Identification of Delay Factors from Mecca's Construction Experts Perspective

Nashwan Al-Emad [1], Sasitharan Nagapan[2]

[1,2] Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja – Batu Pahat, Johor, Malaysia.

Corresponding emails: df080116@gmail.com

Received 11-07-2015; Revised 29-08-2015; Accepted 15-09-2015

Abstract

Delay in construction project is a common phenomenon in construction industry project where there are numerous studies on this issue that identified the factors causing the delay. This paper presents a study on identifying significant delay factors encountered by construction practitioners in Mecca city. A total of 81 delay factors were identified from seven research articles on construction delay study conducted in several parts of Saudi Arabia. These factors were included in the questionnaire form where this questionnaire was distributed amongst the construction experts who involved in the current construction projects in Mecca. The survey was carried out by interviewing 28 selected experts, who are from consultant, contractors and project management's parties. The collected data were analyzed by using Average Index method for each factor and these factors were ranked based on the index to determine its significance to the delay. The result found that the most six significant factors are Changes in design documents, Low productivity level of labour, Shortage of manpower, Difficulties in financing project by contractor, Poor contract management, and Unqualified workforce. The results of this research are helpful to the construction community in avoiding any potential delay for their future construction projects in order to achieve successful construction projects.

Keywords: *Mecca, Construction Industry, Delay Factors*

1.0 Introduction

Saudi Arabia is the largest construction markets in the Middle Eastin bothof its public and private sectors. Where the public sector pertains to the government ministries responsible for infrastructure and national development projects and the private sector comprises the construction projects privately owned or subsidized either by a family corporation or a conglomerate [1]. Saudi Arabia's construction industry is considered the second-largest sector that contributes in the economy of the countryafter oil. It is experiencing rapid expansion, with no shortage of contracts in any segment either from the housing and utilities to transport infrastructure. The public spending is driving the contracting industry forward [2]. According to the Saudi Ministry of Planning, the construction industry contributed between 30% to 40% of the non-oil productive sectors at the end of each National Development Plan from 1980 to 2000 [3].

Mecca city is the most populous city in Saudi Arabia and is located in western part of Saudi Arabia. It has an area of 1200 km² and a population of 1,675,000 people. Mecca city is considered the holiest site for Muslims all across the world, due to the presence of the Al-Haram Mosque which in its premises contains the "Kaaba" where Muslims are required to perform Hajj at least once in their lives, where Umrah is optional in the city Mecca.

Due to the religious significance of the Al-Haram mosque, Muslims from across the globe travel to the city of Mecca for performing annual Hajj. Mecca city receives around 2 million pilgrims during annual Hajj and for the rest of the year more than 20 million people visit the city for performing Umrah, the real estate, infrastructure, hospitality and retail sectors are among those

most likely to benefit. Demanding for hotel rooms in the city of Mecca is very high, especially during Ramadan and Hajj season. The hotels are usually fully occupied during these seasons. Mecca currently has a total of 650 hotels comprising of 125,000 rooms which can roughly accommodate 500,000 pilgrims [4]. However, with availability of hotels Mecca city still has lack of sufficient rooms to accommodate the visitors. Majority of Mecca's old buildings and architecture was reduced to rubble and replaced with numerous of mega structural projects around Al-haram mosque.

A number of mega and popular projects are available and constructing in Mecca city, the Abraj Kudai, currently under construction is the largest hotel in the world expected to open its doors in 2017. The Grand Mosque is now loomed over by the third tallest building in the world, the Abraj Al-Bait (Makkah Royal Clock Tower Hotel), home to thousands more luxury hotel rooms. The western edge of the city the Jabal Omar development project now rises, a sprawling complex that will eventually accommodate 100,000 people in 26 luxury hotels – sitting on another gargantuan plinth of 4,000 shops and 500 restaurants, along with its own six-story prayer hall. Furthermore, The Grand Mosque is undergoing expansion to double the capacity of its prayer halls – from 3 million worshippers currently to nearly 7 million by 2040. Planned like a vast triangular slice of cake, the extension goes so far back that most worshippers won't even be able to see the Kaaba. Figure 1 shows the actual shape after completion of Grand Mosque and surrounded by high rise towers.

Figure 1*:* Grand Mosque with high rise towers

2.0 Construction Delay Factors

One of the majors issues engulf the construction industry is delay in completing the project within the specific/agreed duration. Delay in construction projects is considered one of the most common problems causing a multitude of negative effects on the project and its participating parties [5]. In construction, delay is defined as "the time overrun either beyond completion date

specified in a contract, or beyond the date that the parties agreed upon for delivery of a project [6]. In other study, it is defined as postponing the project completion time due to predicted and unpredicted causes [7]. According to [8] delay is a slowing down of work without stopping it entirely. It is also refers to the long construction period due to the problems that occurred during the implementation of the project [9].

In this study, construction delay factors were identified through a comprehensive literature review where 81 factors were determined from seven research articles related to construction delay issues conducted in several parts of Saudi Arabia.

3.0 Data Collection

A questionnaire survey among the construction practitioners in Mecca city was carried out to acquire their judgment on the degree of significance of each identified delay factor. The factors were identified from past researchers which may not be significant or applicable to Mecca city construction industry. Thus, this survey amongst the experts will give the insight perspective of construction industry in Mecca city. The questionnaire survey was distributed amongst the selected construction experts who involved in the current construction projects in Mecca city. The survey was carried out by interviewing 28 selected experts, who are from consultants, contractors and project management's parties.

The questionnaire form comprised of two parts: respondents' demographic attributes which include the type and size of the project handled, qualification, working experience of the respondents and their position within the organization. The demography of selected respondents is illustrated in the Figures 2 to 6. In the second part; it includes the list of factors causing delay which were identified from literature review. Respondents were requested to indicate the level of significance on the identified 81 delay factors using a 5-point Likert scale which is indicated with 1 as not significant, 2 as slightly significant, 3 as moderately significant, 4 as very significant and 5 as extremely significant.

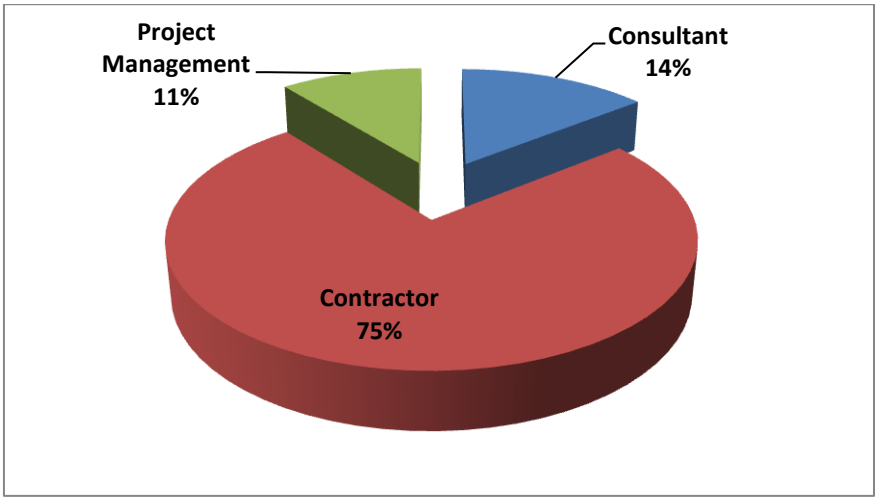

Figure 2: Respondents demography

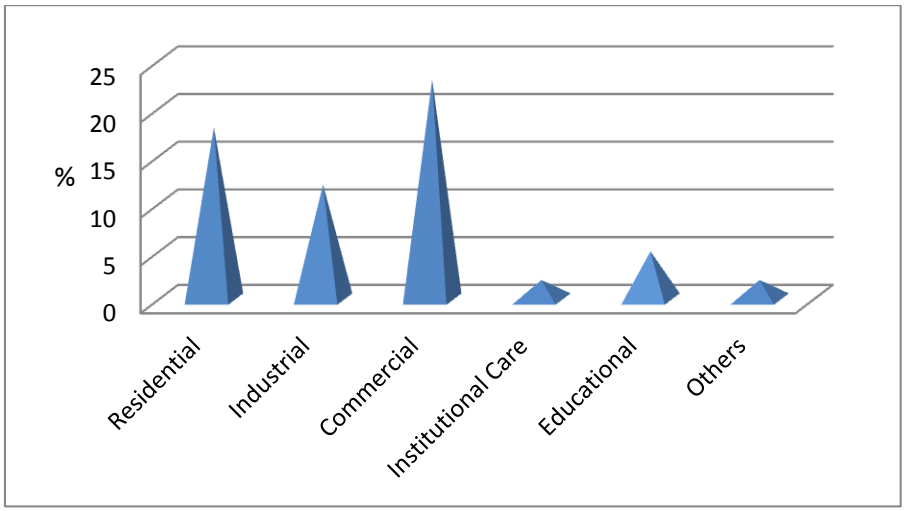

Figure 3*:* Percentage (%) of projects undertaken by the respondents'company

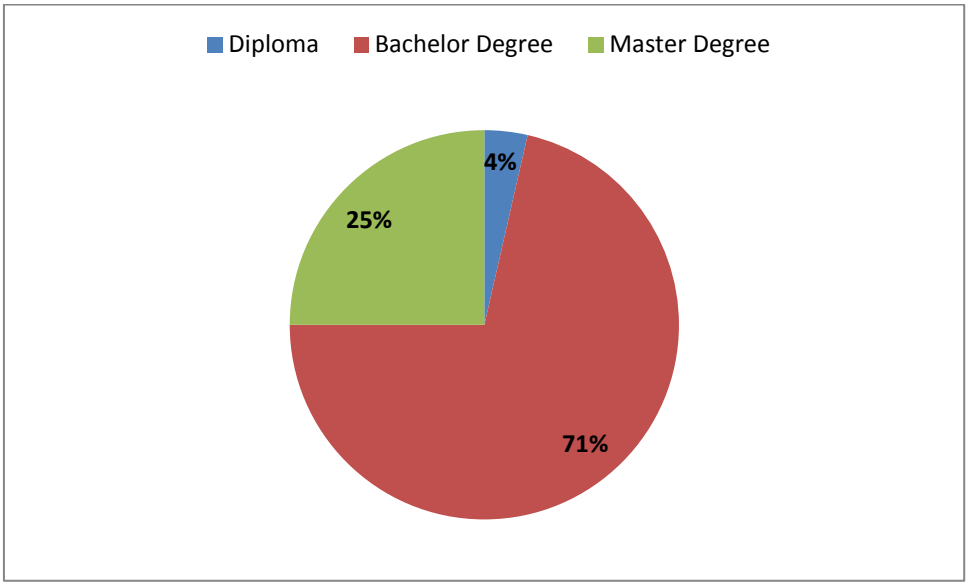

Figure 4*:* Academic qualifications of the selected respondents

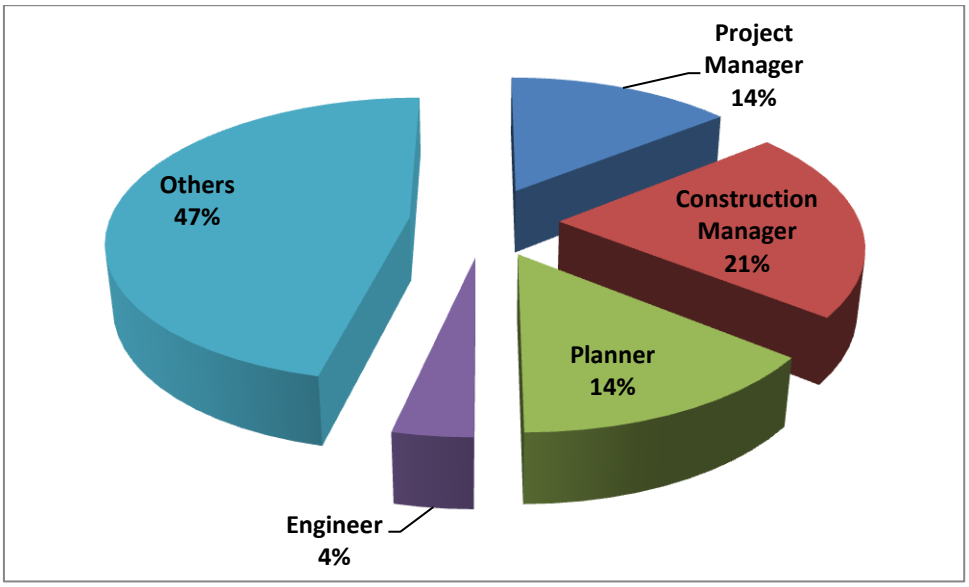

Figure 5*:* Respondents' position in their company

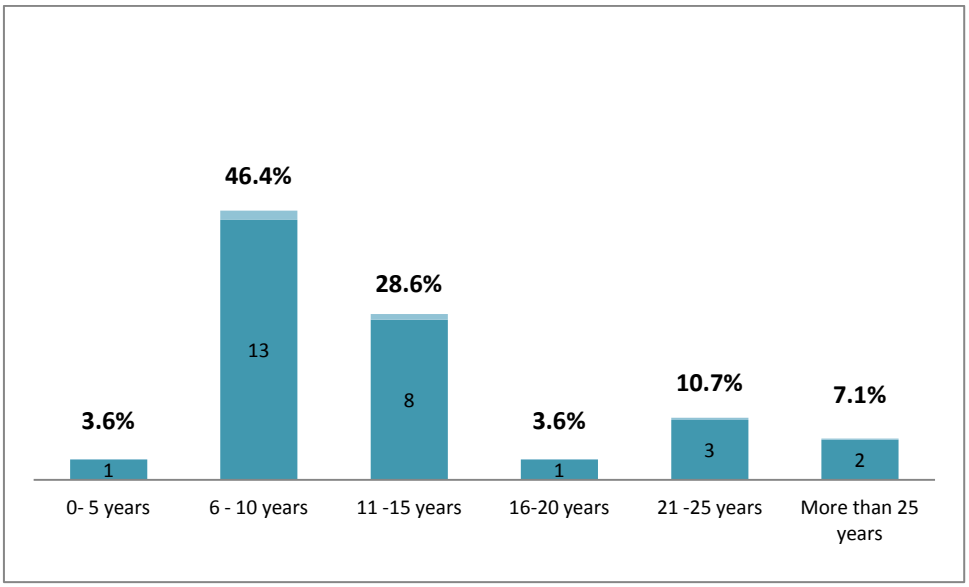

Figure 6*:* Working experience of selected respondents

Figures 2 to 6 of the respondents' demography indicate that most of the selected respondents are eligible in giving their expert opinion regarding the delay factors experienced in the construction projects around the Mecca city.

4.0 Analysis of Delay Factors

Collected data from the survey was analysed using Average Index (AI) method for each the delay factor. The generated average index will determine the degree of significance of each of the factor. The average index is calculated using the formula from [10]

$$\text{Average Index, } AI = \frac{\sum(1X_1 + 2X_2 + 3X_3 + 4X_4 + 5X_5)}{N} \quad (1)$$

Where,

N= Number of respondents,

X_1 = No. of respondents for "Not Significant"

X_2 = No. of respondents for "Slightly Significant"

X_3 = No. of respondents for "Moderately Significant"

X_4 = No. of respondents for "Very Significant"

X_5 = No. of respondents for "Extremely Significant"

Theaverage Index value calculated for each identified factor causing construction delay as presented in Table 1.

Table 1: Average Index for each identified construction delay factors

No.	Factors Causing Construction Delay	AI
1	Unrealistic contract duration	3.79
2	Unrealistic requirements imposed	2.57
3	Type of construction contract	3.14
4	Overdependence on the lowest tender amount in contractor selection	3.43
5	The scope of the project is not well defined	2.50
6	Inadequate project structure	3.04
7	Poor contract management	4.00
8	Inadequate early planning of the project	3.86
9	Inadequate early scheduling of the project	3.50
10	lack of teamwork	3.75
11	Interference by owner in the construction operations	2.96
12	Late in approving design documents by owner	3.61
13	Excessive bureaucracy by owner's administration	3.25
14	Suspension of work	3.04
15	Delay in approving shop drawings	3.46
16	Delay in approving material samples	3.43
17	Variations orders	3.39
18	Delay in issuance of change orders	3.46
19	Slowness of the owner's decision-making process	3.54
20	Owner's lack of experience in construction business	3.43
21	Delay in progress payment by owner	3.82
22	Poor coordination between owner and other parties	3.39
23	Poor communication between owner and other parties	3.64
24	Owner's failure to coordinate with Government authorities during planning stage	3.46
25	Rework due to poor quality works by contractor	3.29
26	Ineffective planning of project	3.68
27	Ineffective scheduling of project	3.79
28	Poor site management	3.71
29	Poor sit supervision	3.54
30	Frauds practices by contractor	2.68
31	Inaccurate technical study of projects timeby contractor during the bidding stage	3.64
32	Poor qualification of contractor's staff assigned to the project	3.50
33	Shortage of technical professionals in the contractor's organization	3.61
34	Inadequate Contractor experience	3.36
35	Ineffective monitoring of the project progress by the contractor	3.57

36	Ineffective controlling of the project progress by the contractor	3.54
37	Incompetent subcontractors	3.50
38	Delay in preparation of shop drawings	3.89
39	Delay in preparation of submissions	3.68
40	Difficulties in financing project by contractor	4.07
41	Poor communication between contractor and other parties	3.36
42	Poor coordination between contractor and other parties	3.64
43	Delay in performing inspection	3.14
44	Delay in approving major changes in the scope of work	3.61
45	Delay in approving shop drawings	3.61
46	Late in approving design documents by consultant	3.43
47	Design changes by consultant	3.43
48	Poor qualification of consultant engineer's staff assigned to the project	3.75
49	Inadequate consultant experience	3.75
50	Mistakes in design documents	3.96
51	Changes in design documents	4.18
52	Delays in producing design documents	3.79
53	Inadequate details provided in drawings	3.68
54	Insufficient data collection and survey before design	3.93
55	Complexity of project design	3.32
56	Poor communication between consultant and other parties	3.39
57	Poor coordination between consultant and other parties	3.64
58	Delay in materials delivery	3.71
59	Late procurement of materials	3.82
60	Changes in material types during construction	3.21
61	Changes in material specifications during construction	3.39
62	Shortage of construction materials in market	3.36
63	Equipment availability	3.32
64	Shortage of equipment	3.25
65	Lack of high-technology mechanical equipment	3.11
66	Delay in equipment delivery	3.54
67	Shortage of manpower	4.11
68	Unqualified workforce	4.00
69	Low productivity level of labour	4.18
70	Labour Absenteeism	3.00
71	Effects of subsurface conditions	3.18
72	Delay in obtaining permits from Municipality	3.46
73	Bureaucracy in Government agencies	3.25
74	Effect of weather	3.21
75	Effect of social factors	2.89
76	Effect of cultural factors	2.96
77	Traffic control of the project	3.11
78	Logistic: Access to site	3.50
79	Changes in government regulations and laws	3.21
80	Economic instability	2.11
81	Political insecurity	2.04

Table 1 shows all the delay factors that were considered in this study together with their average index values ranging from as low as 2.04 up to 4.18. While Table 2 shows the 5 most significant factors of construction delay ranked by the experts of construction industry from Mecca city based on the average index values. However in the 5th place, there are two factors having the same average index of 4.00, then the number of factors considered to be most significant became 6 in

which the factors are Changes in design documents, Low productivity level of labour, Shortage of manpower, Difficulties in financing project by contractor, Poor contract management, and Unqualified workforce.

Table 2: Top significant factors causing construction delay

No.	Factors Causing Construction Delay	AI	Ranking
1	Changes in design documents	4.18	**1**
2	Low productivity level of labour	4.18	**2**
3	Shortage of manpower	4.11	**3**
4	Difficulties in financing project by contractor	4.07	**4**
5	Poor contract management	4.00	**5**
6	Unqualified workforce	4.00	**6**

Based on the Table 2, the 6 factors are elaborated in more details in accordance with the first author experiences working in Mecca city as civil engineer and also the findings from researchers who had carried out similar research in Saudi Arabia construction industry.

Changes in design documents: This factor together with Low productivity level of labour have a same score of 4.18 and can be ranked either 1st or 2nd in term of their degree of significance rated by the experts. This factor inhibits the ability to control time of projects. As a result of design changes, it will automatically give negative effect to time of project. This is true where any changes of design will affect the duration of the project; it also causes the rework of completed item, thus leads to extension of project.This finding concurrently matches with the findings on eastern region of Saudi Arabia construction industry carried out by [6, 11, 12].

Low productivity level of labour: Low productivity level of labour is certainly affects the activity duration and consequently the total project duration. Poor productivity will increase the actual time for a specific activity to be completed and thus, the project will delay. This result is in line with the result found on northern region of Saudi Arabia construction industry conducted by [13].

Shortage of manpower: According to this study, this factor is considered the 3rd most significant contributor to construction delay with average index value of 4.11. Other research works [11, 14, 15] also found that shortage of manpower as an important causes of delay in construction. This is certainly true for Saudi Arabia where the locals are not willing to work on construction site. This has resulted to contractors importing labour and therefore reducing their ability to judge the level of skill of their employees. Thus, the quality of labour available is generally quite poor, which leads to low productivity and poor quality of work. There has also been an unstable workforce in the Saudi Arabian construction industry. This finding is in line with the study conducted by [3] in Saudi Arabia.

Difficulties in financing project by contractor: This the 4thsignificantfactorfound from this study with average index of 4.07. This factor is certainly true for contractors where they are required to start the work once been awarded and this requires initial financing for that matter before the payment from the clients can be disbursed. Hence, adequate cash flow and financial stability of contractors is very critical in keeping construction progress as planned. This finding concurrently matches with the findings on eastern region of Saudi Arabia construction industry done by [3, 6, 11, 12].

Poor contract management: According to the findings of this study poor contract management together with unqualified workforce were agreed by all respondents to have same value of average index of 4 and can be ranked either 5th or 6th in term of their level of significance rated by the construction experts.Competentand professional project team plays a key role to a

successful project and to prevent the project from facing construction delay. Poor contract management is usually caused by lack of management skills and shortage of professional experts among the project practitioners. As a result of poor contractual skills the project could experience negative effects to duration of project.

Unqualified workforce: In this study unqualified workforce was indicatedas one of the significant contributors to the construction delay in Mecca city. Lack and un-availability of adequate numbers of skilled labour, the project will encounter improper execution of the works and rework will be experienced, this will lead to negative impacts in construction progress and consequently time delay will be experience. This findings match with the result found by [6] on eastern region of Saudi Arabia construction industry.

5.0 Conclusion

Delay is a major concern to the parties who are involved in construction projects. There are numerous researches that were conducted on this issue including the causative factors to the delay. However, this study explores Mecca construction industry which presently experiences tremendous construction development in providing accommodation to the pilgrims regarding the delay issue. From the identified 81 delay factors, the selected 28 experts who are involved in construction project in Mecca city had participated in giving their opinions on rating the factors and the analysis found six most significant factors contributing to construction delay in Mecca city are Changes in design documents, Low productivity level of labour, Shortage of manpower, Difficulties in financing project by contractor, Poor contract management, and Unqualified workforce.The findings of this study will assist construction practitioners to control any potential delay for their future construction project in order to achieve successful completion of construction projects within the stipulated times.

Acknowledgement

The authors would like to thank University Tun Hussein Onn Malaysia for supporting this study. Also we are thankful to construction practitioners for providing comprehensive and important information and a lot of cooperation which made data collection easier.

References

[1] Al-Sedairy S.A change management model for Saudi construction industry. International Journal of Project Management 19(3): 161-169, (2001).
[2] Oxford Business Group.The Report: Saudi Arabia, (2010).
[3] Al-Kharashi, Adel and Skitmore and Martin .Causes of delays in Saudi Arabian public sector construction projects, Construction Management and Economics, 27(1), 3-23, (2009).
[4] Aljazira Capital Company. Company's annual report No. 13/229, December (2013).
[5]M. E. Abd El-Razek, H. A. Bassioni and A. M. Mobarak.Causes of Delay in Building Construction Projects in Egypt.JournalOf Construction Engineering and Management November 2008 / 833, (2008).
[6] Assaf, S. A., and Al-Hejji, S. Causes of Delay in Large construction Projects .International Journal of Project Management, 24, 349-357, (2006).
[7] Hasan, R., Suliman, S. M. A., &Malki, Y. Al. An investigation into the delays in road projects in Bahrain .International Journal of Research in Engineering and Science (IJRES), 2(2), 38–47, (2014).
[8] Pai, S. K., &Bharath, J. R. Analysis of Critical Causes of Delays in Indian Infrastructure Projects. International Journal of Innovative Research & Development, 2(3), 251–263, (2013).
[9] Kikwasi, G. J. Causes and effects of delays and disruptions in construction projects in Tanzania. Australasian Journal of Construction Economics and Building, Conference Series, 1(2), 52–59, (2012).
[10] Aftab Hameed Memon. Structural Modelling Of Cost Overrun Factors In Construction Industry. Phd thesis, University Tun Hussein Onn Malaysia,(2013).
[11] S.A. Assaf, M. Khalil, and M. Al-Hazmi.Causes of delay in large building construction projects. Journal of Management and Engineering, 11(2), 45-50,(1995).
[12] M. Al-Khalil and M. A. Al-Ghafl. Delay in public utility projects in Saudi Arabia. International Journal of Project Management, 17(2), 101-106,(1999).

[13] Ibrahim Mahamid. Contributors To Schedule Delays In Public Construction Projects In Saudi Arabia: Owners' Perspective. Journal of Construction Project Management and Innovation Vol. 3 (2): 608-619, (2013).
[14] Odeh, A. M., &Battaineh, H. T. Causes of construction delay: traditional contracts. International Journal of Project Management, 20(1), 67-73,(2002).
[15] ArshiShakeelFaridi and SamehMonir El-Sayegh.Significant factors causing delay in the UAE construction industry. Construction Management and Economics (November 2006) 24, 1167–1176