

# Managing Critical Factors Causing Delays in Public Construction Projects in Kingdom of Saudi Arabia

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## Abstract

Growing demands for public construction in Kingdom of Saudi Arabia (KSA) highlight the importance of public construction sector to the economic and social development of the country. Despite being one of the most important economic drivers in KSA, building construction sector is faced with problems of project delays. Delays are defined as incidents that lead to an extension in the time agreed within a contract to complete a project. Delay is a common problem within both public and private construction projects around the world. However, it is more endemic in the KSA public construction sector from the recent Deloitte's report. If delays continue to occur in public construction projects in KSA, they may have significant negative impacts on the social and economic development of the country. Previous studies have focused majorly on the causes of delays in KSA with limited empirical evidence on the contribution of project management approaches to managing these delays. Various research findings have suggested that problems within projects can be minimized with effective implementation of project management concepts. Through a review of relevant literature, this paper examines the critical factors contributing to the construction delays in KSA and identifies potential contributions of project management tools and techniques to minimizing them.

**Keywords:** building construction projects, delays, project management, Kingdom of Saudi Arabia.

## Introduction

Kingdom of Saudi Arabian public construction sector is regarded as the biggest among the Gulf Cooperation Council (GCC) countries (Deloitte, 2013). In 2013, the cumulative value of the country's various building construction projects was estimated at US\$30 billion, contributing nearly 4.5% to the total GDP of the oil-rich country in that particular year (Deloitte, 2013). According to the construction and projects multi-jurisdictional guide for 2013/2014, construction of critical infrastructure projects is one of the most important future development goals of the KSA government (Husein, 2013). Some of the infrastructural projects currently being constructed by the government of KSA include Aldara Hospital that is worth approximately US\$108million; King Khalid International Airport, Terminal 5 awarded at the cost of US\$403million; Jeddah Corniche, a real estate development project with a price tag of US\$461million; King Fahad Medical City with an approved budget of US\$613million; Abraj Kudai Development, mixed use development complex in Mecca that is projected to cost US\$3.47 billion (Husein, 2013).

Building construction projects have generally led to significant economic and social benefits for the governments, contractors and the society as a whole in KSA. However,

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delays that prevail in those projects are significant and pose great challenges to their implementation. Delay is defined as the “time overrun either beyond completion date specified in a contract, or beyond the date that parties agree upon for delivery of a project” (Assaf & Al-Hejji, 2006). Delay is a major problem confronting public building construction projects in the Kingdom of Saudi Arabia. According to a recent Deloitte’s report, total value of delayed building construction projects in KSA as at July 2012 stood at US\$146 billion, causing pressures on the developmental drive of the oil rich country.

With the growing cases of delays in publicly owned building construction projects in KSA, there is a need for further and significant investigation on this phenomenon. Over years, studies have been published on factors contributing to delays in KSA construction projects, yet, they have not offered empirical theories on how this syndrome can be managed (Kim, et al., 2008). In parallel, research in the project management field has stressed the importance of project management knowledge, tools and techniques in enhancing the effectiveness of managing projects (Frame, 2002).

The ongoing research conducted within the Construction Management Department of Curtin University investigates critical factors that influence the occurrence of delays in construction projects within public sector in KSA and intends to develop ways for mitigating construction delays within the sector. In order to develop sustainable ways of managing construction delays in the country, studies and reports published on delays as well as contemporary construction project management practices within the public sector in KSA are studied in order to develop framework to effectively manage construction delays in KSA.

The aim of the ongoing research is to develop a framework to enhance management of, and therefore minimize, delays within the public construction projects in the KSA. The specific research objectives are:

- To identify the critical factors causing delay in construction projects in KSA and their relative importance.
- To study the current use of project management knowledge, tools and techniques in managing delays in public construction projects in KSA.
- To develop a process model that could be used to minimize the likelihood of delays and support the effective management of delays in public construction projects in KSA.

## **Research Methodology**

Related studies in the past have examined issues pertaining to delays in construction projects from a number of perspectives. The adopted research methodology in this research is mixed method approach. This study intends to triangulate both qualitative and quantitative approaches (Robson, 2011). Quantitative method is basically about collecting numerical data to explain a particular phenomenon (Kumar, 2011), while Qualitative research is about exploring issues, studying and understanding phenomena, and answering questions through the evaluation of personal experiences associated with phenomena (Hanson, et al., 2011). The main rationale for using methodological triangulation in this research is to seek convergence, corroboration, correspondence of results from different methods (Creswell, 2013).

This research begins with a comprehensive and comparative review of studies of relevant studies undertaken in KSA and other regions to establish gaps in practice in the KSA construction sector. (Aliaga & Gunderson, 2003). Once the major causes of construction delays have been explored in-depth and gaps in practice identified, through the literature review, subsequent data collection procedures will include questionnaire survey, semi

structured interviews. Also, focus group discussions will be designed and implemented to develop a conceptual framework that can be applied to effectively manage and reduce incident of construction delays in KSA public sector.

Quantitative data collection through the use of questionnaire will be the main data collection approach for this study. The questionnaire will focus on collecting data on number or construction project implemented by respondents, use or otherwise of standard project management principles, tools and techniques, cases of delays experienced, major sources or causes of these delays etc. The choice of questionnaire as primary data collection tool is based on the numerous advantages of questionnaire use that are relevant to the aims of this study. These advantages include large geographic coverage, especially when the questionnaire is mailed to respondents, possibility of larger samples and also possibility of achieving wider coverage within the sample population (Borrego, et al., 2009; de Graaff & Kolmos, 2010). Nonetheless, in order to be able to develop a robust project management framework that will assist project contractors to minimize construction project delays in KSA, regardless of the context or type of project, it is important to gather more than just quantitative data. Therefore, the qualitative data, through semi-structured interviews and focus group discussions will help to explore the perceptions, experiences and perhaps misconceptions of project contractors. Such rich, in-depth qualitative data is expected to further enrich the outcome of this study. The quantitative data will be analyzed using IBM SPSS (v.20) while the qualitative data will be managed and analyzed with the aid of QSR Nvivo (v10)

However, the objective of this review paper is to present the outcome of an in-depth literature review on construction delays within the public construction projects in KSA as a result of the ineffective deployment of project management tools and techniques. The arguments presented in this paper provides a platform for future research studies on this subject.

### **Delays in Construction Projects**

Delays are synonymous with construction projects. Delay has been established as one of the commonest experience in the construction projects globally (Ahmed, et al., 2003). Multiple studies have identified incident of delay as a major problem facing construction projects (including building construction projects) in the world (Kaliba, et al., 2009; Kazaz, et al., 2012; Sweis, et al., 2008). In Nigeria, a study has suggested that seven out of ten construction projects suffer delay in their execution (Odeyinka & Yusuf, 1997). In Malaysia, about 17.3% of government construction projects examined in 2005 were delayed for more than 3months (Sambasivan & Soon, 2007). Despite large number of studies on construction delays and technological advancement over years, delays have remained common issue in the construction industry worldwide. In Kingdom of Saudi Arabia (KSA), incidents and frequency of building construction delays have remained a major concern to not only the governments but contractors and general public.

Delays experience in building construction projects in KSA`s public sector is not new. As early as 1983, Zain Al-Abidien found that delayed projects accounted for 70% of projects undertaken by the Ministry of Housing and Public Works (Zain Al-Abidien, 1983). Al-Sultan surveyed time performance of different types of projects in KSA and concluded that 70% of public projects experienced delay (Al-Sultan, 1987). The trend was not different with a preliminary survey by the Water and Sewage Authority in the Eastern Province in KSA where it was found that 45 (59%) out of a total of 76 projects completed during the period 1985–94 were delayed (Al-Khalil & Al-Ghafly, 1999). In a more recent survey, cases of delay were reported in 952 (40%) out of 2379 construction projects completed in KSA (Falqi, 2004). In terms of cost and follow-on consequences, project delay is considered to be one

of the most serious and frequent problems in the KSA construction industry (Faridi & El-Sayegh, 2006).

Delays in construction projects are generally categorized into excusable and non-excusable (Menesi, 2007). Excusable delays are defined as those caused by circumstances outside the control of the contractors (Fugar & Agyakwah-Baah, 2010). On the other hand, non-excusable delays are caused by factors that are within the control of the contractors (Majid & McCaffer, 1998). In principle, excusable delays can be either compensable or non-compensable (Wei, 2010). Compensable excusable delays are those caused by project owners or their agents in which the contractors are entitled to claim damages (Fugar & Agyakwah-Baah, 2010). For instance, late delivery of engineering designs by the engineers employed directly by the owners. However, non-compensable excusable delays are by third parties or incidents that cannot be attributed to either owners or contractors. For instance, government changing rules or inclement weather.

Effects of such delays in public construction projects have been examined from a different perspectives. According to Al-Kharashi & Skitmore (2009), construction delays could cause the following: confusion in relation to the public development; disturbance in the budget execution; public inconveniences with possible political implications. Delays are generally costly both financially and otherwise. Delays normally have adverse effects on the building construction projects in several ways. Important success criteria of the projects such as time, cost and quality can be greatly damaged when delays occur (Abdul-Rahman et al., 2006; Alaghbari, et al., 2007).

### **Critical Factors Contributing to Delays in KSA**

Several factors have been identified as contributing to incident of delays in the KSA. A study examined the factors contributing to delays within the public sector construction projects in Eastern Province of KSA through a field survey (Assaf & Al-Hejji, 2006). They classified causes of delays in the construction projects into factors relating to project, owner, contractor, consultant, design-team, materials, equipment, manpower (labour), and external factors. A total of 73 causes of delays in Saudi Arabian construction projects were identified by Assaf and Al-Hejji (2006). According to the majority of 23 contractors, 19 consultants, and 15 owners that participated in the field survey, the most common cause of construction delay in that Province was 'change order' or 'variations'. A change order or variation can be defined as the formal request to add to or remove work from the initial scope of work agreed in a contract, which changes the original contract amount and/or completion date.

Also, Al-Kharashi and Skitmore (2009) studied the causes of delays in KSA public sector construction projects. They classified the causes of delay into six main groups: (1) *Client-related causes*; (2) *Contractor-related causes*; (3) *Consultant-related causes*; (4) *Materials-related causes*; (5) *Labour and equipment-related causes*; (6) *Contract-related and contractual relationship causes*. All the 86 experienced construction clients, contractors, and consultants that participated in the survey as well as the study's analysis of five major public construction projects in KSA revealed that one of the dominant factors contributing to incidence of construction delays relate to the shortage of qualified and experienced manpower. They, however, suspected that this situation must have been precipitated by the current boom in construction activity involving large and innovative projects in the country (Al-Kharashi & Skitmore, 2009).

After an exhaustive review of literature on studies focused on causes of construction delay in KSA, the most critical factors contributing to construction delay in KSA as identified

across different studies are captured in Table 1. Also, most of These research studies were conducted by questionnaire survey, using analysis approaches like Importance Index, Frequency Index and Severity Index .However, the table indicates the agreement between authors on different factors that contribute to delay experienced in construction projects in KSA.

Table 1: Critical Factors Contributing to Delays in KSA

<b>Delay Causes</b>	<b>Authors</b>
<i>Ineffective planning and scheduling of the project by the contractors</i>	Al-Ojaimi, 1989; Assaf et al.,1995; Alkalil & Al-Ghafly, 1999; Falqi, 2004; Assaf & Al-Hejji, 2006; Al-Kharashi & Skitmore, 2009
<i>Poor qualification, skills and experience of the contractors' staff</i>	Al-Ojaimi, 1989; Assaf et al.,1995; Alkalil & Al-Ghafly, 1999; Falqi, 2004; Assaf & Al-Hejji, 2006; Al-Kharashi & Skitmore, 2009
<i>Delay in progress payment by the client</i>	Al-Mudlj 1984; Al-Hzmi, 1987; Al-Subaie, 1987; Alkalil & Al-Ghafly 1999; Falqi, 2004; Assaf & Al-Hejji, 2006; Al-Kharashi & Skitmore, 2009
<i>Changes during construction</i>	Alkalil & Al-Ghafly 1999; Assaf & Al-Hejji, 2006; Al-Kharashi & Skitmore, 2009

### **Managing Critical Factors Contributing to Delays**

Suggestions on how to manage construction delays based on empirical evidence are generally scanty within the body of knowledge. Nonetheless, certain measures have been suggested in order to minimize the problems of construction delays. One of the measures recommended for reducing delays during the implementation phase of building construction project is to have in place, an extensive and robust, project management plan (Abdelnaser, et al., 2005). In a related study, Nguyen et al. (2004) suggest that five factors are required to reduce the likelihood of delays in construction projects. They listed the factors as availability of resources; multidisciplinary/competent project team; competent project manager; accurate initial cost estimates as well as accurate initial time estimates (Nguyen, et al., 2004).

Recommendations from previous studies suggest that critical factors contributing to delays in building construction projects in the KSA may be managed through project management principles. Critical factors contributing to construction delays have been identified across the literature as ineffective planning and scheduling of the project by the contractors; poor qualification, skills and experience of the contractors' staff; delay in progress payment by the client; change order by the client; delay in approving major changes in the scope of work by consultant. Lack of capacity to manage these factors may be linked to the poor implementation of project management principles across publicly executed construction projects in KSA (AlMobarak, et al., 2013). According to these scholars, project management field is still relatively new in KSA and majority of the industry professionals are still unwilling to embrace it. There is need for further studies to identify how project management knowledge, tools and techniques can be applied to reduce incidents of delay within the public construction industry in KSA. Therefore, the current study attempts to improve the effectiveness of managing the critical factors contributing to construction delays

by highlighting and emphasizing the potential benefits of project management tools and techniques in addressing the problem.

Project management approach is basically designed to apply knowledge, skills, tools, and techniques to project activities in order to meet its (the project) requirements (PMI, 2013). The significance of project management techniques and tools in achieving project expectations and objectives has been reported widely in the literature (Milosevic, 2003; Murphy & Ledwith, 2007). For instance, application of project management principles have been considered very effective in managing and controlling project activities (Murphy & Ledwith, 2007). There are various project management tools and techniques that can be applied to address numerous problems confronting projects such as those relating to project planning, human resources management, cost management, time management among others. However, the use of project management principles to drive project success is still at its early stage in KSA (AlMobarak, et al., 2013). Whilst it is expected that adoption of project management tools and principles should contribute towards mitigating construction project delays, previous studies reviewed for this paper have not systematically investigated current practices in order to establish gaps that need to be met through adoption of said tools/principles. As such, this study intends to establish gaps in practice to satisfy the second objective of this study.

However, to emphasize the potential of project management principles to mitigating construction project delays in KSA, in Figure 1 below, the major sources/causes of project delays identified in the literature - namely ineffective planning and scheduling of the project by the contractors; poor qualification, skills and experience of the contractors' staff; delay in progress payment by the client and Change order by the client - have been mapped against project management process during project lifecycle and tools that have the potentials to minimize the impact of these sources of delays.

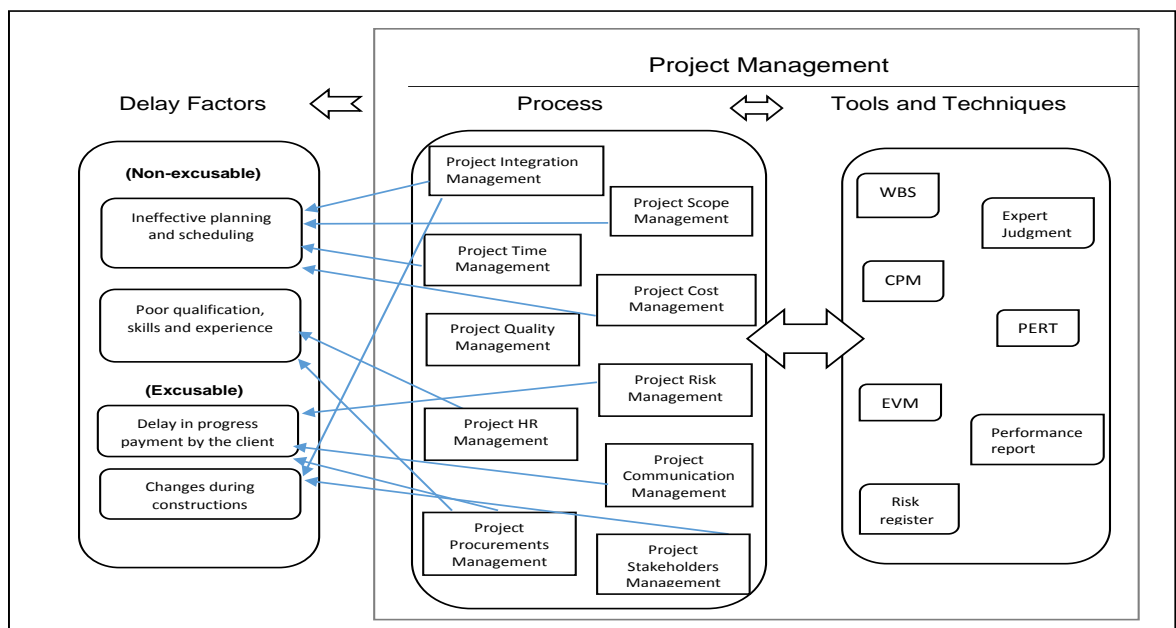


Figure 1. The mapping of sources of delays in KSA against PM process and tool

### **Managing Ineffective Planning and Scheduling in KSA**

There are certain project management tools and techniques that can be utilized to ensure effective planning and scheduling of building construction projects within the public sector in KSA. They include work breakdown structures (WBS), critical path method (CPM), critical chain method (CCM), Precedence Diagram Method (PDM), Program Evaluation Review Technique (PERT) and Gantt chart (PMI, 2013). Also, to control the activities of the project against the plan and the schedule, tools and techniques such as performance Reviews, EVM, analytical techniques, project management information system, and schedule compression have been suggested (APM, 2006). Work breakdown structure (WBS) is a deliverable-oriented decomposition of project elements into phases, deliverables and work packages with each descending level representing an increasingly detailed definition of the project work (Haugan, 2002). WBS is described as a common focal point for presenting the totality of a project from the highest hierarchy to the lowest (Haugan, 2002). It aids in the effective allocation of time to various tasks that are embedded in a project (Burke, 2013). As such, WBS can promote timely completion and manageability of project activities. Generally, WBS facilitates easy planning and scheduling of a project and its activities (Lanford & McCann, 1983).

Apart from WBS, CPM has been identified as another project management tool or technique. CPM is considered an effective time management tool for complex project (PMI, 2013). It assists in the logical display of the sequence and timing of each activity (Yamín & Harmelink, 2001). In addition, CPM communicates interdependency and thus offers a more effective time management tool for large and complex projects (Kallantzis, et al., 2007). The process of critical path method includes breaking down of project into a logical sequence of activities to be completed, estimating the time duration of each activity (PMI, 2013). According to PMI (2013), CPM can enhance good communication and planning for effective time management; assist in the estimation and calculation of time to complete the project; highlight critical activities that may influence project duration; highlight "float times" for all activities. Other project management tools and techniques such as Program Evaluation Review Technique (PERT), Precedence Diagram Method (PDM) and Gantt chart have also been found to be effective in managing project time (PMI, 2013).

### **Managing Poor Qualification, Skills and Experience of the Contractors' staff in KSA**

Poor qualification and lack of project management skills and experience among contractors' staff for public building construction projects in KSA can be managed using appropriate project management principles. In this case, multi-criteria decision analysis as suggested by PMI (2013) can be used by the project contractors or any organization responsible for the recruitment of staff for the project to identify candidates with appropriate experience, competencies, knowledge and skills required to successfully undertake activities entrusted on them for the overall success of the project. Potential staff should be examined for the relevant experience that are required for the successful implementation of the project. In addition, each team member should be screened to be certain they all have competencies needed to complete tasks or activities allocated to them within the project system (Crawford, 2005). Knowledge of staff regarding the project stakeholders, experience implementing similar projects and awareness of nuances of the project environment should also be evaluated (PMI, 2013). It should also be determined whether the staff possess the relevant skills to apply certain project tools or techniques to achieve the overarching objectives of the project (PMI, 2013). Also, regular training can be provided for the project team members to further build their capacity and soft skills (PMI, 2013).

Nevertheless, it is important to acknowledge that the shortage of qualified and experienced manpower can be blamed, partly, on the current boom in the construction sector, especially with regards to large and complex construction projects in the country, as suggested by Al-Kharashi and Skitmore (2009). Another significant factor here may also relate to the educational and training system in the country. As suggested by Cordesman (2003) and Baki (2004), between 1995 and 1999, out of 114,000 graduates, only 10,000 graduated with engineering degrees. Consequently, government and other stakeholders must, as a matter of urgency, design policies and incentives that promote engineering education amongst the Saudi population to create a large pool of educated and qualified experts for construction contractors to recruit from.

### **Managing Delay in progress payment by the client in KSA**

To manage delay in progress payment by the client (basically governments) in KSA, project management principles can be explored to deal with such situation. A robust cost management plan, for instance, can be used to address the issue of delay in progress payment by the client. With effective cost management plan, policies, procedures, and documentation for planning, managing, and controlling project costs including cash flows required for the project can be established from the outset of the project (PMI, 2013). Such plan will assist in the accurate determination of the amount, location, and timing of progress payments in projects from a client's perspective (Dayanand & Padman, 2001). Moreover, contractors may and should take up the responsibility of educating and supporting clients to manage their cash flow for construction projects as this is in the best interest of all parties. It is also important that information regarding project expenditures be presented clearly and in a way that clients can understand. A robust cost management plan can reduce the chance of progress payment delay by the client because it will lay out implications of not making payments available as at when due (Ulusoy & Cebelli, 2000).

### **Construction by client in KSA Managing Changes during**

Change order is any addition or deletion from the project scope which may lead to cost or time overruns or underruns (Park & Peña-Mora, 2003). It is a common practice in construction projects for owners to change orders during project construction by either adding or deleting some activities or deliverables to it (Ibbs, et al., 2007). Considering the significance of change order in project management, it can be recommended that building construction project client in KSA (mostly governments) should be informed about the implications of change order and its potential effect on the project progress. Change order should be evaluated and its impacts established during the management of project work and performance of integrated change control (PMI, 2013). In order to reduce this issue causing unwanted delays in building construction projects in KSA, change order proposed by the client should be better managed using project management principles such as expert judgement, meetings, and change control tools based on the project organization and environmental constraints (PMI, 2013)

Prompt approval of major changes in the scope of project work by consultant also is very crucial to prevent overall project delay. This is because such changes may impact project management plan, project documents or deliverables (PMI, 2013). One way that delay in the approval of major changes in the scope of project work by consultant can be prevented is by hiring an experienced consultant who understand implications of certain actions on the performance of project (Berggren, et al., 2001). The significance of engaging the services of experienced consultants in any major projects cannot be overemphasized. Consultants help set a stage for emerging activities within a project and as such their role is more of foundation laying (Kadefors, 2004). Considering the roles of consultants, it is strongly recommended



that experience of any potential project consultants should be evaluated prior to engaging their services (Berggren et al., 2001).

## **Conclusion and Further Research**

This review has provided a fresh perspective on how issues of delays in public construction projects can be addressed using the case of Kingdom of Saudi Arabia. This review has suggested that factors contributing to frequent incident of delays in building construction projects in KSA are ineffective planning and scheduling of the project by the contractors; poor qualification, skills and experience of the contractors' staff; delay in progress payment by the client; and change order by the client. However, it has been argued that these factors can be better managed by using appropriate project management principles, tools and techniques. The arguments presented in this paper are significant in that they point to a new direction for tackling issue of persistent delay in public construction project in KSA.

Previous studies have focused on causes of construction delays in KSA. However, no study has presented details on how project management principles can be employed to reduce cases of construction delays in the country. Although this study is a conceptual one, arguments offered here can be used to develop new thinking of dealing with problematic issue of construction delays in KSA. The intended framework is expected to help project stakeholders in Saudi Arabia to enhance the effectiveness of the management of public construction projects in the country.

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