

CAUSES OF DELAY IN GCC CONSTRUCTION PROJECTS

A Critical Review

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Abstract. An effective and efficient construction industry is of high importance to the economy of all countries. However, construction projects are notorious for over running time and cost. A plethora of international research has been conducted to define causes of delay in completing projects. These studies employ a wide variety of analytical methods to statistically conclude precise rankings of causes of delay. Moreover, delays for construction projects differ from one country to another and even between types of project within the same geographic location. This study focuses on reviewing the causes of delays within Gulf Cooperation Council (GCC) countries. A comprehensive quantitative and qualitative literature review was carried out around previous work in GCC countries. The primary causes of delays are identified from the literature; these are then taken to exploratory interviews with industry practitioners to investigate the relevance of each cause in the context of current projects in the GCC construction industry. There are recommendations for more work around delays to projects within the region, since in these expanding construction economies, research to date is relatively small.

1. Introduction

Construction projects are often criticized for overrunning time and budgets. In Saudi Arabia, Assaf and Al-Hejji (2006) reported that 70% of projects studied had delayed completions. Research to identify the reasons and causes of delays have been conducted in different countries. It was reported that ineffective planning and control was the most frequently identified delay

factor (87%) in delay cause studies (AlSehaimi *et al.*, 2013). The aforesaid contribution of planning and control as a factor in construction delays, is a key driver to improve the quality of these processes. The causes of delays vary from one geographical location to another. These variations are related to several characteristics such as resource availability, local regulations, and efficiency of public authorities. The cause of delay in a country with a high population might be the lack of trained personnel (Doloi *et al.*, 2012). Meanwhile, in countries with low populations, usually resource availability will be the dominant reason. Consequently, the treatment of causes of delays must be dealt with on an individual case basis.

Construction activities are currently booming in GCC countries. Some GCC countries are undertaking massive developments due to particular events such as organizing the 2022 world cup in Qatar and Expo 2020 in UAE. The construction industry is a main contributor to the economy in Qatar, with a share of 13.1% of the GDP in 2013 and expected to reach 15.7% in 2014 (MDPS, 2014). Construction activities in GCC countries are expected to increase considerably in coming years. The reason for this expected growth is the ambitious investment plans in infrastructure, stadia, residential, commercial and hotel construction. In Qatar again, the government has announced plans to spend 205 billion US dollars on infrastructure projects over the next five years (Reuters, 2014). Planned investments in infrastructure include highways, railways, underground metro, tunneling, energy, water generation, and housing projects.

The amount of investment and projects planned in the GCC over the next five years needs innovative project management techniques to ensure the delivery of projects to time and budget. The significance of delay impacts will considerably increase with the anticipated increases in work.

It was found that only one study of the reasons for delays of projects was conducted in Qatar. Moreover, the aforesaid study explicitly investigated residential buildings. However, in neighboring countries with similar characteristics to Qatar, the construction delay problem was subject to various research.

This study aim is to investigate causes of delay in construction projects in GCC countries. The research method is to (1) conduct a comprehensive literature review for the causes of delays in GCC countries, (2) identify gaps in the literature and additional research effort required, and (3) propose future research effort required to understand the cause of delays.

This paper is organized as follows: the methodology section will be followed by an exploration of the research literature related to causes of delay in construction projects. Results and discussion are then presented and analyzed to identify gaps. Conclusions and recommendations are then offered at the final part of this study.

2. Methodology

Upon defining the broad problem, a comprehensive literature review is conducted to understand the current literature status and identify gaps in the literature. The literature review follows the systematic literature review methodology outlined by Pickering and Jason (2014). In this method, keywords are identified and used to search identified scientific databases. The defined keywords were a combination of ‘Construction’, ‘Causes’ and ‘Delay’ with the combination of the country. The country selection was limited to GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE). The keywords combinations were searched in Scopus, ProQuest, Web-of-science, and EBSCO databases and the results are reported. The inclusion criteria were based on selecting published peer-reviewed journals and conferences that are directly related to the topic. The results of the searches are discussed later in this study. The identified papers are then filtered for their content relevance, and quantitative methods are applied to analyze the results. The process flow for the systematic literature search is shown in Figure 1.

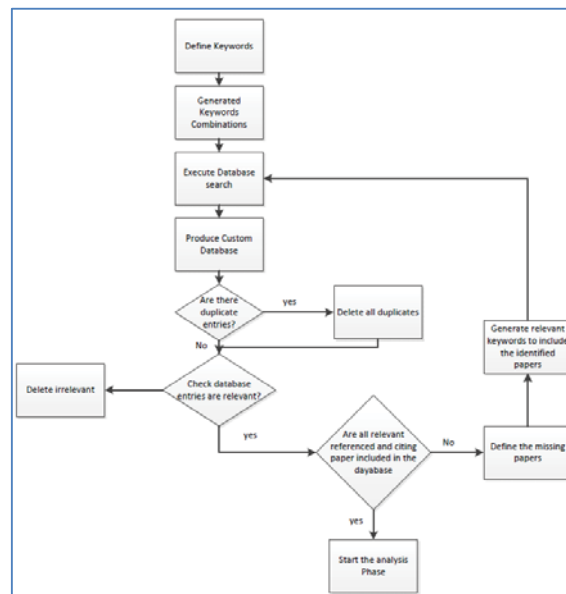


Figure 1: Systematic Search Process Flow

The literature review was then followed by four exploratory interviews with construction professionals. Participants in interviews were chosen to avoid bias by representing several disciplines of construction projects (commercial,

engineering, execution, and project controls). In addition, selected participants had worked in more than one GCC country. The participants were asked to provide their opinions on major contributors of construction delays. Literature survey findings were then presented to them, and they were asked to comment on these.

3. Literature Review

Several studies have been conducted to investigate causes of delays in the construction industry within the GCC. This paper surveys causes of delay research and categorizes it by geographical location. The next sections will summarize the outcome of the literature review. Search results are presented in Table 1, where initial search results shows number of papers returned by applying search criteria, while final search results reported number of publications after filtering and iterative searching. Filtering papers for their relevance due to inclusion criteria and the iterative searching process was performed by identifying referenced and citing articles that are relevant, but not included in the initial search results. New search keywords are then identified and used to search databases as illustrated in Figure 1.

TABLE 1. Systematic Literature Review Results

Search Keywords	Country	Initial Search Results by publication type			Final Search Results by publication type		
		Conference	Journal	Total	Conference	Journal	Total
“Causes” AND “Delays” AND “Construction” AND “Bahrain”	Bahrain	0	0	0	0	1	1
“Causes” AND “Delays” AND “Construction” AND “Kuwait”	Kuwait	1	4	5	0	2	2
“Causes” AND “Delays” AND “Construction” AND “Oman”	Oman	0	1	1	1	1	2
“Causes” AND “Delays” AND “Construction” AND “Qatar”	Qatar	2	0	2	1	0	1
“Causes” AND “Delays” AND “Construction” AND “Saudi Arabia”	Saudi Arabia	1	4	5	2	5	7
“Causes” AND “Delays” AND “Construction” AND “UAE”	UAE	4	3	7	4	1	5
	Total	8	12	20	8	10	18

Final search results as identified earlier used initial search results to add and omit papers based on their relevance; this process is detailed in this section. The results from the search were filtered to remove from the list papers that are not related to the study subject. The results from the search for UAE included a conference paper related to Qatar which was removed from the database; two journal papers were also excluded one for irrelevant subject that was concerned with claims and the other paper was focused on the delays caused by plant breakdown. While filtering the initial search results for Kuwait, three papers were found irrelevant; one was related to Qatar, another related to material delays, and the third related to determining the delay penalty. The resulted publications of Saudi Arabia were reduced by two journal papers; one for focusing on Hong-Kong instead of Saudi Arabia and the other for focusing on delay analysis. It was found that Qatar had one paper that was irrelevant and removed from the database.

In addition to the stated omissions, the relevant papers' references were searched for adequate papers to the topic. Following the filtering of the search results another search iteration in the references used in each of the relevant papers was performed and eight more papers were identified (Bahrain one journal paper, three journal and one conference paper for Saudi Arabia, one journal paper for Oman and two conference papers for UAE). The total number of relevant papers is then 18 papers, ten published in journals and eight published in conference proceeding. The following section will explore studies in each geographic location.

3.1. BAHRAIN

The literature search resulted in one study that investigated the causes of delay in road construction projects in Bahrain by surveying professionals from contractors, consultants and owners (Hasan *et al.*, 2014). The questionnaire included 47 causes of delay identified from the literature and piloted through industry practitioners. The major findings of the research are that major causes of delays related to contractors, are improper planning and inexperienced manpower. While one major cause related to owners is delay in decision-making.

3.2. KUWAIT

Two studies consider reasons for delay in Kuwait. These studies considered government projects and residential buildings projects (Al-Tabtabai, 2002; Koushki *et al.*, 2005). Al-Tabtabai (2002) administered a questionnaire containing 53 causes of delay to 48 practitioners representing contractors, consultants and government organizations. The top ranked reasons for delay

were slow decision making by government organizations, limited authority for supervision staff, slow payment processes, ineffective planning and apprehension towards contractor's favoritism. Koushki *et al.* (2005) explored the causes of delays in private residential buildings in Kuwait. The methodology employed was interviewing 450 private residential owners. The three main reasons identified for time delay are change orders, owners' financial constraints, and owners' lack of experience in the construction business.

3.3. OMAN

Oman was the subject of two studies related to general construction and the oil and gas industries (Alnuaimi and Mohsin, 2013; Ruqaishi and Bashir, 2013). It is noted that research efforts on the causes of delays in Oman only started recently. It was found that 40% of the projects between 2007 and 2010 were completed later than planned (Alnuaimi and Mohsin, 2013). They found that causes of delay were changing over time. Ruqaishi and Hamdi (2013) conducted a survey to identify causes of delay in oil and gas projects. Based on responses from 59 project managers, it was found that there is a high degree of agreement among stakeholders on causes of delays. The top identified causes of delay were related to: poor site management and supervision by contractors, problems with subcontractors, inadequate planning and scheduling, poor management of contractors' schedules, delay in delivery of materials, lack of effective communication among project stakeholders, and poor interaction with vendors in engineering and procurement stages. The study did not find any evidence on relationship with organization size or ownership on delay causes. Meanwhile, it was concluded that results are likely to be applicable to other GCC countries.

3.4. QATAR

Searching the literature resulted in finding one cause of delay study. Jurf and Beheiry (2010) studied reasons of delay in residential building projects. They surveyed construction professionals working for Grade 'A' contractors in Qatar on 42 potential causes of delay. The survey did not consider other stakeholders such as consultants and owners. The surveyed professionals represented projects within time a frame between 2000 and 2005; the results were not segregated to provide granularity if reasons changed over time or were not as found in other studies (Alnuaimi and Mohsin, 2013). It was found that the main causes of time overrun as perceived by contractors are delays in material delivery, design changes, shortage of labor, deficient estimates and inaccurate cash flow planning.

3.5. SAUDI ARABIA

Saudi Arabia is ranked as the first GCC country by total number of publications and number of journal articles as well. The published articles investigated building, general construction, oil and gas, and pipeline projects. The first paper was published in 1995, investigating large building projects in a survey of 56 main causes of delay. It analyzes the results using an importance index, and then tests the correlation factor between two groups on importance ranking (Assaf *et al.*, 1995).

General construction was the most frequent studied sector with four articles published. Assaf and Al-Hejji (2006) directed their research efforts toward large construction projects in the eastern province of Saudi Arabia. A survey questionnaire with 73 identified causes was conducted. The reported findings are 70% of studied projects were delayed with an average overrun of 10% to 30% of the original duration and the significant cause reported by various stakeholders was change orders. Al-Kharashi and Skitmore (2009) identified 112 causes of delay from the literature and used them as the basis of survey questionnaire. The questionnaire was designed on five-point scale ranging from 'No effect' to 'Lot of effect'. Participants were asked to respond with two values for each cause to identify the current situation and what it should be in future. Albogamy *et al.* (2012) administered a survey questionnaire of 63 causes of delay and used an importance index for ranking them. The importance index calculation was based on severity index and probability. The study was conducted on five cities in Saudi Arabia to reduce bias as argued by the authors; Riyadh, Jeddah, Dammam, Abha, and Tabuk. Mahamid (2013) explored the owners' perspectives on causes of delays for public construction projects in Saudi Arabia. There were 22 public owners participated in a questionnaire with 35 identified causes of delay. Results from the study suggested the top reasons for public project delays are: award of bid to the lowest price, poor communication and coordination, poor site management, delay in payment processing, and low labor productivity.

The remaining articles considered pipeline and oil and gas projects. Al-Khalil and Al-Ghafly (1999) studied causes of delay in public utilities projects in Saudi Arabia. It was debated that earlier studies did not consider granular analysis such as the degree of severity and probability. The study employed an importance index measured by identifying severity and probability of each delay cause and ranked causes based on calculated factors; then a correlation between groups ranking was measured using Spearman's correlation. Shash (2012) investigated the delay causes of oil, gas and water wells projects in Saudi Arabia. The study investigated 176 completed projects to determine the extent of the delay and the findings suggested that owner related causes of delay had considerably more

contribution than those related to contractors and consultants. It is noted that all studied projects had delays related to planning and scheduling.

3.6. UAE

UAE came just after Saudi Arabia with five articles found in the literature. General construction attracted three papers while the oil and gas industry and infrastructure projects had one study each. Halloum and Bajracharya (2012) concentrated their research efforts towards Abu Dhabi, the richest emirate within the UAE. They reported 90% of projects studied suffered from delays. Salama *et al.* (2008) investigated the reasons for time overrun in the oil and gas construction sector. There were 37 construction professionals surveyed using 35 reasons for time overrun identified from the literature. The sample included participants from owner and consultant organizations without participation of contractors.

Faridi and El-Sayegh (2006) investigated the causes of delay in the UAE construction industry in general. The study was based on a survey questionnaire with participation of 105 industry practitioners to identify the importance of the 44 identified causes of delay. The participants were from contracting and consultancy backgrounds with no owner representation. The ranking method used the relative importance index methodology that was further statistically analyzed to determine the rank agreement between each pair of rankings using Spearman's correlation factor. The results suggest that participants with more experience rank differently from the participants with less experience. Motaleb and Kishk (2010) discussed the causes of delay in the UAE construction industry. 42 factors of delay were subject to survey with participation of 35 construction companies. The results were compared to earlier studies conducted by Faridi and El-Sayegh (2006); results and deviations were reported which supported the hypothesis of variations of delay causes over time. Ren *et al.* (2008) decided to focus their research on Dubai due to massive developments that were progressing at the time. The results suggested that the main causes of delays are unrealistic projects duration, nominated sub-contractors, and culture impacts.

4. Results and Discussion

This section is devoted to reporting and discussing the results of the literature review. The results presented in this section present geographical coverage, types of studied projects, time distribution of studies, sources of publications, and most frequent causes. Outcomes from the exploratory interviews are integrated in this section with the literature.

4.1 GEOGRAPHICAL COVERAGE

The literature review showed that studies have been conducted involving a wide range of geographic locations. Ruqaishi and Bashir (2013) argued that their conducted study on Oman, is likely to be applicable to other GCC countries. However, the literature review conducted in this study demonstrated that relative importance of causes varies between countries. An example of variations is building projects that were studied in Kuwait, Qatar, and Saudi Arabia as shown in Table 2. This data were supported by interviewees, and their opinions were each country has its own characteristics; some have manufacturing facilities like Saudi Arabia, so they can avoid delays in material delivery due to logistics. The interviews revealed variations in regulations where in UAE for instance, it was stated that government relations were efficient and not considered a major cause of delay. Meanwhile, it was clearly stated that the contrary was found in the rest of GCC countries. Several other examples were reported such as the ease of finance, availability of manpower and sponsorship systems.

TABLE 2. Comparison of top reasons of delay in building projects

Kuwait	Qatar	Saudi Arabia
Change orders	Delays in material delivery	Preparation and approval of shop drawings
Owners' financial constraints	Design changes	Delays in contractors' progress payments by owner
Owners' lack of experience in the construction business	Shortage of labor	Design changes by owner or agent during construction

4.2 TYPES OF STUDIED PROJECTS

The analysis of the literature survey shows a correlation between projects type and causes of delay. Saudi Arabia is used as an example to eliminate geographical location factor and because it has the widest types of projects variety within GCC countries. Studies conducted in Saudi Arabia considered buildings, general construction projects, oil and gas, and pipeline projects. The results of this comparison are illustrated in Table 3.

TABLE 3. Delay causes across different projects types within Saudi Arabia

Buildings	General Construction	Oil and Gas	Pipeline
Cash problems during construction	Type of project bidding and award	Delay material delivery	Cash flow and financial problems
Financing by contractor during construction	Shortage of labor	Changes in types of materials	Delay in issuing work permits
subcontractors' schedules coordination	Delay in progress payments	Requests by owners to early mobilization.	Awarding contracts to lowest bid
Slow owner's decision-making process	Ineffective planning and scheduling	Poor scheduling and planning	Underestimating project duration
Delays in payments by owner	Change orders	Poor coordination between stakeholders	Unexpected ground conditions

Interviewees were asked to comment on variations of reasons of delays through different project types. The majority of responses were positive, and they provided different examples. Road projects are spread over relatively large areas when compared to building projects, which consequently increases variation in ground conditions, number of permits and the amount of utility diversions. The interviews results suggested adding complexity as a factor that is associated to project types for causes of delay study. The frequencies of surveyed literature were analyzed; Figure 2 shows percentages for frequencies of studies for each of type of projects.

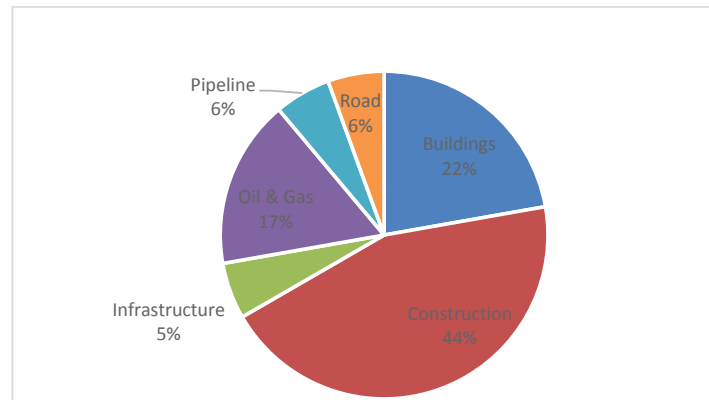


Figure 2: Distribution of Studies by Project Type

Additional analysis by combining findings suggesting that causes of delays varies by project time and geographical location. Further analysis was carried out to identify gaps in literature by the aforesaid combination. Results are then presented in Table 4.

TABLE 4. Mapping the research gaps

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
Buildings	-	2	-	1	1	-
Construction	-	-	1	-	4	3
Oil & Gas	-	-	1	-	1	1
Pipeline	-	-	-	-	1	-
Road	1	-	-	-	-	-
Infrastructure	-	-	-	-	-	1

4.3 TIME DISTRIBUTION OF PUBLICATIONS

Time-frequency relation of publications was analyzed. The reason for the analysis is to investigate the existence of trends in delay causes studies within the GCC region. Figure 3 shows an upward trend that may imply an increasing interest in understanding delay causes.

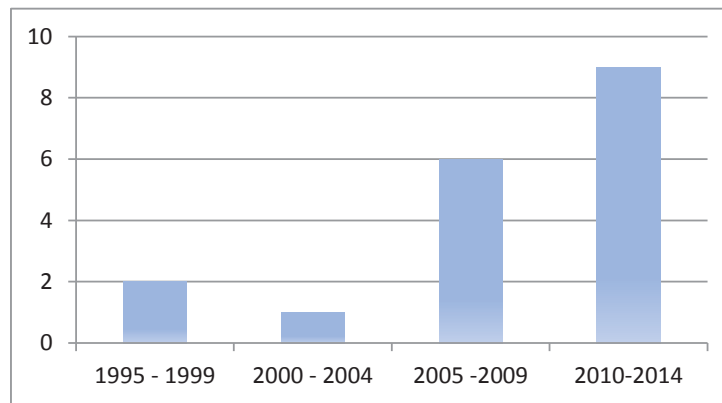


Figure 3: Publications distribution per year

Alnuaimi and Mohsin (2013) observed that causes of delay changed with time. This observation was a result of studying two groups of projects in different time frames in Oman. These results were presented to interview participants; they confirmed the observation as being appropriate. Meanwhile, it was noted that one example was repeated across all participants; that was the financial downturn in 2008. This suggests that this observation need further investigation to confirm its validity. Especially, this

was noticed around same period i.e. between 2007 and 2010 (Alnuaimi and Mohsin, 2013). This observation also needs further investigation to be able to generalize it.

4.4 TOP FREQUENTLY CITED CAUSES

The top ten causes of delay were identified using frequency analysis from identified publications and are reported in Table 5. These causes were presented to interviewees for comment. The participants also were asked to suggest possible mitigation and avoidance strategies if possible to each of these causes.

TABLE 5. Top 10 frequently cited causes of delay

Rank	Description	Assaf <i>et al.</i> (1995)	Al-Khalil and Al-Ghaflly (1999)	Al-Tabatabai (2002)	Koushki <i>et al.</i> (2005)	Assaf and Haji (2006)	Faridi and El-Sayegh (2006)	Ren <i>et al.</i> (2008)	Salama <i>et al.</i> (2008)	Al-Kharashi and Skitmore (2009)	Jurf and Beheiry (2010)	Motaleb and Kishk (2010)	Albogamy <i>et al.</i> (2012)	Shash (2012)	Alnuaimi and Mohsin (2013)	Mahamid (2013)	Ruqaishi and Bashir (2013)	Hasan <i>et al.</i> (2014)
1	Finance and slow payments	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2	Ineffective planning and scheduling	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3	Shortage of materials	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
4	Poor site management	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
5	Design change by owners	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6	Slow decision-making by owners	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7	Delays by subcontractors	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8	Slow process of permits	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
9	Weather conditions	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
10	Poor communication and coordination	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

The participants agreed with aforementioned reasons except weather conditions; that was debatable between them. Hot weather is to be expected during summer time, and its impact can be minimized. On the other hand, it was argued that weather is a factor due to not considering its effect while planning and scheduling projects. Moreover, some participants agreed with factors but not with their rankings, and suggested that ranks are not suitable for the nature of their projects and the countries in which they operate.

Interviews participants were asked to propose some avoidance or mitigation measures to the top ten causes of delay listed above. Finance and slow payment contribution to delays can be reduced by proper financial planning and feasibility studies; investing organizations should plan and secure adequate funds prior to awarding contracts. Planning has been the most frequently used expression to resolve other causes. In response to overcoming ineffectiveness in planning and scheduling, participants referred to reasonable and realistic assumptions, and resource considerations (including manpower, equipment, money, and material). Shortage of materials was agreed between participants to be an often cause of delay. Meanwhile, reasons for materials unavailability are attributed to poor planning. Poor site management was thought as an easy issue to fix by interviewees through proper recruitment processes and by replacing site management when required. Design changes by owners was an emphasized cause of delay and interviewees confirmed it was very often occurring in the majority of GCC projects. The proposed solution is to educate project owners to increase their awareness, use Building Information Modeling (BIM) to visualize end products to owners, and early involvement of all supply chain tiers during the design phase.

Slow decision-making by owners was attributed to owner's representatives not being granted the appropriate level of authority for making decisions. It was proposed to increase authority for owner's representatives to speed up decision-making process. Delays by subcontractors were accepted to be a re-occurring issue, and resolving it is possible by procurement strategic planning and packaging. Breaking down project scope between different subcontractors can be used to reduce exposure to subcontractors' non-performance risk. The slow process of granting permits was acknowledged as a factor that contributes to project delay. Nevertheless, participants emphasized that this particular issue varies between different countries where, in UAE permits are not an issue and can be fast-tracked when required, while, in other countries such as Saudi Arabia, permits have a considerable contribution to project delay. Weather conditions were questioned of being a factor contributes to delay for time for completion of projects. Poor communication and coordination are considered by interviewees as highly frequency cause of delay that repeats in projects.

Alternative contractual frameworks that emphasize collaboration were recommended to be used.

5. Conclusion

This study surveyed literature on causes of delay for construction projects within the GCC region. A quantitative systematic literature review was conducted and identified 18 papers published on the topic. These papers were discussed in detail and analyzed accordingly. The analysis resulted in identifying several variables where causes of delay correlate, with these being; time, geographic location, industry types, project complexity, and type of owners.

The analysis in this paper took cognizance of geographical location, time, and industry type. The types of owners were not considered due to lack of sufficient studies giving granularity on different types of owners while fixing other variables identified earlier. In addition, no studies comparing projects with different frequencies were found in literature. The filtered papers were then analyzed and top ten factors causing delays were identified. These causes were presented and validated by interviews with construction practitioners and recommendations to mitigate or avoid such delays were presented.

Future research efforts have to be directed to cover geographic locations for various types of projects with different complexity levels. Also, studying the effect of owners organization types is important to validate this variables influence on project delay. Moreover, delay change over time should be investigated in detail, to verify it and understand reasons behind such variations.

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