

# Examining Delay Factors and the Related Implications on Highway Projects in Qatar

Mohamed Mohideen Ahamed Akram<sup>1</sup>, Melanka Jayani De Silva<sup>2\*</sup>, and Thisaiveerasingam Thilakshan<sup>3</sup>

<sup>1</sup> Birmingham City University, Birmingham, United Kingdom

<sup>2,3</sup> University of Moratuwa, Moratuwa, 10400, Sri Lanka  
melanka.de.silva@gmail.com\*

**Abstract.** This study investigates the factors contributing to delays in highway projects in Qatar and examines their impact on project outcomes. Highway infrastructures are critical to Qatar's economic growth, yet project delays remain a persistent challenge. This research analyzes these delays and provides insights to improve project management practices. The study focuses on four key objectives: assessing the impact of delays, identifying influential factors, recognizing underlying causes, and examining broader implications. A mixed-method approach was adopted, with quantitative data gathered from stakeholder surveys and qualitative data collected through open-ended questions. The results indicated that project delays in Qatar were primarily caused by inadequate planning and scheduling, scope changes, unforeseen site conditions, and regulatory challenges. These delays lead to increased costs, extended project timelines, and reduced stakeholder satisfaction. The findings emphasize the need for better project planning, improved coordination, and proactive risk management. The study provides recommendations for stakeholders and policymakers to minimize delays and improve project efficiency. By filling gaps in understanding the causes and effects of delays, this research contributes valuable insights to the field of construction management, supporting the development of more effective strategies for managing highway projects in Qatar.

**Keywords:** *highway project delays, construction management, project management practices, qatar infrastructure development*

## 1. Introduction

### Background

Infrastructure projects are crucial to the growth and sustainability of any nation. One of the key components of the Global Competitiveness Index (GCI) is infrastructure, which measures a nation's ability to provide a high quality of life for its citizens (Rab et al., 2021). A well-maintained highway network allows for the smooth and timely movement of goods and services, which is essential for economic development. Amoatey and Nii (2017) found that highway infrastructure projects improve access to healthcare, education, jobs, and other social services in both urban and rural areas. Therefore, improving national highway infrastructure is essential for raising living standards, particularly in developing countries (Walker & Kumar, 2005).

Highways play a central role in providing access and mobility, key elements in a nation's economic growth and development. As a result, many developing countries prioritize the expansion and improvement of their highway networks, dedicating substantial portions of their national budgets to these projects. However, these efforts often face challenges, especially during construction. One of the most persistent problems in highway construction is project delays.

Research by Ahmed et al. (2002) has consistently shown that projects frequently exceed their scheduled time and budget, with many stretching to about 160% of the original timeline. These delays affect all involved stake- holders (Bloom et al., 2017).

The consequences of delays go beyond inconvenience. They strain relationships, create distrust among parties, and often lead to legal disputes such as litigation and arbitration. Financial problems also arise, as delays disrupt the flow of funds and in- crease anxiety among stakeholders (Creedy et al., 2010). These challenges are not unique to developing countries; even industrialized nations face similar issues, as noted by Kaliba, Muya, and Mumba (2009). So that, ensuring timely project completion is a complex challenge, especially in the construction sector. Addressing delays in construction is a critical concern requiring cooperation from all parties involved. Changes are a common feature of the construction process, and poorly managed changes can significantly affect a project's cost and performance (Muir, 2012).

In today's competitive environment, meeting project deadlines, budgets, and performance goals is essential. In the construction industry, project delays have become a major source of concern. "Construction schedule slip" refers to deviations from the original project timeline. Identifying the root causes of these delays is crucial to minimize their effects and ensure that projects are completed on time (Gibbons et al., 2019). Qatar's Expressway Programme, with over 30 projects spanning 46 contracts, is expected to deliver around 800 km of safe, efficient highways. Every road in Qatar, including expressways and municipal roads, has been examined as part of this program. These projects aim to create an integrated road network to meet Qatar's future traffic demands (Biygautane, 2017). The benefits, such as reduced traffic congestion and shorter travel times, will become more evident as these projects progress. The success of these projects is measured by their ability to meet deadlines, deliver high-quality work, and stay within budget, all of which are critical for the Qatar National Vision (QNV) 2030 (Ahmed, 2017).

Several studies have identified various causes of project delays in Qatar, which negatively impact both the transportation system and the country's broader economic development, despite Qatar's strong economy. Ahmed (2017) found that factors related to funding, timing, and equipment are the main contributors to these delays, where this research argues that project delays are counterproductive and advocates for preventive measures to improve the efficiency and effectiveness of the construction industry. An- Analyzing the causes of delays in highway projects in Qatar is, therefore, essential to prevent future setbacks and ensure the optimal performance of the transportation sector, which is the primary focus of this study.

### **Research Aim**

The study aims to analyze the factors contributing to delays in highway projects and examine their related impacts on highway projects in Qatar.

### **Research Objectives**

- To assess the impact of delays on highway projects in Qatar.
- To identify the key factors contributing to project delays in highway projects in Qatar.
- To determine the underlying causes of delays in highway projects in Qatar.
- To analyze the broader implications of these delays on highway projects in Qatar.

## **2. Literature Review**

### **2.1 Project Delay Factors in Highway Projects**

Construction projects are typically planned to be completed on time, within budget, and to meet the client's expectations (Yap et al., 2021). Despite these intentions, delays are common across the construction industry. These delays not only increase financial burdens for clients but also cause overhead expenses to rise for contractors (Alsuliman, 2019). In Qatar, delays are particularly concerning, as the country's infrastructure projects are key to achieving the goals set under the Qatar National Vision 2030 (Al-Buenain, Al-Muhanadi & Falamarzi, 2020).

A range of factors contributes to delays in highway projects. Opeyemi & Neubert (2021) identified client payment delays, bureaucratic decision-making, poor planning, and adverse weather conditions as the leading causes of these delays. Addressing these issues involves improving financial management and decision-making processes, as well as integrating more comprehensive planning and scheduling practices.

### **2.2 Lack of Proper Planning and Scheduling**

Proper planning and scheduling are essential for the successful completion of highway projects. Insufficient planning during the early stages of a project can result in ambiguity in project scope, leading to delays during execution (Wakeling, 1972). For instance, unclear goals and poorly defined timelines make it difficult to manage resources and track progress effectively. By carefully defining project requirements, setting realistic schedules, and leveraging advanced planning tools such as Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT), project teams can better anticipate and address potential challenges (Transportation Research Board, 1998).

Further complicating highway projects is the lack of flexibility in planning, which may not account for unpredictable factors such as environmental impacts, resource availability, or regulatory constraints. Failure to anticipate these challenges during the planning phase often results in delays that could otherwise have been avoided (Wang et al., 2008). Effective communication and collaboration among stakeholders are also crucial for successful planning, as it ensures that everyone has a shared understanding of the project's objectives and timelines.

### **2.3 Resource Constraints and Management Issues**

One of the most critical factors leading to delays in highway construction projects is the lack of adequate resources, including skilled labor, materials, and equipment. Resource shortages are often exacerbated by fluctuations in labor markets, competition from other projects, and supply chain disruptions (Zidane & Andersen, 2018).

For example, in Qatar, the rapid pace of infrastructure development has led to intense competition for skilled workers and essential materials, causing project timelines to stretch. Insufficient availability of construction materials such as concrete and steel can halt progress and create bottlenecks in the project workflow (Hasan et al., 2018). Similarly, delays in mobilizing key equipment can disrupt scheduled tasks and lead to cost overruns. Effective

resource management practices, including strategic scheduling and continuous performance monitoring, are vital for minimizing such disruptions (Ashraf et al., 2024).

## **2.4 External Factors and Environmental Challenges**

Highway projects are vulnerable to a range of external factors that are often beyond the control of project managers. These include regulatory delays, unforeseen site conditions, and adverse weather. In Qatar, complex regulatory frameworks involving multiple government agencies can delay the approval process for construction projects (Ma-Hamid et al., 2012a). Permitting and stakeholder approvals are frequently cited as causes of delayed project start times.

Environmental challenges, such as adverse weather, further worsen project delays. Severe weather conditions, including heavy rains or extreme heat, can pause construction activities, leading to extended downtime (Radevsky, 2012). Additionally, unforeseen geological conditions like unstable soil or groundwater issues can complicate project execution, requiring extra time and resources for mitigation (Wang & Zhang, 2018). Addressing these challenges requires proactive risk management and contingency planning.

## **2.5 Communication and Coordination Issues**

Effective communication and coordination between various stakeholders, including contractors, subcontractors, engineers, and regulatory bodies, are critical for maintaining project timelines. Miscommunication can lead to misunderstandings, errors, and delays in decision-making, ultimately slowing down the project (Gamage, 2022). In many cases, language barriers, unclear roles, and insufficient information sharing contribute to these coordination problems.

In highway projects, particularly in large-scale developments like those in Qatar, different teams and subcontractors often work simultaneously. Without proper coordination mechanisms, tasks may overlap, resources may be underutilized, and delays may accumulate (Al Hinai, Bhuiyan & Widyarto, 2020). For instance, poor alignment between the schedules of different contractors can lead to gaps in the workflow, slowing down the entire project. Effective project management tools and strategies, such as regular coordination meetings and clearly defined communication channels, can help to mitigate these risks (Chan & Oppong, 2017).

## **2.6 Causes of Delays in Construction Projects**

Various studies have identified multiple causes of delays in construction projects, with each highlighting different critical factors. Yap et al., (2021) identified issues like insufficient equipment, inaccurate cost estimates, and financial difficulties on the part of contractors as common delay factors.

Abal-Seqan, Pokharel & Naji (2023) found that slow decision-making and frequent design changes contributed significantly to delays, while Alhawatmeh, Riazi & Mohd (2023) pointed to payment delays and lengthy approval processes as major culprits. Addressing these factors requires a combination of better project planning, enhanced financial management, and efficient communication between stakeholders.

## **2.7 Implications of Delays in Highway Projects**

Delays in highway construction projects have wide-ranging consequences, not only for the project itself but also for stakeholders and the broader economy. Cost overruns, strained relationships among stakeholders, and extended project timelines are common outcomes (Mahamid, Bruland, and Dmaid, 2012). In some cases, delays may lead to legal disputes, further delaying project completion and increasing financial costs (Kaliba et al., 2009).

In Qatar, where large-scale infrastructure projects are vital to the nation's development goals, delays in highway projects could delay the country's economic growth. Therefore, managing delays effectively is essential to ensure these projects contribute positively to Qatar's long-term objectives.

## **2.8 Knowledge Gap**

Despite numerous studies on project delays in the construction industry, limited research has focused specifically on highway projects in Qatar. Given the importance of these projects to the nation's development and the significant financial investments involved this study seeks to address this gap. By examining the causes of delays in Qatari highway projects, this research aims to offer practical recommendations that can improve project management practices, ensuring timely and successful project delivery.

# **3. Research Methodology**

## **3.1 Research Design**

A mixed-method approach was selected due to the complexity of the subject matter, combining quantitative data from structured surveys with qualitative data from open-ended responses. This design enables the collection of measurable data while also gaining deeper insights into the underlying causes of delays (Şahin & Ozturk, 2019).

## **3.2 Quantitative Methods**

The quantitative aspect involved a structured questionnaire distributed to professionals involved in highway construction in Qatar. Likert-scale questions were used to gather numerical data on the frequency and impact of delays. The data was then analyzed using statistical techniques to identify trends and rank the most significant delay factors.

## **3.3 Qualitative Methods**

The qualitative part involved open-ended questions, allowing respondents to elaborate on their experiences with delays. These responses were analyzed using content analysis, enabling the identification of recurring themes and underlying causes of project delays. This method provided richer insights that complemented the numerical data from the quantitative analysis.

### 3.4 Data Collection

A single survey instrument was designed to collect both quantitative and qualitative data concurrently. This integrated approach ensured that the quantitative data was immediately contextualized by the qualitative responses, offering a more complete view of the delay factors.

### 3.5 Data Analysis

Quantitative data was analyzed using statistical methods, including the calculation of the Relative Importance Index (RII), which ranked the delay factors based on their perceived impact (Kassem, Khoiry & Hamzah, 2020) (shown in Eq. 1). Simultaneously, qualitative data underwent content analysis to identify key themes. The combined results from both analyses enabled cross-validation, increasing the reliability of the findings.

$$RII = \frac{\sum(W)}{A \times N} \quad (1)$$

Where, W = weight assigned by respondents, A = highest weight on likert scale, N = total number of respondents

### 3.6 Sampling Strategy

A snowball sampling method was employed to target professionals with relevant experience in highway projects in Qatar. This non-random approach ensured that the sample included knowledgeable respondents who could provide valuable insights into the causes and implications of delays (Leighton et al., 2021).

### 3.7 Qualitative Data Analysis Manual Content Analysis

For the qualitative data collected through the survey's open-ended questions, manual content analysis was employed. This involved thoroughly reviewing the responses, categorizing them into different themes or codes, and identifying patterns that emerged from the data. This process allows for the extraction of subtle insights that may not be captured in numerical data, providing a deeper understanding of the issues behind project delays (Siraj & Fayek, 2019).

#### Thematic Analysis

Thematic analysis is a widely used method in qualitative research that focuses on identifying and analyzing recurring themes in the data. In this study, the thematic analysis was applied to the qualitative responses to uncover common issues related to project delays in highway construction in Qatar. The process involved coding the data by highlighting important points that appeared across multiple responses and categorizing them into themes. For example, issues such as "delays in approvals" and "resource allocation problems" were grouped as key themes. Thematic analysis provided context to the quantitative findings by explaining why certain delay factors were perceived as more critical (Siraj & Fayek, 2019). It complemented the RII analysis, giving a more comprehensive view of the root causes of delays by linking the quantitative rankings to real-life experiences and perceptions shared by the respondents.

### **3.8 Research Process**

The research process was divided into three phases:

#### **Phase I: Background Study and Literature Review**

The first phase involved a comprehensive literature review to identify common delay factors in highway construction and to guide the development of the research questions. This phase established the theoretical foundation for the study.

#### **Phase II: Data Collection**

During this phase, the structured survey was directed to professionals in the highway construction industry. Both closed and open-ended questions were used to capture a broad range of data.

#### **Phase III: Data Analysis**

The final phase involved the analysis of both the quantitative and qualitative data. Quantitative data was processed using the RII, while qualitative data was analyzed through content and thematic analysis. The findings from both analyses were then integrated to provide a comprehensive understanding of the delays.

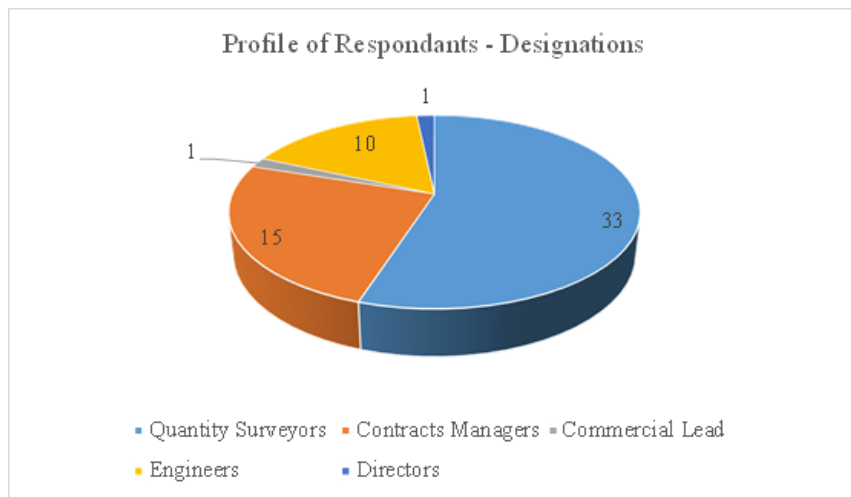
## **4. Results and Discussion**

### **4.1 Profile of Respondents**

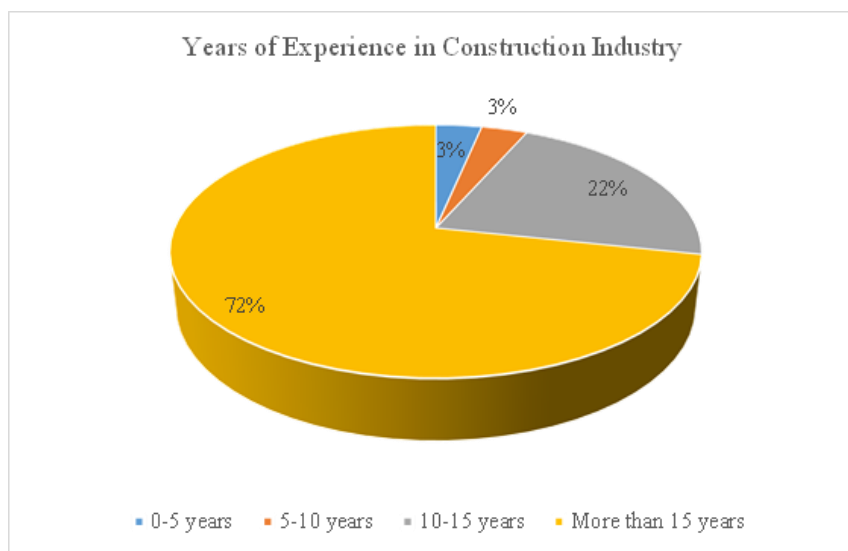
Understanding the background of the respondents is crucial to interpreting the data. The survey primarily targeted professionals involved in highway construction projects, ensuring that the insights come from experienced individuals. As shown in Fig. 1, most respondents were Quantity Surveyors, followed by Contracts Managers and Engineers.

As presented in Fig. 2, 72% of the respondents had more than 15 years of experience in the construction industry, demonstrating a significant level of expertise among the participants. This enhances the credibility of the survey findings, as they are based on input from seasoned professionals with a deep understanding of the challenges faced in highway construction projects.

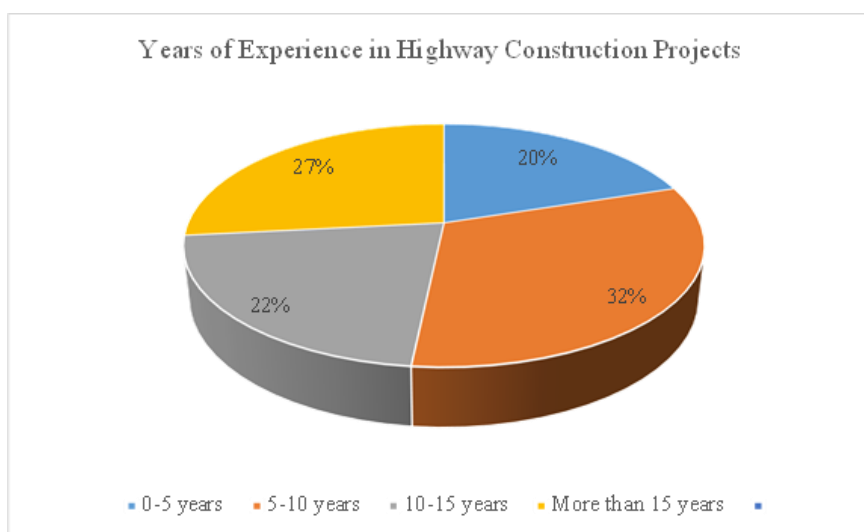
The survey findings revealed that a substantial portion of respondents, 80%, have experience in managing delays in highway construction projects in Qatar (shown in Fig. 3). This indicates that the majority of the professionals surveyed are familiar with navigating the complexities and challenges that delays bring to such projects.



**Fig. 1.** Profile of Respondents



**Fig. 2.** Years of Experience



**Fig. 3.** Years of Experience in Highway Construction Projects

## 4.2 Factors Contributing to Delays in Highway Projects

The analysis was based on the RII, which ranks the factors based on their perceived importance by the respondents (shown in Table 1).

### Inadequate Planning and Scheduling

Inadequate planning and scheduling were identified as the most significant contributors to project delays, with an RII of 0.90. Poor planning often leads to project mismanagement, resulting in delays that disrupt timelines, resource allocation, and project execution. The findings suggest that better project management, including realistic scheduling and upfront planning, is critical for avoiding these delays.

### Client Payment Delays

Client payment delays were also a significant factor, with an RII of 0.87. The delayed release of funds negatively impacts the cash flow of contractors, causing disruptions in procurement, labor payments, and project progress. These delays can lead to a domino effect, where halted work further extends project timelines, increasing overall costs.

### Communication and Coordination Issues

Communication and coordination issues also emerged as significant contributors to delays, with an RII of 0.87. Effective communication is critical in construction projects that involve multiple stakeholders, including contractors, engineers, and regulatory bodies. Miscommunication or poor coordination often leads to errors, misunderstandings, and delayed decision-making, further complicating project timelines. Improving communication protocols and establishing clear coordination mechanisms are necessary for minimizing these delays.

### Other Contributing Factors

Other factors such as external factors (e.g., regulatory approvals and permitting delays, RII = 0.86), bureaucratic procedures (RII = 0.82), and resource constraints (e.g., labor and material shortages, RII = 0.78) were also identified as significant contributors to project delays. These factors often interact with one another, intensifying delays if not addressed in a broader way.

**Table 1.** Ranking of Delay Factors in Highway Construction Projects in Qatar

<b>Delay Factor</b>	<b>RII Value</b>
Inadequate Planning and Scheduling	0.90
Communication and Coordination Issues	0.87
Client Payment Delays	0.87
External Factors (Regulatory Approvals, Permitting Delays)	0.86
Bureaucratic Procedures	0.82
Resource Constraints (Labor, Materials)	0.78
Adverse Weather Conditions	0.72

### 4.3 Causes for Delays in Highway Construction Projects in Qatar

Table 2 shows the ranking of the most significant causes of delays in highway construction projects in Qatar, based on the RII values. These RII values reflect the perceptions of industry professionals regarding the importance of each factor in contributing to project delays.

Table 2 highlights the most critical factors contributing to delays in highway construction projects in Qatar. The analysis reveals that time management and adherence to schedules are the most significant factors, with an RII of 0.92. This suggests that effective time management is crucial for preventing delays, as poor scheduling and failure to meet timelines can lead to severe project setbacks.

Proactive risk management, with an RII of 0.89, also plays a vital role in minimizing delays. By identifying potential risks early and addressing them proactively, project teams can avoid disruptions that might otherwise derail the project timeline. Unrealistic project timelines, with an RII of 0.88, are another major contributor to delays. Setting overly ambitious schedules without accounting for potential challenges often leads to delays as the project progresses.

Financial constraints and budgetary issues are highlighted as significant delay factors, with an RII of 0.85. These issues, such as inadequate funding or delayed payments, can severely disrupt the flow of resources and halt construction activities. Legal and contractual complications, with an RII of 0.80, also contribute to delays, though to a lesser extent. These issues can lead to extended negotiations or changes in project scope, further delaying progress.

Finally, technological and technical challenges, with an RII of 0.76, are identified as contributors to delays, though they are less critical compared to the other factors. These challenges may include difficulties in adopting new technologies, technical errors, or equipment failures, which, while significant, are not as impactful as time management and financial issues. While technological and legal challenges are relevant, they are less critical compared to the pressing issues of time and finance.

**Table 2.** Causes of Delay

Causes of Delay	RII Value
Time Management and Adherence to Schedules	0.92
Proactive Risk Management	0.89
Unrealistic Project Timelines	0.88
Financial Constraints and Budgetary Issues	0.85
Legal and Contractual Complications	0.80
Technological and Technical Challenges	0.76

### 4.4 Broader Implications of Delays

#### Impact of Construction Project Delays on Stakeholder Relationships

Survey respondents agreed through open ended questions that delays in highway construction projects lead to strained relationships between stakeholders, including contractors, clients, and suppliers. Missed deadlines often cause frustration and mistrust, leading to disputes. Cash flow issues caused by delays in payments can further aggravate tensions, sometimes resulting in legal

disputes, arbitration, or litigation. Such disputes not only increase project costs but also harm long-term professional relationships, impacting future collaborations (Durdyev & Hosseini, 2020). Managing delays effectively is crucial to preventing these negative outcomes.

### **Significance of Cost, Time, and Quality as Success Metrics**

Cost, time, and quality were identified as key indicators of project success. Cost overruns can lead to financial strain, making effective cost management vital. Adhering to project schedules is equally important, as delays can lead to increased costs and affect overall project value. Quality should not be compromised, as it ensures the long-term durability and performance of the project. A balanced approach to managing these three metrics is essential to meet stakeholder expectations and project success (Muriithi & Mwenda, 2021).

### **Key Challenges Due to Highway Project Delays**

Respondents highlighted several challenges caused by delays, including economic, environmental, community, and political impacts. Economically, delays often result in cost overruns, while environmentally, extended construction periods can lead to degradation and increased regulatory scrutiny (Deep et al, 2022). Community impacts include lengthy traffic disruptions and negative public perception, while politically, delays can lead to reduced public confidence in government institutions.

### **Major Consequences of Delays**

The primary consequences of delays are time and cost overruns, strained stakeholder relationships, and, in extreme cases, project abandonment. Delays result in higher labor and material costs, which strain budgets (Rivera, Baguec & Yeom, 2020). Stakeholder dissatisfaction and disputes often escalate to legal challenges, further increasing project costs and timelines. In severe cases, projects may be abandoned due to excessive delays.

### **Effects of Payment Delays**

Delayed payments disrupt project cash flow, leading to stalled progress, increased costs, and extended timelines. Financial instability caused by late payments can demotivate workers, lower productivity, and reduce overall project performance (Deep et al, 2022). Ensuring timely payments is crucial for maintaining smooth project execution and financial stability.

### **Effects of Time Overruns**

Time overruns harm public relations, with prolonged delays negatively affecting public perception. Quality can also suffer as contractors rush to complete tasks, leading to defects that increase maintenance costs. In some cases, time overruns escalate to legal disputes and even project abandonment. Effective time management is essential to avoid these issues (Muriithi & Mwenda, 2021).

### **Contribution of Scope Changes to Cost Overruns**

Changes in project scope were identified as a major factor contributing to cost overruns. Alterations often require additional resources, leading to budget increases and project delays

(Herrera et al., 2020). Effective management of scope changes is critical to avoid disruptions in timelines and project costs.

### Critical Factors Leading to Cost Overruns

The key factors contributing to cost overruns include changes in scope, incomplete design at the tender stage, and delays in approving cost variations. Inadequate financial planning and monitoring can also lead to budget overruns (Deep et al, 2022). Timely management of cost variations and scope changes is essential to avoid financial instability and control project budgets.

## 4.5 Key Findings and Discussion

**Table 3.** Achievement of Research Objectives Based on Key Findings

Research Objective	Key Findings
Objective 1: To assess the impact of delays on highway projects in Qatar	- Delays lead to extended project timelines, increasing overall project duration.
	- Delays result in cost overruns due to extended timelines and disrupted resource allocation.
	- Stakeholder relationships are negatively impacted, with conflicts arising from delayed decisions and mismanagement.
Objective 2: To identify the key factors contributing to project delays in highway projects in Qatar	- Inadequate planning and scheduling have the highest RII value of 0.90, making it the most influential delay factor.
	- Communication and coordination issues also have a high RII (0.87), signifying their crucial role in project delays.
	- Client payment delays are ranked equally high (RII = 0.87), highlighting financial constraints as a major contributor to project delays.
	- External factors like regulatory approvals (RII = 0.86) also impact project timelines but to a lesser extent.
Objective 3: To determine the underlying causes of delays in highway projects in Qatar	- Inadequate planning and scheduling are a key cause of delays, emphasizing the need for better project management practices.
	- Financial constraints related to client payment delays affect cash flow and delay project progress.
	- Bureaucratic procedures (RII = 0.82) and external factors like permitting delays are major causes, leading to slowed decision-making processes.
	- Resource constraints (RII = 0.78), such as labour and material shortages, are also identified as significant contributors to delays.
Objective 4: To analyze the broader implications of these delays on highway projects in Qatar	- Cost overruns occur because of extended project durations, increasing the overall project budget.
	- Resource allocation issues arise when delays cause disruption in the planned use of labour and materials, affecting project efficiency.
	- Stakeholder conflicts are a major implication, caused by poor communication and coordination, as well as delays in decision-making and payment schedules.
	- Project quality may be compromised due to rushed completion attempts following delays, which impacts long-term sustainability and performance.

According to the analysis presented, the research successfully meets all four objectives, offering a comprehensive analysis of delay factors in highway construction projects in Qatar. Using the RII, key factors such as inadequate planning (RII = 0.90), client payment delays (RII = 0.87), and communication issues (RII = 0.87) were quantitatively assessed, demonstrating their significant impact on project timelines. Overall, the research provides a solid foundation for developing strategies aimed at reducing delays and improving project outcomes, aligning with Qatar's broader infrastructure development goals.

## **5.0 Conclusions & Recommendations**

### **5.1 Conclusion**

The research findings confirm that delays in highway construction projects in Qatar are a widespread and critical problem. These delays significantly affect project timelines, increase costs, and strain relationships between stakeholders. Among the key factors identified, financial constraints, poor time management, and unrealistic project timelines were found to be the most significant contributors to project delays. The study also highlighted the extensive implications of these delays, including their adverse effects on project quality, stakeholder dynamics, and overall project success.

#### **Achievement of Objective 1: Effects of Delays on Highway Projects in Qatar**

Delays in highway construction projects were found to have profound and far-reaching effects. Primarily, these delays contribute to significant cost overruns, as longer project durations lead to increased labor, material, and equipment costs. Financial burdens, often compounded by the need to renegotiate contracts, impact not only the contractors but also the clients and, by extension, the public. Delays also affect the quality of construction, as rushed work towards the end of delayed projects can result in sub-standard infrastructure, requiring further maintenance or even full replacement shortly after completion. Beyond the project-specific impacts, delays disrupt the flow of traffic and local economies, while also presenting potential safety hazards due to incomplete infrastructure. Furthermore, project delays harm the reputation of construction firms, making it difficult for them to secure future contracts, both locally and internationally.

#### **Achievement of Objective 2: Key Factors Contributing to Delays**

Several key factors contributing to delays were identified in this research, with financial constraints emerging as one of the most significant issues. In many instances, projects suffered from insufficient initial funding, while delays in client payments further compounded cash flow problems. This often led to a situation where contractors had to halt or slow down work due to a lack of financial resources. Furthermore, poor time management was identified as a critical issue, particularly due to the setting of unrealistic project timelines. Many project schedules failed to account for possible disruptions, leaving project teams struggling to meet deadlines, leading to mistakes, re-work, and subsequent delays. Inadequate coordination among stakeholders, contractors, and regulatory bodies also emerged as a significant issue, as miscommunication and conflicting priorities further contributed to time overruns. Additionally, the shortage of skilled labor- particularly in highly technical fields such as engineering and

project management- was another major factor that slowed down project execution and led to further delays.

### **Achievement of Objective 3: The Most Influential Factors of Delays**

The research showed that financial constraints are the most influential factor in causing project delays. Many highway projects in Qatar commenced with insufficient funding, and delays in client payments caused significant interruptions in project workflows. Contractors frequently faced cash flow problems, which led to slowed project progress or complete stoppages until additional funding could be secured. Moreover, time management issues were another major factor identified in the research. Project schedules often did not account for the complexity of highway construction tasks such as land acquisition, utility relocations, and environmental assessments. As a result, when these tasks took longer than expected, the entire project timeline was thrown off balance. The shortage of skilled labor further compounded these issues, as projects were often delayed due to errors requiring corrections, or the need to find replacement personnel in a competitive labor market. Finally, regulatory delays, especially those involving multiple governmental agencies, were found to be highly influential, as approval processes often created bottlenecks that severely affected project timelines.

### **Achievement of Objective 4: Broader Implications of Delays on Highway Projects**

The broader implications of delays in highway construction projects are substantial, not only for the projects themselves but also for the economy and society at large. Financially, delays lead to increased costs, particularly in terms of borrowing. Contractors and clients often need to secure additional funds to cover extended timelines, which puts pressure on public budgets, especially for projects funded through government allocations. These cost overruns can divert funds away from other critical areas, such as healthcare or education. Socially, delays disrupt local communities by increasing traffic congestion, noise, and pollution. These disruptions negatively affect the quality of life for residents and contribute to public dissatisfaction with infrastructure development. In some cases, incomplete road projects opened for public use during the delay period may pose safety risks. From an industry perspective, frequent project delays tarnish the reputation of the construction sector, both locally and internationally. Companies associated with delayed projects face challenges in securing new contracts, as clients often prefer contractors with proven track records of delivering projects on time.

## **5.2 Recommendations for Industry Practitioners**

Based on the findings of this study, it is clear that the construction industry in Qatar must adapt and improve its project management practices to address the issue of delays effectively. A primary recommendation is to improve financial planning processes, ensuring that sufficient funds and contingency reserves are in place from the outset to avoid cash flow problems later in the project. Time management practices must also be enhanced, with project schedules designed to be more realistic and flexible. This includes accounting for potential disruptions and allocating appropriate time for complex tasks.

Investing in workforce development is another key recommendation, as training local labor can reduce reliance on expatriate workers and address skill shortages. Collaborating with educational institutions to develop relevant training programs will be beneficial in the long term.

Furthermore, there is a need to streamline regulatory approval processes by improving communication between contractors and government agencies. Establishing clearer timelines for approvals can prevent unnecessary bottlenecks. Finally, implementing comprehensive risk management strategies that are regularly updated will help anticipate and mitigate potential causes of delays throughout the project lifecycle.

### 5.3 Further Research

Although this research successfully met its objectives, there are several areas where further exploration is needed to deepen the understanding of project delays in the high- way construction sector. Future studies could investigate the impact of emerging technologies such as Building Information Modeling (BIM), Artificial Intelligence (AI), and automation on reducing delays. Case studies of successful highway projects in Qatar and other regions could provide valuable insights into best practices for managing delays. Comparative studies between Qatar and other Gulf countries could help identify common challenges and effective solutions.

Additionally, research into the long-term economic, social, and environmental effects of delayed projects could further enhance our understanding of the broader consequences of project delays. Finally, further research on the role of stakeholder coordination in reducing delays would be valuable, especially in identifying strategies for improving collaboration and communication among project stakeholders.

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