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Research Article**Investigating the causes of delay and cost-overflow in construction industry****Alireza Rezaei^{a*}, Saeed Jalal^b**^aCyprus International University, Nicosia 99258, North Cyprus, Mersin 10, Turkey^bCyprus International University, Nicosia 99258, North Cyprus, Mersin 10, Turkey**ARTICLE INFO***Article history:*

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ABSTRACT

For a construction project to be successfully completed, project objectives must be met within a specified time and budget. ‘Delay’ and ‘cost-overflow’ in the construction projects are two significant defects, as they can negatively affect projects by disputes among stakeholders, work quality and safety level in the project. Hence, it is crucial to have further investigation on these especially in regions where less considered. To overcome such problems and inconsistencies in the construction industry of Northern Iraq, major factors and causes of delay and cost overflow were investigated in a considerable number of construction companies in the region. Sixty-one delay factors and forty-two cost overflow factors were considered in the study. A questionnaire survey was administered, and a quantitative analysis was conducted by SPSS. Major delay and cost overflow factors were determined and the three major causes of delays were found as “security measures”, “high number of sub-contracts by the same contractor”, and “poor labor productivity”. Similarly, three major factors causing cost-overflow were “inadequate labor and skill availability”, “inappropriate contractor policies”, and “domination of construction industry by foreign firm and aids”. It was also found that the majority of problems are raised by owners and contractors. An improvement framework was finally proposed based on findings.

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1. Introduction

There is a vast need for more capable, timely and cost-effective completion of projects in the construction industry. There are inevitable and unexpected changes as well as problems occurring because of the design during the construction stages of projects, thereby causing delay and cost-overflow in projects.

Delay can be defined as an act of carrying out a task that could either be slower than anticipated or achieving a job which was initially planned to be done earlier. In the construction industry, delay in any form has lots of impacts and consequences which may cause obvious or hidden risks [1].

Construction process is characterized by inter-connected phases such that a delay in any of the tasks in a phase may cause serious problems to one or more subsequent tasks and involved parties, which in turn creates certain challenges to owner and contractor. Abandonment of projects is another effect of construction delays, which leads all or some of the construction

project stakeholders abandoning the project entirely [2].

Many studies have been conducted to get intelligible understanding about the most effective factors of delay in Iraq construction industry. Jahanger [3] performed a study on the construction projects delay at city of Baghdad. Fifty-eight factors of delay were employed in his study. The study demonstrated that the most important causes of delay for construction projects are mistakes or unclearness in design documents, missing the planning and scheduling of project by the contractor, weak management and supervision of the site by contractor, unqualified contractors’ technical staff, and in-accurate details in the working drawings. In another study on delay in Iraq construction industry, sixty-five factors were investigated by Bakr [4] and new chronological shape for the factors was concluded. According to the investigation and analysis results, the main factors were found to be inadequate early planning of the project, owners’ lack of experience in construction, delay in hand-over the site by owner to the contractor,

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late payments by the owner to contractor, and deficiency in decision making by the owner.

According to some studies, cost-overflow is the difference between the final cost and the estimated cost of the project [5]. However, some others believe that cost-overflow should be found by comparing the initial amount of original contract value with the final cost when the project is completed [6].

Estimated costs are characterized as planned or measured costs which are prior to the inception of the construction project, regardless of the fact that the activity planning and scheduling process alters with project type, time and region. Actual cost is characterized as accounted cost decided at the time of finishing a task. It can likewise be said that cost-overflow is the sum by which real expenses exceed the standard or planned costs. Thus, cost-overflow is characterized as the difference and always positive. Some studies referred that cost-overruns are common in the projects [7].

Al-Agele and Al-Hassan [8] conducted a research on construction projects' cost-overflow in Iraq to identify the major reasons of cost deviation. Twenty-six factors were studied in their research. The study showed that the most important factors impacting cost-overflow are inability of company to meet project requirements, accepting lowest offers, inadequate planning, inaccurate estimation of the cost, and lack of control to the time of the project or predict the date of its end. In another research about the risks on the project cost-overflow, Jaber [9] demonstrated factors based on their impacts. The factors were security measures incurred due to corruption and bribery, governmental routines for late approvals, un-official holidays, loss incurred due to political changes, and increase in materials price.

Therefore, finding the causes of these delays and cost-overruns can be of major success factors for the contractors in construction industry. In this study, delay and cost-overflow and their causes will be studied in Northern Iraq with especial focus on construction industry.

2. Methodology

To investigate the causes of delay and cost-overflow in construction industry of Northern Iraq, a comprehensive literature review was carried out. Through analyzing the previous literature, the information about the causes of construction delays and cost-overflow and their effects on construction projects were used to design a questionnaire to collect data from the targeted respondents.

The quantitative method was carried out by use of a questionnaire survey. A questionnaire was designed according to the objectives of the study, which are causes of construction delay and cost-overflow. 'Close-ended question' method was also used in designing the questionnaire. The questionnaire was designed in 3 parts. The first part contains a covering letter together with general questions regarding the participant and the company, where second

and third parts include questions relating to the causes of delays and cost-overflow and the responsible party causing the defect. Respondents were several parties involved in the construction process such as contractors, designers, owners, material suppliers, consultants, etc. Hence, the questionnaires were distributed across some companies in Iraq, and were duly completed by the staff members of the companies. The companies were basically construction companies.

The target population in this study was one hundred and twenty employees in ten well-known construction companies in the Northern part of Iraq. The questionnaires were distributed and duly completed by the participants. The companies were construction companies, which are professionals in different fields of construction industry. Out of the distributed questionnaires, hundred were returned which equals a rate of 83%.

The analysis of the obtained data from the questionnaires were performed using the SPSS software (Statistical Package for the Social Science). The results were converted into descriptive results that were useful for drawing an achievable conclusion.

3. Data Analysis, Results, and Discussions

Sixty-one delay factors were asked to be graded based on their importance and effect on projects. These factors were extracted from relevant literature and local and regional factors based on authors' experiences. The considered factors were the following: Security measures, high number of jobs by the same contractor, poor labor productivity, design errors and discrepancies in contract documents, poor controlling of subcontractors by the contractor, material quality problems, uncooperative owner with the contractor or the consultant, inadequate qualification of the consultant to the project, inadequate early planning of the project, deficiency in drawings, slow decision making process by the owner, delay in delivering the site to the contractor, absence of consultant's site staff, delay in approval of shop drawings, delay of material supply, weather conditions effect on construction activities, shortage of qualified engineers, delay in the preparation of contractor document submissions, delay in site mobilization, delay in giving instructions, unforeseen site conditions and geological factors, rise in the prices of materials, delays due to sub-contractor work, difficulties in obtaining work permits from the authorities concerned, documents not issued on time, changes in the scope of the project, delay in test samples of materials, shortage in equipment availability, technical problems in project site by the contractor, lack of high-technology mechanical equipment, unclear and inadequate details in design, late procurement of materials, government tendering system, breach or modification of contract by the owner, slow preparation of change order requests by the contractor, poor planning and scheduling of the project by the contractor, poor site management and supervision by the

contractor, lack of coordination with contractors, delay in the approval of contractor submittals to the owner, contract duration to construction of project is too short, improper construction methods implemented by the contractor, mistakes in soil investigation, weather conditions effect on construction activities, poor qualification of supervision staff of the consultant engineer, delay in progress payments by the owner, design errors made by designers due to unfamiliarity with local conditions and environment, the conflict between contractor, owner and consultant, economic conditions-local or global, poor qualification of supervision staff of the owner's engineer, delays in resolving contractual issues, shortage of construction material, official and non-official holidays, cash flow problems faced by the contractor, insufficient available utilities on site, poor qualification, skills and experience of the contractor's technical staff, equipment availability and failure, government change of regulations and bureaucracy, problems with local community, design changes by the owner, owners' lack of experience in construction, design changes by the consultant.

The 5-scale Likert grading was considered. Respondents were also asked to specify the party and elements responsible in each factor. The involved party could be selected among the project owner, contractor, consultant, designer, labors, external, materials and equipment. The results analysis demonstrated that the first responsible party is external elements, then owner in the second stage, and contractor as a third responsible party (Figure 1). External factors affect the construction project through different ways and used to evaluate through economic issue, social issue, political issue, physical environment, industrial relation environment, and level of technology. Since Iraq is politically, socially, and economically unstable country, previous and existing political conflicts led the external elements to have highest impact on the construction projects in Northern Iraq.

Moreover, these causes cannot be pinpointed to just one person or part of a construction team. Weather conditions, fluctuation of currency, increase in price of materials as well as many other external factors would be detrimental to the project, and collectively they will make a very high impact on the time factor of the project.

The owners were seen to be the second major party responsible for delays. This could be due to the major role of owners in any construction project. The cash flow, employments, equipment type, and other factors all fall under the decisions taken by the owners of the project.

The awareness of the owner about the construction legislation, predicted planning from owner side with accurate financial budget, and cooperation between the owner and other parties (designer, consultant, and contractor) will reduce the delay in the construction projects.

The third party with a high level of responsibility is the contractor, since it is his responsibility to manage the execution of the project and make sure all odds are met to

guide the project through success. The main suggestions to the contractor to improve his ability to reduce the delay in construction projects can be enumerates by;

a) The pre-financial planning and estimation to evaluate the actual budget of the project, with good financial coordination.

b) Improve the management in the site to overcome any technical and even non-technical problem could take place in the site. This could be implemented through expert project manager, and good staff.

c) Good cooperation with other parties especially, owner, consultant, and supplier in order to coordinate whole the work and implement it in the time.

The returned questionnaires were then analyzed, and the factors were prioritized. Ten most important factors are presented in Table 1.

The suggested solution to reduce the delay in construction projects are to provide an especial security team by government, project owner or contractor to guarantee the security in the site which could add some extra cost to the project final cost; strict application of the rules or a legislation suggested to control the limits of binding, and how many contracts or project a contractor can handle at a time, as per his classification; the wages of workers also discussed to be negotiated and reviewed properly as well as other motivations in order to reduce the effect of poor labor productivity on the delay in the projects. Also, special training, workshops and programs seem to be effective, and will increase the knowledge and efficiency of the workers to reduce the impact on delay.



Figure 1. Responsible parties and elements causing delay

Respondents were asked to grade forty-two cost-overrun factors based on their importance and effect on projects. The factors considered for the survey were: Fluctuation in prices of raw materials, unstable cost of manufactured materials, fraudulent practices, kickbacks, corruption, mode of financing and payment for completed work, high cost of machineries, improper planning, high interest rates charged by bankers on loans received by contractors, frequent design changes, long period between design and time of bidding/tendering, lack of coordination between design team and general contractor, lack of cooperation between general contractor and subcontractors, high machineries maintenance costs, bureaucracy in bidding/ tendering method, lowest bidding

procurement method, litigation, numerous construction activities going on at the same time, scope changes occasioned by inadequate pre-contract study, scope changes arising from redesign, inadequate site investigation, inadequate preconstruction study, changes in owner’s brief, work suspensions owing to conflicts, inadequate quality/ ambiguity of contract documents, inappropriate contractor policies, poor project (site) management/ poor cost control, control of construction industry by foreign firms and aids, contract management, inadequate duration of contract period, inappropriate government policies, inadequate production of raw materials in the country, poor financial control on site, absence of construction cost data, inappropriate contractual procedure, wrong method of cost estimation, inaccurate cost estimation, poor relationship between management and labor, stealing and waste on site, inadequate labor/ skill availability, disputes on site, adverse effect of weather, high cost of skilled labor, high transportation cost.

Table 1. Ranking of delay factors

Delay Factor	RII	Rank
Security measures	0.6420	1
High number of contracts by the same contractor	0.6400	2
Poor labor productivity	0.6320	3
Design errors and discrepancies in contract documents	0.5800	4
Poor controlling of subcontractors by the contractor	0.5660	5
Material quality problems	0.5620	6
Uncooperative owner with the contractor or the consultant	0.5610	7
Inadequate qualification of the consultant to the project	0.5590	8
Inadequate early planning of the project	0.5580	9
Deficiency in drawings	0.5570	10

Grading was considered like delay factors. The responsible party for each factor was also asked. The most responsible party was found to be the owner followed by the contractor (Figure 2). The owners control the financial part of the project, they know how much they can afford, when can raise the funds, and when these funds are not available; thus, where the project would have to be delayed due to instability in the budget. On the other hand, the owners sometimes might come up with new ideas required to be implemented in the project which imposes some additional cost. The clear idea for the owner about the project and good planning from owner side to implement the project, as well as good cooperation between the owner and other parties will avoid the cost-overrun in construction projects.

The second most important responsible party in this category is the contractor, since he is the second man in

the project and the implementer of the ideas of the owner. The contractor is responsible because he is the manager of the money that is put into the project by the owner. Incompetency in management on the part of the contractor would lead to the problem of cost overrun. The suggestions to avoid the contractor impact on cost-overrun is through selecting expert contractors to implement the construction project, through qualifying the financial ability, technical ability, as well as legal condition of the contractor. The cooperation between the contractor and other parties in the construction project is another suggestion to overcome the cost-overrun in any project.

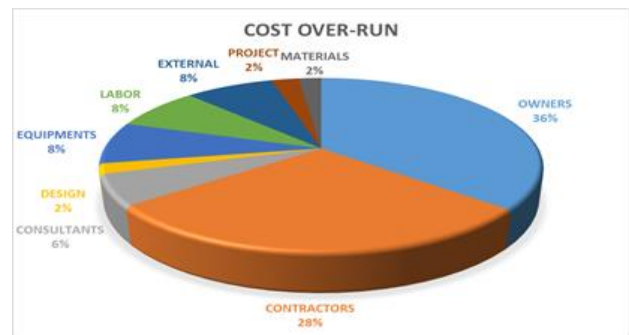


Figure 2. Responsible parties for causes of cost-overrun

Table 2. Ranking of cost overrun factors

Delay Factor	RII	Rank
Inadequate labor/skill availability	0.7760	1
Inappropriate contractor policies	0.6440	2
Domination of construction industry by foreign firms and aids	0.6380	3
Poor project (site) management/ Poor cost control	0.6300	4
Lack of coordination between general contractor and subcontractors	0.5840	5
High machineries maintenance costs	0.5700	6
Litigation	0.5350	7
Scope changes occasioned by inadequate pre-contract study	0.5340	8
Numerous construction activities going on at the same time	0.5320	9
High cost of machineries	0.5270	10

The questionnaires were then analyzed, and the cost-overrun factors were prioritized, and ten most important factors are listed in Table 2. To decrease the impact of the major cost-overrun factors, the owners should investigate the local skills thoroughly before bringing foreigner experiences. Attending different training courses, and improving the quality of education especially in this field will be assisting as well. Encouraging the contractors to be updated with new procedures and techniques through training courses can also decrease the cost-overrun impacts. Locally owned construction companies can be

involved more in projects and be motivated by long period low interest loans for machinery, and provision of facilities to export some types of machinery or materials with less taxes or (tax free) to help the contractor to achieve the work with lowest cost.

4. Conclusions

Delay in construction projects represents an important problem in Iraq as one of growing countries, because it will affect the strategic planning for the development of the country. Hence, time and cost related issues in the Iraq construction industry are issues that must be handled with uttermost caution and care. Thus, carrying out a research in this area will have a paramount importance. The analysis carried out in this study has proven that there is dialect between delay and cost-overrun. For example, when project costs are investigated and completely monitored, with keeping other factors constant, and only project periods increase, there will always be a proportionate increase in the construction project costs, and vice versa. Basically, the main objective of this study was to identify the major causes of delays and cost-overrun in the construction industry of Northern Iraq. These objectives were achieved through a questionnaire survey. Most important factors causing delay in construction projects were found to be security measures, high number of contracts by the same contractor, and poor labor productivity. On the other hand, most important cost-overrun related factors were found to be inadequate labor/skill availability, inappropriate contractor policies, and domination of construction industry by foreign firms and aids. To overcome the delay and cost-overrun problems, some recommendations were made such as provision of especial security teams, strict application of the rules, consideration of motivations for labors to increase their productivity, special trainings and workshops, more investigation on local skills, updating the contractors with new procedures and techniques, and motivation of locally owned construction companies.

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