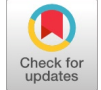


Factors Affecting Construction Delay in Residences

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 carry out an in-depth analysis of the causes of delays because the volume and capacity of the Indian construction sector have changed significantly over the past ten years. Construction delays have a considerable influence on residential projects budgets, schedules, and stakeholder satisfaction. Construction delays are a big issue in the residential construction industry since they increase costs, cause time delays, and disrupt quality. It is crucial to pinpoint the primary causes of these delays in order to reduce the effect they have on project performance. This research study attempts to give a thorough understanding of the factors that contribute to construction delays in residences. This study synthesises previous literature and research findings to investigate a number of factors, their interactions, and their influence on project delays. In order to properly manage and reduce construction delays in residential construction projects, the review underlines the relevance of recognising these aspects.

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

I. INTRODUCTION

Construction projects are an important part of a country's productive potential and efficiency. Almost every developed or developing country benefits greatly from the construction industry. India's economy is the second-fastest growing in the world. The construction industry is big, vibrant, and expensive 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 its socio-economic 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][11][12]. Construction processes are impacted by a wide range of unpredictable circumstances. A project rarely gets completed in the allowed amount of time.

It is well established that Indian construction projects perform unevenly, and this trend is growing. Reports claim that projects are underperforming on all crucial performance metrics, including cost, schedule, and job quality [7]. Delays in construction projects have an effect on the parties involved (developer, contractor, and consultant), resulting in a rise in unfriendly relationships, mistrust, litigation, arbitration, cash-flow concerns, compromises in safety and quality, and a general feeling of discomfort towards each other. The delay thus becomes a particularly sensitive aspect of this macrocosm. Project delays cause schedule overruns, directly and indirectly, raising 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 major issue that can lead to 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 result in higher costs, lower quality, and unhappy customers [13]. 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/cost performance improvement and is impacted by unfavourable attitudes and discontent. The construction business is a project-driven, smart, 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 grown significantly in importance in recent years, especially in the construction of residential buildings. Increased expenditures, missed deadlines, and dissatisfied clients might result from construction delays. In order to avoid delays and guarantee that projects are finished on time and within budget, it is necessary to recognise the reasons that lead to construction delays in residential building. 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][9][10]. Construction is India's second-largest economic industry after agriculture. Delays have long been one of the main problems 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 that compared the effectiveness of foreign development projects in China, Bangladesh, Thailand, and other nations, construction projects in India had the lowest timetable performance.

Significance: The significance of studying factors affecting construction delay 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 thorough evaluation of the factors influencing construction delays in residences are undertaken using a systematic literature search. 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 use a variety of electronic databases to find pertinent journal articles, conference papers, and business reports, including Google Scholar, Scopus, and Science Direct. 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. For the purpose of including recent advancements in the subject, studies from the past ten years are considered. Case studies, theoretical frameworks, or research that offer empirical support for the topic are chosen.

Data Collection and Analysis: Data extraction was carried out to obtain important information, such as the study's purpose, methodology, sample size, identified factors, and conclusions regarding construction delays in residences after relevant research had been found. A thematic analysis method was utilised to identify recurring themes and groups of reasons driving construction delays. In order to find common causes and their importance in creating delays, the extracted data were analysed. Patterns, interactions, and interdependencies among the listed aspects were explored in order to appreciate the complexities and interconnections involved. The study's objective is to provide a comprehensive review of the variables affecting residential construction delay. The approach for the review study involved systematic literature reviews, data extraction, analysis, and conclusion synthesis. This approach made sure that the factors impacting residential development delays were thoroughly investigated and offered a solid framework for applicable outcomes.

II. LITERATURE REVIEW

According to the research that is currently available, time and expense overruns have caused poor performance in India's building industry over the last few decades. A project's success is determined by its timely completion, little cost overrun, lack of on-site hazards, and sufficient quality standards. It is important to note that the construction industry suffers losses as a result of cost overruns, disputes, claim

settlements, and other 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 one of the major difficulties in the industry, despite the fact that the importance of the Indian construction sector has increased dramatically over the past five years. There is strong evidence that Indian building projects perform unevenly, and the trend is accelerating. All of the major performance indicators, including cost, schedule, and quality performances, are apparently failing for projects. While understanding the inherent factors influencing all of these major performance measures still 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 regularly seen in building projects as a result of the inherent risks and increased complexity. Delays can result in a number of things, such as conflicts between a client and contractors that result in 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, a lack of planning, and poor finance management are all causes of 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 construction delays in residential projects. These delays can lead to increased costs, compromised quality, and dissatisfied stakeholders. Understanding the underlying factors contributing to these delays is crucial for effective project management and successful completion of residential construction projects.



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 as a result of unclear designs and requirements. The workflow may be hampered and project dates may be stretched when changes or additions to the initial design are made while the project is being built. Inadequate cooperation amongst stakeholders, including architects, engineers, and contractors, can also lead to disputes, rework, and delays.

B. Procurement and Material Management Factors

The management and procurement of construction materials must be effective for projects to run effectively. 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. Lack of tracking and control of building supplies, as well as poor inventory management, can cause shortages, delays in reordering, and disruptions to the construction process. Delays in the availability of resources can also result from supply chain disruptions like 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 have a big impact on project deadlines and cause delays. Residential construction projects may experience delays or insufficient funding, which can all be caused by financial restrictions. Resources shortages, work stoppages, and delays can also result from late payments to suppliers and contractors. Project delays may occur as a result of legal actions or negotiations that result 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, a lack of monitoring, or

insufficient training. The construction process can be disrupted by workforce turnover, which is characterised by high turnover rates or labour disputes, and this can cause delays in the completion of projects.

E. Weather and Environmental Factors

Residential construction projects can be significantly hampered and delayed by weather and environmental factors. Inconvenient weather, such as heavy rainfall, snowstorms, or heat waves, may hinder construction activities and need 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 add to the amount of time and money needed for mitigation, such as unstable soil conditions or the presence of subsurface utilities. Project timeframes may be impacted by administrative problems caused by environmental rules compliance and getting required permissions.

F. Stakeholder Communication and Coordination Factors

For a project to be completed on schedule, stakeholders must effectively communicate and coordinate. 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

Timelines for projects can be considerably impacted by regulatory constraints and permitting procedures. 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, compliance with construction codes, zoning rules, and other legal requirements must be assured.

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 BIM, productivity is increased, but 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

S.No.	Title of Paper	Year	Author	About	Methodology	Inference
1.	Analysing factors affecting delays in	2012	1. Hemanta Doloi 2. Anil Sawhney 3. K.C. Iyer	Causes of Delays in Indian	A survey of construction professionals representing various	1. Lack of commitment 2. Inefficient site management 3. Lack of formal training



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	Indian construction projects		4. Sameer Rentals	Construction Sector	parties involved in Indian construction projects.	4. Material shortage
2.	Identification of delay causing actor in the Indian real estate project: an AHP-based approach	2018	1. Shumank Deep 2. Mohd Asim 3. Neeti Kesarwani 4. Shweta Kandpal	Determine the factors and project participants that cause 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 base is the use of the Analytical Hierarchical Process (AHP).	It has been noted that the primary factors that influence a contractor's performance include site circumstances, financial concerns, partnering, error detection and correction, and financial concerns.
3.	Analysis of Delay Factors and Claims of Construction Projects	2020	1. Jonbi 2. Azaria Andreas 3. Resti Nur Arini 5. Marlay Yuze	Identifying causes of delays in building projects and compensation claims using RII approach.	This paper uses a case study approach and the Relative Important Index (RII) method to analyze and identify critical factors causing 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 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	1. Mohd Asim 2. Shumank Deep Srivastava 3. 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 emphasizes the importance of cost and schedule management in reducing delays in real estate projects. It suggests the use of Earned Value Management and effective quantity surveying measurements to ensure efficient project management and prevent cost and time overruns.
5.	Delays and its Analysis: Indian Residential Construction Projects	2017	1. Rakesh L. Metha 2. Suraj V. Gaikwad	Analysis of stakeholders' opinions and the causes and effects of delays in residential construction projects in India.	The methodology used in this paper involved a questionnaire survey, Importance Index ranking, Principle Component Analysis, and Correlation Analysis to identify and analyze delays in residential construction projects in India.	The research analyzed the causes of delays in residential construction projects in India using a questionnaire survey and advanced statistical analysis. Finance and labor-related issues were found to be the dominating causes of delays, providing insights to construction stakeholders and researchers.
6.	Effect of organizational culture on delay in construction	2017	1. David Arditi 2. Shruti Nayak 3. Atilla Damci	The research investigates the connection between delays in construction projects and organisational culture.	The methodology used in this paper involves a questionnaire survey administered to construction companies in the U.S. and India to collect data on their organizational culture and the amount of delay experienced in their projects. Statistical analysis was then used to explore the relationship between organizational culture and project delay.	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 causes of delay in nigeria building construction Industry	2023	1. Toriola-Coker 2. Obisanya, A. A 3. Oladitan	Identification and ranking of construction project delays in Nigeria using a survey method.	The paper used a survey method to identify the most significant causes of construction delays in Nigeria by administering a questionnaire to architects, engineers, builders, consultants, contractors, and quantity surveyors.	The study aimed to identify the main 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, and recommended adequate planning and use of experienced professionals for project monitoring to mitigate the impact of delay.

8.	Factors affecting delays on Private construction projects	2016	1. Jamal M. Assbeihat	Identification of factors causing construction delays in private projects sector in Jordan.	The study used a questionnaire survey to gather data from consultants, contractors, and owners in the private construction industry in Jordan to identify the factors causing construction delays. One-way ANOVA was used for analysis.	The study identified shortage of manpower, delay in approval of contractor submissions by engineers, shortage of materials, and the relationship between different subcontractors' schedules as the main factors causing delays in private construction projects in Jordan. One-way ANOVA was used to analyze the agreement between the three groups.
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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 a number of 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 highlight how critical it is to solve these issues in order to reduce delays in the Indian construction industry. Deep, Asim, Kesarwani, & Kandpal did a study to determine the project participants and factors that cause delays in the schedule of real estate projects in India. Structured interviews, a questionnaire-based survey, and a review of the literature were all used in the study. 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, & Ahmad talked about 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 assess the causes of delays [2]. In order to ensure good project management, the findings emphasised the importance of cost and schedule management in decreasing delays in real estate projects and suggested the adoption of efficient quantity surveying measurements. 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, statistical analysis was done. 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, & Oladitan cited financial issues, funding problems and regulations from the government as the main reasons for delays in the Nigerian construction industry. To determine the primary causes of building delays in Nigeria, the researchers conducted a survey among 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 manpower, 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 offer insightful information about the factors influencing construction delays in diverse circumstances. The results demonstrate the importance of taking into account 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 offered in the papers under review show effective methods for reducing delays and provide insightful lessons from delayed projects. The significance of effective project management practises, collaboration, stakeholder engagement, technology integration, automation, and adherence to legal and contractual issues are 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 use effective project management techniques, such as open lines of communication, consistent progress tracking, and quick 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 in order 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, a number of 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 putting the proper strategies and countermeasures into action to cut down on 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 timely complete residential building projects by taking these elements into account throughout the project lifecycle.

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