

Factors Affecting Construction Delay in Residences

Mohd Sameer Malik, M. Kranti Kumar

Abstract: Construction projects in India are facing delays. It is essential to create a clear understanding among experts in the field and conduct an in-depth analysis of the causes of delays, as the volume and capacity of the Indian construction sector have undergone significant changes over the past decade. Construction delays have a substantial impact on the budgets, schedules, and stakeholder satisfaction of residential projects. Construction delays are an essential issue in the residential construction industry, as they increase costs, cause time delays, and compromise quality. It is crucial to identify the primary causes of these delays to mitigate their impact on project performance. This research study aims to provide a comprehensive understanding of the factors that contribute to construction delays in residential projects. This study synthesises previous literature and research findings to investigate several factors, their interactions, and their impact on project delays. To correctly manage and reduce construction delays in residential construction projects, the review emphasises the importance of recognising these aspects.

Keywords: Construction Delays, Critical Factors, Indian Construction Industry, Residential Sector, Time Overruns.

I. INTRODUCTION

Construction projects play a crucial role in a country's productive potential and overall efficiency. Almost every developed or developing country benefits significantly from the construction industry. India's economy is the secondfastest growing in the world. The construction industry is a large, vibrant, and expensive sector to invest in. Construction has a low rate of return when compared to the level of risk involved. Because India is a developing country, the building industry contributes significantly to the Indian economy [7]. The Indian construction industry has been the nation's economic growth engine for the past 50 years, contributing significantly to socio-economic its development. Construction is India's second-largest economic industry after agriculture. With an average annual growth rate of 8 to 10% over the last five years, the construction sector has contributed 6 to 9% of India's GDP. The industry has difficulties like low productivity, limited mechanisation, and a lack of personnel with the requisite qualifications, despite its contribution to the economy and the generation of jobs [5]. A wide range of unpredictable circumstances impacts construction processes. A project rarely gets completed in the allowed amount of time.

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It is well established that Indian construction projects perform unevenly, and this trend is on the rise. Reports claim that projects are underperforming on all crucial performance metrics, including cost, schedule, and job quality [7]. Delays in construction projects have an impact on the parties involved (developer, contractor, and consultant), resulting in increased tension, mistrust, litigation, arbitration, financial concerns, compromises in safety and quality, and a general sense of discomfort towards one another. The delay thus becomes a particularly sensitive aspect of this macrocosm. Project delays cause schedule overruns, both directly and indirectly, resulting in increased project costs. The majority of the projects being or to be undertaken by construction stakeholders are residential [4].

In the construction sector, construction delays are a significant issue that can result in higher costs, schedule delays, and lower customer satisfaction. Residential construction delays are particularly problematic because homeowners frequently want to move into their new houses as soon as possible. Delays are common in the construction sector, which can lead to higher costs, lower quality, and dissatisfied customers. These delays can significantly affect homeowners in the context of residential building, since they might be left without a place to live or incur unforeseen costs [6]. The construction industry is currently expanding in terms of complexity and capital cost on a global scale. The construction industry is resistant to innovation due to its hierarchical structure, which limits schedule and cost performance improvement and is impacted by unfavourable attitudes and discontent. The construction business is a project-driven, innovative, and conservative sector, which makes decentralisation of markets and processes difficult. Because the projects are carried out here at the temporary site by a temporary organisation formed of several parties, i.e., client, consultant, and contractor, and this, too, terminates after project completion, it adds to the complexity and unpredictability connected with it [4].

Construction delays have become increasingly significant in recent years, particularly in the construction of residential buildings. Increased expenditures, missed deadlines, and dissatisfied clients might result from construction delays. To avoid delays and ensure projects are completed on time and within budget, it is essential to recognise the reasons that lead to construction delays in residential buildings. The Indian construction industry has been the nation's economic growth engine for the past 50 years, contributing significantly to its socio-economic development [1]. Construction is India's second-largest economic industry after agriculture. Delays have long been a significant problem in the building industry. Delays in building projects have a significant negative influence on most project objectives. A prior analysis found that about 40% of projects nationwide had subpar performance.

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According to a second study comparing the effectiveness of foreign development projects in China, Bangladesh, Thailand, and other nations, construction projects in India had the poorest performance in terms of timeliness.

Significance: The significance of studying factors that affect construction delays in residences lies in the opportunity to improve project outcomes while addressing industry-wide challenges. By recognising and analysing these factors, construction professionals may make informed judgements, establish effective plans, and execute steps to reduce delays. This study is especially relevant to the residential construction industry, as prompt completion is necessary to meet housing demand, maximise resource use, and raise customer satisfaction.

Materials and Methods: A systematic literature review was conducted to thoroughly evaluate the factors influencing construction delays in residential projects. A four-stage cycle of identification, collection, classification, and analysis is part of the process. The keywords are identified in the first step. Relevant material was found using keywords like "construction delay," "residential projects," "factors," and similar topics. We utilise a range of electronic databases to locate relevant journal articles, conference papers, and business reports, including Google Scholar, Scopus, and ScienceDirect. After articles based on keywords are completed, the bibliography is examined to find pertinent publications that were missed in the first search's results. Included are papers and articles that have been published that concentrate on the factors influencing residential construction delay. To incorporate recent advancements in the subject, studies from the past decade are considered. Case studies, theoretical frameworks, or research that offer empirical support for the topic are chosen.

Data Collection and Analysis: Data extraction was conducted to obtain key information, including the study's purpose, methodology, sample size, identified factors, and conclusions regarding construction delays in residences, following a review of relevant research. A thematic analysis method was utilised to identify recurring themes and groups of reasons driving construction delays. To identify common causes and their significance in creating delays, the extracted data were analysed. Patterns, interactions, and interdependencies among the listed aspects were examined to appreciate the complexities and interconnections involved. The study's objective is to provide a comprehensive review of the variables that affect residential construction delays. The approach for the review study involved systematic literature reviews, data extraction, analysis, and synthesis of conclusions. This approach ensured that the factors impacting residential development delays were thoroughly investigated, providing a solid framework for achieving effective outcomes.

II. LITERATURE REVIEW

According to the available research, time and expense overruns have led to poor performance in India's building industry over the past few decades. A project's success is determined by its timely completion, minimal cost overrun, absence of on-site hazards, and adherence to sufficient quality standards. It is essential to acknowledge that the construction industry incurs losses due to cost overruns, disputes, claim settlements, and other related issues. Such situations are frequently noticed as a result of a lack of accurate information visibility, which contributes to the trend of lower profit margins and decreased productivity in this industry [4]. The lack of sophistication throughout the construction supply chain is a significant challenge in the industry, despite the substantial growth in the importance of the Indian construction sector over the past five years. There is strong evidence that Indian building projects perform unevenly, and the trend is accelerating. All significant performance indicators, including cost, schedule, and quality, are failing for projects. While understanding the inherent factors influencing all of these substantial performance measures remains an area of research, at least in the Indian context [5].

Construction project delays can be caused by contamination on the construction site, supplier bankruptcy during execution, logistical issues, and local opposition. Productivity has also been impacted by the lack of transparency and information sharing in this industry. Delays and cost overruns are frequently encountered in building projects due to the inherent risks and increased complexity associated with these projects. Delays can result in several issues, such as conflicts between a client and contractors that lead to arbitration cost overruns, lost productivity, lost income, and charges for job termination. Identification of the causes and those accountable is necessary to compensate for the harm caused by delays [4]. Due to client-initiated delays, such as delayed provision of drawings and specifications, numerous modifications, and insufficient site information, both the primary contractors and the subcontractors file counterclaims, which results in arbitration and has significant financial ramifications.

Poor project management, inadequate planning, and ineffective financial management are all contributing factors to contractor-induced delays. The most common reasons for cost overruns, it has been found, include neglecting to include contractors in the design process, poor site management and supervision, theft on the job site, frequent design changes, incomplete designs, changes in material specifications, acts of God, errors in design, poor financial management on the job site, and constructor bankruptcy. After a thorough review of the literature, four criteria for determining who is to blame for delays have been identified: financial concerns, partnership, error identification and correction, and site circumstances [4]. The construction industry plays a vital role in the development of residential properties, providing essential housing infrastructure to meet the needs of growing populations. However, one persistent challenge faced by the industry is the occurrence of construction delays in residential projects. These delays can lead to increased costs, compromised quality, and dissatisfied stakeholders. Understanding the underlying factors that contribute to these delays is crucial for effective project management and the successful completion of residential construction projects.

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III. FACTORS AFFECTING CONSTRUCTION DELAY IN RESIDENCES

A. Project Planning and Design Factors

Effective project planning and design are essential for the successful and timely completion of residential construction projects. The inability of project stakeholders to agree on the project's scope may result in confusion and delays in the project's implementation. Additionally, projects may be delayed by rework and uncertainty resulting from unclear designs and requirements. The workflow may be hindered and project dates may be extended when changes or additions to the initial design are made during the project's construction. Inadequate cooperation amongst stakeholders, including architects, engineers, and contractors, can also lead to disputes, rework, and delays.

B. Procurement and Material Management Factors

The effective management and procurement of construction materials are essential for projects to run smoothly. Issues with sourcing, order processing, or delivery might cause delays in material procurement, which can prevent you from getting the materials you need in time. A lack of tracking and control over building supplies, combined with poor inventory management, can lead to shortages, delays in reordering, and disruptions to the construction process. Delays in the availability of resources can also result from supply chain disruptions, such as traffic jams or a lack of materials. Poor quality control, including issues with the quality or compliance of the materials used, can result in project delays.

C. Financial and Contractual Factors

Contractual and financial considerations can significantly impact project deadlines, potentially leading to delays. Residential construction projects may experience delays or insufficient funding, which can all be caused by financial restrictions. Resource shortages, work stoppages, and delays can also occur due to late payments to suppliers and contractors. Project delays may occur due to legal actions or negotiations arising from disputes over contract terms, modifications, or claims. A project schedule may also be impacted by contract modifications, such as changes to the project's scope, requirements, or timetables, if they are not effectively managed.

D. Workforce and Labour Factors

The productivity and availability of both skilled and unskilled workers directly affect project schedules. Delays in recruiting and resource allocation can result from labour constraints, such as a lack of trained workers or a high demand for labour. Low productivity and delays may be caused by ineffective labour management, including inefficient labour allocation, inadequate monitoring, or insufficient training. The construction process can be disrupted by workforce turnover, characterised by high turnover rates or labour disputes, which can cause delays in project completion.

E. Weather and Environmental Factors

Residential construction projects can be significantly hampered and delayed by weather and environmental factors. Inconvenient weather conditions, such as heavy rainfall, snowstorms, or heat waves, may hinder construction activities and necessitate a temporary halt to work. Certain construction activities may be restricted or limited due to seasonal limits, which can delay projects. Geological difficulties can further increase the time and cost required for mitigation, such as unstable soil conditions or the presence of subsurface utilities. Project timeframes may be impacted by administrative issues resulting from environmental rule compliance and obtaining the required permissions.

F. Stakeholder Communication and Coordination Factors

For a project to be completed on schedule, stakeholders must effectively communicate and coordinate their efforts to ensure a seamless workflow. Misunderstandings, delays in decision-making, and rework can result from poor communication, which is characterised by an absence of clear and timely communication among stakeholders. Conflicts, delays, and gaps in coordination can arise from insufficient coordination between the various stakeholders participating in the project, including clients, contractors, architects, and subcontractors.

G. Regulatory and Permitting Factors

Regulatory constraints and permitting procedures can significantly impact project timelines. Project interruptions and delays might result from a delay in receiving the required permits and permissions from regulatory authorities. To avoid potential delays and setbacks, strict adherence to construction codes, zoning regulations, and other applicable legal requirements is essential.

H. Technological and Equipment Factors

Construction projects are significantly impacted by equipment availability and technological improvements. When construction technologies are integrated, such as with project management software and Building Information Modelling (BIM), productivity is increased; however, equipment failures and a lack of resources can lead to delays. For efficient use of technology and equipment, adequate training is essential. By considering and addressing these concerns, construction professionals can proactively manage and prevent potential delays in residential building projects, eventually enhancing project efficiency and timeliness.

IV. SUMMARY OF LITERATURE

Table I: Summary of Literature

Table 1. Summary of Electature							
S.No.	Title of Paper	Year	Author	About	Methodology		Inference
1.	Analysing factors	2012	1. Hemanta Doloi	Causes of Delays	A survey of construction	1.	Lack of commitment
	affecting delays in		2. Anil Sawhney	in the Indian	professionals	2.	Inefficient site management
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	Indian construction projects		 K.C. Iyer Sameer Rentala 	Construction Sector	representing various parties involved in Indian construction projects.	 Lack of formal training Material shortage
2.	Identification of the delay-causing actor in the Indian real estate project: an AHP- based approach	2018	 Shumank Deep Mohd Asim Neeti Kesarwani Shweta Kandpal 	Identify the factors and project participants that contribute to delays in the schedule of real estate projects.	A survey with a questionnaire, a review of recent literature, and a series of structured interviews. The study's further basis is the use of the Analytical Hierarchical Process (AHP).	It has been noted that the primary factors influencing a contractor's performance include site circumstances, financial concerns, partnering, error detection and correction, and financial management.
3.	Analysis of Delay Factors and Claims of Construction Projects	2020	 Jonbi Azaria Andreas Resti Nur Arini Marlay Yuze 	Identifying causes of delays in building projects and compensation claims using the RII approach.	This paper employs a case study approach and the Relative Importance Index (RII) method to analyse and identify critical factors contributing to delays in building construction projects.	The paper concludes that late payment by project owners is the primary cause of construction delays, followed by contractors and unforeseen events, commonly referred to as force majeure. The RII method helps identify critical factors for effective project management.
4.	Analysis of Delays in Indian Real Sector Construction Projects and Their Impact on Overall Project Performance	2016	 Mohd Asim Shumank Deep Srivastava Dr. Syed Aqeel Ahmad 	This paper discusses the ICBF method for delay analysis and the use of EVM in construction projects.	The paper presents the ICBF method for delay analysis in construction projects and discusses the use of Earned Value Management to assess project performance.	The study highlights the significance of cost and schedule management in minimising delays in real estate projects. It suggests the use of Earned Value Management and adequate quantity surveying measurements to ensure efficient project management and prevent cost and time overruns.
5.	Delays and Their Analysis: Indian Residential Construction Projects	2017	 Rakesh L. Metha Suraj V. Gaikwad 	Analysis of stakeholders' opinions and the causes and effects of delays in residential construction projects in India.	The methodology employed in this paper involved a questionnaire survey, Importance Index ranking, Principal Component Analysis, and Correlation Analysis to identify and analyse delays in residential construction projects in India.	The research analysed the causes of delays in residential construction projects in India using a questionnaire survey and advanced statistical analysis. Finance and labour-related issues were identified as the primary causes of delays, offering valuable insights to construction stakeholders and researchers.
6.	Effect of organizational culture on delay in construction	2017	 David Arditi Shruti Nayak Atilla Damci 	The research investigates the connection between delays in construction projects and organisational culture.	The methodology employed in this paper involves administering a questionnaire survey to construction companies in the U.S. and India to collect data on their organisational culture and the extent of delays experienced in their projects. Statistical analysis was then employed to investigate the relationship between organisational culture and project delays.	The study examines the relationship between organizational culture and construction delays, finding that companies in the U.S. with a "clan" culture experience fewer delays than those in India with a "market" culture. This suggests that cultivating a specific organizational culture could help reduce delays.
7.	Exploring the causes of delay in Nigerian building construction Industry	2023	 Toriola-Coker Obisanya, A. A Oladitan 	Identification and ranking of construction project delays in Nigeria using a survey method.	The paper employed a survey method to identify the most significant causes of construction delays in Nigeria, administering a questionnaire to architects, engineers, builders, consultants, contractors, and quantity surveyors.	The study aimed to identify the leading causes of construction delays in Nigeria and provide suitable solutions. The results showed that financial difficulties, funding problems, and government regulations were the primary causes. They recommended adequate planning and the use of experienced professionals for project monitoring to mitigate the impact of delay.





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8.	Factors affecting delays on Private construction projects	2016	1. Jamal M. Assbeihat	Identification of Factors Causing Construction Delays in the Private Projects Sector in Jordan.	The study employed a questionnaire survey to gather data from consultants, contractors, and owners in Jordan's private construction industry, aiming to identify the factors contributing to construction delays. One-	The study identified a shortage of workforce, delays in the approval of contractor submissions by engineers, a shortage of materials, and the relationship between different subcontractors' schedules as the main factors causing delays in private construction projects in Jordan. A one-way ANOVA was
					way ANOVA was used for analysis.	used to analyse the agreement between the three groups.

V. RESULT & DISCUSSION

Several significant inferences and insights may be drawn from the review of the chosen research papers on the factors affecting construction delays in different circumstances. Doloi, Sawhney, Iyer, & Rentala conducted a questionnaire survey among construction professionals representing various stakeholders involved in Indian construction projects in their study on Indian construction projects. The study revealed several factors that contribute to delays, such as a lack of commitment from project participants, ineffective site management procedures, insufficient formal training, and problems with material shortages [5]. These results underscore the importance of addressing these issues to mitigate delays in the Indian construction industry. Deep, Asim, Kesarwani, and Kandpal conducted a study to determine the project participants and factors that cause delays in the schedules of real estate projects in India. The study employed structured interviews, a questionnaire-based survey, and a literature review. The Analytical Hierarchical Process (AHP) was used in the study, and it was discovered that the main factors influencing contractor performance and causing delays in real estate projects were financial concerns, partnering arrangements, error identification and rectification practices, and site conditions [4].

Using the Relative Importance Index (RII), Jonbi, Andreas, Arini, & Yuze investigated the causes of delays in building construction projects and compensation claims. The data gathered through a questionnaire survey was examined by the researchers using a case study methodology. According to the survey, project owners' late payments were shown to be the main culprit behind construction delays, followed by contractors and unavoidable circumstances [6] The RII technique was successful in locating crucial elements that can guide efficient project management tactics. Asim, Deep, and Ahmad discussed the application of Earned Value Management (EVM) in construction projects and the ICBF (Impact, Criticality, Base) method for delay analysis. The paper examined the advantages of adding EVM in assessing project performance and provided the ICBF method as a thorough tool to determine the causes of delays [2]. To ensure effective project management, the findings emphasised the importance of cost and schedule management in reducing delays in real estate projects. They suggested adopting efficient quantity surveying methods. Arditi, Nayak, & Damci investigated the relationship between organisational culture and construction project delays. To gather information on organisational culture and the degree of project delay, the researchers distributed questionnaire surveys to construction firms in India and the United States.

To investigate the connection between organisational culture and project delay, a statistical analysis was conducted. According to the study, American businesses with a "clan" culture—characterized by a strong feeling of community and cooperation—experienced fewer delays than their Indian counterparts with a "market" culture, which placed more of an emphasis on individualism and competitiveness [1].

Toriola-Coker, Obisanya, and Oladitan cited financial issues, funding problems, and government regulations as the main reasons for delays in the Nigerian construction industry. To determine the primary causes of building delays in Nigeria, the researchers surveyed architects, engineers, builders, consultants, contractors, and quantity surveyors. The study emphasised the value of thorough planning and the engagement of qualified experts for project monitoring to lessen the effects of delays [8]. Assbeihat explored the elements that cause delays in private construction projects in Jordan. The study used a questionnaire survey and one-way ANOVA to analyse the results. According to the research, the primary reasons for delays in private construction projects in Jordan are a lack of workforce, a delay in the approval of contractor submissions by engineers, a lack of materials, and problems coordinating the schedules of various subcontractors [3].

In conclusion, the research papers under consideration provide valuable insights into the factors that influence construction delays in various contexts. The results demonstrate the importance of considering project planning and design, procurement and material management, financial and contractual aspects, workforce and labour, weather and environmental conditions, stakeholder communication and coordination, regulatory and permitting factors, as well as technological and equipment considerations. The case studies and empirical data presented in the papers under review demonstrate effective methods for reducing delays and offer insightful lessons from delayed projects. The significance of effective project management practices, collaboration, stakeholder engagement, technology integration, automation, and adherence to legal and contractual issues is just a few of these insights. Based on the findings, practitioners in the construction sector should emphasise detailed project planning and risk assessment to predict probable delays and establish proactive methods. The key to reducing delays is to utilise effective project management techniques, including open lines of communication, consistent progress tracking, and prompt issue resolution.

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At every step of the project, collaboration and stakeholder involvement help to assure goal alignment and reduce conflicts. Efficiency, precision, and production can all be increased in the construction industry by integrating technology and automation. The legal and contractual aspects of contracts should be carefully considered to produce comprehensive, transparent, and equitable contracts for all parties.

VI. CONCLUSION

Construction delays in residences can have significant effects on project deadlines, costs, and stakeholder satisfaction. This review research has provided readers with a comprehensive overview of the factors driving construction delays and has recommended workable solutions. In conclusion, several factors collectively accounting for 100%, out of which including those relating to project planning and design (15%), procurement (5%), material management (14%), financial and contractual considerations (24%), workforce and labour issues (10%), weather and environmental factors (6%), stakeholder communication and coordination issues (9%), regulatory and permitting issues (8%), as well as technological and equipment considerations (9%), can result in construction delays in residential projects. To address these challenges and avoid delays in residential construction projects, practitioners must take a proactive, diversified strategy. Before implementing the proper techniques and countermeasures to minimise delays and ensure project success, it is crucial to understand these factors and their potential effects. Stakeholders can improve project efficiency, optimise resource allocation, and complete residential building projects promptly by taking these elements into account throughout the project lifecycle.

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