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# Significant factors causing delay in the UAE construction industry

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Construction delay is considered one of the most recurring problems in the construction industry. Delays have an adverse impact on project success in terms of time, cost, quality and safety. The effects of construction delays are not confined to the construction industry only, but influence the overall economy of a country like UAE, where construction plays a major role in its development and contributes 14% to the GDP. Thus, it is essential to define the most significant causes of delay in order to avoid or minimise their impact on construction projects. A detailed questionnaire was developed and used to get input from professionals associated with the UAE construction industry. The perspective of contractors and consultants has been analysed to rank the causes of delays based on their Relative Importance Index. Contractors and consultants were in agreement on the most significant causes of delays. The research revealed that 50% of the construction projects in UAE encounter delays and are not completed on time. The top 10 most significant causes of construction delays have been identified by this research. Approval of drawings, inadequate early planning and slowness of the owners' decision-making process are the top causes of delay in the UAE construction industry.

**Keywords:** Delay, project management, project controls, time, UAE

## Introduction

Construction delay is considered one of the most recurring problems in the construction industry. Delays adversely impact on project stakeholders including owners, design professionals, construction professionals, users and others. The key objectives of construction projects are time, cost, quality and safety. These objectives are jeopardised by delays. Delays result in extension of project time, which leads to extra overheads that increase the cost. Delay is a serious problem that has to be dealt with in any construction project. Thus, it is important to identify the most significant causes of delay in the UAE construction industry to be able to find ways to avoid them, or at least, mitigate their impact.

The United Arab Emirates (UAE) construction industry has reached an unparalleled position in the last decade. Since the discovery of oil, in the late 1960s,

the construction industry started to grow to meet the increasing demand for shelter, offices, electricity, roads among others. The real boom, though, started in the mid-1990s with the shift from an oil-dependent country to a more industrial, commercial and tourism hub. The growth is initiated by the public sector but the private sector is as active. The Emirate of Dubai is now being credited with the highest per square kilometre of construction activity in the world. Dubai's key role in the recent expansion of construction activity in the Gulf is obvious: of the \$50 billion estimated Gulf-wide building spends, 60% of that, about \$30 billion is in the UAE alone; and the majority of that is in Dubai (ITP Construction, 2004). Table 1 shows the key facts about the UAE construction industry.

Much emphasis is now placed on projects to be completed within the specified project duration due to the current trend of shifting most projects towards the fast track approach. This has led to the need to pinpoint exactly the relevant causes of delay that have to be monitored during the entire phases of the project to complete the project on time. Construction projects

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**Table 1** Key facts about UAE and the UAE construction industry

Gross domestic product (GDP)		Dhs 293 billions in 2003
Construction industry's contribution to GDP	13.8%	
Total no. of contractors	16,000	
Total no. of employees in construction industry	340,000 (16.5% of the total work force)	
Value of ongoing construction projects	\$30 billion	
Landmark ongoing projects	World's tallest tower, world's biggest mall, and world's biggest man made island	

Source: Compiled from Gulf News (2005), ITP Construction (2004), Dubai Economic Department (DED) (2005), UAE Interact (2004).

do not suffer delays only during one time period or phase of the project, but during all phases (Al-Saggaf, 1998). It becomes essential to the interests of all parties that delays, or their effects, are reduced. Even quite small advances in the recovery of a delayed schedule are likely to have a significant impact on the financial returns of those involved. Since delay is associated with cost and time overrun, the causes of delay have been a matter of concern for construction professionals and a topic of study for researchers. There has been some research carried out in the past to find out the causes of delays for construction projects of different countries based on the requirements of the region, time, classifications, responsibilities, etc.

Assaf *et al.* (1995) surveyed the causes of delay in large building construction projects in the Eastern Province of Saudi Arabia as seen by contractors, architect/engineers and owners. Ogunlana *et al.* (1996) identified and studied the causes of delay for construction projects in Bangkok. Kaming *et al.* (1997) identified many variables that have an impact on construction time and cost overruns in Indonesia. Mezher and Tawil (1998) surveyed randomly selected owners, contractors and architects from Lebanon to find out the main causes of delays from the pre-identified causes and their groups. Kumaraswami and Chan (1998) also studied the causes of construction delays for Hong Kong. Al-Moumani (2000) conducted a quantitative analysis of construction delays in Jordan. He investigated various causes of delays on 130 public projects in Jordan that were constructed during the period 1990–97. Research conducted by Frimpong and Oluwoye (2003) revealed that financing, natural conditions and materials-related factors contributed mainly to the delay of groundwater projects in Ghana. Odeh and Battaineh (2002) studied the causes of delays in traditional contracts. As for delay analysis, many authors, Alkass *et al.* (1996), Ng *et al.* (2004) and Shi *et al.* (2001), recommended different techniques.

Time is money, and timing is an integral part of every construction plan and can affect each party's contractual obligations. The time allowed for construction performance is an important consideration for both the

project contractor and the project owner. Since delay is costly for all the parties involved in the construction industry, it must be identified and its causes should be addressed. The main objective of this research is to identify and rank the significant causes of delay in the UAE construction industry based on their Relative Importance Index (RII) from the perspective of the construction industry's main participants—contractors and consultants. Further, 10 most significant causes of delays for the construction projects in UAE are specified based on the overall analysis. These 10 most significant causes of delays are then compared with significant causes of delays in Kingdom of Saudi Arabia (Assaf *et al.*, 1995) and Lebanon (Mezher and Tawil, 1998).

### Causes of construction delays

Various causes of construction delays were identified in the first stage of the research through a literature review and personal interviews with many construction professionals associated with the UAE construction industry. Forty-four major causes of construction delays were found to have an impact on the UAE construction industry. These causes of delay were then structured to develop a detailed survey questionnaire. The causes are grouped into eight practical categories. The contractor's group consists of causes of delays which are mainly originated by contractors. This includes the availability of resources, supervision and experience. Three most important resources for any construction project are manpower, materials and machines. Contractors have to ensure that all these resources are available throughout the project whenever needed. Causes such as skill and the productivity of manpower, productivity, availability and the reliability of machines/equipment affect the project at each and every stage of its construction. Contractors' experience and their supervision also have great impacts on the project. Any of these causes can delay a construction project if not incorporated in the project planning, scheduling and controlling programme.

The causes within the consultant's category are related to the designs, drawings, inspection and quality control. Owing to the nature of a construction project, it has to deal with many changes in drawings/specifications, materials, etc. Consultants are the ones who are held responsible for these causes. The owner's involvement in the construction project varies significantly depending on the project and the contract type. In all cases, there are many causes of delays which originate from the owner. One important cause is the owner's slow decision-making process. Other causes of delays are the change of materials type and specification, excessive bureaucracy and the unrealistic contract duration imposed by the owner.

Other causes of delays are related to finance, for which both the owner and contractor are responsible. These causes play very important role in the smooth running of the project activities and the completion of the project on time. Causes related to the contractual relationship, planning and scheduling are vital for many projects. All the parties involved in a construction project are responsible for their respective roles at different stages of the project. This starts right from the conceptual stage till the finishing stage. All the important causes related to these issues have also been identified and included in the questionnaire.

The planning and scheduling of any construction project depends heavily on the local government regulations. On many occasions contractors, consultants and owners need to study various services (underground/over ground), such as telecommunication cables, water/electricity/gas lines, etc. before they start the construction. It depends on the location of project also. Permits and approvals are required in most cases. Construction participants must be aware of these regulations and estimate the requirement of time and effort for this. There are some causes of delays over which no party has any control. One of these causes for UAE is the weather conditions, which are extreme.

The questionnaire survey forms were distributed to 400 randomly selected construction professionals associated with the UAE construction industry to get their responses. The number of contractors in the UAE is 16,000. Out of these, 12,000 are active. However, this number includes all contractors and a large portion is small contractors and specialty contractors. The chosen sample represents the large and medium size general construction contractors, consultants and owners that are active in the UAE. The completed responses were collected either personally, or received through regular postal mails, e-mails and faxes. A total of 105 responses were received, thus a response rate of 27% was achieved. This included 52 from contractors, 46 from the consultants and seven from the owners. Since the

data (seven responses) from the owners were not sufficient, these were not included for the analysis. Ninety-three out of 98 responses (from contractors and consultants) were complete and used in the analysis. Out of those respondents, 47 had experience of more than 10 years, 32 respondents had experience between five and 10 years whereas only 14 professionals had experience less than five years. One of the strategically asked questions from these construction professionals through this questionnaire revealed that 50% of the UAE construction projects are delayed.

## Statistical methods of analysis

The Relative Importance Index was used to analyse these causes of delays. Equation (1) was used to compute the Relative Importance Index (RII) for all the causes.

$$\text{Relative Importance Index, RII} = \frac{\sum_{i=1}^4 W_i X_i}{\sum_{i=1}^4 X_i} \quad (1)$$

where:

$W_i$  = Weight assigned to  $i$ th response;  
 $W_i = 3, 2, 1$  and  $0$  for  $i = 1, 2, 3$  and  $4$  respectively;  
 $X_i$  = Frequency of the  $i$ th response;  
 $i$  = Response category index =  $1, 2, 3$  and  $4$  for Very important, Important, Less important, and Not important respectively.

Accordingly,  $W_1 = 3$  for Very important,  $W_2 = 2$  for Important,  $W_3 = 1$  for Less important, and  $W_4 = 0$  for Not important have been used for this analysis.

To study the strength of relationship between two sets of ranking, the Spearman rank correlation coefficient was determined. The Spearman rank correlation coefficient is calculated using equation (2) (Kottegoda and Rosso, 1997):

$$r_s = 1 - \frac{6 \sum d^2}{(N^3 - N)} \quad (2)$$

where:

$r_s$  = Spearman rank correlation coefficient;  
 $d$  = Difference in ranking between contractors and consultants;  
 $N$  = Number of variables (causes) = 44.

The higher the value of  $r_s$  (approaching 1 or -1) indicates a strong association between the two sets of ranking (Odeh and Battaineh, 2002).

### Ranking based on contractors' and consultants' perspectives

Contractors and consultants are the two main participants of construction projects. The data were first analysed based on the perspectives of contractors and consultants separately.

The frequency of each of the above responses (Very Important, Important, Less Important, and Not Important) for the individual causes of delays have been compiled from the 93 responses. Using equation (1), weights and the compiled frequencies, the RII of all these causes has been computed, and is shown in Table 2 along with the corresponding ranking. From the analysis of the results, it is found that preparation and approval of drawings, inadequate early planning of the project and slowness of the owner's decision-making process are ranked high by both contractors and consultants. Preparation and approval of drawings, productivity of manpower and unsuitable leadership style of construction/project manager have been given almost same ranking by contractors and consultants.

Although the contractors and consultants agreed on most of the factors, there were some disagreements. Shortage of materials on site is ranked much higher (Rank 5) by the contractors whereas this was ranked lower (Rank 16) by the consultants. Financing by the contractor during construction was ranked much higher (Rank 3) by the consultants as compared to that by the contractors (Rank 14).

To study the strength of relationship between these two sets of ranking (based on contractors and consultants), a further analysis was done to find the agreement between contractors and consultants on these rankings using the Spearman rank correlation coefficient (equation (2)). The Spearman rank correlation coefficient is found to be 0.855 for these research data. This higher value of  $r_s$  (approaching 1) indicates a strong agreement between contractors and consultants for the ranking of the causes of delays.

### Ranking based on the respondent's years of experience in the UAE construction industry

The UAE construction industry has attracted construction professionals from around the world with varying numbers of years' experience. Therefore, further analysis has been done for these data based on the respondent's years of experience in the UAE construction industry. For this purpose, these respondents are classified into three categories. The first category consists of the construction professionals having experience greater than 10 years, whereas the second

category includes the professionals having experience between five and 10 years. The third category that includes professionals with less than five years' experience was not considered in the comparison because of the small number of respondents (<30).

The analysis showed that the rankings of the causes of delays are almost similar based on the perspective of both categories of respondents (based on their years of experience). The top 10 causes of delays according to the construction professionals having experience between five and 10 years falls within the overall top 10. Whereas based on the construction professionals having experience greater than 10 years, seven of the top 10 causes of delays are among the overall top 10 causes of delays (Table 2).

The Spearman rank correlation coefficient for the above data (using equation (2)) is found to be 0.914. This higher value of  $r_s$  (approaching 1) indicates a strong agreement between these two categories of professionals.

It is remarkable to note that productivity of manpower, poor supervision and poor site management are ranked much higher by the construction professionals having experience between five and 10 years as compared to lower rank by construction professionals having experience of more than 10 years. People with more experience consider inadequate early planning of the project and the unsuitable leadership of the project/construction manager as major causes of construction delays in the UAE.

### Overall ranking

The collected data were statistically analysed further to determine the overall Relative Importance Index (RII) of these 44 causes of delays. The results are shown in Table 2. The analysis of the data shows that the preparation and approval of drawings has been ranked highest by the respondents for which the consultant/designer is responsible. This is followed by inadequate early planning of the project, slowness of the owner's decision-making process, shortage of manpower, poor supervision, and poor site management, productivity of manpower, skill of manpower, non-availability of materials on time, obtaining permit/approval from the municipality/different government authorities and the financing by contractor during construction.

The 10 most significant causes of delay for the UAE construction projects are shown in Table 3 along with their RII values. It is observed that, out of the top 10 most significant causes of delay, five causes fall under the category of contractor which implies that contractors can be held responsible for the delay of the project due to those

**Table 2** Summary of Relative Importance Index and rank for the causes of delays

S.No	Category	Causes of delay	Contractors		Consultants		5–10 years		≥10 years		Overall	
			RII	Rank	RII	Rank	RII	Rank	RII	Rank	RII	Rank
1	Contractor	Shortage of manpower	2.362	8	2.333	4	2.323	4	2.489	1	2.348	4
2		Skill of manpower	2.244	12	2.318	5	2.300	6	2.340	6	2.281	7
3		Productivity of manpower	2.362	8	2.227	7	2.438	2	2.170	16	2.297	6
4		Shortage of materials on site	2.413	5	1.976	16	2.094	13	2.283	9	2.205	12
5		Non-availability of materials on time	2.292	10	2.267	6	2.258	8	2.362	5	2.280	8
6		Shortage of equipment	1.911	28	1.867	20	1.656	30	1.979	25	1.889	28
7		Failure/breakdown of equipment	1.354	39	1.378	33	1.344	35	1.349	40	1.366	41
8		Defective work	1.638	35	1.600	31	1.581	32	1.652	37	1.620	38
9		Construction method	1.958	23	1.814	23	2.000	18	1.804	32	1.890	27
10		Construction mistakes	1.804	32	1.636	28	1.767	27	1.739	35	1.722	33
11		Poor supervision and poor site management	2.447	3	2.222	8	2.313	5	2.255	11	2.337	5
12		Inadequate contractor's experience	2.000	20	1.955	17	2.000	18	2.196	14	1.978	22
13		Delay in subcontractor's work	2.146	15	1.818	22	1.844	23	2.067	21	1.989	21
14		Necessary variations	1.689	34	1.558	32	1.516	34	1.822	31	1.625	37
15		Poor control of site resource allocation	1.830	31	1.818	22	1.742	28	1.907	28	1.824	29
16		Unsuitable leadership style of construction/project manager	2.298	9	2.133	10	2.094	14	2.298	8	2.217	11
17		Delay in special manufactured imported materials	2.109	17	1.867	20	1.903	22	2.000	24	1.989	21
18	Consultant/ Designer	Preparation and approval of drawings	2.521	2	2.467	1	2.656	1	2.383	4	2.495	1
19		Waiting time for sample/materials approval	2.106	18	2.000	14	1.938	20	2.022	23	2.054	19
20		Waiting time for site inspection and approval of quality control tests/results	1.913	27	1.727	26	1.969	19	1.870	30	1.822	30
21		Change in drawings	1.896	29	1.978	15	1.938	20	2.064	22	1.935	23
22		Change in specifications	1.979	21	1.800	24	1.813	24	1.915	27	1.892	26
23		Incomplete drawings/specifications/documents	2.298	9	1.978	15	2.188	11	2.130	19	2.141	15
24		Design error due to unfamiliarity with the local conditions, environment, and the materials	1.851	30	1.622	29	1.625	31	1.804	32	1.739	32
25	Owner	Change order	1.696	33	1.698	27	1.581	32	1.727	36	1.697	35
26		Slowness of the owner's decision-making process	2.417	4	2.378	2	2.375	3	2.457	2	2.398	3
27		Materials type and specification change during the construction	2.191	13	2.111	11	2.094	14	2.239	12	2.152	14
28	Owner	Excessive bureaucracy/uncooperative owner	2.128	16	1.933	18	2.032	16	2.146	18	2.033	20
29		Unrealistic contract duration imposed by the client	2.104	19	2.070	12	2.063	15	2.261	10	2.088	18

**Table 2** Continued

S.No	Category	Causes of delay	Contractors		Consultants		5–10 years		≥10 years		Overall	
			RII	Rank	RII	Rank	RII	Rank	RII	Rank	RII	Rank
30	Financial	Financing by contractor during construction	2.170	14	2.356	3	2.281	7	2.304	7	2.261	10
31		Delays in contractor's progress payment (of completed work) by owner	2.250	11	2.133	10	2.125	12	2.217	13	2.194	13
32		Late payment to subcontractor by the main contractor	1.935	25	2.023	13	1.806	25	2.067	21	1.978	22
33	Planning and scheduling	Inadequate early planning of the project	2.522	1	2.333	4	2.250	9	2.435	3	2.429	2
34		Lack of data in estimating the activity duration and resources	1.957	24	2.000	14	1.806	25	2.149	17	1.978	22
35		Overestimation of the productivity	1.979	22	1.864	21	1.774	26	2.087	20	1.924	24
36		Inadequate progress review	1.553	36	1.867	20	1.625	31	1.795	33	1.707	34
37		Unavailability of the construction/project management group for the project	1.915	26	1.932	19	1.903	22	1.978	26	1.923	25
38		Lack of communication and coordination between the parties involved in construction (contractor–subcontractor–consultant–owner)	2.383	7	1.867	20	2.031	17	2.191	15	2.130	16
40	Government regulations	Contract modifications	1.696	33	1.619	30	1.906	21	2.239	12	1.659	36
41		Obtaining permit/approval from the municipality/different government authorities.	2.383	7	2.159	9	1.548	33	1.756	34	2.275	9
42		Transportation permit	1.467	37	1.372	34	2.226	10	2.217	13	1.420	39
43	Unforeseen conditions	Subsurface soil condition (geological problem/water table problem, etc.)	1.830	31	1.750	25	1.300	36	1.533	39	2.261	10
44		Weather conditions (mainly high temperature)	1.429	38	1.378	33	1.677	29	1.894	29	2.194	13

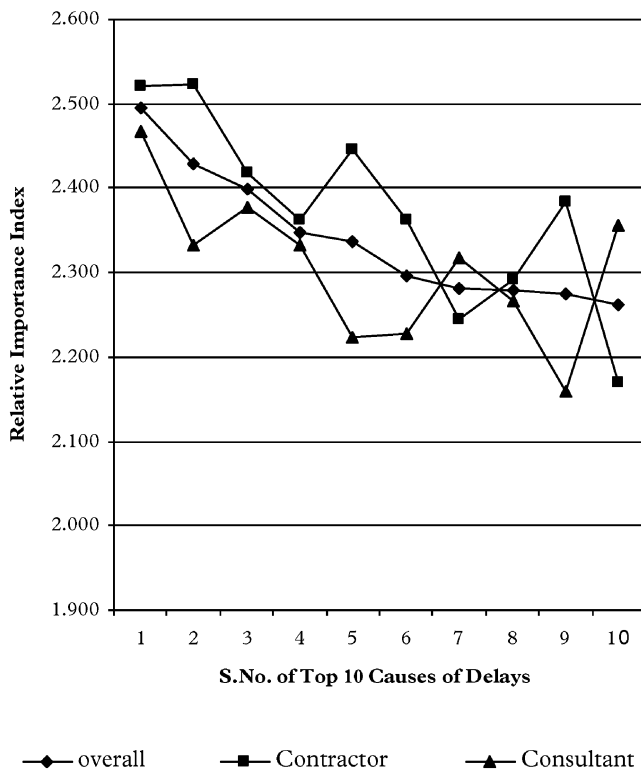
**Table 3** Ten most significant causes of delays in the UAE construction industry

Causes of delay	Rank	RII
Preparation and approval of drawings	1	2.495
Inadequate early planning of the project	2	2.429
Slowness of the owner's decision-making process	3	2.398
Shortage of manpower	4	2.348
Poor supervision and poor site management	5	2.337
Productivity of manpower	6	2.297
Skill of manpower	7	2.281
Non-availability of materials on time	8	2.280
Obtaining permit/approval from the municipality/different government authorities	9	2.275
Financing by contractor during construction	10	2.261

causes. Shortage of resources is also found to be a major factor contributing to the delay. Shortage of manpower, productivity of manpower and the skill of manpower are among the 10 most significant causes of delays.

The analysis of the data shows that based on contractors' points of view, eight of the top 10 causes of delays are from the overall top 10 causes of delays. Whereas all the top 10 causes of delays based on consultants' perspectives are found to be among the overall top 10 causes. The comparative profiles of 10 most significant causes of delays in terms of their rank and RII are shown in Figure 1 and Figure 2.

Although some of the major causes of delays for the UAE construction industry follow the same trend as found in earlier research (such as preparation and approval of drawings, financing, etc.), it is found that the productivity, skill and the shortage of manpower have emerged as the major causes of delays now. While

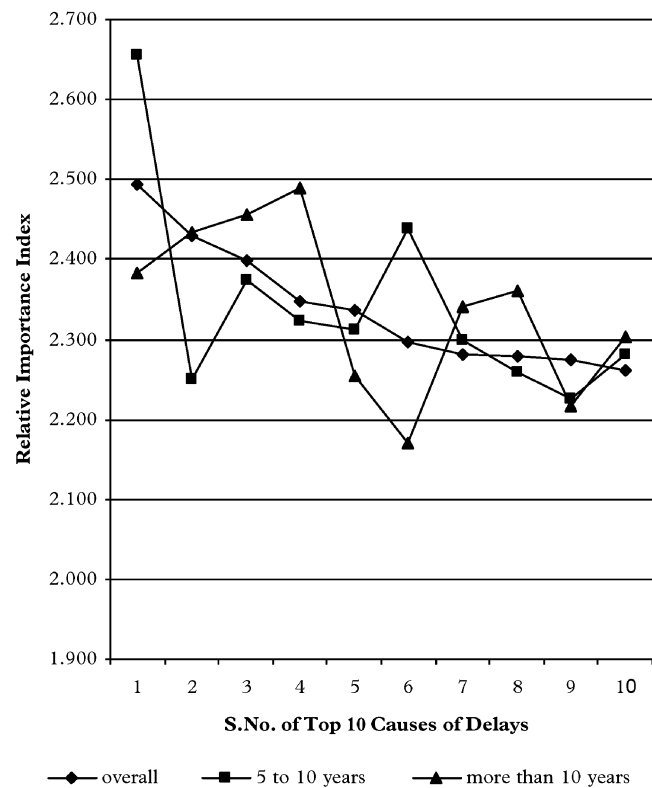


**Figure 1** Comparative profiles of overall 10 most significant causes of delays in terms of RII with respect to contractors and consultants

causes related to proper communications were some of the major causes of delays based on earlier research, these are not the major causes of delays at present for UAE construction. It is also observed that most of these top 10 causes of delays are experienced during the construction phase.

### Comparative study

For a fair comparison, it was essential to correlate similar causes of delays for UAE, the Kingdom of Saudi Arabia (KSA) and Lebanon, and synchronise them to do the comparative study so that each of the significant causes reflects the most representative cause of delays for all the three countries. This was necessary because each of the researchers had identified the causes of delay based on the local conditions and the prevailing problems. A similar study was done for the construction industry of Eastern province of Saudi Arabia (Assaf *et al.*, 1995) and for Lebanon (Mezher and Tawil, 1998). The causes of delays, their ranking, analysis, and the results of the above-mentioned two pieces of research were studied carefully, to extract the rank of the causes of delay corresponding to the causes of delay in the UAE construction industry.



**Figure 2** Comparative profiles of overall 10 most significant causes of delays in terms of RII with respect to the respondent's years of experience

It is observed that only three of the top 10 causes of delays of KSA are found to be significant for the UAE construction industry as per the contractors (Table 4) as well as consultants (Table 5). These three causes from KSA are preparation and approval of drawings, slowness of the owner's decision-making process and non-availability of the materials on time. The remaining top seven causes of delays for the UAE construction industry have been ranked comparatively lower in KSA. Some of the other causes of delay in UAE, like obtaining permit/approval from the municipality/different government authorities (Rank 7) and productivity of manpower (Rank 8) which are found to be very important, are almost of no concern (Rank 49 and 55 respectively) for the contractors of KSA. On the other hand, slowness of the owner's decision-making process and financing by the contractor during construction have been ranked higher (Rank 2) by the consultants of KSA, and are in line with the consultants of UAE who have given a similar ranking for above two causes. Delays in contractor's progress payment (of completed work) by owner is also a cause of concern for the consultants of both the countries. Again, the productivity of manpower, which is among the most significant causes of delay in UAE as per the consultants'



**Table 4** Contractors' perspective: ranking of 10 most significant causes of delays in UAE and their corresponding ranking in KSA and Lebanon

Causes of delays	Rank as per contractors' perspective		
	UAE	KSA	Lebanon
Inadequate early planning of the project	1	16	11
Preparation and approval of drawings	2	1	3
Poor supervision and poor site management	3	16	11
Slowness of the owner's decision-making process	4	5	1
Shortage of materials on site	5	10	19
Conflict between contractor and the consultant	6	13	11
Obtaining permit/approval from the municipality/different government authorities	7	49	4
Lack of communication and coordination between the parties involved in construction (contractor-subcontractor-consultant-owner)	7	23	11
Productivity of manpower	8	55	27
Shortage of manpower	8	28	59
Incomplete drawings/specifications/documents	9	18	
Unsuitable leadership style of construction/project manager	9	36	17
Non-availability of materials on time	10	7	20

perspective, also, has been of no concern (Rank 49) for KSA construction industry.

These discrepancies in the ranking for the productivity of manpower for these two countries may be due to the fact that the construction industry of KSA is well established whereas the UAE construction industry is still on the learning curve. As the culture and the working environment for both the countries are similar, this is reflected in the form of similar rankings given by the construction professionals from both the countries, for the slowness of the owner's decision-making process and the preparation and the approval of drawings by the consultants.

A further analysis shows that, as per Lebanon's contractors' point of view, only three of the top 10 significant causes of delay are found to be among top

10 causes of construction delays in UAE. Slowness of the owner's decision-making process, preparation and approval of drawings and obtaining permit/approval from the municipality/different government authorities are the only three causes from Lebanon that are of much concern in UAE also. Besides the above causes, the Lebanon's consultants, similar to UAE consultants, have ranked unsuitable leadership style of construction/project manager.

Again, productivity and the shortage of manpower, which is of great concern for UAE consultants as well as contractors, have been ranked very low by the contractors and the consultants of Lebanon. This is due to the fact that foreign labourers are easily available in Lebanon from the regional and neighbouring countries. Also, there is huge demand on manpower

**Table 5** Consultants' perspective: ranking of 10 most significant causes of delays in UAE and their corresponding ranking in KSA and Lebanon

Causes of delays	Rank as per consultants' perspective		
	UAE	KSA	Lebanon
Preparation and approval of drawings	1	11	1
Slowness of the owner's decision-making process	2	2	9
Financing by contractor during construction	3	2	26
Shortage of manpower	4	27	54
Inadequate early planning of the project	4	16	9
Skill of manpower	5	27	9
Non-availability of materials on time	6	16	6
Productivity of manpower	7	49	32
Poor supervision and poor site management	8	11	20
Obtaining permit/approval from the municipality/different government authorities	9	21	47
Unsuitable leadership style of construction/project manager	10	24	2
Delays in contractor's progress payment (of completed work) by owner	10	5	20

due to the number and magnitude of current projects. Obtaining permit/approval from the municipality/different government authorities (Rank 9 for UAE) is not significant at all (Rank 47) as per the perspective of Lebanon's consultants.

## Conclusions

A total of 93 construction professionals from the UAE construction industry participated in this study and provided their expert opinion in the form of their response by completing the questionnaire survey. Most of the respondents participating in this research believe that preparation and approval of drawings, slowness of the owner's decision-making process and inadequate early planning of the project are the major causes of delay in UAE construction projects. Shortage, skill and the productivity of manpower also play a vital role in construction delays. Conflict between contractors and the consultants is a major cause of concern from the contractors' point of view, where it is fairly insignificant in the overall analysis. Lack of communication and coordination between the parties involved in construction (contractor-subcontractor-consultant-owner) also follows the same trend.

Delay is a major problem in the UAE construction industry and worldwide. Project participants should be familiar with these significant causes of delays and plan to avoid or at least mitigate their impact on project success. Some recommendations that will help the UAE construction professionals in minimising constructions delays and their impacts are presented.

- (1) There must be an agreed schedule (between contractors and consultants) for preparation, submittal and approval of drawings which should be strictly followed.
- (2) Owners should incorporate requirements for scheduling and schedule control in the contract documents.
- (3) There is an urgent need for the involvement of construction management companies to help minimise delays or their impacts.
- (4) Better human resource management can help improve labour skills and productivity. Companies should invest in the training and development of their employees.
- (5) Contractors need to act early to obtain permits and approvals from the different government agencies.

There is very strong agreement between the contractors and the consultants for some of the most significant causes of delay. Many of the significant

causes of construction delays for UAE have turned out to be related to manpower. This may be due to the fact that higher wages (compared to the neighbouring countries) in the UAE construction industry have compelled contractors to curtail this resource to compensate others. It is also found that the culture of supervision, approval and coordination need to be revitalised for the UAE construction industry. The comparative study reveals that the causes of delay for the UAE construction industry vary significantly from the causes of delays for KSA and Lebanon. Most of the top 10 causes of delay for KSA and Lebanon are found to be insignificant for the UAE construction industry except a few causes, like slowness of the owner's decision-making process and the preparation and approval of drawings.

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