

# A Study of Root Causes of delays in the public-sector construction projects in Kuwait

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## Abstract

After the Kuwait Government launched the 2035 vision of Kuwait, development of the construction industry became one of the priority themes of the country. However, the construction industry faces many problems such as delays, defects, cost overruns and poor productivity and efficiency. Nevertheless, delays in projects are one of the most significant issues in this industry globally and in particular, in Kuwait. To solve this problem, it is important to understand the main root causes of delays by examining and identifying the causes. This paper aims to examine the key root causes of delays in public construction projects in Kuwait. This study provides a comprehensive insight into the issues causing delays in construction projects in Kuwait from reviewing the literature and by reviewing the results of a distributed online questionnaire. This online survey targets the experts in the AEC industry who are involved in these governmental projects from different public construction authorities in Kuwait. These government agencies are the Ministry of Public Works (MPW) and the Public Authority of Housing Welfare (PAHW) which are responsible for the major public facilities projects and residential projects in Kuwait. The findings of this study provide an in-depth understanding of this problem and possible solutions will be recommended. The survey results proved that group 1 which is the client-related factors group has the most significant factors for the delays in these construction projects in Kuwait. Therefore, the client in these projects was the main responsible part of these delays. However, one of the reasons of delays in public-sector construction projects is the government did not apply new construction management methods for this sector. Yet, lack of collaboration and coordination between stakeholders, traditional procurement system, and long approval processes are the main reason behind this issue.

**Keywords:** Construction industry, Kuwait, Delays, Building Information Modelling (BIM), Lean construction

## 1. Introduction

Internationally, there are many issues and challenges confronting the construction industry. Camilleri (2016) revealed that the main criterion for the success of any construction project is delivering the project on time and within the budget. Since time is money, cost overrun is frequently associated with delays in construction projects. Recently, the public-sector construction projects in Kuwait are suffering from delays. According to Al Marri, Ibrahim, and Nassar (2012), a significant number of large-scale projects suffer from delays or sometimes from suspension. For instance, it was reported that 90% of the Ministry of Public Works (MPW) projects in Kuwait are confronting delays in their projects (Alshahed, 2017). From a

comprehensive reviewing of the literature, it was revealed that 81% of the studies on the problems facing the Kuwaiti construction industry were due to delays in projects. However, this issue has a major effect on the economy of Kuwait, as Al-Kharashi and Skitmore (2009) believed that time overrun in projects is considered to be one of the significant obstacles to delivering projects successfully.

Additionally, Al Zubaidi and Al Otaibi (2008) confirmed that the frequency of time overruns in the construction projects in Kuwait is significantly high. Delays in construction projects in Kuwait come from several factors. These factors include inadequate project management practices (Al Tabtabai, 2002; P. A. Koushki & Kartam, 2004), ineffective initial planning for the project (Al Marri et al., 2012; AlSanad, 2015), change orders (Al-Tabtabai & Thomas, 2004; Alaryan, 2014; P. A. Koushki & Kartam, 2004) due to insufficient scope definition, and a long duration of the planning approval process between authorities (Al-Reshaid, Kartam, Tewari, & Al-Bader, 2005; Al Tabtabai, 2002; Al Zubaidi & Al Otaibi, 2008); due to the absence of electronic documents and contracts (Al Tabtabai, 2002; Almutairi, 2016); which are considered as a lack of correlation between stakeholders (Almutairi, 2016; Soliman, 2017a). Also, the insufficient contract details and errors, which leads to creating problems and difficulties during execution (Al Marri et al., 2012; Almutairi, 2016; SOLIMAN, 2017b). "Time is money" is a common term used in the construction industry; it indicates that expediting the project delivery schedule creates an increase in project costs and sometimes leads to poor construction quality.

Since the government of Kuwait has launched the new 2035 vision of Kuwait, construction development became one of the priority themes of the country. Therefore, improving the efficiency of this industry has become crucial for it to keep up with the evolution of the construction industry. Hence, adopting new technologies and processes will help to achieve the aim of the new Kuwait vision for this industry.

## **2. Literature Review**

### **2.1 Causes of Delays in Construction Projects**

The issue of delays in construction projects has received a great deal of public attention because these projects have been associated with people's daily lives, their nation, and future. These delays in the achievement of projects are a significant issue as the construction industry is an important contributor to the economy that generates both, commerce and resources. Sepasgozar, Razkenari, and Barati (2015) argued that the delays in construction projects could cause negative consequences such as complaints between clients and contractors, lack of efficiency and revenues, and the cancellation of the contract.

In order to avoid these results, the causes of these consequences should be understood based on the source of their occurrence. Therefore, the author considers some of the studies that have been conducted in the Middle East region especially the Gulf Cooperation Countries (GCC), which is the nearest to the conditions in Kuwait due to the similarity of each of the economic, financial, climatic, and political situations, then, identifying the delay factors in these projects. Hence, these factors were adopted for the questionnaire survey to determine the major causes of delays in the construction projects in the State of Kuwait. Twelve studies from the different GCC countries were selected to provide a comprehensive clue about the causes of delay in construction projects. H Emam, Farrell, and Abdelaal (2014) reported that there are many causes of delays in the Middle East projects. These causes are funding and slow payments, ineffective planning and scheduling, shortage of materials, poor site management, weather conditions, and poor communication and coordination between stakeholders.

In Kuwait, It was found that the main factors that cause delay in the public sector construction projects are poor project management, client's administration, and site supervision practices (Al Tabtabai, 2002). While in the private sector, P. Koushki, Al - Rashid, and Kartam (2005) indicated that the top factors of time overrun are frequent changing orders, budget constraints, and client's lack of experience in construction.

In the United Arab Emirates, the reason of time overrun risk are change orders, financial issues, and client-related factors (Motaleb & Kishk, 2010) such as preparation and approval

of drawings, slowness of the client's decision-making procedure, and inadequate initial planning (Faridi & El-Sayegh, 2006).

Three studies were found in Saudi Arabia examining the causes of delays in their construction projects. These factors were identified as land acquisition, contractor's lack of expertise (Elawi, Algahtany, Kashiwagi, & Sullivan, 2015), change orders by owner during construction, delay in progress payments, ineffective planning and scheduling, poor site management and supervision, shortage of labour, difficulties in financing (Assaf & Al-Hejji, 2006), and the lack of qualified and experienced personnel (Al-Kharashi & Skitmore, 2009).

Also, construction projects in Qatar are suffering from delay. According to Hassan Emam, Farrell, and Abdelaal (2015), the main factors being slow decision-making, discrepancies between specifications and drawings, main changes in design during construction, delay in the settlement of contractor claims, and unreasonable project timelines. Additionally, a study of the factors that caused delay in construction projects in Qatar revealed that there are seven significant root causes of time overrun. These root causes are delay in decision making, poor site management and supervision, shortage of construction materials, changes to the project by owner, shortage of labour, low productivity of labour, delays related to sub-contractor's work, changes to the project by owner, delay in revising and approving documents and an unqualified workforce (Gunduz & AbuHassan, 2016).

In construction projects in Oman, potential changes in primary designs, climate, poor sub-contractor performance and variations, and claims are the major roots of delay in construction projects (Alnuaimi, Taha, Al Mohsin, & Al-Harhi, 2009). While in Bahrain, the main reasons of time overrun in the construction projects are delay in decision making, lack of experience and improper planning and scheduling of the project (Hasan, Suliman, & Malki, 2014).

## **2.2 Identify and Classify the Significant Causes of Delay in GCC Construction Industry**

After identifying and discussing the previous studies focusing on causes of delays in the construction industry in GCC countries, the main essential delay factors from these reports have been determined. To reveal the main causes of delay in public sector construction projects in Kuwait, these factors should be classified and incorporated into a questionnaire survey. Sixty-four factors have been identified and classified into eight groups based on their sources. These categories are as follow:

1. Client-related factors.

the factors which the client is responsible for such as pay and funding for accomplished tasks, the involvement of the owner, frequent changing of decisions that have been made and an unrealistic contract period imposed by the clients.

2. Contractor-related factors.

The factors which the contractor is responsible for such as site management, planning, lack of experience, faults during construction, sub-contractors' problems, inappropriate procedures of construction.

3. Consultant- related factors.

This group contains delays concerning works permissions, inspections and rigidity of the consultant.

4. Contract-related factors.

This group contains delays resulting from change orders, errors and issues in the contract documents.

5. Contractual relationship- related factors.

This group comprises the major disputes and discussions that occur at the start of construction such as; unprofessional organisational framework for all parties linked with the project and poor communication between these parties.

6. Manpower-related factors.



Table 1: Causes of delays categorized in eight groups

No.	Category	Causes
1	<b>Client-related delay factors</b>	<ol style="list-style-type: none"> <li>1- Delay handing over the site to the contractor by the client.</li> <li>2- The owner delays in settlement of claims.</li> <li>3- Suspension of work by the client.</li> <li>4- Delays in the issuance of change orders by the client.</li> <li>5- Delay in approvals and late decision-making.</li> <li>6- Delay in periodic payment of the completed works to contractors.</li> <li>7- Client's shortage and poor communication with the relevant government authorities.</li> <li>8- Owner's failure to coordinate with government authorities during planning.</li> <li>9- Frequent changing of decisions.</li> <li>10- Original contract duration too short.</li> <li>11- Changing the executive.</li> <li>12- Client's tendering system requirement to select the lowest bidder.</li> <li>13- Delay in approving sample materials.</li> </ol>
2	<b>Contractor-related delay factors</b>	<ol style="list-style-type: none"> <li>1- The contractor is detaining in requesting a preparation of change order.</li> <li>2- Inefficient contractor head office involvement in the project.</li> <li>3- Delay in general mobilization.</li> <li>4- Loose safety rules and regulations at the contractor's company.</li> <li>5- Poor qualifications of the contractor's technical personnel.</li> <li>6- The deficiency in the technical study of the contractor during the bidding phase.</li> <li>7- Ineffective project planning and scheduling by the contractor.</li> <li>8- Delay in the field survey by the contractor.</li> <li>9- The contractor's shortfall in controlling the progress of the project.</li> <li>10- Inactive quality control by the contractor.</li> <li>11- Delays in the preparation of the contractor submissions.</li> <li>12- Difficulties in financing the project by the contractor.</li> <li>13- Conflicts between the contractor and his subcontractors.</li> <li>14- Inappropriate construction ways implemented by the contractor.</li> <li>15- Frequent changing the subcontractors due to ineffective works.</li> <li>16- Inadequate contractor experiences.</li> <li>17- Delays in the subcontractors' works.</li> <li>18- Re-work because of faults during construction work.</li> </ol>
3	<b>Consultant-related delay factors</b>	<ol style="list-style-type: none"> <li>1- Delay in performing inspection and testing.</li> <li>2- Delay in approving main changes in the scope of work.</li> <li>3- Inflexibility (rigidity).</li> <li>4- Poor communication/ coordination between consultant and other parties.</li> <li>5- Conflicts between consultant and design team.</li> <li>6- Late in reviewing and approving design documents.</li> </ol>
4	<b>Contract-related delay factors</b>	<ol style="list-style-type: none"> <li>1- Ineffective delay penalties.</li> <li>2- Mistakes and discrepancies in design documents.</li> <li>3- Complexity of project design.</li> <li>4- Misunderstanding of owner's requirements by design engineer.</li> <li>5- Type of construction contract is not appropriate.</li> </ol>
5	<b>Contractual relationship-related delay factors</b>	<ol style="list-style-type: none"> <li>1- Lack of communication and settlement between the parties.</li> <li>2- Major disagreements.</li> <li>3- Work interference between the different contractors.</li> </ol>
6	<b>Manpower-related delay factors</b>	<ol style="list-style-type: none"> <li>1- Shortage of manpower.</li> <li>2- Unqualified workforce.</li> <li>3- Low productivity level of labours.</li> <li>4- Personal disputes among labourers.</li> <li>5- Shortage of required equipment.</li> </ol>
7	<b>Material-related delay factors</b>	<ol style="list-style-type: none"> <li>1- Shortage of construction materials in the market.</li> <li>2- Delay in the materials delivery.</li> <li>3- Change in materials types and specifications during construction.</li> <li>4- Damage of sorted material while they are needed urgently.</li> <li>5- Delay in manufacturing special building materials.</li> <li>6- Increases in material prices.</li> </ol>
8	<b>External-related delay factors</b>	<ol style="list-style-type: none"> <li>1- Delay in obtaining permits from municipality.</li> <li>2- Severe weather conditions on the job site.</li> <li>3- Effect of the social and cultural factor.</li> <li>4- Effects of subsurface conditions (e.g., soil, high water table, etc.)</li> <li>5- Accident during construction.</li> <li>6- Changes in government regulations and laws.</li> <li>7- Delay in providing services for utilities (such as water, electricity)</li> </ol>

### 3. Research Methodology

The authors of this research have obtained the information from various sources using primary and secondary data collection to achieve the study aim and objectives. The data has been gathered into two phases. A literature review was conducted, concerning the subject matter that addressed the delay causes in Kuwait construction projects by determining and rating the main factors of this problem and revealing the impacts of these delays.

After conferring the literature review about the reasons of delays in construction projects that were found in GCC countries, sixty-four factors were concluded, then they were categorized into eight categories based on their bases and sources. Also, reviewing literature helped to explore the major consequences of these delays in the Kuwaiti construction projects. Then, primary data, about the significant reasons that are responsible for these delays in projects, was collected by distributing a questionnaire survey through an online survey to attain the largest possible number of responses from the AEC industry experts who has been involved into public projects. The data collection sample was randomly selected for this study based on the aim of this research that does not required the characteristics details to determine the root of the addressed problem. The questionnaire targeted three groups of individuals who

have worked on the public facilities and housing construction projects in Kuwait from the Ministry of Public Works (MPW) and Public Authority for Housing Welfare, which are the organizations that are responsible of large-scale projects and residential projects, respectively, in Kuwait. These three groups consist of: client representatives, contractors, and consultants; in order to obtain various opinions from diverse parties. The target number of the sample was 100 responses, 59 responses from the owner representative, 25 responses from contractors, and 25 responses from consultant. However, the researcher was not capable of predicting the responses number and the respondents' reactions to this process. Therefore, the author was ready for all possible responses in order to complete this survey easily.

#### 4. Findings

The research strategy was quantitative research and the analysis techniques for the quantitative approach help the researcher to investigate, present, define and test interactions and trends within the data. According to Saunders et al. (2007) these techniques are: graphs, charts, and statistics. As mentioned before, the questionnaire has been designed using multiple choices response format for the first part which is the personal information of the participants, and using a Likert scale to responses format for the second part which includes 64 causes of delays that have been classified into eight groups based on their bases:

- |                                |   |
|--------------------------------|---|
| 1- Client-related factors.     | 5- Contractual relationship- related factors. |
| 2- Contractor-related factors. | 6- Manpower-related factors.                  |
| 3- Consultant-related factors. | 7- Material-related factors.                  |
| 4- Contract-related factors.   | 8- External-related factors.                  |

Therefore, the researchers have adopted both numerical and categorical analysis for the purpose of this study. The quantitative data was exported from the online survey website to CSV/Excel file and examined using MS Excel.

#### 4.1 Statistical Methods of Analysis of Findings

The Relative Importance Index (RII) has been adopted to analyze the addressed causes of delays in educational construction projects in Kuwait. Kometa, Olomolaiye, and Harris (1994) developed the RII method to set the relative importance of characteristics of owner's companies which may impact project consultant's functioning. This method was adopted to match the index to different contributors such as: client, consultant, and contractors. A Likert scale "five-point scale" was applied and converted to the relative important index for all causes to indicate the ranks of the various factors. These classifications cross-compare the relative importance of the reasons as seen by the three groups of contributors (Al Tabtabai, 2002). The following equation will be used to compute the RII for each causes of delay in each eight groups.

$$\text{Relative Importance Index (RII)} = \frac{\sum_{i=1}^5 W_i X_i}{A \times N} \quad (1)$$

Where:

$W_i$  = Weighting given to each factor by the respondents and it ranges from 1 to 5.

The participant to the questionnaire has to choose one level of agreement for each factor that causes delays. There are five levels of agreement (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). The average results of all the respondents' responses were calculated using the RII equation.

$X_i$  = Frequency of the  $i$ th response given for each cause.

A = Highest weight (which is 5 in this case)

N = Total number of contributors.

The Spearman's rank correlation is applied to indicate the strength of relationship between two parties based on the importance index. It is a measurement of correlation between two

sequences using the ranks rather than the real values (Coakes & Steed, 2007; Rosso, 1997). Equation 2 expresses the calculation method of the correlation factor.

$$r_s = 1 - \left[ 6 * \frac{\sum d^2}{(n^3 - n)} \right]$$

where:

$r_s$  = Spearman rank correlation coefficient between two parties.

d = Difference in rank assigned to variables of each cause.

n = The number of ranks.

Odeh and Battaineh (2002) mentioned that the higher the value of  $r_s$  approaching 1 or -1, the stronger the connection between the two series of ranking.

## 5. Results and Discussion

The questionnaire was designed to assess the level of importance of factors in each eight groups in the public-sector construction projects. Sixty-four factors were addressed to measure the participants' level of agreement on the effect of these factors on the delay in projects. The number of participants who responded was 35 people with 62.9% completion rate. However, the 35 participants comprise 22 of them who completed the whole survey and 13 of them who partially conducted the survey. Although the researcher's target was to get 100 responses the responder's number are unpredictable.

The Relative Importance Index (RII) has been calculated for each factor in each eight group. Based on the RII, each factor in each group was ranked and the top ranked factors in each group were determined. Table 2 presents the highest ranked factors in each category.

Table 2: The highest ranked factors of delays in construction projects in Kuwait

No. of Group	Group/ category name	Delay factors
1	Client-related factors	<ol style="list-style-type: none"> <li>1. Delay in approvals and late decision-making.</li> <li>2. Owner's failure to coordinate with government authorities during planning.</li> <li>3. The tendering system of the client required to select the lowest bidder.</li> <li>4. Delay in revising and approving design documents.</li> <li>5. Frequent changing of decisions.</li> </ol>
2	Contractor-related factors	<ol style="list-style-type: none"> <li>1. Conflicts between the contractor and his subcontractors.</li> <li>2. Delays in the subcontractors' works.</li> <li>3. Inactive quality control by the contractor.</li> <li>4. Inefficient contractor head office involvement in the project.</li> <li>5. Ineffective project planning and scheduling by the contractor.</li> <li>6. Delays in the preparation of the contractor submissions.</li> </ol>
3	Consultant-related factors	<ol style="list-style-type: none"> <li>1. Delay in approving main changes in the scope of work.</li> <li>2. Conflicts between consultant and design team.</li> <li>3. Late in reviewing and approving design documents.</li> </ol>
4	Contract-related factors	<ol style="list-style-type: none"> <li>1. Mistakes and discrepancies in design documents.</li> <li>2. Misunderstanding of owner's requirements by design engineer</li> <li>3. Ineffective delay penalties</li> </ol>

5	Contractual relationships-related factors	Lack of communication and settlement between the parties
6	Manpower-related factors	<ol style="list-style-type: none"> <li>1. Unqualified workforce</li> <li>2. Low productivity level of labors</li> <li>3. Shortage of required equipment</li> </ol>
7	Materials- related factors	<ol style="list-style-type: none"> <li>1. Increases in material prices.</li> <li>2. Change in materials types and specifications during construction.</li> <li>3. Delay in manufacturing special building materials.</li> </ol>
8	External- related factors	<ol style="list-style-type: none"> <li>1. Delay in obtaining permits from municipality.</li> <li>2. Severe weather conditions on the job site.</li> <li>3. Delay in providing services for utilities (such as water, electricity).</li> </ol>

In order to assign the most appropriate solution for the delays in the public-sector construction projects, the researchers have conducted overall ranking for the highest fifteen factors according to the RII which are the highest ranked factors from overall factors for each eight groups, as shown in Table 3.

*Table 3: Top 15 Delay Factors*

No.	Delay Factor	Related factor group
1	Delay in approvals and late decision-making	Client
2	Delay in obtaining permits from municipality	External
3	Owner's failure to coordinate with government authorities during planning	Client
4	Client's tendering system requirement to select the lowest bidder	Client
5	Delay in revising and approving design documents	Client
6	Frequent changing of decision	Client
7	Severe weather conditions on the job site	External
8	Delay in approving sample materials	Client
9	Unqualified workforce	Manpower
10	Client's shortage and poor communication with the relevant government authorities	Client
11	Delays in the issuance of charge orders by the client	Client
12	Mistakes and discrepancies in design documents	Contract
13	Increase in material prices	Materials
14	The owner delays in settlement of claims	Client
15	Conflicts between the contractor and his subcontractors	Contractor

The survey results proved that group 1 which is the client-related factors group has the most significant factors for the delays in the public-sector construction projects in Kuwait. Therefore, the client in these projects was the main responsible part of these delays.

## 6. Conclusion

In the public-sector construction projects in Kuwait, there are several factors that caused time overrun in projects in this sector. The client is the main responsible of delays in construction projects, which have been drawn from data analysis. However, one of the reasons of delays in public-sector construction projects is the government did not apply new construction management methods for this sector. Yet, lack of collaboration and coordination between stakeholders, traditional procurement system, and long approval processes are the main reason behind this issue. Therefore, it can be concluded that these are the main factors that

need to be addressed in order to mitigate delays in construction projects in this sector in Kuwait. As a result, the mitigation strategy should be adopted by the government for the public construction projects. Because the government is the main driver of this sector and the need of improvements should be the main priority in order to resolve this issue.

For future research, it is recommended to study the potential benefits of integrated Lean construction and Building Information Modelling (BIM) in order to overcome some of the Kuwaiti construction issues related to delays. Building Information Modelling is a large platform for the whole life cycle of a project. Also, BIM is the future of construction as Kassem, Succar, and Dawood (2013) revealed that many developed countries have mandated BIM to their projects such as the UK, US, Australia, and even Dubai in the Middle East region (Abdalla, 2016). While Lean Construction (LC) is a management philosophy that was derived from the manufacturing industry in particular Toyota manufacturer. LC has been adopted globally and proven its efficiency of construction in terms of reducing waste of time, materials, and efforts and improving customer value and management practices. Therefore, the integration of these two approaches would help to improve overall projects performance and productivity as well as reducing construction delays internationally and specifically in Kuwait.

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