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The causes of construction delays in Libya and identify possible solutions to avoid or reduce the delay in projects

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Abstract

Project delays, particularly in construction projects remain a major problem, with serious implications for the project costs, customer satisfaction, and the overall efficiency of the construction industry. Using mixed research methods and a sample of 10 project managers, consultants, and contractors, drawn from a mid-sized construction company in Libya, this study sought to identify and evaluate the main causes of delays in construction projects in Libya, with a view of developing a framework for preventing and/or mitigating their effects on the projects. The main causes of construction project delays are identified from the review of peer-reviewed studies undertaken elsewhere in Africa and the Middle East, on the basis of which a conceptual framework of how to manage these factors is developed. Data was collected using self-administered, semi-structured questionnaires. The results showed that the most critical causes of delays in construction projects are poor infrastructure, extreme insecurity, lack of access to credit (owner/contractor related financing problems), unrealistic/unreasonable project durations, dysfunctional government and law enforcement systems, inefficient supply chains, excessive government bureaucracy, war/conflict, and the failure to capture the owner's requirements at the design phase. A tested framework to address these factors is presented.

1.0 Introduction

This study's aim is to identify and evaluate the main causes of delays in construction projects in Libya with a view of developing strategies to prevent or mitigate them. This chapter begins by contextualising the research problem, including peer-reviewed and anecdotal evidence of the extent of the construction project delays in general and in Libya. This is followed by the definition of project delays and their effects. This chapter also includes a brief background of the Libyan macro-environment conditions, in order to highlight the context of the study and the construction projects, followed by a similarly

brief background into the Libyan construction industry. This chapter concludes with a problem definition, the research aim, and specific objectives.

1.1 Construction Project Delays in Construction Projects in Libya

Completing projects on time, within the set budget, and in line with the specifications of the client (and other stakeholders), represents the most important and basic traditional measures of project success (the iron triangle), that is unfortunately, not achieved by most construction projects (Aziz & Abdel-Hakam, 2016; KPMG International, 2015). In a global survey of construction project owners, KPMG International (2015) established that only 25% of projects undertaken in 2012-2015, were completed within 10% of the originally set deadlines. Similarly, Abbosh et al. (2016) found that only 30% of large construction projects in the energy industry are completed on budget and up to 85% of projects are not completed on time. Emam & Farrell (2014) and Assaf & Al-hejji (2006), and Nassar (2016) also found that upward of 70% of construction projects in North Africa and the Middle East, particularly large projects, experience significant delays and time overruns. In Libya's case, General People's Committee (2003) found that 97% of private and public construction projects face delays, with serious implications for the project time and cost. Similarly, Greenwood (2008) established that only 31% of 120 construction projects studied in Libya were completed in time. Shebob et al. (2012), on the other hand, found that construction projects in Libya suffered more delays relative to those in the UK and that the critical delay factors are different in the two countries. Construction projects in Libya were delayed for up to 46 days compared to 34 days in the UK (Shebob et al., 2012). There is also anecdotal evidence that major construction projects have been delayed (Reuters, 2013; Rogers, 2016). In 2011, the $100mn project for the construction of a sea water desalination plant was hit by delays that resulted in the complete suspension of the project. In the same year, an estimated $19bn worth of construction and civil engineering projects, mostly involving the construction of residential houses in Libya stalled (Rogers, 2016). In 2013, the construction of PT Medco Energi Internasional's oil production facility that was slated for completion in 2014 was only completed late in 2016 (Reuters, 2013; Shaibany, 2015; Bechtel, 2017). The delays are not limited to major projects, for there is also evidence that medium sized, and even small projects have posted substantial delays over the past decade (Atanasova, 2016; KPMG International, 2015).

1.2 Project Delays

Delay in project settings refers to the execution of any project activity (or the completion of the overall project) later than (a) is intended in the plan/contract, (b) a particular period, and/or (c) a specific time agreed upon by concerned parties for the completion of the activity and/or the delivery of the project (Alebarkos & Hatush, 2015; Ramanathan et al., 2012). Chronic delays and time overruns often translate into higher costs (for example because of time-linked labour contracts and equipment utilisation or hiring contracts), loss of goodwill, customer dissatisfaction, penalty claims, litigation, and complete repudiation of the contract (Sambasivan & Soon, 2007; Aziz, 2013). Depending on the nature of the contract and its specific provisions, delays affect nearly all project stakeholders in varying ways and degrees. Normally, project activities that are delayed are either accelerated or extended, resulting in higher costs. While contract conditions attempt to anticipate possible sources of delays and provide for them through time extensions and penalties, it is much more beneficial for all parties to identify the major causes of delay and prevent or mitigate them (Aziz, 2013; Aziz, 2013). According to Aziz & Abdel-Hakam (2016), factors and groups causing delays are specific to countries, locations, projects, and even individuals, which cannot be generalised but can be defined in sufficient detail to allow for corrective to be adopted.

1.3 Libyan Economy, Society, and Politics: A Background

In Libya, as in many other parts of the world, construction project delays, remain a major challenge to the industry. It is, however, critical to understanding the consequences of such delays in the context of mega projects that are underway in the country and the difficult macro-environmental conditions in the country. Libya has been in the throes of a bloody civil war since the 2011 Revolution that saw the overthrowal of the long-term leader, Muammar Gaddafi. While the country has attained a semblance of stability after the cessation of most hostilities, it still lacks a functioning social or political system. The risk of terror attacks and criminality is extremely high, which when coupled with a broken criminal justice and law enforcement. The Libyan economy has been the hardest hit by the protracted political instability and lawlessness. In 2010, Libya’s GDP stood at $74.76bn, but fell by more than 50% in 2011 and has remained low since.

The situation was compounded by record low global oil prices, which pushed Libya into recession in 2015. Libya's budget revenues from oil/gas in 2016 has fallen by 80% of the level in 2010, but government spending remains high, with the public wage bill, as a share of GDP, standing at 59.7%. Predictably, investments have tapered off and are incapable of sustaining the demand for public provision of education, health, water, and sanitation services. The country's budget deficit increased from 43% of the GDP in 2014 to more than 75% of the GDP in 2015 as oil export receipts have declined to just 15% of the level in 2012. At the same time, Libya's consumption driven imports have ensured that its current account balance is negative in 2015 and the official exchange rate weakened (The World Bank, 2016). While the country's economy is set to rebound in the near future, considerable challenges are expected over the coming decades (The World Bank, 2016), and with which the construction industry must deal with (Deloitte, 2017).

Key Economic Indicators

	2014	2015e	2016p	2017p
Real GDP Growth (%)	-24.0	-10.2	22.2	46.2
Inflation Rate (%)	2.4	9.2	3.5	3.0
Fiscal Balance (% of GDP)	-43.3	-75.3	-59.9	-10.1
Current Account Balance (% of GDP)	-54.8	-75.6	-69.0	-14.7

Figure 1: Libya's economic indicators (The World Bank, 2016)

1.4 Construction Industry

While there are significant variations from country and project to the other, the construction industries across the world share a number of characteristics that predispose projects to delays and other forms of failure (Assaf & Al-hejji, 2006; Aziz, 2013). These industries are characterized by deep fragmentation (low concentration), unreliable supply chains, poor quality materials, under-skilled and inexperience contractors, excessive regulation, high sensitivity to macro-environmental conditions, inexperienced clients, capital intensity, lack of equipment, differences in site conditions, and sensitivity to the weather (Doloi et al., 2012; Alias et al., 2014; Cox et al., 2006; Aziz, 2013). According to the Chartered Institute of Building (2010), construction projects

1.5 Libyan Construction Industry: A Background

Libya, like the rest of the countries in North Africa and the Middle East, is highly dependent on expatriate/migrant labour, which limits its ability to meet both its short-term and long-term labour and human capital needs (Ventures Middle East, 2012). Rising commodity prices and stiff regional competition for construction materials/labour are important challenges that the industry must face up. Further, the increasing scale and complexity of projects represent a critical challenge to project managers and investors, due to the heightened risk of failure and the resultant losses. Region-wide competition has heightened, as emerging firms take on major foreign players that previously dominated the Libyan construction industry (Ventures Middle East, 2012; Ramanathan et al., 2012). The Libyan construction industry, which comprises 5.7% of the country's GDP, has come a long way. From the 1950s, construction firms were owned by the state, which ensured that firms were few in number and large in size (Gherbal, 2015). In the 1970s, private construction companies were re-established, and which state-run firms remain dominant in the industry, many private entities have reduced the industry's fragmentation with the consequence of increasing the industry's competitiveness on one hand, and on the other, the increased fragmentation increased inefficiency due to high transactional costs (Ventures Middle East, 2012). Perhaps even most importantly, the construction industry does not only offer Libya an opportunity to move away from its dependence on oil/gas but equally importantly, it should ensure that the country rebuilds its transportation and petroleum infrastructure destroyed during the War (The World Bank, 2016).

Major projects are either underway or in the pipeline. These include the construction of the $9bn, 3170km railway network between Sebha and Sirte (with the possibility of extending to both Chad and Niger); the $2bn, 450km high speed railway line, the $1.85bn Sirte to Khums railway; the $1.25bn, housing infrastructure works in Benghazi and Tripoli; the $640mn Tajura infrastructure project; the $824mn railway link between Misratah and Sabha; and the $850mn railway line between Hicha and southern towns (Ventures Middle East, 2012; Deloitte, 2017). There are also private sector projects, large and small, currently underway and/or are expected as the economy turns around. These are substantial projects, whose timely completion and overall success has implications on not only the primary and secondary stakeholders but also on the Libyan economy.

Understanding and/or mitigating major causes of construction project delay in Libya can help ensure these mega projects are completed in time (Aziz & Abdel-Hakam, 2016)

1.6 Research Objectives

(i) To identify the main causes of delay in construction projects in Libya

(ii) To construct a conceptual framework exploring the key strategies for improving timely construction project delivery in Libya

(iii) Using data, construct a case study of a construction organisation in Libya, to collect the views of the key construction project stakeholders on the conceptual framework developed, including its potential benefits, weaknesses in reducing construction project delays, and practicability in the industry.

(iv) As an output of this study, develop a strategic framework for preventing and/or mitigating delays in construction projects in Libya

2.0 Methodology

This study's aim is to determine the causes of delays in construction projects in Libya with a view of developing strategies to prevent and/or mitigate them. To achieve this aim, this study, as indeed any other research effort, is underpinned by some philosophical basis about what comprises valid research and the suitable methods for developing knowledge in the study (Hughes, 1990; Smith, 1998). As such, prior to undertaking this study, it is critical to set out these underpinning assumptions. This chapter's purpose is to discuss the chosen research philosophy relative to other philosophy and give justifications as to why it was preferred. This chapter also expounds on the selected research strategy (including the specific methodologies selected and the participants) and introduces the research instruments that were adopted in the pursuit of the research aim.

2.1 Research Philosophy

According to Terre Blanche & Durrheim (1999) and Crowther & Lancaster (2008), research process comprises three primary dimensions i.e. ontology, epistemology, and methodology. A research paradigm is an all-encompassing system of interrelated thinking and practice that defines the fashion of inquiry along the three dimensions. A paradigm is an integrated collection of substantive concepts, problems, and variables attached to the respective methodological tools and approaches. Ontology describes the world view, while epistemology refers to the perception of reality or the relationship between the

reality and the researcher. The two most important (or perhaps the most dominant, for no paradigm is intrinsically better than the other), are positivism and interpretivism (Terre Blanche & Durrheim, 1999).

Positivism holds that reality is stable, observable, and capable of being described objectively (Mason, 2002). The research phenomena can and should be isolated and observations on the same are infinitely replicate-able. It entails the manipulation of reality by which a few aspects of reality are varied in order to identify regularities and relationships to other aspects of the same reality. Crucially, positivism maintains that reality exists externally to human beings, which is why researchers are expected to be detached so as to ensure there is a clear separation between subjective feelings and objective reason. In order to be able to do this, positivism requires the use of methods that can ensure objectivity and consistency. This is why mathematical and statistical tools/techniques that mechanistic, deterministic, and methodical, are preferred (Terre Blanche & Durrheim, 1999).

According to Hughes (1990), positivism seeks to make generalisations about reality that are free from context and time. This is necessarily possible and desirable even in social research not only because the researcher is independent of the research subjects, but also because it is possible to explain human behaviour by referring to the actions that immediately precede behaviour. There is, however, is a debate about the suitability of positivism to social research, with a considerable number of researchers showing a preference for more pluralistic attitudes towards social research methodologies (Hughes, 1990). While this debate is ongoing and extensive (Mason, 2002; Hughes, 1990), it is outside the scope of the present study.

Interpretivism, on the other hand, is hinged on the belief that only contextual interpretation and subjective intervention, in reality, allows for its full understanding. The reality is relative and several versions of reality are, therefore, possible because of the differences in contexts of systems of meaning (Terre Blanche & Durrheim, 1999). While positivism requires that researchers remain detached from their research subjects, interpretivism considers the researcher's involvement with the subject an important part of knowing about reality, since reality is socially constructed (Terre Blanche & Durrheim, 1999; Smith, 1998). Further, interpretivism moves away from the rigidly structured methods.

Instead, it prefers flexible and personal structures that are amenable to capturing meaning (both objective and subjective reality) in social relationships. The researcher and the research subjects co-construct meaning, and thus their mutual and active involvement is extremely important to the understanding of reality (Hughes, 1990). Perhaps one of the most fundamental differences between positivism and interpretivism, according to Crowther & Lancaster (2008), Mason (2002), and Smith (1998), is that while former seeks to describe a population, interpretivism is more focused on obtaining deeper insight about the section of the population that is sampled.

For the purposes of this study, both interpretivism and positivism have important roles to play. On one hand, it is important to determine the relative importance of the causes of delay in Libyan construction projects, which is best done using quantitative research methods (Aziz & Abdel-Hakam, 2016), but on the other, the study needs to explore a broad range of strategies that can be used to reduce project delays and their applicability in the industry. According to Terre Blanche & Durrheim (1999), the most important factor to consider when choosing the research paradigm is the research question. In this case, therefore, mixed methods should help to satisfy the research aim more effectively.

2.2 Participants and Sampling

The subjects in the vast majority were contractors, consultants (site engineers, design engineers, owner representatives, and/or architects), project managers, and owners (Afshari et al., 2011; Chan & Kumaraswamy, 1997; Shebob et al., 2012). This study is no exception. However, owing to the limited amount of time available to complete this study, owners were not included in the sample because of the practical challenges of recruiting and gathering data from them. The project managers and other practitioners were also highly likely to be alive to the issues that project owners feel strongly about and thus can serve as an excellent proxy for owners. The sample was also drawn from one organisation. To obtain the sample, the researcher used Internet search engines, industry reports, and company websites to compile a list of 108 construction companies based in, and/or with operations in Tripoli. The companies had to have worked on projects valued at least $5 million during the previous three years. A random firm was selected from the compiled sample, after which the researcher contacted both the firm's management potential respondents to request them to take part in the study. If the firm did not wish to participate,

a new organisation was drawn. All the project managers, consultants, and contractors in the selected company that were willing and available were included in the sample. Up to 27 potential respondents were willing to participate and questionnaires were sent to all of them. The final sample comprised of 10 respondents who returned duly completed questionnaires. See the Table below.

Position	
Average Age (Years)	44.72
Years of post-qualification experience	11.69
Contractors	3
Consultants	2
Project managers	4
Male	7
Female	3

Table 1: Demographic characteristics of the respondents

2.3 Questionnaire Design and Data Collection

The data was collected using semi-structured questionnaires. The questionnaires comprised four sections. The first section comprised of demographic data, (including the age of respondents, their academic qualifications, post-qualification experience, and designation in the organisation) as summarised in Table 3. Section II comprised of the number of projects that the respondents were involved in the previous five years, which experienced delays as well as the causes for the aid delays. Section III was a structured. It allowed the respondents to rate the causes of delay causes in terms of their effect on the timely delivery of the project.

A total of 81 factors that cause delay, any delay factor at least twice was included in the final compilation of delay factors that were considered in the study. Overall, the factors were grouped into six major categories. The factors were placed in the same categories as had been categorised in the individual studies in which they were identified. In cases individual factors were categorized in different groups in different studies, then the category that was adopted by most studies was adopted. In other cases, the researcher requested respondents to classify the factors accordingly. The major categories and the total number of factors categorized under them were as follows: owner related factors (15

causal factors), contractor related factors (14), external macro-environmental factors (13), Consultant related factors, including those factors related to project design/site engineer, and other specialists (19), project related factors (10), and material/labour/equipment related factors (7) . A five-point Likert Scale for every factor was included and used to rate the importance of the factor, from "*Very Little Effect" (1), "Little Effect" (2), "Average Effect" (3), "High Effect" (4) and "Very High Effect"* (5). Section IV was semi-structured. Based on the individual and factor groups in Section III ,and questions are drawn from the conceptual framework in Table 2, the respondents were asked for evidence of the identified solutions as well as to suggest any other strategies for preventing and/or minimising the effects of the factors on the projects.

The questionnaire was designed and piloted on two respondents, who were then excluded from the final sample. The pilot study sought to ensure clarity, logical ordering of questions, and internal validity of the questions (ensure b the questions addressed the issues that they were meant to address). The pilot study was also helpful in gauging the average amount of time required to complete the questionnaire, in order to advise the respondents accordingly so that they prepare themselves and not feel frustrated in the event they feel that the questionnaire is too long (Smith, 1998). The questionnaires were sent by email to all the respondents who had agreed to participate. They agreed to print out the questionnaires and complete them, after which the researcher collected them from the company's offices once they indicated that they had completed them.

2.4 Data Analysis

The scoring and data analysis procedures were closely drawn from Aziz (2013), Hamzah et al. (2011), and Doloi et al. (2012). The data in the questionnaire was scanned and entered into a template created in MS Excel. Qualitative data were transcribed verbatim into MS Word. To analyse the qualitative data, the number of respondents that selected the same score for every factor (that causes delay) was counted and entered below the score in the table as shown in Table 4.

To analyse the scores, the study the Relative Importance Index (RII) was computed for every factor. The formula for computing the RII as obtained from Doloi et al. (2012) and Aziz (2013) is as follows:

$$RII = \frac{1x(n1) + 2x(n2) + 3x(n3) + 4x(n4) + 5x(n5)}{5x(n1 + n2 + n3 + n4 + n5)}$$

Where

n1, n2, n3,n4, and n5 are the numbers of each grouped respondents that selected 1, 2, 3, 4, and 5 on the Likert Scale, respectively.

Table 2: Equation 1

The RII measures the relative importance of the various causal factors and it is computed for every factor. Essentially, the analysis transformed the Likert Scale scores by individual respondents into percentage (actual RII ranges from 0 to 1 and can be multiplied by 100 to change it into percentages) ratings for all the respondents (Doloi et al., 2012; Aziz & Abdel-Hakam, 2016).

Qualitative data gathered in Section IV of the questionnaire were analysed using a framework recommended by Pope & Mays (2000) and Silverman (2004). Firstly, data was transcribed as it is (verbatim) into a word processor. The researcher then read through the individual responses naively, followed by a more closer read while summarising key points. With the summaries, the researcher generated codes, which were applied to the rest of the paper, in a such a way that similar information was subsumed under the code, without reducing information. New codes were created for information that could not be put under the already generated codes. The same was repeated for every questionnaire, but with each subsequent questionnaire, the researcher went over those that had been analysed before to update the codes and other information depending on the new insight from reading other responses. The results of this process are included in the next chapter.

2.5 Validity and Reliability

As any good quality research must be valid and reliable (Smith, 1998), this study's design was careful to ensure that the results were confirmable, transferable, capable of replication, and dependable. In order to achieve construct validity, the factors that cause project delay were generated from peer reviewed studies conducted in Libya, elsewhere in Africa, and the Middle East. These factors were, therefore, already proven to be relevant and had significant impacts on the projects' timely delivery. To be sure, only those factors that were identified in at least two studies and/or were identified in one study as being extremely significant were included in the factor list that was considered in this study.

In addition, the study adopted the same methods and measures such as the RII as the leading studies that have been conducted in this area, including Aziz (2013), Hamzah et al. (2011), and Doloi et al. (2012). This makes it possible to compare results to the past studies as well as replicate the research elsewhere and/or at another time. Qualitative data was similarly analysed in line with an accepted and procedural framework for analysing such data, to ensure such consistency that it can be replicated, even though this is difficult for qualitative studies (and not really as important) (Pope & Mays, 2000). While the generalisability of the study is limited by the small sample drawn from the same organisation. To mitigate against this fact, however, the organisation was selected at random and all respondents that agreed to participate in the study and completed the questionnaires in time were included in the study.

2.6 Ethical Considerations

This study elicited responses that were indicative of the organisation's delivery of projects, causes of delays, and other information that may reflect poorly on the organisation in the eyes of current and potential customers. The respondents were also requested to suggest strategies that could help reduce project delays as well as the reasons why those strategies had not been adopted or implemented effectively. These responses may equally reflect poorly on the organisation and paint the respondents' colleagues in a bad light and/or invite repercussions. Other data may flow from or point to the organisation's strategies.

To begin with, it was important that the respondents were well informed about the nature and purpose of the study, as well as their participation. The researcher explained to the respondents in person, telephone and through email correspondence about the aim of the study, and shared other information. Further, permission was sought from the organisation for the respondents to participate in the study, and informed consent was sought and received (in writing) from all the respondents. To protect the confidentiality of the respondents, the questionnaires were only referenced using codes and did not include personally identifying data. Immediately the researcher received the questionnaire from the respondent, the data was transcribed into MS Word and Excel templates, scanned so it could be kept in a password secure folder on a computer, and then the actual copy was destroyed.

2.7 Summary and Limitations

This study only involved 10 respondents drawn from one organisation in Libya, on account of time and resource constraints. Effectively, the generalizability of this study's results to construction is heavily limited. This is why it is critical that more studies of the same nature, involving larger samples drawn from more construction organisations across Libya are conducted, in order to ascertain, with greater validity and reliability, the nature of causes of project delays in Libya. As at this time, only Kuşakcı et al.

3.0 Results

The aim of this study was to identify the causes of delays in construction projects as a first step towards identifying possible strategies to prevent them or reduce their impacts on the projects. The most consequential factors were identified in the previous studies and a conceptual framework for possible solutions was developed. These were then tested in the field. This chapter presents the results of the field work.

3.1 Types of Delays

The 10 respondents indicated that they had worked on a total of 28 projects in the previous five years. Up to 23 (82%) experienced a delay with 16 (57%) of the projects have faced serious delays. Only 36% of the delays were excusable, of which just 13% were compensatable. Non-excusable and concurrent delays comprised 41% and 24% of all delays, respectively. See Table 5.

Types of Delays Experienced	
Total number of projects in 5 years	28
Number of projects that experienced delays	23 (82%)
Excusable	36%
Compensatable	13.16%
Non-compensatable	22.3800%
Non-excusable	41%
Concurrent	24%

Table 3: Project types

3.2 Identification of the Main causes of Delay in Construction Projects in Libya

The delay-causing factors are sorted by their respect RII score, which points to their relative impact on the project.

3.2.1 Most Critical Causes of Delay

Up to seven out of 13 external factors were ranked as being among the top 23 factors that cause a delay in the Libyan construction industry. The most critical factors in this study included poor infrastructure, insecurity, difficulties in accessing credit for both the owners and the contractors, the delayed supply of utilities; unrealistic/unreasonable project durations; poor workmanship; excessive government bureaucracy; inefficient supply chains; dysfunctional political, legal, and law enforcement systems. Others are summarised in Table 6 and the factor category are shown in Figure 2 .

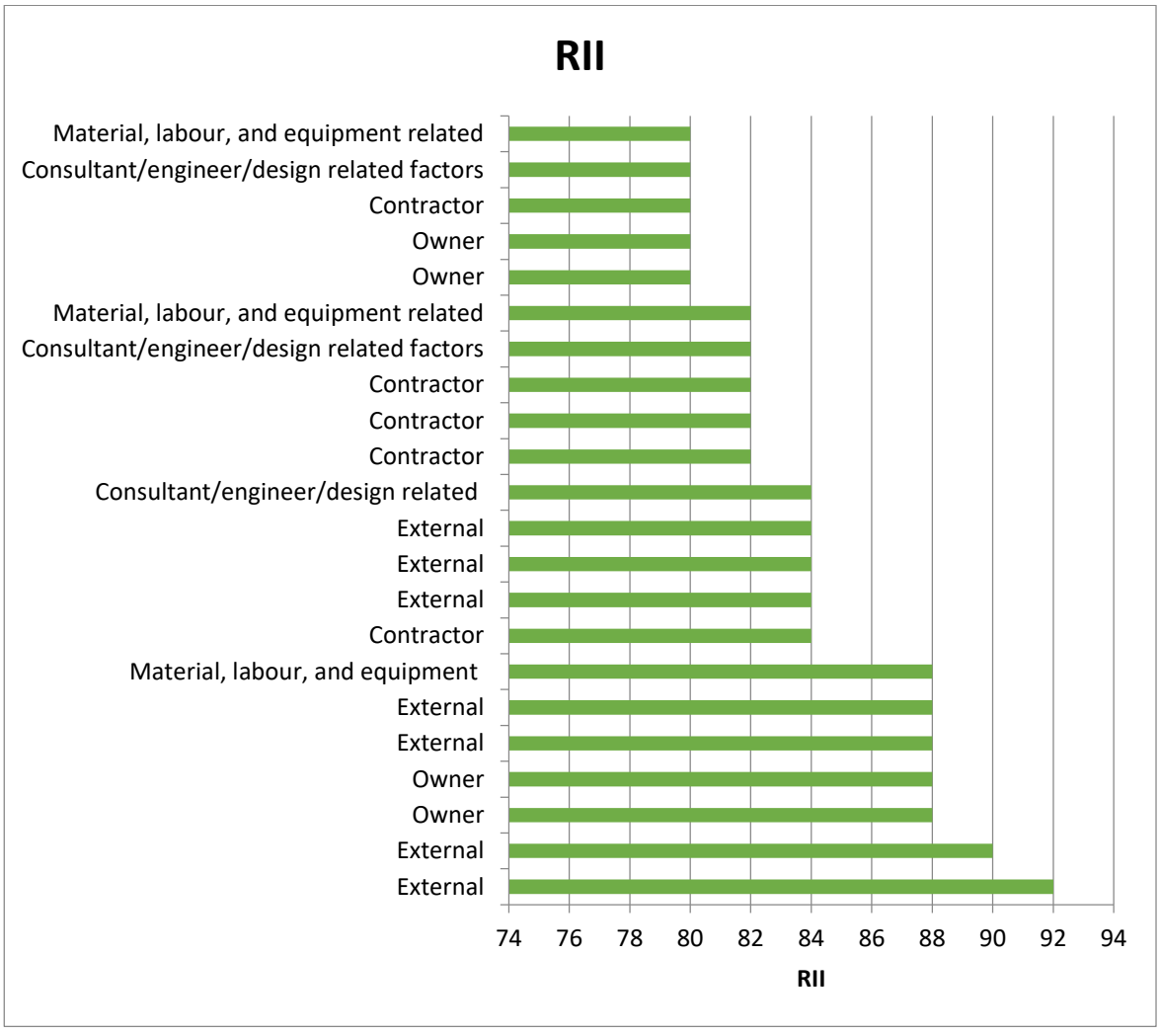

Figure 2: Factor Category Summary

Table 6 includes the same information as Figure 2, but includes the specific factors under the said categories that were ranked highest by the respondents.

Factor Category	Factor Description	RII
External	Poor infrastructure	92
External	Extreme insecurity	90
Owner	Difficulties accessing credit	88
Owner	Unrealistic/unreasonable project durations	88
External	Dysfunctional political, legal, and law enforcement systems	88
External	Inefficient supply chains	88
Material, labour, and equipment	Poor workmanship	88
Contractor	Excessive bureaucracy	84
External	Delay providing essential utilities	84
External	War and conflict	84
External	Design failure to capture the owner's requirements	84
Consultant/engineer/design related	Improper/poor planning and scheduling	84
Contractor	Unqualified staff/labour	82
Contractor	Inefficient or bad contract forms	82
Contractor	Inadequate contractor and sub-contractor capacity	82
Consultant/engineer/design related factors	Labour shortages	82
Material, labour, and equipment related	Changes in project scope	82
Owner	Lowest bidder criterion for selecting bids	80
Owner	Unqualified sub-contractors	80
Contractor	Unfair risk transfer to contractors	80
Consultant/engineer/design related factors	Consultant inexperience	80
Material, labour, and equipment related	Low technological adoption	80

Table 4: Critical Causes of Delay

3.2.2 Least Critical Causes of Delay

The least critical factors from the RII ranking scored less than 64. These included late revision/ approval of designs particularly when changes require valuations of the changes. Similarly, indemnities for the owner, slow mobilisation of labour by the contractor, delayed provision of plans, poor buildability evaluation, issues with neighbours the public,

owner suspension of works, and lack of higher education programmes catering to the industry's needs were also not considered urgent problems. See Table 7.

Factor Category	Factor Description	RII (%)
Contractor	Contractors often indemnify owners for accidents and losses	64
Contractor	Slow labour mobilisation	64
External	Delay approvals of plans and plan changes	64
Consultant/engineer/design related factors	Delayed provision of plans	64
Consultant/engineer/design related factors	Design errors	64
Consultant/engineer/design related factors	Poor buildability evaluation	64
Project related factors	Problems with neighbours/public	64
Owner	Owner suspension of works	62
External	Lack of advanced project management, engineering, and other construction-related courses in Libyan universities/colleges	62
Owner	Ineffective delay penalties	60
External	Revolution, War, and riots	60
Owner	Restrictive partial or lump sum payment arrangements	58
Owner	Owner interference	56
Contractor	Stoppages and suspensions	56
Contractor	Site accidents and safety problems	56
Contractor	Frequent changes in subcontractors	56
Owner	Financing problems (cash flows and payments issues)	52
Consultant/engineer/design related factors	Undefined structure	52
Consultant/engineer/design related factors	Engineers make change orders without consulting the client, hence dissatisfaction	52
Owner	Mistakes and discrepancies in the contract and the contract documents	50

Table 5: least critical factors causing delays

3.2.3 Delay Factor Categories

In respect to the categories of factors, external factors and factors related to materials, labour, and equipment were collectively considered to be most urgent threats to the timely completion of construction projects, while owner related factors were considered the least critical. It is, however, notable that all the groups registered very high RII scores, and the average RII may, in fact, be due to the many numbers of factors under a category with low scores that in turn mask serious factors.

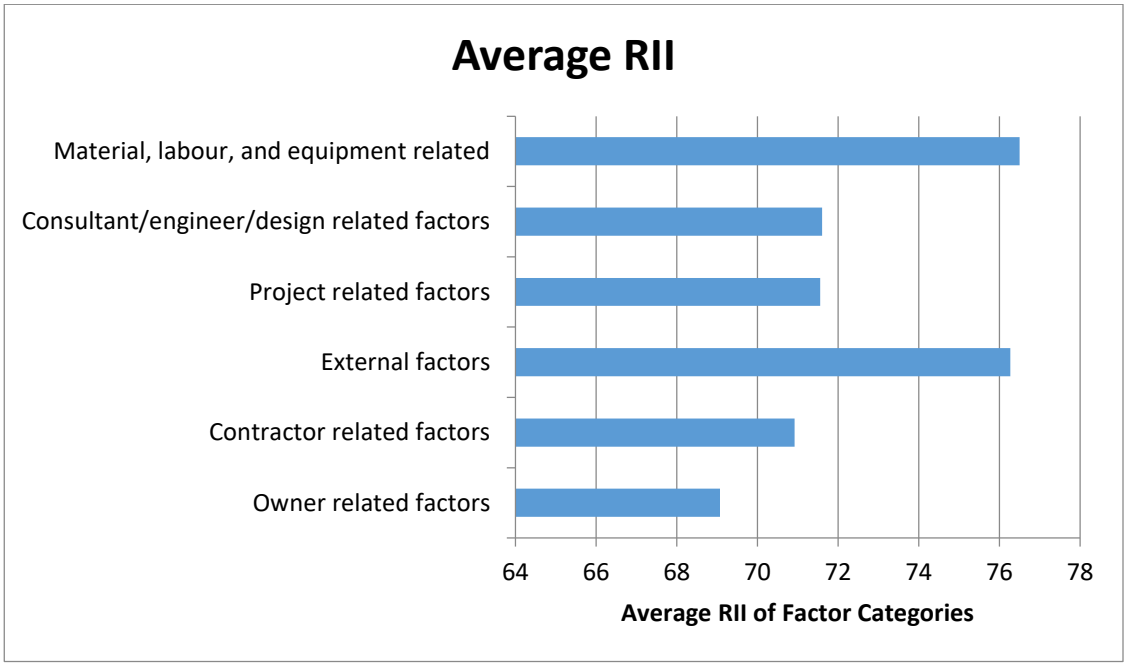

Table 6: Factor Categories

3.2.4 Owner related factors

The most important owner related factors included the delayed revision and approval of design documents, financing problems due to lack of credit, project scope changes, legal disputes, incompetent owner representatives and tendency to select the lowest bidder. Other factors, in order of relative importance, include too many or unnecessary change orders, owner inexperience, unrealistic/unreasonable project durations, ineffective delay penalties, owner suspension of works, and discrepancies/mistakes in the contract documents.

3.2.5 Contractor related factors

The most critical contractor related factors by the RII, in order of importance, include poor workmanship causing defects/reworks, unqualified staff, improper selection of consultants, ineffective planning and scheduling, lack of multi-disciplinary teams, financing problems, failure to adopt technology, execution mistakes, slow labour mobilisation, and frequent stoppages due to delayed material supply.

3.2.6 External factors

All the external factors were highly ranked by the respondents, with the least RII score being 64 and the highest being 92. The most urgent external factors, in order of relative importance, include poor infrastructure; insecurity; dysfunctional government, political, and legal systems; excessive government bureaucracy; cultural barriers to technology and best practices adoption; and War/conflict, terrorism; industrial disputes.

3.2.7 Project related factors

The most serious project related factors are difficult/unexpected site/sub-surface conditions, project uniqueness, technically complex processes, ineffective communication, delayed availability of utilities, inadequate research before design, and resistance from neighbors (or the public).

3.2.8 Consultant/engineer/design related factors

This category included, by far, the highest number of factors, in part because several categories in other literature i.e. design and engineer related factors were subsumed under this category. The most critical factors in this category, in order of relative importance, include the designer's failure to capture the customer's requirements (which results in many change orders in the subsequent stages), consultant inexperience, tendency of designers to transfer risk upstream, ineffective communication, poor site management/supervision, and poor contract management. Others are a lack of working drawings, delayed rendering of project plans, poor buildability evaluation, and unclear or incomplete details in the project plans.

3.2.9 Material, labour, and equipment related

The factors under this category ranked very highly, overall. The most critical include inefficient supply chains, unqualified labour, low technological adoption, and poor

operator skills. Others include labour shortages, material shortages, and low-quality materials.

3.3 The strategic framework for preventing and/or mitigating delays in construction projects in Libya

3.3.1 Value Stream Mapping and Flow

The respondents felt that minimising delay requires that all stakeholders, right from the conception/design phase of the project work together, whether directly or through contracts. The respondents blamed clients for introducing difficulties in the project from the designers that result in "bumpy" executions. Disruptive factors that ultimately lead to delays, according to the respondents included ineffective client-designer/client-contractor/contractor-designer/contractor-consultant communications, unfair penalties for delays, selection of the lowest bidder without adequate regard for capacity and experience, and delayed approvals and revisions of plans. Other factors that cause a delay that was also thought to arise from a broken value chain include poor coordination among stakeholders, late material delivery, poor quality materials, and unqualified labour. One respondent recommended that construction firms consider vertical integration to include design, construction, and either supply materials or establish reliable supply chains in order to avoid related shortages and delayed deliveries.

3.3.2 Planning, Scheduling, and Control

The best practices highlighted by many respondents with respect to preventing delays included communication, scheduling, quality management, scope management, procurement management, time management, human resources management, and project risk management. In relation to the aspects of the conceptual model, the respondents placed an emphasis on effective scheduling and the need for flexibility in order to take changes that occur after the process are accommodated without major disruptions to the project. One respondent explained that flexibility in scheduling must balance between the necessity for buffers and the costs/time implications resulting from such provisions. When asked for examples of scheduling, all the respondents mentioning approaches such as PERT, Gantt charts, and CPM, which they said if they are used properly, they are effective. Three respondents believed that software applications make the use of these tools easier and suitable for more sophisticated settings. None of the respondents believed that new

scheduling approaches were necessary or practical. There was a consensus on the role of communication, quality assurance procedures, and work progress certifications.

3.3.3 Dynamism and Proactivity

The respondents indicated that they are still heavily reliant on the planning-execute-control model of project management. Standard risk management practices, including insurance, indemnities, time-buffering, manpower buffering, risk assessment, and monitoring/control. However, there were no mechanisms to learn from past projects, limited training opportunities, formal project closing/handover reports, and lack of technology. Risks are managed by exception.

3.3.4 Project Management Team

All, but one respondent, agree that finding qualified and experienced construction workers in Libya is a big problem. Two respondents explained that Libya had been highly dependent on migrant labour, whose supply declined after the revolution, insecurity, and poor economic conditions. Suitably qualified and experienced project managers are hard to find. For project managers, respondents point to “adequate technical qualification”, the experience of at least five years in the Libyan industry, and understanding of innovative scheduling approaches. High retention, career planning, good pay, training, availability of equipment, and good communication are emphasised. Some respondents described the subcontractors’ lack of capacity as woeful and urged care in the selection of contractors.

3.3.5 Contract Management

The respondents were asked if any delays arose from contractual issues and possible solutions to fix those issues. Most of the respondents blamed “bad contracts”, which they described as unfair/imbalanced, impractical, and unfit for purpose. Owners fail to make progress payments and some contracts restrict payment to lump sum payments, which cause cash flow problems. Further, competitive bidding results in the selection of contractors without capacity. Procurement strategies are chosen by the owner, including design-bid-build, construction management, design and build, and management contracting affected risk transfer, coordination of project activities and resulted in delays. Disputes arising out of incomplete contracts, undefined project engineer’s roles, unfair decisions/determinations by the project engineer, delayed determinations of claims, bad faith, delayed certification of completed work and payment processing, owner suspensions

of work, and valuation of variations may lead to delays. Solutions included the use of standard contract forms, effective contract management practices, use of integrated contracts, and competent owner representation.

4.0 Conclusion

The aim of this study was to identify the main causes of construction project delays in Libya, with the intention of developing a framework to help prevent and/or mitigate them. The literature review helped isolate the most common and significant factors causing a delay as well as helped create a tentative framework for preventing/mitigate the identified causal factors. This chapter summarises the study's main findings and makes recommendations for further researcher and practice.

4.1 Identification of the Main causes of Delay in Construction Projects in Libya

This study shows that the most critical causes of delay in construction projects in Libya are, in order of relative importance, poor infrastructure, extreme insecurity, lack of access to credit (owner/contractor related financing problems), unrealistic/unreasonable project durations, dysfunctional government and law enforcement systems, inefficient supply chains, excessive government bureaucracy, war/conflict, and the failure to capture the owner's requirements at the design phase. The least severe causes of delay include mistakes and discrepancies in contracts, failure of engineers to consult clients before making/approving change orders, on-site accidents, stoppages and suspensions, and ineffective delay penalties. It is clear in this study that while many other factors that cause delay are closely ranked, external factors are highly ranked, unlike in other studies in other countries (Assaf & Al-hejji, 2006; Aziz & Abdel-Hakam, 2016; Mezher & Tawil, 1998; Hamzah et al., 2011). This, clearly points to the extreme macro-environmental difficulties that affect construction projects in Libya as well as the fact that sizeable construction projects are complex (Flanagan & Norman, 1993).

4.2 The strategic framework for preventing and/or mitigating delays in construction projects in Libya

The results in this study, read together with the results of similar/related studies in the industry across the world, point to the existence of a multiplicity of factors that affect delays (Kuşakcı et al., 2017; Abdelnaser et al., 2005; Flanagan & Norman, 1993). These

difficulties require a multi-pronged strategies, including those that are specific to the individual delay factors and those that address the general organisational and macro-environmental environments.

4.2.1 Factor Specific Factors

4.2.1.1 Owner related factors

The study, as well as other available literature, shows that owners are generally inexperienced, inadequately informed, make decisions slowly, and struggle with financing problems. To mitigate these factors, it is important to:

(i) Ensure effective communication between the client and both the designers and the contractors throughout the project period, by using a mix of traditional and emerging tools such as communication plans, ICT, and meetings.

(ii) Ensure the requisite financing is available for the project and manage payments to contractors in such a way that there is a continuous flow of cash throughout the project

(iii) Set reasonable and realistic deadlines for the project

(iv) Elect a technically competent and experienced representative to make up for owner inexperience

4.2.1.2 Contractor related factors

Contractors struggle with human resources' shortages, unqualified staff, financing difficulties, and misunderstandings with clients/designers over slow decision-making and unnecessary change orders. To mitigate these factors, it is important to:

(i) Ensure effective communication with the client, the design team, and all other primary stakeholders

(ii) Build human capital (and labour) and its productivity by pursuing robust strategies to attract, equip, develop, and retain highly qualified employees

(iii) Ensure financing is available, particularly for projects funded by them.

(iv) Effective project an site supervision

4.2.1.3 Consultant/engineer/design related factors

Consultants are faced by the same problems as clients and contractors, but shoulder the additional responsibility of ensuring smooth working relationships. They are partially responsible for eliminating design errors, bad contracts, and unfair upstream risk transfer. To address these issues, they should:

(i) Understand client requirements and undertake thorough research of the site before drawing up plans to ensure plans are error free and reflective of customer needs (Fugar & Agyakwah-Baah, 2010)

(ii) Work closely with both the client and the contractors by fostering excellent communication and monitoring project progress closely

(iii) Speedy decision-making (Głuszak & Les´niak, 2015)

4.2.1.4 **Material, labour, and equipment related**

Poor quality or late-delivered materials, unreliable supply chains, unqualified staff, and poor infrastructure are key challenges, which may be managed by:

(i) Establishing reliable suppliers and maintaining lasting relationships with them (Cox et al., 2006

(ii) Vetting suppliers/subcontractors for financial and technical capacity (Harris & McCaffer, 2006)

(iii) Human capital capacity development (Gherbal, 2015)

4.2.1.5 **External factors, Project related factors**

The Libyan construction industry faces extreme uncertainty and risk arising from government dysfunction, poor infrastruction, War/insecurity, and deficient labour markets. While most of the challenges under this factor category may be addressed through the broader factors addressed in the conceptual framework, it can help to adopt decentalised and flexible planning and risk management practices (Głuszak & Les´niak, 2015; Alaghbari et al., 2007; Fugar & Agyakwah-Baah, 2010).

4.2.2 **Project Delay Minimisation Factors**

4.2.2.1 **Contract Management**

Good faith and cooperation are important but need to be formalised in a robust contract to guide behaviour and decision making. Contracts are also a bulwark against delays factors such as unfair risk transfer, slow decision-making, and variations. To this end, it helps to:

(i) Consultants should help customers choose the right form of contract and procurement strategy for every projects

(ii) Contracts must apportion risks and benefits fairly, according to the ability of the parties to control and/or benefit from them (Harris & McCaffer, 2006).

(iii) Require a thorough research of the client requirements and site conditions before design and impose liabilities for errors arising due to the failure to do this (Carmichael & Karantonis, 2015).

4.2.2.2 **Project Management Team**

While the project manager's technical, personal, and managerial capacity is important, that of the team is just as important (Ikediashi et al., 2014; Gherbal, 2015). To build the team capacity:

(i) Adopt a high retention strategy by attracting, motivating, developing, and engaging well-qualified employees

(ii) Foster effective communication in the team

(iii) Ensure team members are well qualified and receive continual skills development (DeNisi & Pritchard, 2006; Gherbal, 2015).

4.2.2.3 **Value Stream Mapping and Flow**

Value stream mapping helps avoid value leakages, including delays, by creating an unbroken flow of value throughout the project. To achieve this:

(i) Implement lean thinking, Six Sigma, and/or individual lean/six sigma tools/techniques in construction projects

(ii) Ensure effective communication among all primary project stakeholders

4.2.2.4 **Planning, Scheduling, and Control**

Effective planning, scheduling, and control are critical to preventing and minimising the impact of delays. To ensure this is realised:

(i) Use conventional methods as required for effectiveness

(ii) Adopt innovative scheduling/planning tools and techniques that are specific to the industry (Cox et al., 2006; Hinze, 2004).

4.2.2.5 **Dynamism and Proactivityproject**

Macro-environmental conditions have considerable effects on the possibility of delivering construction projects on time (Głuszak & Leśniak, 2015; Nassar, 2016). TO manage them:

(i) Ensure flexibility, dynamism, and proactivity in planning and scheduling

(ii) Establish effective knowledge management structures

(iii) Foster continual learning in the organisation (Alias et al., 2014; Harris & McCaffer, 2006; Flanagan & Norman, 1993).

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