

The Most Important Causes of Delays in Highway Construction Projects: Libyan Investigation Based

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Abstract

The study is laying its foundation on quantities' statistical data collected from current and former consultants who have had the opportunity to investigate the delaying of the construction such as projects, identifying the system bottle-necking and accelerate the system performance by overcome any delaying obstacles. The purpose of this study is to investigate the most important causes of delays in Libyan highway construction projects. The participants, who were a representative segment of Libyan people all commented on 35 possible reasons for delay and their views were evaluated using data analysis techniques (Relative importance index (RII) by the SPSS program and average index calculation) to report on the data collected. Within the limits of the data analysis the results revealed that; the effective delays are caused by mainly six reasons which including the following; obstacles from government, poor contract management by consultant, delays in payment by clients to implementing companies, ineffective planning by contractor and inaccurate scheduling, poor site management, and sluggishness in the decision-issuing process from clients.

Keywords: *Libya, causes of delay, Highway, construction Project*

1. Introduction

Across the globe, the construction industry faces challenges in guaranteeing the completion of projects on time. This problem also heavily affects the construction industry in Libya. There are complex ranges of reasons lead to delay in construction that make it tedious problem to model and overcome. Mapping such reasons stand behind disruption in schedule of the highways construction in Libya is essentially the aim of this study. By accurately identifying the system flaws, it leads to

effectively optimizing the performance of operations and reducing the time lapse beyond the schedule or totally avoid it.

One of the main reasons for embarking on this study is the unimpressive performance of previous projects in Libya. In developed countries, study usually based on the application of critical factors to monitor, control and ensure that the outcome of a project is predictable. However, such study is limited in developing countries, such as Libya. Therefore, typically, the actions of the developed countries emulated in order to assist in eliminating delays in the construction of highways. Nonetheless, to determine the effectiveness and application of the existing study findings, it is important to conduct a study on the causes of such delays in Libya.

The objective of this paper is to investigate the causes of delay in highway construction projects in Libya, as perceived by both consultants and public clients; this will have done by using a survey questionnaire.

2. Literature view

Highway construction projects involve several parties because of their interdisciplinary nature. For the employer (usually the public), time is of great importance, as the highway construction field is anxious about project completion dates.

Highway construction jobs that completed on time are termed as being successful. [18] agreed with this, suggesting that a project will be deemed to be successful if the actual time spent on construction is less than or equal to the time allocated. In addition, they reported that highway construction projects usually include a relationship between time and functions and the actual cost. Therefore, it is suggested that time delays will relate to increased costs for the overall project.

Everybody wishes to deal with a client who aims to complete the construction projects in a shorter period of time. In their reports, [15] suggested that timely project deliveries with 100% ability to accurately predict completion dates are one of the things needed by clients in the construction industry. Contractors are seen to seek the use of advanced technological tools and techniques in order to realise the demands of contracted projects. Alternative procurement methods are employed to reduce highway construction delays, including the use of construction management, design-build-operate and build-own-operate-transfer project delivery methods, and project management [24]. By these approaches, the importance of the time and costs for construction projects is emphasised. Nonetheless, there are frequent delays with both measurable and immeasurable associated costs.

[3] stated that “delay in construction can have a number of consequences in a project, such as late completion, lost productivity, acceleration, consequential damages, increased cost, and contract termination” (p. 242). Thus, it can be asserted that project delays have negative effects, ultimately resulting in increased costs.

[25] on his research conducted, he divided delays into two categories: disruptions and interruptions. The former is defined as sufficiently adverse conditions that can slow the project down without

necessarily bringing it to a standstill. Although disruptions do not affect the overall schedule of the project, which lead to construction delays. On the other hand, interruptions are an adverse state of affairs that cause the project to come to a standstill for at least an hour.

According to [7], delays do not only affect the financial terms of the contractor, but also expose the employer to serious economic and financial risks, such as the loss of market opportunities and higher interest rates. They can affect other activities set out in the programme because of the interdependence of the nature of a highway construction project. Arguing that a change in a project can emanate from many other factors, [9] Confirmed that many of these are interrelated. This means that delays can result from the slightest disruption or interruption.

An incident can have an effect if its impacts on clients, contractors, regulators or any other of the series of people or groups that interact with the building project [3], pp,243. Usually, when countless delay events occur, caused by different parties, this results in a delay to the whole project [7]. However, this is a very complex matter, which can create uneasiness in such projects. [7] pointed out that “investigating how these events affect the various project activities and the contract completion date for purposes of justifying and quantifying delay claims has been a matter of the greatest difficulty.”

[3] added that the parties experiencing damages from delays, as well as the ones responsible for them would need more time to reorganise themselves. It is commonly understood that when a delay occurs, a party or some parties must be held responsible, and that the cost needs to be covered somehow. Thus, it is vital to assess and resolve any claims that are cause the delays. However, this is seen as a challenge, because multiple parties may be involved in a delay, making the task of apportioning blame extremely difficult [7]. Highway construction projects present the notion of delays as a form of risk.

Activity delays may not necessarily result in the same issues as project ones. Nevertheless, it can be argued that a delay involving any single event in the construction industry can result in a disturbance to overall performance and create unnecessary confusion among the parties involved. [25] established that delays have a great impact on productivity. He further argued that construction project delays are the main cause of losses of productivity, resulting in loss of time.

Delays in construction require one of the parties to take responsibility and so be able to compensate the other for losses. This leads to problems when the employer, the contractor or neither party is responsible [11]. Compensation claims arise from time lost causing a cost overrun. Delays on the part of the employer result in the contractor making compensation claims for prolonged project delivery times leading to additional overhead costs. However, if a delay is caused by the contractor, it can result in liquidated damages [11].The owner of the project should be paid compensation for any loss in benefits (profits) that may have emanated from the project being completed according to plan. Delays in this kind of project will increase costs [3]. According to [18], time is an important factor for cost evaluation in a construction project. It was also stated, that the construction period correlates to actual cost. Therefore, an increase in this has a direct impact, with increases in

additional costs eating away at the company's profit.

In the NEDO report, [20] argued that the success of a project depends on management efforts made to complete the project on time. These are useful in reducing and controlling costs. As a result, [28] also claimed that a project delay has severe implications on the cost and quality of the work. Therefore, it follows that delays affect the overall success of the project. [22] argued that the timely completion of construction projects is seen as a criterion for success. This view cements the fact that in the construction industry, time is a factor that used to measure the extent of success.

According to the current literature, delays are a major factor in causing cost overruns that are circumstantial and associated with claims. A cost overrun means exceeding an actual cost, as defined in the budget. Therefore, this can be derived from the difference between the actual cost and the estimated one, expressed as a percentage of estimated costs [9]. Determining that a delay is an existing cost in projects will assist in identifying possible solutions put forward to avoid cost overruns. Studies on cost overruns have focused on the risk factors that lead to them. The [9], generally held that highway construction projects are exposed to many environmental risks, such as the complexity of the design and planning, the presence of other interest groups and the economic and political environment. As a major construction risk, a cost overrun is often seen with apprehension, due to its negative implications for all stakeholders involved in the project. Other authors, particularly [17], have added that a cost overrun results in the loss of clients' confidence. There is a suggestion that it can result in deterring the decision of the client to invest in future projects.

For the client, rising costs means costs exceeding what was agreed upon at the beginning of the project, and this results in a reduction in return on investment. This affects the ultimate user because the additional costs are passed the form of higher rental charges, tolls and prices. The contractor also suffers significant loss of earnings when not finishing a job on time as well as negative word of mouth. The result that they may not be able to receive continued funding to complete the project due to concerns about additional risks,[17].

Overrun costs have resulted in the loss of clients' confidence, adding investment risks [17]. The global highway construction industry suffers from cost overruns that are a direct result of project delays. To clients, the implication is that cost overruns are any costs additional to the ones agreed for the project [17]. The client demands value for the money invested, and has the potential to tarnish a contractor's reputation, resulting in a massive lack of confidence from potential future clients [17]. Therefore, the increased costs resulting from delays undoubtedly have a negative result for both the contractor and the client. Delays to a contract often result in higher costs, claims or liquidated damages. Unquestionably, additional high costs raise concerns when identifying factors associated with delays and when looking into possible means of eliminating, or at least minimising them during the delivery of a project. However, there are some studies been done in developing countries and identified the major causes delay in road construction projects. Such as,[21]they are indicated that the five major causes a delay in Nigerian construction projects which is a Lack of funds to finance

the project to completion, changes in drawings, lack of effective communication among the parties involved, lack of adequate information from consultants; and slow decision making. In Tanzania, construction projects [12] stated that the major causes of delay, Design changes, Delays in payment to contractors, Information delays, Funding problems and Poor project management.

[13] analysed the main cause's construction projects in Egypt and they found that the most important were; Political insecurity (instability); Financial difficulties of contractor; Escalation of material prices (inflation); High cost of skilled labour; and Difficulties in getting work permits from government. In summary, literature stated that the delay cause by different factors based on the environment and different countries. However, this study will focus in Libyan construction projects.

3. Methodology

The previous studies highlighted the fact that the survey was one of effective manner of cost to collect and analyze significant number of responses from the various parties involved to achieve the better statistical analysis of data [26]. Therefore, the questionnaire was designed based on the general questions that were previously used to find the delay factors in the construction industry [4]. The purpose of the survey is to discover the main delay factors that arise in highway construction in Libya. Project managers, engineers and other professions were requested to take part in the survey and share their knowledge and opinions gained by their experience in Libya to answer a questionnaire regarding highway construction.

The questionnaire was divided into two parts. The first part related to common factors that may cause a delay to the construction of highways, which cannot be controlled by either the client or the contractor. These factors include ground conditions and bad weather that is due to the Sahara climate that causes blowing dust to occur regularly. The second part consists of questions that are caused by any of the parties involved neglecting their responsibilities. These parties are categorised into four categories, which are client, contractor, subcontractor and consultants.

The probability of the factors being the main factor delaying the construction of highways was divided into five headings as follows: strongly agree, agree, neither agree or disagree, disagree and strongly disagree as shown in Table (1). The scale started from 1 to 5 where 1 is strongly agreed and 5 represents strongly disagrees. Even though the main language in Libya is Arabic, however the survey was only designed in English. People within Libya, America and the UK took part in this survey. To avoid the need to collect data from everyone individually, the Survey monkey website was utilized to carry out this survey thus making it easier to collect the data from different professions in less time.

Table 1. Relationship between the average index and scale

Average index	Scale
$1 \leq \text{Average index} \leq 2$	Strongly Agree
$2 \leq \text{Average index} \leq 3$	Agree
$3 \leq \text{Average index} \leq 4$	Neither agree nor disagree
$4 \leq \text{Average index} \leq 5$	Disagree
Average index > 5	Strongly disagree

I. Survey data analysis

The data analysis was carried by calculation the Average index, where it calculated the average of each of the 35 factors that have been included in the survey. The data was also analysed by the Statistical Package for Social Science (SPSS) programme to get a more accurate result as this programme uses a more complex method to analyse the data by using the relative important index. The formulas used to calculate the Average index and relative important index is as follows:

II Average Index

$$\text{Average index calculation} = \sum \frac{PiU}{Ui} \quad (1)$$

Pi= Respondents classification of reason for delay

U= Number of participants with identical weight on a given reason for delay

III Relative important index (RII)

$$RII = \frac{\sum W}{AN} \quad \text{Where: } 0 \leq RII \leq 1 \quad [23] \quad (2)$$

A= the highest scale for survey is (5)

$$W = 5n_1 + 4n_2 + 3n_3 + 2n_4 + 1n_5$$

$$RII = \frac{5n_1 + 4n_2 + 3n_3 + 2n_4 + 1n_5}{5N} [15]$$

Where:-

n1= number of respondents for Strongly Agree.

n2= number of respondents for Agree

n3= number of respondents for neither agree nor disagree

n4= number of respondents for Disagree

n5= number of respondents for strongly disagree

N= Total number of respondents.

4. Data and analysis

This section provides an analysis of the results, which were obtained from the questionnaire. Thirty-five possible reasons were provided which significantly contributed towards the delaying of the construction of the highways in Libya. These were analysed by two methods: the calculation of the average index and the relative important index (RII), using the SPSS program.

The data was collected from the 76 questionnaires that were distributed there were only 64% of the questionnaires returned, will illustrates in the next three Figures (1), (2), and (3) in terms of skills science and qualifications profile and years of experience. This study verifies the most important reasons for delays in highway construction projects in Libya by using two ways the average Rating calculation and the relative importance index (RII) using SPSS program [14]. The investigation is based on data collected from questionnaires. Males from different disciplines who had different levels of experience in their professional fields completed the questionnaires as described in Table (2) . The comparative significance of the individual factors was calculated and ranked, and the same was done for the groups [6]. The principal objective of this analysis is to determine the major reasons for delays in highway construction in Libya. After identifying these causes, suggestions are given for ways to eradicate them or reduce them to the minimum possible delays.

This survey analysis is to establish the importance of various reasons for delays in highway construction in Libya. Because not all factors have the same influence on delays in highway construction, average index calculation [2]. In addition, relative importance index (RII) used to distinguish between the various factors [8]. All the process information gathered from the questionnaire, which was distributed to a sample of Libyan people, was then analysed a by a statistical computer software program (SPSS).

Average Index Results;

$$\text{Average index} = \sum \frac{P_i U}{U_i} (3)$$

P_i= Respondents classification of reason for delay

U= Number of participants with identical weight on a given reason for delay

$$\text{Average index for first sample Obstacles from government} = \frac{27*1+14*2+4*3+2*4+2*5}{27+14+4+2+2} = 1.73$$

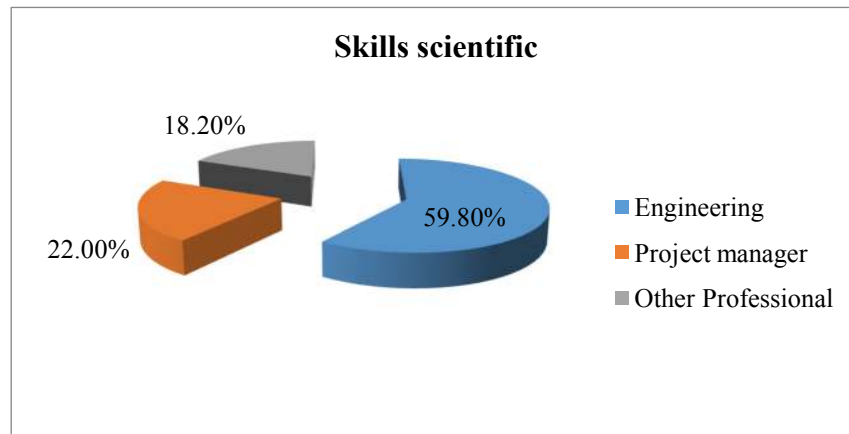


Figure (1): The percentage of scientific skills for the Libyan people who responded to the survey

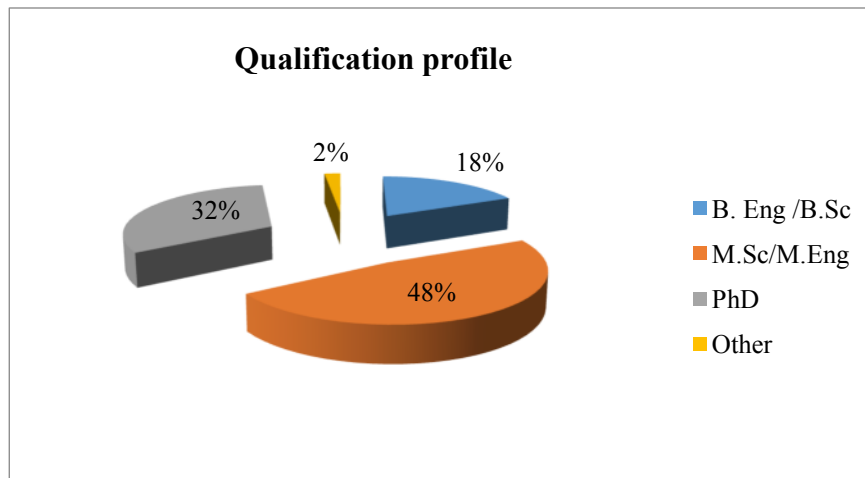


Figure (2): The percentage qualification profile for the Libyan people who responded to the survey

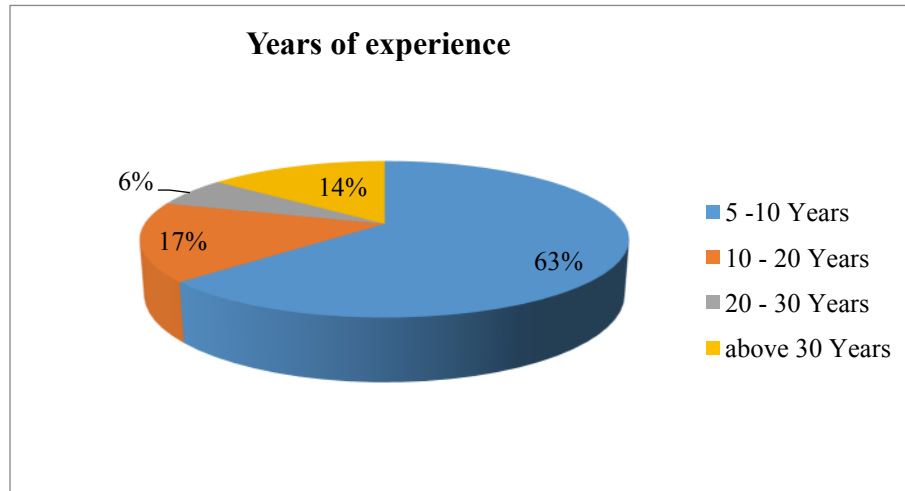


Figure (3): The percentage Years of Experience for the Libyan People who responded to the Survey

Table 2. The factors percentage (%) with total survey respondent N (49) and ranking

Attitude of	Factors	1	2	3	4	5	Ranking
Project	Obstacles from government.	55.10%	28.57%	8.16%	4.08%	4.08%	1
Consultants	Poor contract management by consultant.	36.73%	46.94%	10.20%	4.08%	2.04%	2
Clients	Delays in payment by clients to implementing companies.	38.78%	42.86%	8.16%	8.16%	2.04%	3
Contractor	Ineffective planning by contractor and inaccurate scheduling.	20.41%	57.14%	16.33%	4.08%	2.04%	4
Contractor	Poor site management.	36.73%	32.65%	18.37%	6.12%	6.12%	5
Clients	Sluggishness in the decision-issuing process from clients.	26.53%	44.90%	18.37%	6.12%	4.08%	6

(1)=Strongly Agree (2) =Agree (3) =Neither agree nor disagree (4)=Disagree (5)=Strongly disagree

5. Discussion of the results

This section provides discussion of the results, which were obtained from the questionnaire. These were analysed by two methods: the calculation of the average index and the relative important index (RII), using the SPSS program. However, this study will only focus on the delay factors with a very high impact: less than **2.16** when calculated by the average index; and above **0.773** when calculated by the RII. These include Table (3):

Table 3. The delay factors with a very high impact calculated by the average index and the RII

No	Factors	Method of analysis:	
		Average index	RII
1-	Obstacles from government.	1.73	0.852
2-	Poor contract management by consultant.	1.88	0.834
3-	Delays in payment by clients to implementing companies.	1.92	0.823
4-	Ineffective planning by contractor and inaccurate scheduling.	2.10	0.782
5-	Poor site management.	2.12	0.781
6-	Sluggishness in the decision-issuing process from clients.	2.16	0.773

Although the government must firstly be supportive of the projects in the country and that, they are undertaken correctly and supplemented without delays, the results of the analysis showed the opposite practice. Thus, the government was the main obstacle, which resulted in delays to the establishment of the Libyan highway projects. The government also caused significant problems for local and foreign companies who had signed a significant number of contracts with them. This has led to the disintegration of those particular contracts, which has resulted in losses to the state budget.

Consultant contract management was the second important factor contribute in delaying of operations execution followed by the funding issue was ranked as the second highest factor by all the respondents for delays in the construction of the Libyan highway projects. Funding difficulties were also identified as the main principal factor for delays within Malaysian construction projects [1] and [5]. Overall, the inability to regularly pay contractors for work which had been undertaken had impeded progress and had caused delays. In addition, the failure to provide adequate financial resources to contractors ultimately led to their inability to complete the required goals of the designated projects [19].

Accurately scheduling of operations and contractor effectively planning laid forth in the scale of affecting project timing site management was ranked fifth with the highest number of factors. This indicated that construction in Libya was not well managed, and had poor planning, estimation and site management. Overall, these factors have resulted in significant delays for Libyan highway construction [10]. In order to prevent this, proper planning, and accurate estimations are required. In addition, the sites need to be properly managed in order for efficiency to be increased.

The study findings conclude that the obstacles the government put in place contributed to the main reasons for delays in highway construction of Libya, which caused issues affecting contracts between companies and their client. This result was a surprise as the government that is supposed to be a catalyst in the completion of the project due to possessing financial resources to finance such projects from the Country treasury however; the government seemed to be causing the problem. Funding and finance difficulties from the contractor and delay in payment by the client to the contractor were also causing a delay. Additional delays in Libya were attributable to scheduling, control issues and contractual relationships.

6. Conclusions

Based on the study and scrutiny of a group of previous studies regarding the reasons for delays in the setting up of projects, which have varied in their effect from one project to another and from one place to another. Thus, thirty-five reasons have been studied for the delays within the construction of the Libyan highways in order to determine those of significant importance. The results were discussed the analysis of those ratios, which were obtained from the quantitative survey in accordance with their level of impact from high to low. However, this paper focused only for the most six important reasons leading to delay in the construction of the Libyan highways with average index between (1.73 -2.16).

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