MEASURES FOR MITIGATING THE DELAY IN HIGH-RISE BUILDING CONSTRUCTION PROJECTS IN DUBAI

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A project report submitted in partial fulfilment of the requirement for the award of the Degree of Master of Civil Engineering

Faculty of Civil and Environmental Engineering
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DEDICATION

I dedicate this to Allah Almighty my creator my strong pillar, my source of inspiration, wisdom, knowledge and understanding. He has been the source of my strength throughout this program and on His wings only have I soared. I also dedicate this work to my beloved parents and teachers for their prayers and support.
ACKNOWLEDGEMENT

My deepest gratitude goes to Allah SWT who has provided all that was needed to complete this project and the program for which it was undertaken for. There was never lack or want. Throughout this entire study, He took care of everything that would have stopped me in my tracks and strengthened me even through my most difficult times.

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ABSTRACT

Construction industry faces several challenges such as low labour productivity, cost overrun, time overrun, and extreme weather condition. Globally, the most severe challenge is project delay, particularly in Dubai where the construction industry is booming rapidly than other parts of the world, especially in high-rise building construction projects. Hence, objectives of this research are to identify the factors causing delay, to determine the significant factors and their mitigation measures, and to assess relationship between significant factors of delay and their mitigation measures. This study consists of two stages. In stage one, based on 56 common factors causing delay in construction projects identified from literature review, a questionnaire survey was designed and distributed to 100 respondents among the construction practitioners. Through SPSS version (20) analysis, 11 out of 56 common factors were found to be significant factors causing delay. In stage two, a preliminary study was initially carried out by developing a semi-structured questionnaire which was distributed among 30 construction experts in order to determine the mitigation measures for each of 11 significant delay factors. The 44 mitigation measures associated respectively with each of the 11 significant factors were then utilized in the development of final questionnaire. This finalized questionnaire was distributed among 100 construction experts of high-rise building construction projects in order to assess the relationship between significant factors and their mitigation measures. It was unveiled from bivariate analysis of Pearson correlation coefficient that relationship between significant factors and their mitigation measures has very significant, positive and linearly correlated with each other. This research would be helpful for all construction practitioners who are involved in high-rise building construction projects in mitigating the relative delay to the project. Thus, it will directly benefit the construction community and contribute in raising the economy of the country.
ABSTRAK

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<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>OBOR</td>
<td>One Belt One Road</td>
</tr>
<tr>
<td>BMI</td>
<td>Building Management Institute</td>
</tr>
<tr>
<td>CTBUH</td>
<td>Council on Tall Buildings and Urban Habitat</td>
</tr>
<tr>
<td>MENA</td>
<td>Middle East North Africa</td>
</tr>
<tr>
<td>AECOM</td>
<td>American Engineering multinational Corporation</td>
</tr>
<tr>
<td>DM</td>
<td>Dubai Municipality</td>
</tr>
<tr>
<td>RTA</td>
<td>Road and Transport Authority</td>
</tr>
<tr>
<td>DEWA</td>
<td>Dubai Electric and Water Authority</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
</tr>
<tr>
<td>FIDIC</td>
<td>International Federation of Consulting Engineers</td>
</tr>
<tr>
<td>DF</td>
<td>Delay Factor</td>
</tr>
<tr>
<td>bn</td>
<td>Billion</td>
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<tr>
<td>Mn</td>
<td>Million</td>
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<td>m</td>
<td>meter</td>
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<td>US Dollar</td>
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<td>£</td>
<td>Pound Sterling</td>
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CHAPTER 1

INTRODUCTION

1.1 Scenario of construction industry

Construction industry is one of the important industries which contribute significantly to the economy development of a country. It is a highly dynamic sector that plays vital role for the socio-economic growth of country (Al-Emad & Nagapan, 2015). It enhances the quality of life surrounding community by providing necessary facilities such as roads, hospitals, schools, hotels and other. Thus, it is important to complete construction projects within the time, budget and desired quality.

The construction industry is among one of the world's largest industries as it shares for roughly 11% to 13% of the world’s Gross Domestic Product (GDP) and employing around 180 million people or 7% of the global employment (Jones, 2014).

According to Chris Rhodes (2015), UK’s construction industry share in 2014 was £103 billion, which is 6.5% of total economy. There were 2.1 million jobs in construction industry and 6.2% of total population.

As reported in Canada Economy (2017), the construction industry of Canada shares 11.3% of GDP in economy of country.

Qatar’s construction industry shared 9.80% in GDP of total economy (Mohammed 2017).

As reported by AECOM (2017), Asian construction markets are estimated to be largest in the world. Currently around USD 3.9 trillion as of June 2017 and it is expected to grow at a rate of 4.7% annually between 2017 and 2021.

However China is considered as the largest construction market in Asia and is expected to grow by 5.1% annually between 2017 and 2021.
China’s one belt one road (OBOR) initiative is considered a key driver in infrastructure development in Asia. It includes mega projects such as the China-Pakistan economic corridor project valued at over USD 60 billion. This project was launched to promote infrastructure development and connectedness between two countries.

Building management institute AECOM (2017) estimates the projects in pipeline for middle east & north Africa (MENA) to be around USD 1.6 trillion. Where Egypt has projects of worth USD 160 billion, Saudi Arabia has project of worth USD 328 billion and the UAE has the largest project pipeline estimated at USD 427 billion.

UAE is seen by many investors as one of the most attractive countries in the world. BMI estimates that the UAE construction industry will grow at an average rate of 6% between 2017 and 2020 before slowing down at a rate of 4.6% between 2021 and 2026. Hence maximum portion of budget is allocated for Dubai construction projects of worth USD 364.79 billion out of USD 427 billion.

Construction industry is considered as the backbone for the prosperity and development of any country. There are many challenges faced by construction industry of UAE like competitive market, shortage of skilled labor force, material shortage, lower oil prices, very hot weather, due to these challenges in construction industry more than 90% of infrastructure projects are delayed which is very serious concern in construction industry, (Al – Emad, & Nagapan, 2015).

According to Flanders (2016), Dubai construction market especially for residential and commercial building construction is expected to benefit from Expo 2020 event, because 25 million international visitors are expected to visit Dubai and more than 20,000 new businesses will be set up. However, it also reported in Arabian business (2016), that Dubai’s construction industry currently has over 3,700 projects ongoing across the emirate worth estimated USD 400 billion. Growing population, tourism sector, strategic government investments like the Dubai plan 2021 and the Dubai expo 2020 are fueling the local construction industry. Commercial and residential units, education, healthcare and hospitality buildings, make up approximately 77% of all project values in Dubai.

Dubai is famous landmark for high-rise buildings as shown in APPENDIX A, most of high-rise building construction projects are in progress to meet the requirement of growing population and visitors.
According to study carried out by Assaf and Al-Hejji (2006) found that around 70% construction projects are delayed. However, this high-rise building construction industry of Dubai is facing major issue of delay. Thus, it is very important to find out the factors and mitigate them ensure the success of construction projects in Dubai.

1.2 Problem statement

Construction activities are subjected to influence of highly challenging variables and unpredictable factors which may affect the construction success. These variables are from different sources such as the performance of construction parties, resources availability, environmental conditions, involvement of other parties, contractual obligations, design errors, unexpected site conditions, changing in scope of work and other changes (Hamid et al., 2015).

Construction industry in United Arab Emirates (UAE) have been developing for more than three (3) decades in all areas and directions, horizontally and vertically. Landmark projects are announced every now and then and completed, giving an alternative perspective to the construction industry all over the world. UAE is a profitable market for local and foreign investors that attracts people to invest in real estate market resulting in rapid growth of populations in a very short time and effect GDP as well (Dubai chamber of commerce 2016). Dubai is currently experiencing mega development projects due to award of Expo 2020, Dubai plan 2021 and other upcoming mega developments. According to Skyscraper center UAE (2017), it was noticed that the ratio of ongoing high-rise building construction projects in Dubai more than other states of UAE.

The construction project is generally considered as successful when it is completed and delivered within the required period, defined budget, as per the required specifications and fulfilling stakeholder satisfaction (Takim & Akintoye, 2002). As consequences of these variabilities, most of construction projects around the world are facing many problems and most commonly and predominantly is delay in completion of construction projects (Hallrum and Bajrachray, 2012). Delays in construction industry can directly or indirectly affect the overall economy of a country like UAE.

According to Hassan Emam et al., (2015) stated that 70% of projects are delayed in Saudi Arabia and 90% of the infrastructure projects are delayed in Abu Dhabi the
capital of UAE. Clients and investors have been complaining of non-receipts of their projects on time due to delays in the projects as reported to be one of the most critical problem in UAE. Delay in construction projects have resulted in negative impact to construction industry (Sweis et al., 2008) and this negative impact has motivated many of researchers (Assaf et al., 1999; Assaf & Al- Hejji, 2006, Al- Kharashi & Skitmore, 2009, Albogamy et al., 2012; Mahamid, 2013; Mahmid, 2014; Alotaibi et al., 2014 and Elawi, 2015), to explore the construction delay issues.

The main purpose and justification for selecting this thesis topic is, that it seems that there has not been any particular work done in Dubai, Therefore, this study not only identifies the common delay factors but also identifies the significant factors along with their possible mitigation measures causing delay in high-rise building construction projects. furthermore, this study also assesses the relationship between significant factors and their mitigation measures. This study will be helpful in controlling any potential delays faced by construction industry of Dubai for their future projects to achieve successful completion of high-rise building construction projects within stipulated time frame.

1.3 Research questions

Based on the problem statement of the study, research questions are formulated to help the researcher into achievable objectives. This research focuses on the following research questions:

i. What are factors causing delay in high-rise building construction projects?

ii. What are the most significant factors causing delay in high-rise building construction projects?

iii. What are the proposed mitigation measures for most significant factors to reduce delay?
1.4 Aim and Objectives

The aim of this research is to propose mitigation measures for most significant factors causing delay in high-rise building construction projects of Dubai. To achieve the aim following three objectives are set;

i. To identify the factors causing delay in high-rise building construction projects.

ii. To determine the most significant factors causing delay in high-rise building construction projects.

iii. To propose mitigation measures for most significant factors and assess relationship between mitigation measures and its most significant delay factors.

1.5 Scope of research

This study is carried out in United Arab Emirates focusing on construction industry of Dubai. All the respondents of this study are the construction practitioners who are involved in high – rise building construction projects in Dubai. Questionnaire survey was carried out to collect the data from construction practitioners including contractor, consultants, client and project management parties. Collected data from survey was analyzed by using statistical package for the social sciences (SPSS) and Pearson correlation coefficient method. The SPSS was used to determine the significant factors of delay in high-rise building construction projects, whereas Pearson correlation coefficient method was used to assess the relationship between mitigation measures and its most significant delay factors in high-rise building construction projects of Dubai, UAE.
CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents a thorough literature review; it presents overall scenario of the UAE construction industry, Dubai high-rise building construction industry and problems related to it. Further, it discusses how delay has become a critical problem in high-rise building construction projects. Review of studies has been carried out on the problem of delay in different countries of the world. This review was essential for this research, as one of the objectives of this study is to determine the factors causing delay in high-rise building construction projects in Dubai.

2.2 Construction industry of United Arab Emirates (UAE)

United Arab Emirates (UAE) is considered as one of the most quickly developing economies in the Middle East. This country is known as one of the wealthiest and most developed in western Asia.

Geographically this country is located on the eastern side of the Arabian Peninsula. It has coastlines along with gulf of Oman and the Persian Gulf, it shares borders with Saudi Arabia, Oman & Qatar as shown in Figure 2.1. As far as UAE is concerned, Abu Dhabi and Dubai control the construction sector of the UAE and both emirates set the pace for the country. With a strategy of development and improvement, the government of the UAE continues to drive the economy forward.
Ren et al. (2008) highlighted that UAE had witnessed remarkable development in economic and social sector in the last 20 years. Al- Sayegh (2008) highlighted that the main objective of the construction industry development within the UAE is to improve the living standards of individuals coming from the visionary leadership who are having the perspective and vision of continued development.

This has given a large boost to the emirates in the private and public sector with major investment for the construction industry. Abu Dhabi city is considered a well-planned city and the capital of UAE. Actual developmental works started some thirty to forty years ago and the construction industry is still developing. Ahsan & Gunawan (2010) highlighted the construction industry in the UAE has developed greatly as compared to the rest of the Middle East, most specifically Saudi Arabia.

Adel & Martin (2009) highlighted that even if there was a commercial crunch in 2008 the construction industry recorded high growth rate during the year 2007 till 2009 where GDP was recorded 8%. Frenten (2009) highlighted that the construction industry is directly related to increase revenues from the Oil & Gas sector. A large number of infrastructure works have been started in recent years in the United Arab Emirates. Major roadway, airport, and port (upgrade) projects are ongoing in preparation of further expected population influx and of the upcoming Expo 2020.
event.

Today the UAE’s infrastructure already boasts an impressive international ranking worldwide first place for roads, second for ports and third for airports, Flanders (2016). It was further pointed out that the major expansion of the industry happened during the economic development period which started from 1990. As per the present economic situation of UAE they are still in the process of getting involved with mega projects from residential, commercial and infrastructure project most of the project execution is done by national and international contractors which involves different kinds of contracts and requirements complained to different standards.

Currently UAE is more focused on constructing the building projects rather than infrastructure projects. The total value of ongoing and planned infrastructure projects in UAE is USD 55.112 billion and building projects is USD 294.365 billion Flanders (2016) which is 5.34 times higher than infrastructure projects. A detailed study of ongoing and planned building projects across the UAE is given below.

### 2.2.1 Building projects

The building construction market is dominated by the UAE’s two major cities, Dubai and Abu Dhabi. The total value of ongoing building projects across the UAE is USD 294.365 billion (Flanders, 2016).

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>Office &amp; Mix use</th>
<th>Hospitality</th>
<th>Healthcare</th>
<th>Retail</th>
<th>Total value</th>
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<tr>
<td>$</td>
<td>132000 Mn</td>
<td>109000 Mn</td>
<td>6710 Mn</td>
<td>1500 Mn</td>
<td>45155 Mn</td>
<td>294365Mn</td>
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UAE building construction sector remains largely positive. The continuous growth of the population, along with major government investments, makes for a large number of projects in residential, office and mix used projects, hospitality, healthcare and retail projects. More care is being taken by investors and developers with regards to complete the projects to meet the requirements.
2.3 Construction industry of Dubai

United Arab Emirates is consisting of seven states which are Abu Dhabi, Dubai, Sharjah, Ras Al Khaimah, Umm Al Quwain, Fujairah and Ajman. The Emirate of Dubai is one of the seven states of UAE. Dubai is the second largest and most populous state in the United Arab Emirates. Geographically Dubai is located on northeast of the Persian Gulf, in the United Arab Emirates as shown in Figure 2.2.

![Geographical location of Dubai](Source: Almay UAE)

According to the report by Dubai Statistic Centre (2013), population of city Dubai was 2,213,845 and has a total area of 4114 km². Dubai is emerged as a global city and business hub of the Middle East. According to Faeez, F. (2016), Dubai is recently named for best designation considered by tourists.

Dubai Department of Civil Aviation (2017) confirms that 88,242,099 passenger traffic was recorded in 2017 which was 5.5% more than 2016. Dubai has recently attracted world attention through many innovative large construction projects and sports events. The city has become iconic for its skyscrapers and high-rise buildings, the world’s tallest building, the Burj Khalifa. Dubai is an extravagant city, which pushes the limits on its architecture and its cultural diversions. Due to high-rise
building construction industry Dubai has made a remarkable position on the map of the world as reported by Dubai Statistics Center (2013).

Table 2.2: Rankings of Dubai (Source: Dubai statistics center, 2013)

<table>
<thead>
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<th>Worldwide ranking</th>
<th>Regional ranking</th>
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<tr>
<td>1. Dubai’s having world’s Tallest Building. Burj Khalifa (828m)</td>
<td>On Regional ranking Dubai is on 1st No in the middle east having Maximum no 150m+ completed Building.</td>
</tr>
<tr>
<td>2. Dubai is on 3rd No in the world by completing 150m+ completed Buildings.</td>
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Due to achievements of worldwide and regionally rankings, Dubai was awarded with hosting expo 2020 event by general assembly of Paris France.

According to database of Skyscraper center of UAE (2018), the progress of construction of high-rise buildings from 2010 to January 2018 in Dubai is recorded more than Abu Dhabi and all other states of UAE. Skyscraper center of UAE has more classified the building according to type of buildings and according to height of Buildings.

2.3.1 Type of buildings

The Skyscraper center of UAE has divided the buildings into four types residential, hotel, office and mix used buildings. Figure 2.3 shows the progress of different types of buildings constructed in Dubai and Abu Dhabi.
REFERENCES


Agyakwah -Baah, Frank DK Fugar (2010). Delays in Building Construction Projects in Ghana; Delays in building construction projects in Ghana’, Australasian Journal of Construction Economics and Building, 10 (1/2) 103-116


Dubai chamber of commerce (2016). An Annual performance highlights report
list/detail/dubai-airports.
Frenten, G. y Gueller, P. (2009), "Interpersonal skills for mediation", Memories of the Workshop held within the Culture and Peace Program of the Félix Varela Center, Havana.


Mohammed S. El-Abbasy; Tarek Zaved, M.ASCE; Marwa Ahmed; Hani Alzraiee; and Mona Abouhamad (2013). “Contractor Selection Model for Highway


The Canada Economy 2017. Department of Finance Government of Newfoundland and Labrador


