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RESEARCH PAPER

Analyzing the Key Factors Contributing to Project Delays in the Construction Industry: A Comprehensive Study

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ABSTRACT

This study investigates the complex web of reasons contributing to construction project delays. Delays in construction initiatives are pervasive and expensive, affecting all industry stakeholders. Construction delays are a significant issue for the global construction industry, resulting in economic downturns, employment losses, and disincentives for foreign investors. Poor project management is a prevalent cause of construction delays that could have been avoided if an effective impact assessment method had been used. This study identifies and analyzes the main causes of construction project delays through a systematic review of existing literature, case studies, and expert interviews. Inadequate planning, unanticipated site conditions, labor shortages, design modifications, and weather-related disruptions emerge as major themes in the analysis. In addition, this study investigates the effects of delays on project stakeholders, such as contractors, proprietors, and the economy as a whole. It also investigates the efficacy of various mitigation strategies and project management techniques in addressing delays, emphasizing preventative measures. Ultimately, addressing the primary causes of construction project delays can increase project success rates, reduce costs, and boost industry performance.

KEYWORDS Construction Project Delays, Design Modifications, Inadequate Planning, Labor Shortages, Project Stakeholders, Weather-Related Disruptions

Introduction

The construction industry is the backbone of global infrastructure development, contributing significantly to economic growth and societal progress (Mbachu et al., 2016). However, it is beset by a persistent and pervasive challenge: delays in construction projects. These delays have far-reaching implications, including increased costs, contractual disputes, and diminished stakeholder satisfaction (Chan & Kumaraswamy, 1997; Assaf & Al-Hejji, 2006). To address this issue comprehensively, it is imperative to delve into the multifaceted nature of construction project delays, examining the underlying causes that often remain hidden beneath the surface.

Over the years, researchers and practitioners have recognized the importance of understanding the root causes of construction project delays, as this knowledge can inform better project management practices and facilitate more effective mitigation strategies (Aibinu & Jagboro, 2002; Love et al., 1998). However, despite a substantial body of research in this area, the construction industry continues to grapple with delays, suggesting that there may be gaps in our understanding of the issue or evolving factors that require renewed investigation.

This research paper aims to contribute to the ongoing discourse on construction project delays by comprehensively examining the major reasons behind them. By synthesizing existing literature and incorporating recent case studies, researchers seek to shed light on the evolving landscape of construction project management and identify emerging challenges that project stakeholders face. In doing so, researchers hope to provide valuable insights that can guide practitioners, policymakers, and researchers to address delays more effectively and proactively.

The construction industry's specific structure, including project types, work ranges, site locations, and workforces, makes project implementation riskier and may result in unfavorable consequences. To meet the expanding needs of the human population, new construction technologies such as factories, hospitals, schools, bridges, and hydro dams are being deployed. However, the complexities of these endeavors and their time and money management constitute a serious threat to human life. The involvement of investors, contractors, architects, consultants, and supply providers impedes project implementation. Project management strives to accomplish work within the time frame specified; however, flaws in execution techniques frequently result in contractor and customer unhappiness.

Despite substantial studies, the construction sector is experiencing recurring delays, which negatively influence project outcomes. This study article aims to identify and characterize the key reasons for construction project delays, examine their interplay and cumulative impact, and make practical recommendations and mitigation techniques. The study is significant because it tackles a prevalent issue in the sector, improving stakeholder satisfaction, lowering costs, and contributing to the efficient execution of infrastructure projects. It can also help policymakers and industry stakeholders establish plans to increase the construction sector's resilience and competitiveness. The study issues include identifying the primary categories of reasons leading to construction project delays, understanding how these factors interact and influence project timeframes, and giving practical recommendations and solutions to prevent delays effectively.

Literature Review

Construction projects are complex enterprises involving numerous players, countless variables, and significant resources. Delays in project completion are a continuous global concern for the construction industry (Assaf & Al-Hejji, 2006; Chan & Kumaraswamy, 1997). Construction project delays can result in large financial losses, disagreements, and a loss of stakeholder confidence (Mbachu et al., 2016; Love et al., 1998).

It is important to understand that different delay factors often interact with each other and amplify their effects. For example, design flaws may lead to a purchase adjustment, delaying material delivery. External variables like regulatory changes can worsen labor shortages, extending project life. Understanding these complex relationships is critical to developing methods to reduce delays successfully.

Construction delays are a significant issue for the global construction industry, resulting in economic downturns, employment losses, and disincentives for foreign investors. Poor project management is a prevalent cause of construction delays that could have been avoided if an effective impact assessment method had been used. According to research, proactive application of project management techniques can considerably reduce issues associated with delays in various projects, particularly construction projects. Numerous studies have been conducted in various countries and regions to identify the theoretical and actual causes of construction project delays. Several studies have been conducted, some concentrating on construction projects and others on highway construction delays. Nonetheless, estimating construction project delays has proved to be a challenging task, as demonstrated by several studies highlighting the procedure's complexities.

According to a 1996 study by Ogunlana and his colleagues, construction project delays in Thailand can be broken down into six categories: proprietors, designers, construction managers, contractors, and resource suppliers. According to Abd El Razek et al. (2008), 57 main delays can be categorized into eight groups: client-related, finance-related, consultant-related, contractor-related, equipment-related, material-related, and labor-related—delays and delays caused by external factors. Sambasivan and Soon (2007) report that 17.3% of public construction projects in Malaysia are behind schedule. Poor site management, insufficient contractor experience, insufficient client funds and payments for completed work, problems with subcontractors, material shortages, lack of labor supply, equipment availability and failure, a lack of communication between parties, and construction errors were the most prevalent. These are typical causes of delays.

Abd El Razek et al. (2008) investigated the reasons for construction project delays in Egypt. The top five causes were design modifications made by the proprietor or his agent during construction, partial payments made during construction, lack of professional construction/contract management, contractor financing during construction, and late payment to the contractor. Hasib et al. (2011) examined the causes of construction project delays in Pakistan. The most common causes of construction delays are natural disasters, financial and payment issues, inadequate planning, site mismanagement, misunderstandings, and a lack of materials and equipment. Kikwasi (2013) assessed the elements contributing to delays in construction projects in Tanzania using a questionnaire survey. It was determined that frequent design modifications, late supplier payments, poor project management, a lack of communication between project stakeholders, and untrained contractors are significant contributors to construction delays.

Lindhard and Vandal (2015) discovered that, among the 5,424 scheduled operations they analyzed, work linkage, modifications to the work plan, personnel, external conditions, materials, and construction design were the most prevalent causes of project delays. This was the conclusion of an investigation into the leading causes of construction project delays in Denmark. According to Emam et al. (2015), the most common causes of delays in Qatar are design changes, improper planning and scheduling, project scope changes, miscalculated project schedules, and a lack of trained personnel.

Durdiev and Hosseini (2019) reviewed prior research on construction project delays (CPD) published between 1985 and 2018. They examined 97 publications and identified 149 CPD-influencing factors. The ten most common CPDs identified by the authors were weather and climate conditions, poor communication, lack of coordination and stakeholder conflicts, ineffective or inadequate planning, material shortages, financial problems, payment delays, equipment/plant shortages, lack of experience/project stakeholders skills/competence among, lack of workforce and poor site management. CPD covers equipment/plant shortages, payment delays, and labor shortages.

This literature review emphasizes the multidimensional nature of construction project delays and various contributing factors. The interaction of these factors highlights the complexity of the issue. To effectively resolve delays, project stakeholders must adopt a comprehensive strategy that considers the individual and cumulative effects of the various causes of delays. The subsequent sections of this research study will delve deeply into these topics to provide actionable advice for preventing construction project delays.

Materials and Methods

This qualitative research study seeks to investigate the primary causes of construction project delays by analyzing key project stakeholders' experiences, perspectives, and insights. The study's design is exploratory and descriptive, with semi-structured interviews as the primary qualitative data source. Participants with various roles, experiences, and points of view were selected using the techniques of purposive and

snowball sampling. The procedure for collecting data includes an interview questionnaire with open-ended questions designed to encourage participants to share their experiences and insights regarding the causes of construction project delays. Interviews were conducted in person or virtually to ensure veracity and audio recordings were made with participants' permission.

The qualitative data obtained from the interviews were analyzed using thematic analysis, which included transcription, data familiarisation, categorization, and theme development. Validity and dependability were assured via peer debriefing and member verification. The ethical considerations are informed consent, anonymity and confidentiality, and narrative reporting. The findings are presented in narrative format, with direct participant quotations used to illustrate key themes and insights. Possible limitations include participant and recall bias, which meticulous sampling and data analysis techniques will mitigate. Nonetheless, this qualitative research methodology provides a complex and nuanced examination of the primary causes of construction project delays, drawing on the experiences and perspectives of key construction industry stakeholders. It was possible to identify key themes and patterns related to delay factors through thematic analysis, contributing to a deeper understanding of this complex issue.

Analysis

Interview participants included project managers, architects, contractors, engineers, and clients with diverse experiences in construction projects. The analysis revealed a range of codes, sub-themes, and major themes.

Table 1
Thematic Analysis

Major Themes	Sub-Themes	Codes
Design Related Obstacles	Design challenges	❖ Usability issue ❖ Accessibility concerns ❖ Cross-platform compatibility ❖ Performance optimization ❖ User feedback incorporation ❖ Resource constraints ❖ Design Complexity
	Design changes	❖ Version control for design files ❖ Change request tracking ❖ Redesign for improved user experience ❖ Visual style updates ❖ Responsive design adaptations ❖ Iterative design process ❖ Design documentation updates
	Incomplete designs	❖ Wireframes missing for key screens ❖ Placeholder images or content ❖ Unresolved design conflicts ❖ Missing design specifications ❖ Unapproved design drafts ❖ Incomplete user flows ❖ Design elements pending review
Procurement and Supply Chain Disruptions	Material Delays	❖ Delayed shipments ❖ Manufacturing hold-ups ❖ Inventory shortages ❖ Quality control issues ❖ Logistics problems

	Supplier Disputes	❖ Contract disagreements ❖ Payment disputes ❖ Delivery discrepancies ❖ Quality assurance disputes ❖ Communication breakdowns
Labor and workforce issues	Labor shortages	❖ Insufficient workforce ❖ Staffing challenges ❖ Employee scarcity ❖ Workforce deficits ❖ Recruitment difficulties
	Skills gap	❖ Competency mismatches ❖ Training needs ❖ Skills deficiency ❖ Knowledge gaps ❖ Learning requirements
	Labor disputes	❖ Employee grievances ❖ Union conflicts ❖ Collective bargaining issues ❖ Workplace disagreements ❖ Industrial disputes
External influences	Weather conditions	❖ Extreme weather events ❖ Climate-related disruptions ❖ Natural disasters ❖ Seasonal impacts ❖ Weather-related delays
	Regulatory changes	❖ Legislative updates ❖ Compliance modifications ❖ Regulatory shifts ❖ Legal amendments ❖ Policy changes
	Economic downturn	❖ Recession effects ❖ Economic instability ❖ Financial setbacks ❖ Market downturn ❖ Economic challenges
Communication Failures	Poor Communication	❖ Lack of information sharing ❖ Communication breakdowns ❖ Ineffective messaging ❖ Misinterpretation of information ❖ Unresponsive team members
	Coordination issues	❖ Team collaboration problems ❖ Task overlap ❖ Synchronisation difficulties ❖ Workflow disruptions ❖ Planning and execution misalignment

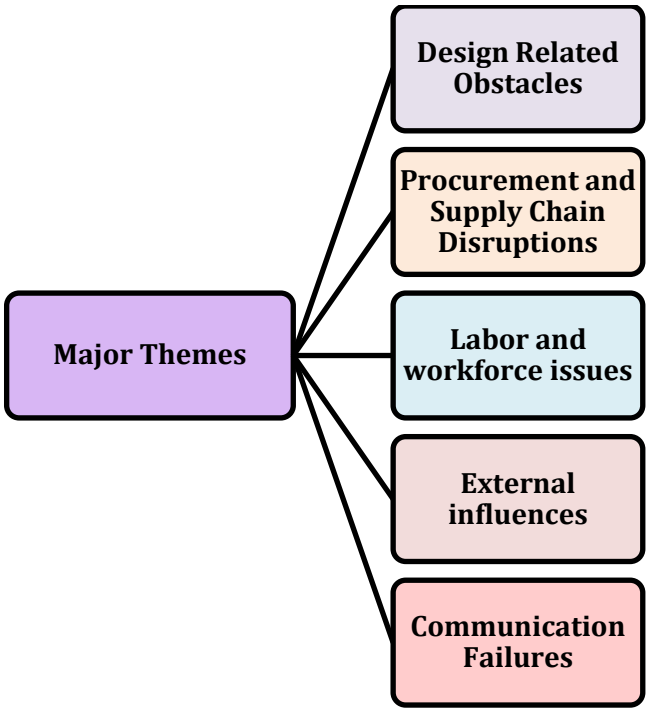

Figure 1 portrays the major themes extracted from the thematic analysis.

Discussion

This thematic analysis reveals the major reasons behind delays in construction projects, encompassing design-related challenges, procurement disruptions, workforce issues, external influences, and communication breakdowns. These findings provide valuable insights for stakeholders in the construction industry to understand better and address the complexities of construction project delays.

Theme 1: Design-Related Obstacles

Concerns with project design, such as design revisions and inadequate designs, significantly impact project schedules and are categorized as design-related obstacles. Chan and Kumaraswamy (1997) researched Hong Kong construction project delays and found that design modifications were a common cause of schedule overruns. These modifications were frequently necessitated by shifting customer requirements or unanticipated site conditions. In the Hong Kong construction industry, inadequate designs were identified by Love et al. (1998) as a cause of project delays. They noted that inadequate or unclear design documentation can lead to confusion and disruptions on the job site. The problem of design-related obstacles highlights the importance of rigorous and well-defined design processes in construction projects. Incomplete or evolving designs can introduce uncertainty, necessitating costly adjustments and delays.

Theme 2: Procurement and Supply Chain Disruptions

Delays in the delivery of materials, disputes between suppliers, and procurement complexities all contribute to construction project delays. Assaf and Al-Hejji (2006) identified procurement issues as a major cause of delays in significant construction projects. They observed that supplier disagreements and material delivery delays frequently led to project setbacks. Aibinu and Jagboro (2002) investigated the causes of construction delays in the Nigerian construction industry. They found that procurement-related issues, such as late delivery and equipment failures, significantly contributed to project delays. The problem of procurement and supply chain disruptions highlights the critical importance of

efficient procurement processes and dependable supply chains for minimizing delays. Timely material deliveries and competent supplier management are crucial to the success of a project.

Theme 3: Labor and Workforce Issues

Significant human resource issues contributing to project delays include labor shortages, talent gaps, and conflicts. Mbachu et al. (2016) investigated the Nigerian construction industry and determined that labor constraints are the leading cause of project delays. They observed that a constant concern was the scarcity of skilled workers. In their study on variation orders in the Hong Kong construction industry, Love et al. (1998) discovered that labor disputes could influence project schedules. Disagreements between employees and management led to work stoppages. The motif of labor and workforce concerns emphasizes the need for a competent and efficiently managed workforce in construction projects. It is necessary to address labor shortages, provide training, and manage labor relations to avoid delays.

Theme 4: External Influences

External factors, such as inclement weather, regulatory changes, and economic downturns, substantially impact project timelines. Chan and Kumaraswamy (1997) identified poor weather as a significant external factor contributing to construction delays in Hong Kong. They stated that weather-related disruptions were beyond the purview of the project's stakeholders. In their investigation of large construction projects, Assaf and Al-Hejji (2006) identified regulatory changes as an external factor causing project delays. Frequently, changes in permit or compliance requirements necessitate modifications to the project. The external factors motif emphasizes that some delays are beyond the control of project teams. Effective risk management and contingency planning are required to limit the influence of external factors on project timelines.

Theme 5: Communication Failure

Poor communication and coordination between project stakeholders are significant obstacles to success. Love et al. (1998) discovered that delays in the Hong Kong construction industry were caused by deficient communication and coordination among project stakeholders. Insufficient information exchange and collaboration impeded progress. Aibinu and Jagboro (2002) investigated communication disruptions in the context of the Nigerian construction industry. They observed that miscommunication between project teams and stakeholders led to misunderstandings and delays. The issue of communication failure emphasizes the importance of effective communication and collaboration in construction initiatives. Clear communication channels, regular updates, and collaborative problem-solving can all aid in avoiding delays resulting from misunderstandings or misalignment.

Each subject concentrates on distinct difficulties that, when adequately addressed, can contribute to more efficient project management and on-time project delivery. Construction stakeholders must recognize the complexity of these obstacles and conceive solutions to mitigate their impact on project schedules.

Conclusion

Delays in construction projects are a complex problem that can substantially impact the timetables of those projects. The most important causes include problems with the design, disruptions in the procurement and supply chain, problems with personnel and labor, uncontrollable external conditions, and ineffective communication. Rigorous preparation and clear communication are required because of the potential for uncertainty

and disruption caused by incomplete designs and design adjustments. It is possible for the development of a project to be stymied by arguments with suppliers and delays in the delivery of materials. This risk can be reduced by streamlining the procurement process and managing the suppliers. Delays can also be caused by a lack of available labor, necessary skills, or a dispute, making it necessary to spend on the training and development of personnel and efficient labor management. Uncontrollable external conditions such as poor weather, legislative changes, and economic downturns can also impact projects, which is why risk management and contingency planning are required for these endeavors.

Recommendations

The research results propose a few ideas for minimizing construction project delays.

- Clarity in early design, effective procurement methods, staff development, reduction in exposure to external risks, and enhanced communication are some of these.
- Early design clarity enables detailed and well-documented project designs, while effective procurement methods, such as on-time material delivery and proactive supplier management, reduce delays. Early design clarity also ensures that projects are designed correctly.
- < UNK> Skilling skill gaps can be accomplished by investing in training and development activities, while external issues can be addressed through effective risk management and contingency planning.
- Fostering collaboration and problem-solving skills among stakeholders can be facilitated by cultivating a culture of effective communication.

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