

# Project Time Overruns in Saudi Arabian Construction Industry

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**Abstract**— Construction industry of Saudi Arabia is developing on a large scale, participating in employment and overall economic growth of country due to changes in the Kingdom's socio-economic development policies, and thereby recognizing the need for more efficient and timely completion of projects. Construction time often serves as benchmark for assessing the performance of a project and efficiency of project organization. Due to unexpected problems and change in original design during construction phase led to unwanted delay in timely completion.

The primary objective of this paper is to identify factors responsible for delay in Saudi Arabian construction industry by critically analyzing and evaluating delay factors proposed by researchers, and further determining their relative importance. This has been achieved by undertaking a critical analysis of the literature and carrying out a questionnaires survey among consultants, project managers and engineers in construction firms and collecting their responses. The importance of Project owner's role, contractor related, Financing related, Materials related, and Site management & supervision have often been cited as main delay factors.

**Keywords:** Construction Industry, Construction time, Performance indicator, Project delay,

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## 1 INTRODUCTION

Recent changes in socio-economic policies has led to wide spread development of construction industry in the Kingdom of Saudi Arabia (KSA). The reasons behind this socio-economic changes are the increase in oil production and price, as well as changes in lifestyle driven by economic development. The government strategy and rebuilding process of Kingdom construction of new roads, bridges, sports facilities, residential, and governmental offices has led to this expansion in construction industry.

These projects attracted regional, national and international contractors to enter the Saudi construction industry amid high competitive market.

With the economic development currently taking place in Saudi Arabia, building construction contributes to a large portion of the construction sector. Construction sector is estimated to grow by 6.7 percent in FY 2014, Infrastructure and Transportation was allocated around SR 63 (US \$ 16.8) billion (6% of total budget) in, 2014 (Budget report, Ministry of finance, KSA (<http://www.mof.gov.sa/english/downloadscenter/pages/budget.aspx>)).

Construction delays lead to increase in overall project cost, henceforth completing projects on time is beneficial to all project parties. Therefore, it is essential to identify the actual causes of delay in order to minimize and avoid the delays and their corresponding expenses. Therefore, the objective of this paper is to determine the most important causes of delay in building construction projects in Saudi Arabia. This paper identifies the causes from the points of view of the main project parties: owner, contractor, and consultant.

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## 2 CONSTRUCTION DELAY

Construction delay may be 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" (Assaf and Al-Hejji, 2006). Delay was also defined as an "act or event which extends required time to perform or complete work of the contract manifests itself as additional days of work" by Zack (2003).

Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations.

The time required to complete construction of public projects is frequently greater than the time specified in the contract. These 'overruns' or time extensions are granted for many reasons, such as designer changes or errors, user changes, weather and late deliveries.

Chalabi and Camp[10] conducted a review on project delays in developing countries during planning and construction stages. In their study they found that the delay and cost overruns of construction projects are dependent entirely on the very early stages of the project. Fereig and Qaddumi[11] in their study on the construction experience of the Arabian Gulf demonstrate the various components of the planning, controlling and productivity on construction delay.

Kumaraswamy and Chan (1995) enumerated a hierarchy of both qualitative and quantitative factors which affect the con-

struction duration of a building project. Construction time" often serves as a benchmark for assessing the performance of a project and the efficiency of the project organisation. Factors used to evaluate the project success have been investigated by Ashley et al. (1987) and Pinto and Slevin (1988). Moreover, Chan and Kumaraswamy (1994) found that a project is usually regarded as "successful" if it is completed on time, within budget and to the level of quality standard specified by the client at the outset of the project.

In fact, the realisation of the often complex construction projects of today, involves the co-operation and co-ordination of many separate parties including the clients, consultants, contractors, subcontractors, and suppliers (Cherns and Bryant, 1984). The impacts of contractor selection methods and performance on project outcomes have been investigated by Russell and Skibniewski. However, the way in which the client organizes and manages the project will also exert a significant influence on subsequent project outcomes.

### 3 INTERNATIONAL STUDIES

Several articles have discussed causes of delay in construction projects in numerous manners; some studies identified the main causes of delay in several countries and various project types, while other studies discussed the delay analysis methods and the proposed ways to mitigate it.

The study of Baldwin et al. (1971) was carried out to determine the causes of delay in the construction process in the United States. The next study was by Mansfield et al. (1992) which investigated the causes of delay and cost overruns that affect completed highway projects in Nigeria.

As a case study regarding the Nontaburi bypass road project, Noulmanee et al. (2000) discussed the internal causes of delay in a highway construction project in Thailand. Noulmanee et al. (2000) investigated causes of delays in highway construction in Thailand and concluded that delays can be caused by all parties involved in projects; however, main causes come from inadequacy of sub-contractors, organization that lacks of sufficient resources, incomplete and unclear drawings and deficiencies between consultants and contractors. The study suggested that delay can be minimized by discussions that lead to understanding.

Al-Momani (2000) investigated causes of delay in 130 public projects in Jordan. The main causes of delay were related to designer, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity (i.e. poor design and negligence of the owner, change orders, weather condition, site condition, late delivery, economic conditions, and increase in quantities are the main causes of delay). The study suggested that special attention to factors will help industry practitioners in minimizing contract disputes. Delays have strong relationship with failure and ineffective performance of contractors.

Ahmed et al. (2003) carried out a study to identify the major causes of delays in building construction in Florida, then allocated the responsibilities and types of delays for each cause.

Regarding commercial construction projects, Choudhury and Phatak (2004) studied the causes that affect time overrun.

Kaming et al. (1997) studied influencing factors on 31 high-rise projects in Indonesia and found out that cost overruns occur more frequently and are more severe problem than time overruns. They pointed out that the major factors influencing cost overrun are material cost increase due to inflation, inaccurate material estimation and degree of complexity. While in time overrun, the most important factors causing delays are design changes, poor labor productivity, inadequate planning, and resource shortages.

According to Amer (1994), the major causes of delay in construction projects in Egypt are: poor contract management, unrealistic scheduling, lack of owner's financing/payment for completed work, design modifications during construction, and shortages in materials such as cement and steel.

Abd El-Razek et al. (2008) studied delay in building construction project in Egypt, a total number of 32 delay causes were selected grouped according to responsibility (contractor, consultant, owner and common responsibility) and categorized under 9 groups (financing, manpower, Changes, Contractual relationships, Environment, Equipment, Rules and regulations, Materials, Scheduling and Control), each delay cause measured on a Likert scale using four options: very important; important; somewhat important; and not important. They concluded that the most important causes identified by the survey, and based on overall results, were: financing by contractor during construction; delays in contractor's payment by owner; design changes by owner or his agent during construction; partial payments during construction; and non utilization of professional construction/contractual management. They suggested that "a joint effort based on teamwork is required to mitigate delays"

Chan and Kumaraswamy (1997) conducted a survey to evaluate the relative importance of 83 potential delay factors in Hong Kong construction projects and found five principal factors: poor risk management and supervision, unforeseen site conditions, slow decision making, client-initiated variations, and work variations.

Chan and Kumaraswamy (1996) observed that almost 70% of building projects were completed behind schedule. Although the delays were often not of large magnitudes, They conducted a survey to investigate how project completion time is affected by a series of factors such as those related to the project environment, the roles and responsibilities of participants, managerial arrangements, human aspects, contract forms, planning and control systems. They identified 83 delay factors (general and applicable to most projects), grouped under eight major categories: (1) project-related; (2) client-related; (3) design team-related; (4) contractor-related; (5) materials; (6) labour; (7) plant/equipment; and (8) external factors. These factors represent some features inherent in projects which are under the control of clients, consultants and contractors.

In their findings, they concluded that all three groups of practitioners in construction industry (Client, Consultant, Contractor) opined that "poor site management and supervision", "unforeseen ground conditions", and "low speed of decision making involving all project teams" are the three most significant factors causing delays in local building works. The clients and consultants asserted that the main source of

delays is due to "lack of contractor experience in planning and supervision on site", but the contractors controvert that many delays arise from "insufficient design experience of the consultants".

They suggested to "employ the methods of pre-qualification of tenderers and selective tendering, rather open competitive tender", "comprehensive site investigation, accompanied by thorough and properly detailed design of groundwork and foundation before commencing construction", "clear and comprehensive contract documents to ensure proper communication amongst practitioners", complete and clear project brief from client to minimize variations (client/consultant initiated), and "establishment of construction time prediction model".

Kumaraswamy and Chan (1998) studied the causes of construction delays in Hong Kong. They found that there was a difference in perceptions as to causes of delays by different groups of participants in building and civil engineering works. They suggested that biases of different industry groups might direct blame for delays to other groups.

#### 4 SAUDI ARABIAN STUDIES

Delays in delivering construction projects on time can create major problems to clients and contractors. It has a serious impact on the financial commitment, image of the clients and the contractor and the impact on the environment. The delay in project delivery in Saudi Arabia is made worse due to sharp change in the price of the construction materials.

Al-Ghfly (2005) identified that, project owner involvement, contractor performance and the early design and planning of projects are important factors for the project delay in Saudi Arabia. He discussed the delay in public water and sewage projects. Sixty causes were identified and classified. He concluded the following: the delay occurred frequently in medium and large size projects, and considered severe in small projects. There are many important causes of delay related to owner involvement, contractor performance, and the early planning and design of the project. Important causes are financial problems, changes in the design and scope, delay in making decisions and approvals by owner, difficulties in obtaining work permit, and coordination and communication problems.

Ubaid (1991) discussed the performance of contractors as one of the major causes of delay. Thirteen (13) major measures were considered. These measures are related to contractor resources and capabilities. He identified contractor performance as one of the major causes of delay in project in Saudi Arabia.

Al-Barak (1993) discussed the main causes of failure in Construction industry in Saudi Arabia by surveying 68 contractors and about 34 different causes of failure. The study concluded that lack of experience, poor estimation practices, bad decisions in regulating company's policy, and national slump in the economy are the severe factors.

Assaf et al. (1995) studied the main causes of delay in large building projects. The survey covered a random sample of contractors, consultants, and owners. They grouped the delay causes (56 causes) into nine major groups: financing, materials, contractual relationships, changes, government relations,

manpower, scheduling and control, equipment, and environment.

Assaf and Al-Hejji (2005) investigated time performance of different types of construction projects in Saudi Arabia to determine the causes of delay and their important according to each of the project participants, owner, consultant and contractor. The investigation included a field survey of 23 construction contractors, 19 consultants and 15 owners. They concluded, based on the owner's specification, that the main delays are related to contractors and labours. Owners and contractors both indicated that ineffective planning and scheduling by contractor is one of the delay to the project; poor management, poor site management and supervision by contractor.

Assaf and Al-Hejji (2006) studied causes of delay in large construction projects. 76% of the contractors have indicated that average of time overrun is between 10% and 30% of original duration, while about 56% of the consultants specified the same percentage. 25% of the consultants have indicated from 30% to 50% average time overrun. Owners specified that causes of delay are related to contractor and labors. Study indicated that owners and consultants realize lowest bidder is the highest frequent factor of delay, while, contractors considered severe causes of delay are related to owners. Both owners and consultants specify labor and contractor related causes as the severe and important sources of delay, while, contractors indicate that the important sources of delay in construction projects are owners and consultants. They recommended to owners ("Timely payment to contractor, minimum change in order during construction, timely reviewing and approving of design documents, checking resources and capability of contractor"), contractors ("sufficient number of labors, managing financial resources, proper planning and scheduling, better site management and supervision"), consultants ("timely reviewing and approving design documents, flexibility in evaluating contractor works")

#### 5 RESEARCH OBJECTIVE

The objective of study is to determine causes of delay (time expansion) in construction projects in Saudi Arabia. The study was carried out in Riyadh Province. the objective of this paper is to determine the most important causes of delay in building construction projects in Saudi Arabia. This paper identifies the causes from the points of view of the main project parties: owner, contractor, and consultant.

#### 6 RESEARCH METHODOLOGY

Quantitative questionnaires were used to provide a large number of responses from the Saudi construction sector at reasonable time and cost. The distributed questionnaire was designed to identify the Saudi public construction sectors current factors causing Time overruns/Project delay. The collected quantitative data was analysed using Statistical Package of Social Sciences (SPSS).

, The main aim was to provide a detailed assessment of experience and understanding of these factors. These are main three objectives fulfilled by quantitative study:

1. To identify knowledge and understanding of project completion in construction organisations.
2. To assess the practices and effectiveness of the current construction industry.
3. To explore and identify delay factors in construction industry.

Field data was collected from project owners, construction industry consultants, contractors and Working engineers. The collected (quantitative) data were gathered from the construction industry in Riyadh province, KSA

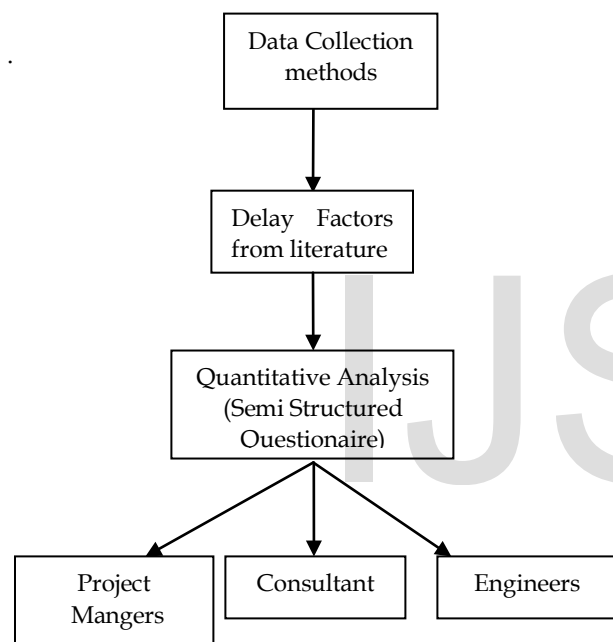


Fig. 1: Data Collection Methods

Present research introduced criteria structure for prequalification of contractors, working mainly with government organisation. 95 causes of delay were identified through literature review. These delay factors were categorised into eleven factors namely: Project related, owner related, Contractor elated (Technical, Reputations, management ability, Organization culture), Consultant related, Client related, Financing related, Design related, Plant/equipment related, Materials, Workforce (Manpower) related, External factors related. A questionnaire was developed in order to evaluate frequency of occurrence, severity and importance of identified causes.

## 7 RESULTS & DISCUSSIONS

The main findings of the quantitative data analysis was that the main problems facing construction industry in Saudi Arabia is the delay in the project. Project delay costs have in-

creased sharply and have impacted on the initial costing of the project.

A total number of 39 filled questionnaires were received, most of them were engineers (61.5%) followed by Consultant (23.1%). All the respondents were related to Construction industry.

TABLE 1: Respondents work Position

Work Position	Engineer	Consultant	Project Managers
Frequency	24	9	6
Percentage	61.5	23.1	15.4

The majority of respondents belonged to 26-30 years of age, (30.7 percent). Only 7.7 percent of the respondents were >50 years old.

TABLE 2: Classification of respondents by their age

Age	26-30 Years	31-35 Years	36-40 Years	41-50 Years	>50 Years
Frequency	12	9	6	9	3
Percentage	30.7	23.1	15.4	23.1	7.7

The vast majority of respondents had 5-10 years of work experience, i.e. 30.7 percent, while 23.1 percent have over 20 years experience.

TABLE 3: Respondents' years of experience

Experience	<5 Years	5-10 years	11-15 years	16-20 years	>20 years
Frequency	6	12	9	3	9
Percentage	15.4	30.7	23.1	7.7	23.1

The responses were analysed to find top 15 significant factors causing delays.

Table 4 shows 15 main delay factors as identified by Consultant.

TABLE 4: Consultant responses to top 15 significant factors causing delays

Hypothesized factors	Rank
Type of Project (Government/Semi Govt./Private)	1
Slowness of owner decision making process	2
Partial payment during construction	3
Late in revising and approving design documents by owner	4
Delay in progress payment by owner	5
Low speed of decision making involving all project teams (contractor, subcontractor, owner, consultant)	6
Change orders by owner during construction	7
Lack of communication between client and contractor	8
Uncooperative owners	9
Suspension of work by owner	10
Delay in contractor's payment by	11

owner	
Cash flow to subcontractor	12
Unexpected foundation conditions encountered in field	13
Low speed of decision making within each project team	14
Qualification and experience of technical staff	15

Table 5 shows 15 main delay factors as identified by Project Managers.

**TABLE 5:** Project Managers responses to top 15 significant factors causing delays

Hypothesized factors	Rank
Slowness of owner decision making process	1
Delay in contractor's payment by owner	2
Delay in progress payment by owner	3
Original contract duration is short	4
Change orders by owner during construction	5
Late in revising and approving design documents by owner	6
Shortage of materials in markets	7
Long waiting time for approval of test samples of materials )	8
Delay in selection of material due to various choice	9
Delay Penalties	10
Delay to furnish and deliver site to contractor by owner	11
Cash flow to subcontractor	12
Relationship with suppliers	13
Number of direct workers available for the project	14
Inflexibility (Rigidity) of consultant	15

Table 6 shows 15 main delay factors as identified by Engineers.

**TABLE 6:** Engineers responses to top 15 significant factors causing delays

Hypothesized factors	Rank
Slowness of owner decision making process	1
Uncooperative owners	2
Delay in contractor's payment by owner	3
Delay to furnish and deliver site to contractor by owner	4
Change orders by owner during construction	5
Long waiting time for approval of drawings	6
Delay in progress payment by owner	7

Past management performance	8
Credit rating of contractor	9
Suspension of work by owner	10
Delay in contractor payment by owner	11
Long waiting time for approval of test samples of materials	12
Delay in selection of material due to various choice	13
Low speed of decision making involving all project teams (contractor, subcontractor, owner, consultant)	14
Contractor relationship with suppliers	15
Delays in design information	15

## 8 CONCLUSION

The main delay factors that lead to Project overruns are related to "Project owner's role, contractor related, Financing related, Materials related, Design documents and Site management & supervision".

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