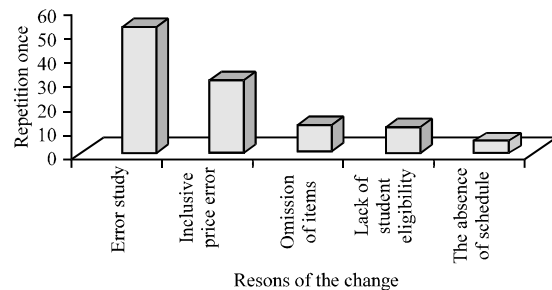


Fig. 2: Reasons for the change resulting from the designer office. Resource researcher calculation in 2013

(60%) of a repeat of the change request and this confirms that: the imbalance in owner's research leads to changes that will impact on the workflow.

**Analyzing the impact of change orders on the cost and time of the project:** Through the reality of experience and the analysis of data on this aspect, shown that the average of cost deviation is (33%). Also, the delay of all projects was 30%. Then calculated the value of the changes for each item separately and the value of total changes, then finding it as a percentage of deviation in the cost. The percentage deviation coming only from change orders equal (31%) of the values contractual projects. Then specified the periods which are necessary for the completion of the changes within each item and calculated the overall duration of the changes and the output was: time deviation coming only of change orders is (29%).

**Implementation mechanism of change orders within the public sector projects:** Through the experience and professional practice, theoretical and field studies and in order to show and document procedural steps to work out

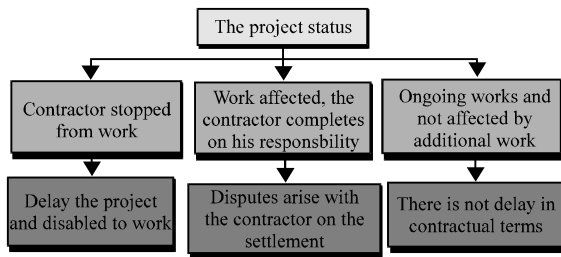


Fig. 3: The reflection of the delay on the status of the project

and facilitate the process of discovering the defect sites where development and innovation in the field of change management and improve the level of the project management. We designed a flow chart to sequence the flow of processes and procedures in the various cases that result from the change request. The scanning process and the analysis that, we have had through the tracking of proceedings implementation of the projects, shows that there are several scenarios could pass by the project depending on the quality of the works which behave changing:

Simple changes on the works: it is located within the powers granted to the supervision in accordance with the contract.

Changes in the work necessary to complete the project within its contractual borders and depends on its implementation, the follow-up work on the project and commitment to the plan. Delay in this case produces because of the centralized.

Determination the changes that go beyond the limits of the project (job, size, scope) and organize contract appendices for them.

In cases of non-contractual items and working stops if not remedied can rely on the settlement meetings. As shown in Fig. 3.

**System for the management of change orders in building projects:** Through tracking the processes of change orders and calculating the lost time and disruption of the work, defined the parties have the responsibility of each case has done, researcher found that monitoring implementation of changes not only requires monitoring the process of the implementation of a change but also should be seen as an opportunity for the project team to resolve other difficulties that might be encountered to date on the project. Monitoring implementation requires substantial documentation of a change, so that, disputed impacts can be resolved later or so, lessons can be learned from the change and the mistakes that cause

Table 1: The control procedures proposed to adjust the change orders resulting from the owner

Change's reason	The proposed control procedures
Defect in the owner's management	Emphasis on strict commitment in methodology to respond to correspondence within 15 days Put an item in the contract shall be fined the owner in case of delays (The principle of balance the contract) Develop clear procedures and written for the receipt and delivery operations
Contractual problems	Put contractual items include detailed strict descriptions of change Clarify the scope of the change
Replace the materials	Securing materials in time and quality required
Change items	Develop solutions in accordance with the schedule and financial
Change works programme	Engage the Owner effectively in design Interested in pre-study (economic feasibility, social investigation)
Speed up work	Must be according to technological and regulatory solutions
Lack of funding	Linking the adoption of projects to the provide of the necessary funding, according to finance plans tied to the schedule clearly

Table 2: The control procedures proposed to adjust the change orders resulting from the designer

Change's reason	The proposed control procedures
Study error	Encourage the design review with the aim of improving the work Rehabilitation the engineers and designers Encourage the establishment of companies specialized study Design on site
Inclusiveness price error	Commitment in the supervisor accounts in site as exhibits to the detailed account of the amounts when the contract builds on units
Omission of items	Strict checking in the matching process between the charts and tables
Lack of designer's eligibility	Clarify the functions of the heads of the specialized teams and commitment in coordination and design models to fill it periodically
Absence of a detailed schedule	Develop a detailed schedule with the financial procedures necessary when prejudice to this item

changes. The researcher suggested that through linking the results with some proposals can minimize the impact of the change shown in Table 1 and 2.

**The role of the owner in innovation process for building projects:** Construction clients are able to stimulate innovation not only by determining building specifications and demanding higher building and process performance but also by establishing and controlling the mechanisms that account for the extent of collaboration and communication of project participants (Blayse and Manley, 2004; Miozzo and Dewick, 2004; Hartmann *et al.*, 2006). As clients increase their

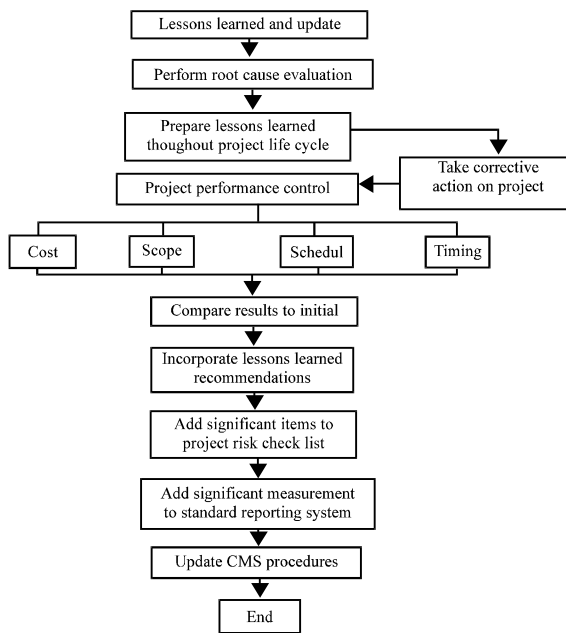


Fig. 4: Lessons learned and update the change order system

expectations of the performance of their built facilities and face increasing cost and schedule constraints, the industry as a whole will need to develop more effective and efficient methods of delivering these assets. Clients must acknowledge their pivotal responsibilities in establishing the context for their project teams to successfully develop and implement innovations to meet those needs (Slaughter and Cate, 2008; Hansen and Birkinshaw, 2007). Given the complexity of innovations, the different types and modes of innovations and the nature and different types and categories of construction clients, it would be unwise to suggest that all clients play similar roles in different types of innovations, at different stages of innovation (Egbu, 2008).

**Innovation and development in the change management system:**

The existence a team of all disciplines to manage changes is important and necessary. The team members must understand the causes of the changes, to be able to evaluate and correct it. Project team members should take advantage of lessons learned in the past using the suggestions and recommendations coming out of analysing several projects of public sector projects in Syria. Figure 4 shows a flow chart explains the possibility of development the change management system by learning of the past lessons and avoiding the last mistakes.

The central idea of any change management system is to anticipate, recognize, evaluate, resolve, document and learn from conflicts in ways that support the overall

viability of the project. Learning from the conflicts are important because the team members can enrich and apply their experience in the future. The change management system outlined in this study cannot be directly inserted into an organization without some adaptation. However, the principles and processes presented should be a reasonable starting point for many engineering construction related companies trying to establish a project change management system.

**CONCLUSION**

The main goal of this study was to introduce and explain a systematic change management system for projects. By having a systematic way to deal with changes, the efficiency of project work and the likelihood of project success should increase.

The increasing role of the owner in projects within construction sector clearly indicates that owners are not content to just successful closure of projects. It is clear that the owner has the determining role in establishing the incidence and rate of innovation on its projects. That binds the project team members together to develop and successfully implement innovative approaches. Owner creates a social system which determines innovation by the nature and intensity of interactions interconnectedness and synergies from a wide spectrum of agents which gravitate around a project setting. Owner leadership is most effective in defining and realizing successful innovations.

Owners have the capability in managing the uncertainty and risks associated with innovation, (e.g., risks associated with design and build ability of construction projects, technological risks, financial risks, contractual and increased exposure to litigious claims, safety risks, risk of complete failure of the innovation). The findings reveal that the changing role of the owner creates the new value for innovation in construction.

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