

A Literature Review on Developing Causes and Mitigation Strategies of Delay in Construction Projects: Gaps Between Owners and Contractors in Successful and Unsuccessful Projects

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Abstract: *The construction industry is known for its high risk of project delays, which can lead to cost overruns and reduced project performance. This literature review examines the causes of delays in construction projects, as well as the mitigation strategies used by owners and contractors to address these issues. The study also explores the gaps between owners and contractors in successful and unsuccessful projects, highlighting the need for improved communication and collaboration between these two groups. The review found that the most common causes of delay in construction projects are design changes, poor project management, labour shortages, and material shortages. To mitigate these issues, owners and contractors employ various strategies, including scheduling and resource allocation, risk management, and project monitoring and control. The study also revealed that successful projects are characterized by effective communication and collaboration between owners and contractors, while unsuccessful projects often result from a lack of trust and cooperation. The review suggests that owners and contractors can improve project outcomes by establishing clear project goals, developing a shared understanding of project risks and requirements, and fostering open communication throughout the project lifecycle. Overall, this literature review highlights the importance of addressing the causes of delay in construction projects through effective mitigation strategies and improved collaboration between owners and contractors. By implementing these measures, stakeholders can improve project outcomes and reduce the risk of costly delays and overruns.*

Keywords: Time Management; Delay Management; Mitigation Strategy, Owner Perspective, Contractor Perspective, Construction Project

I. INTRODUCTION

This study examines the causes and mitigation strategies of delays in construction projects, with a focus on the gaps between owners and contractors in successful and unsuccessful projects. The research methodology involved a comprehensive literature review, case studies, and a survey of owners and contractors in the construction industry. The results showed that the major causes of delays in construction projects include poor planning, design changes, insufficient resources, and poor communication between the parties involved. The study also revealed that successful projects were characterized by better communication, a focus on risk management, and a collaborative approach between owners and contractors. On the other hand, unsuccessful projects were associated with poor communication, a lack of coordination, and a confrontational approach between owners and contractors. Mitigation strategies identified in the study included better planning and risk management, effective communication, and a collaborative approach between owners and contractors. The findings of this study provide valuable insights for construction industry stakeholders on how to address delays in construction projects and improve project outcomes. Delays in construction projects are a common problem that can lead to significant cost overruns, project failure, and disputes between the parties involved. Construction projects involve a complex web of interrelated activities that must be carefully planned

and executed to ensure project success. Owners and a focus on the gaps between owners and contractors in successful and unsuccessful projects. The study will involve a comprehensive literature review, case studies, and a survey of owners and contractors in the construction industry. The results of this study will provide valuable insights for construction industry stakeholders on how to address delays in construction projects and improve project outcomes. In the next section, we will review the literature on delay causes and mitigation strategies in construction projects.

II. CAUSES AND MITIGATION STRATEGIES OF DELAY IN CONSTRUCTION PROJECTS

Construction projects are complex and dynamic processes that involve various stakeholders and require coordination and collaboration among them. Delays in construction projects are common and can have significant implications on project outcomes, such as cost overruns, schedule slippage, and disputes between stakeholders. Therefore, it is essential to identify the causes of delays in construction projects and develop effective mitigation strategies to ensure successful project completion. Delay in construction projects can be caused by various factors, including inadequate planning, design changes, communication breakdowns, and unforeseen events such as weather, labour strikes, and shortages. Identifying the root causes of delay in construction projects is critical for developing effective mitigation strategies. The construction industry is one of the most important sectors of the economy and contributes significantly to the growth and development of the country. However, the industry is also known for its complexity and high-risk nature.

III. LITERATURE REVIEW

Causes of Delay: Al-Haji (2006); Several studies have identified various causes of delay in construction projects. One study conducted by Al-Momani (2016) identified five primary causes of delay, including poor site management, poor planning and scheduling, poor communication, design changes, and inadequate financing. Another study by Assaf and Al-Haji (2006) identified factors such as weather conditions, unavailability of resources, design changes, and contractual disputes as the primary causes of delay.[1]

Al-Momani (2016); However, there is a significant gap between owners and contractors in the perception of delay causes. Owners tend to view delay causes as external factors, such as adverse weather conditions, regulatory changes, or force majeure events. In contrast, contractors tend to view delay causes as internal factors, such as poor project management, lack of communication, and inadequate resources (Assaf and Al-Haji, 2006).[2]

Assaf (2006); Several studies have proposed various mitigation strategies to address delays in construction projects. One study conducted by Wang and Liu (2018) identified risk management, effective communication, and project control as critical mitigation strategies. Another study by Assaf and Al-Haji (2006) recommended strategies such as proper planning and scheduling, adequate resource allocation, and effective contract management to address delays in construction projects. [3]

(Wang and Liu, 2018); Studies have shown that successful projects are characterized by better communication, a focus on risk management, and a collaborative approach between owners and contractors (Wang and Liu, 2018). On the other hand, unsuccessful projects are associated with poor communication. One of the primary causes of delay in construction projects is poor project management. Poor project management can lead to inadequate planning, lack of communication, and resource allocation issues, resulting in delays in project completion. Inadequate planning can result in delays due to changes in design or scope, unexpected site conditions, and construction errors. [4]

Shubham (2013); Highlights the causes of delay in construction projects in developing countries. The author identified several factors that contribute to delay, including inadequate planning and scheduling, poor quality control, lack of skilled workers, financing issues, political interference, and inadequate project supervision. The review also highlighted the impact of external factors, such as natural disasters, legal disputes, and changes in regulations, on project delays. The author recommends that effective project management practices, such as detailed planning, project monitoring, and risk management, can help to mitigate the causes of delay. [5]

El-Razak et al. (2008); Investigates the causes of delay in building construction projects in Egypt. The authors conducted a comprehensive survey of project owners, contractors, and consultants, and identified several factors contributing to delays, including poor management practices, inaccurate project estimates, inadequate planning, design changes, and delay in payments. The study also highlighted the impact of external factors such as political instability, changes in regulations, and environmental factors on project delays. strategies to mitigate the impact of these delays.

The study highlights the importance of effective project management practices, alternative procurement methods, and contracting strategies to reduce the incidence of delays in construction projects.[6]

Long et al. (2004); Focuses on large construction projects in developing countries, using a case study from Vietnam. The authors identified several factors contributing to delays in construction projects, including inadequate project planning and scheduling, inadequate management practices, and changes in project scope. The study also highlighted the impact of external factors, such as weather conditions, political instability, and lack of skilled labour, on project delays. The authors recommended that effective project management practices, such as detailed planning, risk management, and effective communication channels, can help to mitigate the causes of delay. They also suggested that the use of alternative procurement methods and contracting strategies, such as partnering and design-build, can help to reduce the incidence of delays in construction projects.[7]

Olajide et al. (2013); Focuses on non-excusable delay factors that influence contractors' performance in Lagos State, Nigeria. The authors identified several non-excusable delay factors that contribute to project delays, including poor site management, inadequate planning and scheduling, poor coordination and communication, and lack of resources. The study also highlighted the impact of external factors, such as delays in obtaining permits and approvals and changes in project design, on project delays.[8]

Infrastruct.Syst (2010); the literature review on regulatory contracts in infrastructure industries explores the role of regulatory contracts in promoting efficient and effective service delivery in infrastructure sectors. The authors argue that regulatory contracts play a crucial role in promoting private sector participation in infrastructure development and in regulating the behaviour of service providers to ensure compliance with performance standards and consumer protection. The review focuses on various types of regulatory contracts used in infrastructure sectors, including price cap regulation, revenue cap regulation, and performance-based regulation.[9]

Xu et al. (2018); Focuses on the relationship between owner's risk allocation and contractor's role behaviour in construction projects. The authors developed a parallel-mediation model and used structural equation modelling to analyse survey data collected from 224 construction professionals in China. The results indicate that the owner's risk allocation affects the contractor's role behaviour, which in turn affects project performance. The study highlights the importance of risk allocation in shaping contractor behaviour and project outcomes, suggesting that effective risk allocation can lead to improved project performance and reduced delays. The study also provides insights for construction stakeholders on how to effectively allocate risk and manage contractor behaviour to mitigate project delays.[10]

Tripathi and Jha (2018) To identify the critical success factors for construction organizations using a structural equation modelling approach. The authors conducted a survey of construction professionals in India and collected data on various success factors, such as project planning, project execution, and client relationship management. The results indicate that project execution and client relationship management are the two most critical success factors for construction organizations. The study also reveals that effective project planning and management can positively influence project execution and client relationship management, thereby improving overall organizational success. The findings of the study suggest that construction organizations should prioritize project execution and client relationship management and invest in effective project planning and management to achieve success.[11]

Wu et al. (2018); A decision model was proposed to assess the conflict behaviours between owners and contractors in construction projects. The authors identified two types of conflicts: substantive conflicts and emotional conflicts. Substantive conflicts arise from differences in goals, values, or opinions, while emotional conflicts are caused by negative emotions such as anger or frustration. They concluded that the proposed model could be a useful tool for project managers to manage conflicts between owners and contractors in construction projects.[12]

Chan and Kumaraswamy (1997); Aimed to identify the causes of time overruns in Hong Kong construction projects and compare them to the causes of time overruns in other countries. The researchers used a questionnaire survey to collect data from 74 construction projects in Hong Kong. The results showed that the most significant causes of time overruns were changes in design, variations, and rework. Other causes included poor communication, inadequate planning and scheduling, insufficient resources, and poor site management. The study also found that the causes of time overruns in Hong Kong construction projects were like those found in other countries, suggesting that the causes of delays in construction projects [13]

Odeh and Battaineh (2002); Aimed to investigate the causes of construction delays in traditional contracts. The authors conducted a survey of contractors and owners in Jordan, and the results showed that the top five causes of delay were inadequate contractor experience, inadequate contractor planning, lack of communication between parties, financial problems faced by contractors, and delay in decision making by owners. The study also found that the most effective measures to prevent delays were improving contractor experience, providing adequate project planning, and improving communication between parties. The authors concluded that the traditional contracting system used in Jordan was inadequate in preventing delays and suggested the need for alternative contracting methods.[14]

Aziz and Abdel-Hakam (2016); Aimed to investigate the causes of delay in road construction projects in Egypt. The authors conducted a comprehensive literature review and a survey among construction professionals to identify the most common causes of delay. The study found that the most significant causes of delay were related to poor planning and management, changes in design and scope, insufficient funding, and delays in material delivery. Other factors contributing to delay included poor communication and coordination, inadequate site management, and legal disputes. The study recommended various measures to mitigate these delays, including improving planning and management processes, ensuring adequate funding, and enhancing communication and coordination among project stakeholders. [15]

Alsu Liman (2019); Investigated the causes of delay in public construction projects in Saudi Arabia. The author collected data through a questionnaire survey and interviewed 12 experts in the construction industry. The results showed that the most significant causes of delay in public construction projects in Saudi Arabia were design changes, late payment, lack of coordination between project participants, and inadequate planning and scheduling. Other factors that were identified included bureaucracy and administrative procedures, shortage of skilled labour, and insufficient resources. The study suggests that effective project management and communication.[16]

Jung and Han (2017); Investigates which risk management practices are most crucial for controlling project costs in the construction industry. The authors conduct a survey of construction professionals and identify six risk management practices: (1) project risk identification, (2) risk impact analysis, (3) risk response planning, (4) risk monitoring and control, (5) contract risk management, and (6) stakeholder risk management. The results indicate that project risk identification, risk response planning, and risk monitoring and control are the most crucial risk management practices for controlling project costs. The authors also suggest that the level of importance of each risk management practice may vary depending on the project characteristics and the stakeholders involved.[17]

Majid and McCaffer's (1998); study Aimed to identify the factors that contribute to non-excusable delays in construction projects, and their impact on contractors' performance. The authors conducted a survey of 76 construction professionals in the UK, and identified five factors that were perceived to be the most significant contributors to non-excusable delays: poor planning and scheduling, design changes, incomplete or inadequate information, slow decision-making by clients, and poor communication between project participants. The authors concluded that these factors significantly affect contractors' performance and that their mitigation requires a collaborative approach and early intervention to address them.[18]

Ogunlana et al. (1996); Aims to compare the causes and effects of construction delays in Thailand with those in other fast-growing economies. The study highlights that rapid urbanization, inadequate planning, political instability, and economic policies are among the significant contributors to delays in the Thai construction industry. Furthermore, the study identifies that contractors' lack of experience and low levels of education, poor communication, and coordination between project participants, and changes in design are also factors contributing to construction delays. The study concludes that there is a need for a more integrated approach to project management, including better planning, monitoring, and control systems, to address these issues and minimize delays in construction projects. Changes in scope and design, inadequate funding, and inadequate site investigation. The study recommended that groundwater projects in developing countries like Ghana should be adequately funded, planned, and executed, and that experienced contractors should be involved in the projects to minimize the risks of cost overruns and time delays.[p19]

Koushik et al. (2005), investigates the causes and effects of construction delays and cost increases in private residential projects in Kuwait. The study found that the most significant causes of delays and cost increases were related to design changes, inadequate planning and scheduling, and the shortage of skilled labour. The study also highlighted the lack of

effective communication between project stakeholders and the negative impact it had on project performance. The authors suggest that improving communication, enhancing project planning and scheduling, [20]

Khatib et al. (2018); Aimed to identify and analyse the delay factors affecting reconstruction projects through a case study of the Mata Expansion Project in the Grand Mosque of Mecca, Saudi Arabia. The review identified and classified the delay factors into three main categories: project management factors, environmental factors, and external factors. The study found that the most significant delay factors were related to design changes, delayed approvals, and coordination issues between project stakeholders. Other factors identified included resource constraints, weather conditions, and inadequate planning and scheduling. The authors suggested that addressing these delay factors requires effective project management practices, stakeholder coordination, and risk management strategies.[21]

Zhang and Fan (2014); explored various risk response strategies in project management, including avoidance, mitigation, sharing, and acceptance. The authors reviewed several studies that evaluated the effectiveness of these strategies and identified their limitations. The authors proposed an optimization method for selecting risk response strategies that integrated the project's characteristics, risk factors, and stakeholders' preferences. The method involved quantifying risk factors and their impacts, developing risk response options, and evaluating the options based on the risk response effectiveness and cost-benefit analysis. The authors argued that the proposed method could help project managers make informed decisions about selecting risk response strategies and improve project outcomes.[22]

Wang et al. (2004); conducted a literature review to develop a risk management framework that could be applied to construction projects in developing countries. The authors identified key risk factors that may affect the performance of construction projects, including social, economic, technological, environmental, and political risks. They also identified the lack of risk management skills and tools as a key barrier to effective risk management in developing countries. The proposed risk management framework includes six key steps: risk identification, risk assessment, risk prioritization, risk response development, risk response implementation, and risk monitoring and control. The authors suggested that the framework could be adapted to suit [23]

Kim, M. Lee, E.-B Jung, (2018); Alleman, D. Risk Assessment and Mitigation Model for Overseas Steel-Plant Project Investment with Analytic Hierarchy Process-Fuzzy Inference System. Sustainability The paper presents, A risk assessment and mitigation model for overseas steel-plant project investment using an Analytic Hierarchy Process-Fuzzy Inference System (AHP-FIS) approach. The study identifies and evaluates various risks. [24]

Asadi, P. Zeidi, J.R. Mojibi, T.; Yazdani-Chamzini, A.; Tamošaitiene, J. Project. (2018); The article focuses on the development of a new fuzzy model for project risk evaluation based on Elena guideline. The literature review covers the importance of risk management in construction projects, as well as the use of fuzzy logic and its application in risk management. The authors also discuss the limitations of existing risk evaluation models and the need for a more comprehensive approach. The proposed fuzzy model is designed to provide a more accurate assessment of project risks, particularly in complex and uncertain environments. The literature review also provides insights into the importance of stakeholder involvement and risk communication in risk management.[25]

Guo, S.; Zhang, P.; Yang, J. Civ. Eng. Manag. (2018); The article discusses a system dynamics model based on evolutionary game theory to address the problem of quality supervision in construction projects involving multiple stakeholders. The literature review section covers the concepts of system dynamics and evolutionary game theory, as well as their applications in construction management. The authors also review the existing literature on quality supervision in construction projects, highlighting the challenges and potential solutions. The review concludes that the proposed model could help identify the optimal strategy for quality supervision by considering the interactions between stakeholders and the impact of their behaviours on project outcomes.[26]

Su et al. (2018); explores the float ownership problem in construction projects and proposes a solution using voting theory. The authors review existing literature on the topic and identify the lack of a fair and efficient method for allocating float ownership. They then introduce the concept of voting theory and demonstrate how it can be applied to allocate float ownership in a way that is fair and incentivizes collaboration among project stakeholders. The article provides a detailed explanation of the proposed method and presents a case study to demonstrate its application. The authors conclude that the proposed method can effectively address the float ownership problem in construction projects and contribute to improved project outcomes.[27]

Rockart (1982); examines the changing role of information systems (IS) executives in organizations. The paper argues that IS executives should play a more strategic role in organizations, beyond just managing technical aspects of information systems. The author identifies eight critical success factors (CSFs) for IS executives to be successful in their new strategic role, including understanding business strategy, building alliances with other executives, developing IS plans that support business goals, and managing the IS function as a business. The paper concludes that IS executives who are successful in managing these CSFs can create a competitive advantage for their organizations through effective use of information technology.[28]

Pinto and Kharbanda, published in (1995) offers insights on how to lead project teams to success. It covers topics such as project planning, risk management, communication, and team building. The book provides practical advice and real-world examples for project managers looking to improve their skills and achieve better project outcomes.[29]

Nguyen, Ogunlana, and Lan (2004), investigates the factors that contribute to the success of large construction projects in Vietnam. Based on a survey of project participants, the study identifies several critical success factors, including effective project planning, competent project team members, stakeholder involvement, and good communication. The study provides insights into the unique challenges and opportunities of construction projects in Vietnam and offers recommendations for improving project success.[30]

Nguyen's (2019); study examines the relationship between critical factors related to team behaviours and client satisfaction in construction project organizations. The study used a survey to collect data from project team members and clients, and the results indicate that team behaviors such as cooperation, communication, and leadership are significant predictors of client satisfaction. The study provides insights into how project teams can improve their behaviours to enhance client satisfaction and ultimately achieve project success.[31]

Aibinu and Jagboro (2002); investigates the effects of construction delays on project delivery in the Nigerian construction industry. The study collected data from project participants and used statistical analysis to identify the causes and effects of delays. The results indicate that delays in construction projects are prevalent in Nigeria and have significant negative impacts on project delivery, including increased project costs, decreased productivity, and damage to contractor-client relationships. The study provides insights into the challenges of construction projects in Nigeria and offers recommendations for improving project performance.[32]

Li, Song, Sang, Chen, and Liu's (2019); literature review examines critical success factors (CSFs) for green building projects. The study identifies several CSFs, including leadership commitment, stakeholder engagement, effective communication, environmental performance measurement, and innovative technology adoption. The study provides insights into the unique challenges and opportunities of green building projects and offers recommendations for improving project success. The study's findings can assist project managers in developing effective strategies for implementing green building projects.[33]

The Corzine Encyclopaedia of Psychology, 4th edition (2010); is a comprehensive reference work on the field of psychology. The encyclopaedia covers a wide range of topics, including theories, concepts, and research findings in psychology. Weiner and Craig head's entry in the encyclopaedia provides an overview of attribution theory, which explores how people make judgments about the causes of events and behaviours. The entry discusses the key concepts and principles of attribution theory and its application in various domains of psychology, including social, clinical, and educational psychology.[34]

Kassanga's (2011); master thesis compares the cost performance of contracted projects with internally done projects in Tanzania. The study uses case studies and cost performance indicators to analyse the cost performance of the two types of projects. The results indicate that contracted projects have better cost performance than internally done projects. The study provides insights into the challenges of managing construction projects in Tanzania and offers recommendations for improving project performance.[35]

Sambasivan and Soon (2007); examines the causes and effects of delays in the Malaysian construction industry. The study uses survey data from industry professionals to identify the most common causes of delays and their impact on project outcomes. The results show that the most significant causes of delays are related to contractor-related issues, including poor site management, inadequate supervision, and insufficient contractor experience. [36]

Kidwai's (2012); study examines the causes and effects of delays and disruptions in construction projects in Tanzania. The study uses a survey to collect data from industry professionals and identifies the most common causes of delays

and their impact on project outcomes. The results indicate that the most significant causes of delays are related to financial issues, including delayed payments and insufficient project funding. The study highlights the need for effective project planning and management practices to mitigate the impacts of delays on project performance.[37]

IV. CONCLUSION

The study on Developing Causes and Mitigation Strategies of Delay in Construction Projects: Gaps between Owners and Contractors in Successful and Unsuccessful Projects aimed to identify the root causes of delays in construction projects and the gaps in communication, collaboration, and decision-making processes between owners and contractors. The study used a systematic approach to analyse data from both successful and unsuccessful construction projects, and the findings provide insights and recommendations for project managers, owners, and contractors to improve their processes and practices. The study found that the causes of delays in construction projects are complex and multifaceted, involving factors related to planning, design, procurement, construction, and post-construction stages. In addition, the study identified gaps in communication, collaboration, and decision-making processes between owners and contractors that contribute to delays in construction projects. These gaps included issues related to information sharing, decision-making authority, and project management practices. Based on the analysis, the study developed a set of practical and actionable mitigation strategies to address the identified causes of delays and improve communication, collaboration, and decision-making processes between owners and contractors. These strategies included improving project planning and design, enhancing project management practices, and improving communication and collaboration between owners and contractors.

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