

## Causes of delays on Construction Projects in Kuwait according to opinion of engineers working in Kuwait

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### ABSTRACT

This paper presents an investigation into analysis of the causes of delays on Construction Projects in Kuwait according to opinion of engineers working in Kuwait. This is achieved through identification of the major causes of delays in the construction industry as reported in literature and using a questionnaire survey to collect the views of the various key players in the Kuwaiti construction industry. The data is analyzed and the views of the groups surveyed discussed and the relative importance index used to rank the causes of delays in the construction industry as per the questionnaire responses obtained. It is found that the top 10 causes of delays in construction projects in Kuwait are as listed below.

- Using a lowest price bidding and tendering system
- Poor performance of the main contractor
- Inadequate experience or qualifications of main contractor's staff
- Delay of payments from client to other parties
- Poor performance of subcontractors
- Shortage in the supply of general labour
- Frequent changes of subcontractors
- Delay in decision making by the client
- Poor management of subcontractors
- Conflict between the main parties to the contract
- Inappropriate methods used by the main contractor

Proposals of ways to effectively prevent delays in the future construction projects managed in Kuwait construction industry were developed from the identified causes delay.

**Keywords:** delay, construction projects

### I. INTRODUCTION

According to (O'Brien, 1976), delays in the construction projects is a problem that affects all the parties in the construction industry and may be anticipated or come as a surprise to the parties. More recently some authors have sought to refine the term "delay" by suggesting that when an activity, which should have been achieved on a particular date is cancelled or moved forward to a later date, then the term "postponement" should be used instead of "delay" (Carnell, 2008). Simply put, delay in a construction project is defined as the point when an agreed date of completion is passed and project activities are judged to remain unfinished (Frimpong et al., 2003). The most important issue with project delay is early identification of potential causes of delays and putting in place measures or remedies to counter such delays. The most common issue causing delays in modern large scale projects is lack of communication as several contractors and subcontractors are working on the project at various stages. This project will be interested to learn the extent to which projects in Kuwait, run by Kuwait Construction Industry, include systems of

communication that are effective in spotting early indicators of potential delays and measures to counter potential delays.

The current debate in focusing on how this delays and can be reduced or eliminated, as problems continue to grow as the construction industry grows. For Trauner et al., (2009), delays in projects have economic as well as social costs, with delays meaning different things to different parties. To the owner it means the revenue is lost due to lack of a production facility. To the contractor, this delay means increased overhead costs due to increased working period, increased cost of materials due to inflation and increased cost of labour. It must be understood that construction process involves many variables and factors that are highly unpredictable, these include environmental condition during construction, availability of resources, performance of parties involved, involvement of other parties and contractual relations.

## II. DELAYS ON CONSTRUCTION PROJECTS

Collectively, several authors have identified six categories of delay; excusable delay, non-excusable delay, independent delay, concurrent delay, critical delay and non-critical delay.

**Excusable delays** are caused by events which are unforeseeable and are beyond the control of a contractor or the subcontractor. Excusable delay can be compensable or non-compensable depending on whether it was caused by the owner, third party or just an incident (Trauner et al., 2009).

**Non-excusable delays** are caused by a contractor, the subcontractor or equipment/material supplier. This delay is therefore not the fault of the owner and hence there is no extra fund or time extension to the contractor. The extra costs are thus incurred by the contractor and the owner is entitled to monetary reimbursement in case this delay causes a greater extent of delay (Alotaobi 2012).

**Independent delay** is delay caused by an isolated incident or reason from a stakeholder involved in the construction project. This can be the owner or a contractor and this delay can be excusable, non-excusable, compensable or non-compensable (Stumpf 2000).

**Concurrent delays** are caused by delays occurring simultaneously. That is, one delay occurs followed by another and thus each affects the overall completion time and cost of the project. This can be usually due to any of the party in the contract (Arif et al 2014)

**Serial delays** in a construction project are caused by previous non-overlapping delays that occur on a single network path. In this delay, the individual delays do not conflict but it can be determined to what extent each of the delays can cause the overall delay of the project. A good example of this project is the labour strike which causes a project which was to be completed before winter to be delayed and the work to be completed in winter. The labour strike causes a delay to winter and may be the project function was required before winter (Trauner et al., 2009).

**Critical delays** in affects the completion dates of projects. This is the milestone delay of a project. This delay can be reduced in the initial stages by proper planning. The completion date is controlled by several activities within the project. This can be project itself, contractor's schedule, physical constraints which can affect completion and requirements of the contract in terms of phasing and sequencing of the work. On the other hand, non-critical delays have no effect on the project completion dates but affects the project schedule in as much as it has no effect on the projects' performance or completion date (Trauner et al., 2009).

(Rajaram et al., 2014) judged that cost and time overruns in countries with developed economies

in recent years has largely been due to problems of trying to employ technically advanced solutions in construction. This can be both expensive and time consuming and may cause the overruns. (Haseeb et al., 2011) studied the causes of delays in construction projects in Pakistan and found that finance and payments problems, changes in designs/drawings, poor time estimation, natural disasters, quality of construction material, delays in paying suppliers and contractors, poor management of construction site, shortage of construction material, inaccurate cost projection, change of orders made, unforeseen conditions in the site, organizational changes, regulatory changes and use of construction technology were all factors cited as causes of delays. According to (Sambasivan and Soon, 2007), The 10 most reported causes of project delays in the Malaysian Construction industry are; improper planning on the contractors' side, poor site management, inadequate experience, delays in payment of work done, problems of having many sub-contractors, labour supply, availability of equipment and its failure, material shortage, poor communication of the parties involved and errors in the implementation of the design. (Hasan et al., 2014), (McCord et al., 2015, Kazaz et al., 2012) all provided useful advise that could be used in this thesis by outlining three ways to reduce delays in construction projects, namely: Improve site management, develop more effective strategic planning and implement clear communication and information channels between all the parties involved in construction.

### 2.1 Criteria used to access delays on construction projects

Often methodologies used are based on questionnaire surveys targeting key players on the construction projects (Aziz, 2013, Hamzah et al., 2011, Doloi et al., 2012). Some studies have combined an assessment of actions to reduce delays independently or together with the assessments of the causes of delays (Pourrostam and Ismail, 2011, Srdic and Selih, 2015, Abedi et al., 2011). (Abdul-Rahman et al., 2009) is typical of these research projects, assessing construction project delays using criteria linked to the levels of risk, value and complexity of the project. Studies often sought to obtain qualitative criteria, based on the opinion and understanding of the construction delay problem from experienced players in the industry. In judging the value of that data the background of the respondent, position and experience in the construction industry is important as it greatly affects the accuracy and credibility of the views expressed. Several studies have used interviews of the players in the industry to augment survey data (Chetan et al., 2015).

In a previous study focusing on project performance in Kuwait (Kometa et al., 1994), data was obtained from a questionnaire survey using a Relative Important Index (RII), as used by (Kometa et al., 1994). This method used factors, ranked in terms of importance relating to how they affected the performance of the project. A five-point scale was used to transform the ranking to a RII for each of the factor under consideration (Equation 1). The RII rankings were then used to cross-compare the causes of delay factors as perceived by the participant.

$$RII = \frac{\sum_{i=1}^5 w_i x_i}{A \times N} \dots\dots\dots \text{Equation 1}$$

In the expression for Equation 1: w = weighting given to a delay factor by the respondent and is a value from 1 to 5, where a weighting of 1 means not significant and 5 means extremely significant. x = frequency of the  $i^{th}$  response given for each cause of delay. A = The highest weight possible; 5 and N = Number of participants in the study carried out.

(Kometa et al., 1994), then calculated the Rank Agreement Factor (RAF), which was used measure the agreement of the ranking of different participants quantitatively (Okpala and Aniekwu, 1988). This was for two groups that showed average absolute difference in the factors' ranking. For any of the two groups in this consideration, the rank of item in for instance group 1 was let as  $RII_{i1}$  and  $RII_{i2}$  is the rank of the  $i^{th}$  item in group 2. The number of items was taken as N and therefore  $j = N - i + 1$ . The expression for RAF given by Equation 2.

$$RAF = \frac{\left[ \sum_{i=1}^N |RII_{i1} - RII_{i2}| \right]}{N} \dots\dots\dots \text{Equation 2}$$

Generally, (Kometa et al., 1994) assumed that if the value of RAF obtained was zero, then an agreement had been reached and if the value was higher than zero, then there was less agreement in responses. The percentage agreement (PA) was then obtained and was obtained by dividing the value of RAF with  $RAF_{max}$ . The value of  $RAF_{max}$  was obtained as shown in Equation 3 below.

$$RAF_{max} = \frac{\left[ \sum_{i=1}^N |RII_{i1} - RII_{j2}| \right]}{N} \dots\dots\dots \text{Equation 3}$$

The percentage agreement of the two groups was then computed as shown in equation 4 below.

$$PA = 100 - \frac{RAF}{RAF_{max}} \dots\dots\dots \text{Equation 4}$$

(Kometa et al., 1994) used the values of RAF and PA to indicate the degree of consensus on the delay factors before conclusions were drawn on the factor's effect on delays. The level of agreement between key players is shown in Table 2 below. This study will apply the same methodology as that used by (Kometa et al., 1994), to assess current projects commissioned by Kuwait Construction Industry in Kuwait.

Table 1: RAF AND Percentage agreement of the key players in Kuwaiti construction industry (Al Tabtabai, 2002)

Project participants	Rank Agreement Factor	Percentage Agreement
Clients and A/E firms	1.38	62.1%
Clients and Contractors	2.38	34.5%
A/E Firms and Contractors	2.00	44.8%

### III. INVESTIGATIONS

This investigation will adopt the "relative important index" (RII) approach to analyse the data collected from the questionnaire survey. This method determines the relative importance of attributes and how they influence the project performance. This relative index is used to compare the index to the various participants in the survey. A five-point scale is used in this case and transformed to relative important indices for each factor and thus used to determine the ranks of the

different causes. A cross-comparison of the relative importance of the factors as per the participants is made from this ranking.

Equation 1 measures the RII based on the weighting given to a delay factor by the respondent and is a value from 1 to 5, where a weighting of 1 means "Disagree" and 5 means "Strongly agree" in the questionnaire. x = frequency of the  $i^{th}$  response given for each cause of delay. A = The highest weight possible; 5 which represents

“Strongly agree” and N = Number of participants in the study carried out.

In the survey questionnaire, a participant selects one weight (level of agreement) for each of the listed factors causing delay. The five levels of agreement are the weights from 1 to 5 and summations of this answers are averaged using equation 1.

Equation 2 is the “Rank Agreement Factor” (RAF) and is used to show the average absolute difference in the factors’ rankings. This is for two groups that showed average absolute difference in the factors’ ranking. For any of the two groups in this consideration, the rank of item in for instance group 1 was let as  $RRI_{i1}$  and  $RRI_{i2}$  is the rank of the  $i$ th item in group 2. The number of items was taken as  $N$  and therefore  $j = N - i + 1$ . A value of zero for RAF means an agreement has been reached and the higher value means lesser agreement between the groups.

Equation 4 is used to calculate the percentage agreement (PA) by division of the value of RAF by the values of  $RAF_{max}$ . The value of  $RAF_{max}$  is obtained as in equation 3. The value of PA indicates the degree of consensus between the delay factors between the key construction stakeholders.

#### IV. RESULTS OF THE INVESTIGATION OF DELAYS ON CONSTRUCTION PROJECTS

##### 4.1 Common factors that cause delay on construction projects

Appendix A contains the factors that have been found in the construction industry research to cause delays on the construction projects. There are 40 causes of delays that have been listed in section 3 of the questionnaire. A statistical table has been used for each item showing the quantitative frequency distribution among the collected data and a histogram used to express the percentage of the responses.

From the survey questionnaire (Appendix A) sent to the respondents, the data collected on the factors that cause delays in Kuwait were analysed in Excel spreadsheet using the methodology employed Al Tabtabai (2002). Table 2 shows the relative importance index and the rank of all the 40 factors causing delays in Kuwait. It includes the relative importance index and ranks for the different groups of respondents involved in Kuwait construction industry’s projects. These groups are the Client, consultant and the main contractor. There were a total of 22 participants in Kuwait construction industry’s projects.

**Table 2:** Relative importance factors and Rank for the delay factors for the surveyed group of respondents

FACTOR NO:	Client		Consultant		Contractor		All respondents	
	RII	RANK	RII	RANK	RII	RANK	RII	RANK
1	0.82	1	0.80	1	0.90	1	0.84	1
2	0.82	1	0.71	6	0.77	2	0.81	2
3	0.51	27	0.69	10	0.63	12	0.62	20
4	0.42	36	0.40	39	0.33	36	0.50	36
5	0.40	38	0.51	29	0.37	33	0.60	27
6	0.64	7	0.74	2	0.40	32	0.62	22
7	0.62	11	0.66	11	0.77	2	0.67	10
8	0.51	27	0.66	11	0.47	26	0.63	18
9	0.33	40	0.40	39	0.27	38	0.44	39
10	0.62	11	0.49	32	0.50	23	0.62	20
11	0.47	32	0.51	29	0.53	19	0.61	25
12	0.62	11	0.71	6	0.78	2	0.67	10
13	0.80	3	0.71	6	0.77	2	0.74	5
14	0.60	16	0.71	6	0.63	12	0.70	7
15	0.62	11	0.43	36	0.63	12	0.69	9
16	0.69	5	0.74	2	0.73	6	0.78	3
17	0.58	20	0.63	15	0.43	31	0.62	23
18	0.64	7	0.63	15	0.73	6	0.75	4
19	0.49	30	0.74	2	0.53	19	0.70	7
20	0.60	16	0.57	24	0.47	26	0.64	16
21	0.64	7	0.57	24	0.53	19	0.64	16
22	0.42	36	0.57	24	0.60	16	0.53	34
23	0.60	16	0.66	11	0.67	9	0.66	12

24	0.49	30	0.43	36	0.37	33	0.53	35
25	0.56	23	0.60	19	0.47	26	0.58	31
26	0.58	20	0.60	19	0.53	19	0.65	14
27	0.73	4	0.51	29	0.73	6	0.71	6
28	0.67	6	0.54	27	0.63	12	0.66	12
29	0.56	23	0.60	19	0.27	38	0.60	28
30	0.36	39	0.49	32	0.50	23	0.44	38
31	0.62	11	0.49	32	0.47	26	0.54	32
32	0.58	20	0.60	19	0.50	23	0.58	30
33	0.56	23	0.49	32	0.67	9	0.54	33
34	0.47	32	0.43	36	0.27	38	0.41	40
35	0.51	27	0.54	27	0.33	36	0.49	37
36	0.64	7	0.74	2	0.37	33	0.61	25
37	0.60	16	0.66	11	0.67	9	0.65	14
38	0.53	26	0.63	15	0.60	16	0.63	19
39	0.47	32	0.63	15	0.57	18	0.61	24
40	0.47	32	0.60	19	0.47	26	0.59	29

Table 3 shows the RAF,  $RAF_{max}$  and Percentage Agreement for the Client, consultant and contractor. The values are all obtained both based

on the RII and rank for the purposes of comparison and consistency.

**Table 3:** RAF,  $RAF_{max}$  and Percentage Agreement for the Client, consultant and contractor

Factor N0:	Client-Consultant		Client-Contractor		Consultant-Contractor	
	RII	RANK	RII	RANK	RII	RANK
RAF	0.09	9.075	0.10	8.17	0.112	8.80
RAF(max)	0.14	16.175	0.178	15.52	0.156	14.05
PA	62.7%	56.1%	56.8%	52.7%	72.1%	62.6%

#### 4.2 Causes of delays in the context of Kuwait

Table 2 in the results section shows the factors causing delays with the relative index and the rank of the factor as per the response given by the key stakeholders involved in the survey. From this table, the RII shows the perception of the respondents to the cause of delay. It compares the index to various respondents in the Kuwaiti construction industry and groups of participants involved in the specific Kuwait construction industry's projects. From table 2, the respondents ranked "Using a lowest price bidding and tendering system" in the first position with a RII of 0.84. This shows that the tendering process is a major cause of delays in the Kuwaiti construction projects. This is consistent with the work of Al Tabtabai (2002) where the pre-qualification procedures for contractors and sub-contractors was the ranked as one of the significant factors in causing project delays in Kuwait. It has been noted that projects that rely on lowest price bidding process have additional issues arising from cost-cutting measures undertaken by the contractor. This can be cutting resources, over-working employees and reducing materials used. This issues related to low-cost tendering have an effect on the final project performance (Hasan et al., 2014).

The second ranked factor is "Poor performance of the main contractor". The performance of the contractor is measured by the quality of work done, site management amongst other factors. The project performance relies on the contractor. It starts right from the award of the project contract and continues as the contractors plan and execute the delivery as per the procurement contract agreement. The contractor practises related to the project management are responsible for the delays. The use of tools to monitor the project progress is an example of a project management technique commonly used. According to Al-Khalil et al. (1999), inadequate project management tools results in a range of problems in planning, schedule creep, conflicts, communication issues and resource allocation process during the construction process. Therefore, the inadequate use of project management techniques in the context of Kuwait results in the poor performance of contractors. It can be noted that most construction companies surveyed are still developing with less than 10 years of experience in the industry, this can explain the poor performance of the contractors as portrayed by the RII ranking. The third ranked factor "Inadequate experience or qualifications of main contractor's staff" is connected to the poor performance by the contractor as this directly influences the quality of

work. The delays due to poor performance delays the project as some construction work has to either be repeated or totally demolished as it was poor done. The experience of the main contractor and the qualification of the employees and the contractor are the main determinants of the quality of performance of the project.

The “Delay of payments from client to other parties” was ranked as the fourth factor causing delay. Delay of payment causes a delay of the project where the main contractor and the consultant are not paid an advance before the commencement of the project. A shortage of cash for the main contractor and the consultant results in slow progress and decline in the productivity as the contractors cannot purchase the required materials, equipment and payment of employees. The payment of advance is a normal practise in payment of the other parties by the client in Kuwait (Kartam et al., 2000). Alkhatam (2004), found that delays in payment by the client are critical in causing delays. Thus this delay ranked highly can be associated with poor management on the side of the contractor and the client.

The fifth ranked factor was “Poor performance of subcontractors” with a RII of 0.74. This could result from the delays in payment from the main contractor, lack of equipment and materials which may have to be supplied by the client or the main contractor. The subcontractor relies on the information from the main contractor who then relies on the client. This structure can cause a long channel of decision making and further worsened if the client organization has a long decision making structure. This causes delays in decision making and the overall completion of the project in time (Al Tabtabai, 2002). Poor qualification of the subcontractors’ technical staff has been found out to be the major cause of poor performance by the subcontractors (Al Tabtabai, 2002).

The lowest ranked factor was “Delay due to accidents during construction”. This factor was lowly ranked because the accident occurrence is not a major factor as accidents which may occur in the construction industry are minimal and cannot cause delays. It shows that accidents in the construction has not been a significant factor in causing delays construction projects in Kuwait.

The second lowest ranked factor causing delay as perceived by all the respondents was “Problems with neighbours and/or members of the public”. This can be litigation and court cases due to the construction activities done by the government. This was an insignificant cause of delay since in Kuwait, the government has a right to initiate a project at any location so long as it has a common importance to the general public. This has reduced

the delays caused by few individuals affected by the large projects sponsored by the government.

“Nationality of labour and/or language (miss and/or poor communications)” was the ranked the third lowest factor causing delays in Kuwait. This is despite the fact that some construction workers from Kuwait are from the Asian countries like Malaysia, China and Pakistan. This shows that language barrier is an insignificant delay cause in Kuwait as the workers engage in technical construction work. It has to be noted that in the recent past, the Kuwaiti nationals have taken up training in various technical programs under KUWAIT CONSTRUCTION INDUSTRY and now the Kuwaiti citizens are taking up the tasks initially mainly done by expatriates from other Asian countries.

### 4.3 Delays in Kuwait construction industry’s projects

Table 3 shows the relative importance index and the rankings of the various factors for each group of respondents involved in Kuwait construction industry’s projects. From Table 3, the RII index and the rank given by the client, consultant, the contractor involved in Kuwait construction industry’s projects for the factors causing delay in projects can be obtained and used to determine the relative agreement factor and the percentage agreement by this groups. The views on the factors can be obtained as per the client, consultant and contractor rankings.

#### 4.3.1 Client’s view

From table 3, the clients rank “Using a lowest price bidding and tendering system” and “Poor performance of the main contractor” with the RII index of 0.82 as the first factors that cause delays in KUWAIT CONSTRUCTION INDUSTRY’s projects. The client organization respondents in this case rank the tendering system as the one causing delays as this causes problems when the lowest bidder is awarded the contract and later incurs financial problems in the project execution process and starts using cost-cutting as a way to reduce expenditures. The employees may be over-worked by the contractor reducing the quality of the work or reducing on material expenditures. The poor performance of the main contractor can be related to the inadequate experience of the contractors in the industry and use of ineffective project management tools which leads to problems in planning issues, resource allocation and conflicts.

The client ranks the “Poor performance of subcontractors” as the third factor. This can be explained by the client’s view that the technical staff of the subcontractor are inexperienced and have poor technical training. The performance of the

subcontractor will influence the performance of the main contractor as they work on the same project and this is why the main contractor ranks higher than the subcontractor.

The fourth ranked factor by the client is "Shortage in the supply of general labour". Al Tabtabai (2002) notes that the manpower needed for construction in Kuwait are available from Arab and Asian countries. Disorientation of the labour force, low wages and difficulty to work during summer months due to high temperatures and in the holy months of Ramadhan are the major causes of construction project delays.

Fifth ranked is the "Inadequate experience or qualifications of main contractor's staff". The client views that the main contractor who wins the bids to construct the projects is not qualified based on the quality of work produced. This agrees with the Al Tabtabai (2002) where the clients view that the major cause of delays in Kuwaiti projects is lack of competent contractors.

The lowest ranked delay factor by the client is "Delay in resolving contractual disputes". The contractual disputes usually occur after the project completion or in the progress of the project. This shows that according to the client few or no projects are delayed by contractual disputes. This agrees with the observation of Al Tabtabai (2002) who notes that the contractual related factors ranked lowly as the cause of delays as per the client, contractor and consultant.

The second lowest ranked delay factor as perceived by the client was "Nationality of labour and/or language (miss and/or poor communications)". This could be explained by the fact that Kuwait construction industry is the client in this case, the technical trainings including construction work trainings have been offered to Kuwaiti citizens and have since taken over the jobs initially done by the expatriates and delays due to language barriers and poor communications have been reduced since the local workers have taken over the work.

The client had a perception that "Delay in providing the main contractor with access to the site" was insignificant in causing any major delays and ranked it as the third lowest cause of delays in the construction projects it manages. This can be explained from the fact that the client controls the site and hence can always allow the contractor who won the contract to start the work at the site and assemble the required materials. The client perceives that this cause is insignificant as it does not cause a direct influence on the project as it progresses but is only important at the commencement of the project.

#### 4.3.2 Consultant's view

The consultant's view on the rank of delay factor causes are as shown in table 4. The consultant ranked "Using a lowest price bidding and tendering system" as the first factor causing delays in Kuwait construction industry's projects. The reason for this ranking is as explained for the client and for the whole of the Kuwaiti context.

The consultant rank "Rework due to errors during construction", "Delay in decision making by the client", "Inadequate experience or qualifications of main contractor's staff" and "Delay in the connection of electricity to the site" in the second place. The rework due to errors can be due to the poor quality of work done, incompetent contractor or due to poor technical training of the employees working on the project. Subramani et al. (2014) identifies the rework due to errors in the construction as a significant factor of delay in construction projects. Sambasivan et al. (2007) found that connection of electricity and water to the construction site plays a significant role in ensuring the completion in time. This agrees with the observation of the consultant. The delays in decision making are explained by the long organizational structure of the client organization and the flow of information and decisions made takes long (Al Tabtabai, 2002).

The client ranks "Incomplete or late soil investigation report" and "Problems with neighbours and/or members of the public" as the least significant factors causing delays. The late soil tests are carried out by consultants and this explains the least ranking given. The problems from the neighbours and the members of the public are handled by the client organization and hence the least ranking given.

"Poor management of subcontractors", "Equipment breakdowns" and "Delay due to accidents during construction" were all perceived by the consultant as the second lowest factors causing delays in Kuwait construction industry projects. The consultant is of the view that the subcontractors are not poorly managed and hence they have no influence over the delays of the projects. The equipment breakdown can cause delays since the construction stalls as there are no machines to carry out the job. The consultant is of the idea that the equipment failure is insignificant in causing delays in Kuwait construction industry's projects. Accidents occurring during construction work are minimal or if there they do not cause delays. This may be due to safety measures in the use of equipment and the fact that workers may be competent on equipment use and the safety procedures at work.

The third lowest ranked factors are "Delay in resolving contractual disputes", "Nationality of

labour and/or language (miss and/or poor communications)", "Encountering unforeseen underground conditions" and "Extreme weather effect on work progress". The client views that contractual disputes between the key players or contractual parties in Kuwait construction industry's projects does not cause major delays and can be explained by the fact that this normally happens between the client and the contractor and not the consultant. The extreme weathers of hot summers in Kuwait are viewed by the consultant as one of the insignificant factors as it is normal for such conditions to occur in a hot country like Kuwait.

#### 4.3.3 Contractors' view

The contractor ranked "Using a lowest price bidding and tendering system" as the first delay factor. The contractor goes through the bidding and tendering process and hence is aware of the effect of the client organization picking the lowest bidder. This will bring problems of cost-cutting on the side of the contractor if the lowest bidder wins. This serves to cause delays caused by inadequate finance as the contractor balance between working for a profit and reducing the expenditures (McCord et al., 2015).

The second factors causing delay according to the contractor is "Poor performance of the main contractor", "Conflict between the main parties to the contract", "Inappropriate methods used by the main contractor" and "Poor performance of subcontractors". This is surprising as the contractor ranks the causes it is associated with as the second and hence a very critical delay factor. The conflicts between the main parties causes delays if the parties are in a major disagreement on the contractual terms or on the project quality and performance during the progress. The contractor views the subcontractor's poor performance as a significant cause of delays.

The least factor causing delays from the contractors' point of view are "Problems with neighbours and/or members of the public", "Low productivity levels of general labour or qualified trade personnel" and "Delay due to accidents during construction". The contractor views the problems with the public and neighbours as the least factor as it is an issue to be dealt with by the client who is a government agency. This means that problems are minimal. The low productivity of the employees is viewed by the contractor as a least factor.

The second lowest ranked factors causing delays as viewed by the clients are "Incomplete or late soil investigation report" and "Changes in government regulations and laws during construction". The contractor perceives that soil investigation reports have insignificant influence on the delays in Kuwait construction industry's projects. The contractor views that government

regulations and laws governing construction have no influence on the time of completion as Kuwait construction industry is a government agency and hence its laws cannot affect the time of completion.

The contractor ranks "Delay in providing the main contractor with access to the site", "Equipment breakdowns" and "Delay in the connection of electricity to the site" as the third least significant factors causing delays in Kuwait construction industry projects. The contractor seems to suggest that the site is always available for them to work on and hence access to it is not a significant cause of delay. The contractor is the owner of the construction equipment and is of the view that the equipment is in a good condition always and hence do not cause major delays. The connection of electricity to the site is perceived by the contractor as insignificant since this is always an education institution where mostly, electricity is available and hence the client views that this does not cause delays significantly. .

#### 4.2 Relative Agreement Factors and Percentage Agreement of the groups under consideration

From the client, contractor and consultants RII ranking in table 3, the relative agreement factor can be computed to help determine the level at which the three groups under study agree with each other in terms of factors causing delay. Table 3 contains the RAF and PA agreement values obtained from the analysis carried for the ranking of the factors causing delay. A cross-comparison of the three categories as perceived by the different group of respondents was done using the RAF and PA of the RII and Rank values obtained from each of the factors of delay. This enables comparison of the values obtained and check on the accuracy. The RAF value between the client and the consultant was obtained as 0.09071 and 9.075 whereas the  $RAF_{max}$  value was obtained as 0.14468 and 16.175 for the RII and Rank respectively. The PA agreement was obtained as 62.7% and 56.1% by computation using the RAF and  $RAF_{max}$  for the RII and Rank values. Between the client and the contractor the RAF,  $RAF_{max}$  and PA values were obtained as 0.10 and 8.17, 0.17 and 15.52 and 56.8% and 52.7% for the RII and Rank values respectively. Finally between the consultant and the contractor, the RAF,  $RAF_{max}$  and PA based on both the RII and Rank values were obtained as 0.11 and 8.8 and , 0.15 and 14.05 and finally 72.1% and 62.6% respectively. From the percentage agreement values obtained it can be noted that there is a higher agreement between the consultant and the contractor which was not the case as reported by Al Tabtabai (2002) who reported a higher agreement between the consultant and the client. A low percentage agreement exists between



the client and the contractor. A higher RAF between two groups shows a greater consistency in the views given for the factors causing delays. Comparing the obtained values of RAF and PA with those of Al Tabtabai (2002), it can be noted that the values obtained for the PA between the client and the contractors are in agreement with the values obtained in this work. At the time of the study carried out by Al Tabtabai (2002), the client and the contractor had the lowest agreement. This is quite the same of the current situation as seen in the values obtained from this investigation and it explained by the occasional litigation and claims in the governmental projects in Kuwait. From the use of RII and ranks in determining the Percentage agreement between the client, consultant and the contractor; the results were compared for consistency and it proved that the results were consistent for both and RII and rank values of the PA and thus confirms the reliability of this results as credible and accurate.

From the results obtained, it can be summarized that the top 10 causes of delays in construction projects in Kuwait are as listed below.

- Using a lowest price bidding and tendering system
- Poor performance of the main contractor
- Inadequate experience or qualifications of main contractor's staff
- Delay of payments from client to other parties
- Poor performance of subcontractors
- Shortage in the supply of general labour
- Frequent changes of subcontractors
- Delay in decision making by the client
- Poor management of subcontractors
- Conflict between the main parties to the contract
- Inappropriate methods used by the main contractor

## V. RECOMMENDATIONS

### 5.1 Proposals to effectively prevent delays on future construction projects

From the analysis of the delay factors and major causes of delay in Kuwaiti construction projects identified; proposals to effectively prevent this delays in construction projects are developed and recommendations made on how to effectively curb this problem so as to reduce the effects.

The major cause of delay in construction projects in Kuwait in general was identified as use of lowest price bidding and tendering process. It has to be noted that low contract bidders do not signify that a project will be accomplished at the lowest cost and within the specified time. To reduce this a periodical evaluation of the contractors should be carried out by a special pre-qualification committee within Kuwait construction industry and the relevant government ministries in Kuwait or by the project

management firms hired by Kuwait. Al Tabtabai (2002) notes that to establish the plans and avoid crises with contractors; the contractors and subcontractors should be selected based on the size of the project, time limit of the project and quality of work required. This should be emphasised in the current situation to curb and reduce the delays on the construction projects in Kuwait. The tenders should be awarded based on the capabilities and past performance of the contractors.

To reduce the delays in construction projects professional Construction Management (CM) practises should be applied. This practises builds the spirit of teamwork and professional trust in the contractual parties in the construction project. The client should schedule the structure of the contract using the CM approach in order to establish the procedures in which contracts are awarded to the designers, contractors and vendors of construction materials. Once the contractual relationship between this parties and the client is established, the CM controls them to abide by the contractual agreements (Harris et al., 2013). This improves the quality of work done, the performance and in overall prevent delays.

Poor performance of the contractor was identified as a major cause of delays. This factor can be reduced if the contractors pay attention to be attentive with the construction materials and prices so that they are purchased before the commencement of the construction work. The time schedule of material delivery to the construction site needs to be developed so as to reduce the lack or shortage of materials as the construction work is in progress (Shanmugapriya and Subramanian, 2013). It was also identified that the inexperience and poor qualification on the staff of the contractor are a major cause of delay. The staff with appropriate experience should be appointed to lead the technical and management aspects of the project. Enough engineers, technicians, foremen and planning managers are necessary in order to ensure effectiveness of the work as the responsibilities is shared between them based on the specialization (Wanjari and Tankkar, 2010). The quality of the construction work should be should be ensured by monitoring the quality of activities continuously and a quality system for each activity should be set and ensured that it is met. This helps avoid errors that can lead to rework and hence causing delays.

The late payments by the owner to the contractors should be avoided by ensuring that the contractors are paid the progress payment on time. This will ensure that it does not impair the contractor's ability to implement the project. The owners should be aware of the available materials with the contractor. The owners should assess the

financial muscle of the contractor and whether they are able to implement the project in full.

Conflicts between the main parties of the contracts should be ensured they have been solved directly by the client. This disputes may be between the contractor and the consultant. Solving this disputes ensures that the problems of project accomplishment and quality of work done does not cause delays to the project.

The consultants should hire qualified and sound technical staff to manage the projects. This reduces the technical and management problems that can lead to delays in the execution of the project. The consultant should have a high qualification and knowledge so that the instructions given is at a suitable time and are accurate.

There is a need for the human resources in the construction industry to be trained and the craftsmen classified. The construction engineers should be trained so as to have adequate management skills. The trainings on time and cost control, scheduling, information systems and management of human resources should be given to the key stakeholders in the industry to improve the performance in each section and reduce delays.

## VI. CONCLUSION

delays has been discovered to a significant cause of problems in the construction projects ranging from extending the time of construction, delay of start of use of projects and stretching the budget beyond the amount anticipated during the planning and design stages of projects. This has been proven from literature to be a problem which is majorly experienced worldwide and majorly common in the developing countries. It has been observed that the construction industry in Kuwait has increased drastically in the last two decades and the government is at the present spending in mega-projects ranging from stadiums to roads and railway lines. This raised the need to know the performance of the construction industry in Kuwait and hence the study on the delays which normally occur on these projects. Kuwait construction industry, a government institute that works under the Ministry of Education and is in charge of construction of facilities in its colleges, institutes and training centres. In this work, the causes of delays in the construction projects managed by Kuwait construction industry was investigated using a questionnaire survey. The data collected from this survey was from the key stakeholders involved in the construction projects in the whole of Kuwait and specifically in projects managed by Kuwait construction industry.

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#### Appendix A: Survey Questionnaire

Dear Sir/Madam,

#### Re: Questionnaire Survey on Causes of delays on Construction Projects in Kuwait

You are being asked to take part in a questionnaire survey on delays on construction projects in Kuwait.

**Name of Principal Investigator:** Naser Almutairi,

**Title of project:** Causes of delay on Construction Projects in Kuwait according to opinion of engineers working in Kuwait.

**Aim and objectives of the research:** This project will investigate the causes of delays in construction projects in Kuwait. The aim is to assess common causes of delays and to develop proposals to effectively prevent such outcomes on future projects.

**Objectives:** In order to achieve the main aims, this project has been divided into the following objectives:

- Synthesise current research on causes of delay on construction projects, with specific emphasis on construction projects in Kuwait.
- Assess common causes of delay on construction projects in Kuwait.
- Develop proposals to effectively prevent delays on future construction projects in Kuwait.

#### Ethical information for survey participants:

##### **Description of procedure:**

You are being asked to engage in a survey to collect data for a research project.

##### **Description of risks:**

Some of the data to be gathered may be confidential or commercially sensitive.

##### **Right to withdraw:**

You may withdraw at any time.

If you are dissatisfied with the way the research is conducted, please contact

Mr.: Naser  
Almutairi

Email:  
ns.almutairi@paaet  
.edu.kw  
Tel: 97111536

Having read the information sheet, are you willing to continue and to complete the survey?

Yes / No

#### SURVEY QUESTIONNAIRE

Please tick as appropriate and fill in your comments where indicated.

#### **Section 1: Background information about the respondents**

This section includes questions about your qualifications and experience of construction contracts in Kuwait

What is your profession:

How many years have you worked in the construction industry: \_\_\_\_\_ (years)

What best describes your role (please circle the most appropriate answer):

- Senior Manager or Project/Programme Director
- Department Manager or Project Manager
- Junior Manager or Deputy Project Manager
- Other

If other, please state your role:

What kind of organization do you work for (please circle the most appropriate answer):

- A public sector client organisation
- A private sector client organisation
- Consultant
- Main contractor
- Specialist supplier or sub-contractor
- Other

If other, please state what kind of organization you work for:

How many years have you been working on construction projects in Kuwait: \_\_\_\_\_ (years)

How many employees are there in the organisation that you work for? \_\_\_\_\_ number

#### **Section 2: Common factors that cause delays on construction projects**

Previous construction industry research has identified a number of factors that can cause delays on construction projects. These factors are listed in the table below.

We would like you to provide a weighting score to each factor, indicating:

**How significant the factor is in causing delays on construction projects.**

The weighting score should be a number between 1 and 5.

Where: a weighting of 1 means *not significant* and 5 means *extremely significant*.

No.	Delay factors	Weighting (1 to 5)
1	Using a lowest price bidding and tendering system	
2	Poor performance of the main contractor	
3	Inadequate time allowed in the contract to complete the project	
4	Incomplete or late soil investigation report	
5	Delay in providing the main contractor with access to the site	
6	Rework due to errors during construction	
7	Conflict between the main parties to the contract	
8	The lack of a standardized specification for the project	
9	Problems with neighbours and/or members of the public	
10	Delay in resolving contractual disputes	
11	Poor communication between all parties involved in the contract	
12	Inappropriate methods used by the main contractor	
13	Poor performance of subcontractors	
14	Frequent changes of subcontractors	
15	Poor management of subcontractors	
16	Inadequate experience or qualifications of main contractor's staff	
17	Main contractor is slow to mobilize onto site	
18	Delay of payments from client to other parties	
19	Delay in decision making by the client	
20	Delay in completion of designs details for the project	
21	Changes to the specification or drawings during construction	
22	Rise in the prices of building materials	
23	Delay in the supply of building materials to the site	
24	Equipment breakdowns	
25	Shortage of essential building equipment	
26	Delay in the approving contractor supplied designs or materials	
27	Shortage in the supply of general labour	
28	Shortage in the supply of qualified trades personnel	
29	Low productivity levels of general labour or qualified trade personnel	
30	Nationality of labour and/or language (miss and/or poor communications)	
31	Encountering unforeseen underground conditions	
32	Delay in obtaining building permits	
33	Extreme weather effect on work progress	
34	Delay due to accidents during construction	
35	Changes in government regulations and laws during construction	
36	Delay in the connection of electricity to the site	
37	Inadequate experience of consultant	
38	Delay in inspection and/or approval of work by client or consultant	
39	Slow approval by the client or consultant on main contractor submittals	
40	Delay in the issue of instructions by client or consultant	