FACTORS AFFECTING CONSTRUCTION PROJECT DELAYS IN BUILDING PROJECTS: AN ANALYTICAL STUDY OF TIME OVERRUNS, CONTRACTOR PERFORMANCE, MATERIAL SHORTAGES AND CLIENT-RELATED FACTORS

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Abstract: Construction project delay is one of the most common problems affecting building projects. Delays in construction projects result in time overruns, cost escalation, disputes, productivity loss, contractual claims, and dissatisfaction among project stakeholders. Multiple parties, sequential construction activities, uncertain site conditions, material dependency, labour coordination, design decisions, financial arrangements, and continuous client involvement are some of the factors that make building projects vulnerable to delays. This paper aims to identify and examine the major factors affecting delays in building construction projects, with special emphasis on time overruns, contractor performance, material shortages, and client-related factors. Delays are usually associated with clients, contractors, consultants, materials, labour, equipment, finance, design changes, site management, and external conditions. Delays in material supply, poor planning, and slow decision-making are some of the major causes of construction delays. A detailed analysis of delay factors is provided in the paper. The effects of these factors on project completion time and project performance are discussed. The paper shows that the interplay of technical, managerial, financial, and contractual issues is responsible for construction delays. The study concludes that effective project planning, timely client decisions, reliable contractor performance, proper material management, regular monitoring, and improved communication are essential for reducing delays in building construction projects.

Index Terms **- Construction delay, building projects, time overrun, contractor performance, material shortage, client-related factors, project management, delay causes, construction planning, schedule performance.**

I. INTRODUCTION

The construction industry creates physical infrastructure. Residential buildings, commercial complexes, institutional buildings, and public facilities contribute to social and economic development. Poor time performance, cost overruns, and frequent disputes are some of the major criticisms of the construction industry. Delay is a significant problem in construction project management. A construction delay can be defined as a situation in which the actual progress of work is slower than the planned schedule, resulting in late completion of one or more project activities.

Delays in construction projects have serious consequences for all stakeholders. Delays can result in late occupancy, loss of revenue, increased financing costs, and dissatisfaction for the client. Delays can lead to increased overhead costs, labour idling, and exposure to penalties for the contractor. Delays can also create problems for consultants. Delay is a project performance issue that affects cost, quality, contractual relationships, and stakeholder confidence.

According to several studies, construction delay is a global problem. Poor site management, unforeseen site conditions, slow decision-making, client variations, and necessary design changes were some of the major delay causes studied by Chan and Kumaraswamy [1]. According to Assaf and Al-Hejji, delays were common in large construction projects in Saudi Arabia [2]. Significant delay factors include contractor performance, owner intervention, inadequate contractor experience, financing issues, and labour productivity [3]. Poor contractor planning, poor site management, inadequate contractor experience, client financing problems, subcontractor issues, material problems, and labour shortages were some of the major causes of delay [4]. The integration of design, procurement, labour, materials, equipment, approvals, finance, and site operations can cause delays in building construction projects. The construction process is sequential and interdependent. A delay in one activity, such as foundation work, can affect several other activities. It is possible for late delivery of steel or cement to delay structural work, which in turn delays masonry, plastering, service installation, and finishing works. Procurement and execution schedules can also be affected by delayed client decisions. This interdependence makes delay control a complex task.

Time overrun is a major consequence of construction delays. Every project has a planned or contractual completion period, and the actual completion time may exceed that period. Poor planning, unrealistic schedules, inadequate resource allocation, design changes, late approvals, material shortages, labour problems, financial constraints, and weak project monitoring are some of the causes of time overruns. The original project schedule may be prepared without considering site conditions, procurement lead time, labour availability, weather conditions, and coordination requirements. As a result, it becomes difficult to achieve the planned timeline. Contractor performance is another major factor affecting project delays. The contractor is responsible for executing the work. Poor contractor performance may include inadequate planning, weak site supervision, poor labour management, insufficient equipment, lack of technical capability, and poor subcontractor coordination. Slow project progress may be caused by a contractor who fails to mobilize resources on time. Studies show that delays in construction projects are often caused by contractor-related factors [2].

Material shortages also play a critical role in construction delays. Building projects depend on the timely availability of materials such as cement, steel, aggregates, bricks, tiles, electrical materials, plumbing materials, finishing items, and specialized components. Poor material planning, supplier failure, price fluctuations, transportation problems, market shortages, delayed approval of material samples, or late payments to suppliers are some of the reasons material procurement may be delayed. Late delivery or shortage of materials can significantly affect the project schedule. Client-related factors are equally important in building project delays. The client initiates the project, provides finance, approves drawings, makes decisions, and coordinates with consultants. Delays in payments, late approval of drawings, frequent changes in scope, slow decision-making, and unclear project requirements can affect construction progress. Variations are common in building projects. Changes that require rework can further contribute to delays.

The problem of construction delay is therefore multidimensional. Technical issues alone cannot explain it. Delays result from the combined effects of planning failures, managerial inefficiencies, financial constraints, material problems, contractual issues, and stakeholder decisions. Understanding delay factors is important for project management. It enables stakeholders to prioritize preventive and corrective measures. This paper aims to identify, classify, and analyse the major factors affecting delays in building construction projects. The study focuses on four dimensions: time overrun, contractor performance, material shortages, and client-related factors. The literature reviewed was published before October 2016. The study provides a structured understanding of delay causes and their impact on project performance, which is useful for students, researchers, contractors, consultants, and clients involved in building construction projects. The literature review, classification of delay factors, research methodology, ranking of delay causes, analysis, and discussion are presented in the remaining sections of the paper.

II. LITERATURE REVIEW

Construction delay is one of the most researched subjects in construction management. The extension of project completion time is called a delay. Delays affect project schedules and result in cost overruns, productivity losses, contractual disputes, and reduced stakeholder satisfaction. The causes and effects of delays have been investigated by researchers from different countries. The causes of time overruns in Hong Kong construction projects were examined by Chan and Kumaraswamy [1]. Delays were caused by a combination of project complexity, poor site management, inadequate coordination among project participants, and variations initiated during construction according to their research. The study showed that construction projects involve many interrelated activities and that delays can affect subsequent activities. Communication and coordination among stakeholders are important for avoiding schedule overruns.

Mansfield et al. identified poor contract management and inadequate planning as major causes of schedule overruns [9]. According to their findings, project delays are associated with managerial and financial challenges. Project delays are often caused by weak coordination among project participants. Kaming et al. investigated time and cost overruns in high-rise building projects in Indonesia and found that material shortages, labour productivity problems, and design changes significantly affected project completion [5]. They found a strong relationship between time overruns and cost overruns, indicating that delays can lead to increased project expenditure. Resource management and planning are important for maintaining project schedules.

According to a study carried out by Kumaraswamy and Chan, contractor-related problems, client-related issues, communication deficiencies, and resource constraints are some of the major factors affecting project performance [11]. Delays often arise from a combination of factors and therefore require coordinated management efforts from all stakeholders. Odeh and Battaineh investigated delays under traditional contracting arrangements [3]. Poor planning, weak site management, and low labour productivity were some of the factors that resulted in schedule extensions. According to the researchers, project success depends on the contractor's ability to organize resources, coordinate activities, and maintain effective supervision throughout the construction process.

Aibinu and Jagboro reported that delays in the Nigerian construction industry result in time overruns, cost overruns, disputes, litigation, and loss of productivity [10]. Their research highlighted the importance of implementing effective project control systems. Frimpong et al. found that major causes of delays are financing difficulties, contract management issues, and procurement problems [6]. Many of the findings from their research were applicable to building projects. Construction projects in Saudi Arabia were examined by Assaf and Al-Hejji [2]. Delays were associated with financial problems, material procurement issues, contractor

performance deficiencies, and change orders initiated by project owners. According to the study, construction delays are influenced by both financial and managerial factors.

Lo et al. reported that resource constraints, design changes, coordination problems, and management deficiencies are some of the issues that caused delays in Hong Kong civil engineering and construction projects [15]. According to the study, effective communication is important in reducing delays and improving project performance. Alaghbari et al. identified financial difficulties, labour shortages, material procurement issues, and inadequate site management as contributors to project delays [12]. Schedule overruns were caused by poor planning and ineffective resource management. Project performance can be improved by better planning and coordination mechanisms.

Delays in Malaysian construction projects were examined by Sambasivan and Soon [4]. Poor contractor planning, inadequate site management, labour shortages, client financial problems, and material procurement delays were some of the causes of project delays. They found that cost overruns, disputes, and litigation were the most common consequences of delays. Le-Hoai et al. reported that insufficient financial resources, ineffective project management, material shortages, and design changes are some of the most critical delay factors [7]. Their research highlighted the importance of management efficiency in maintaining project schedules.

Enshassi et al. reported that material shortages, delayed payments, funding constraints, and external environmental factors have a significant influence on project completion [13]. The study showed that external conditions can affect construction projects. Ramanathan et al. found that poor project coordination, inadequate planning, and financial instability are some of the most frequently reported causes of construction delays [14]. Construction delays are a global challenge for the industry, and many delay factors are common across different countries.

Doloi et al. [8] analysed delay factors in Indian construction projects. Lack of commitment among project participants, poor planning, financial constraints, and ineffective site management were some of the contributors to project delays. Organizational and managerial weaknesses were found to be major reasons for construction delays. The studies show that construction delays occur across different regions. Even though the relative importance of specific factors may vary, there are certain delay causes that appear consistently in the literature. Poor contractor performance, material shortages, delayed client decisions, financial difficulties, inadequate planning, and ineffective project management are among the most common factors. The recurring nature of these factors suggests that they are fundamental challenges for the construction industry.

The literature indicates that delays rarely occur because of a single reason. Multiple factors can contribute to project delays. A contractor experiencing financial difficulties may not be able to procure materials on time, which affects labour productivity and project progress. Similarly, delayed client approvals can cause construction site downtime. Understanding the relationships among various project participants is therefore required for effective delay management. There is a close relationship between time performance and cost performance. Cost overruns are likely to occur on projects with large schedule overruns. Delays increase overhead costs, labour costs, equipment utilization costs, and financing expenses. Completing a project on time is an important determinant of project success.

Construction delays have consequences beyond the project environment. Delays can lead to contractual disputes. Long delays can cause project abandonment, financial losses, and reputational damage. These consequences highlight the importance of identifying delay factors at an early stage. The dimensions identified in previous research are time overruns, contractor performance, material shortages, and client-related factors. These factors are among the most significant causes of delays in building construction projects. The study aims to contribute to a better understanding of delay mechanisms and provide recommendations for improving project performance.

Table 1: Summary of Major Studies on Construction Project Delays

Author(s)	Year	Country	Key Findings
Mansfield et al. [9]	1994	Nigeria	Financing difficulties, contract management issues and inadequate planning contributed to project delays.
Chan and Kumaraswamy [1]	1997	Hong Kong	Poor site management, variations and coordination issues caused significant delays.
Kaming et al. [5]	1997	Indonesia	Material shortages and labour productivity significantly affected project duration.
Kumaraswamy and Chan [11]	1998	Hong Kong	Client, contractor and communication-related issues affected project schedules.
Odeh and Battaineh [3]	2002	Jordan	Contractor performance and owner interference were major delay causes.

Aibinu and Jagboro [10]	2002	Nigeria	Delays resulted in cost overruns, disputes and productivity losses.
Frimpong et al. [6]	2003	Ghana	Financing difficulties and procurement issues contributed to delays.
Assaf and Al-Hejji [2]	2006	Saudi Arabia	Financial constraints, change orders and procurement delays were critical factors.
Lo et al. [15]	2006	Hong Kong	Design changes, resource constraints and coordination problems contributed to delays.
Alaghbari et al. [12]	2007	Malaysia	Labour shortages, financial problems and material procurement issues caused delays.
Sambasivan and Soon [4]	2007	Malaysia	Poor planning, site management and material-related issues caused delays.
Le-Hoai et al. [7]	2008	Vietnam	Material shortages and management inefficiencies affected project schedules.
Enshassi et al. [13]	2009	Gaza Strip	Funding constraints, delayed payments and material shortages delayed projects.
Ramanathan et al. [14]	2012	Multiple Countries	Communication failures, planning deficiencies and financial instability were common delay factors.
Doloi et al. [8]	2012	India	Stakeholder commitment, planning and financial issues significantly influenced delays.

A detailed investigation of the major factors affecting building project completion is supported by the literature reviewed. The studies show that planning deficiencies, contractor performance issues, material shortages, and client-related problems are the main contributors to construction delays. These findings provided the foundation for the research framework and methodology.

III. Ease of Use Classification of Delay Factors and Conceptual Framework

The successful completion of a building project depends on the performance of stakeholders. Delay factors should be categorized into meaningful classes because they may originate from different sources. The root causes of delays can thus be identified by researchers and project managers. Previous studies have classified delay causes using various approaches. Some researchers grouped delay factors according to stakeholder responsibility, while others categorized them according to project resources or project management functions. Construction delays are influenced by a number of factors.

Time overrun factors, contractor performance factors, material shortage factors, and client-related factors have been grouped into four major classes for the purpose of this study. These classes were chosen because they represent the most frequently cited causes of delay and have a direct influence on project completion.

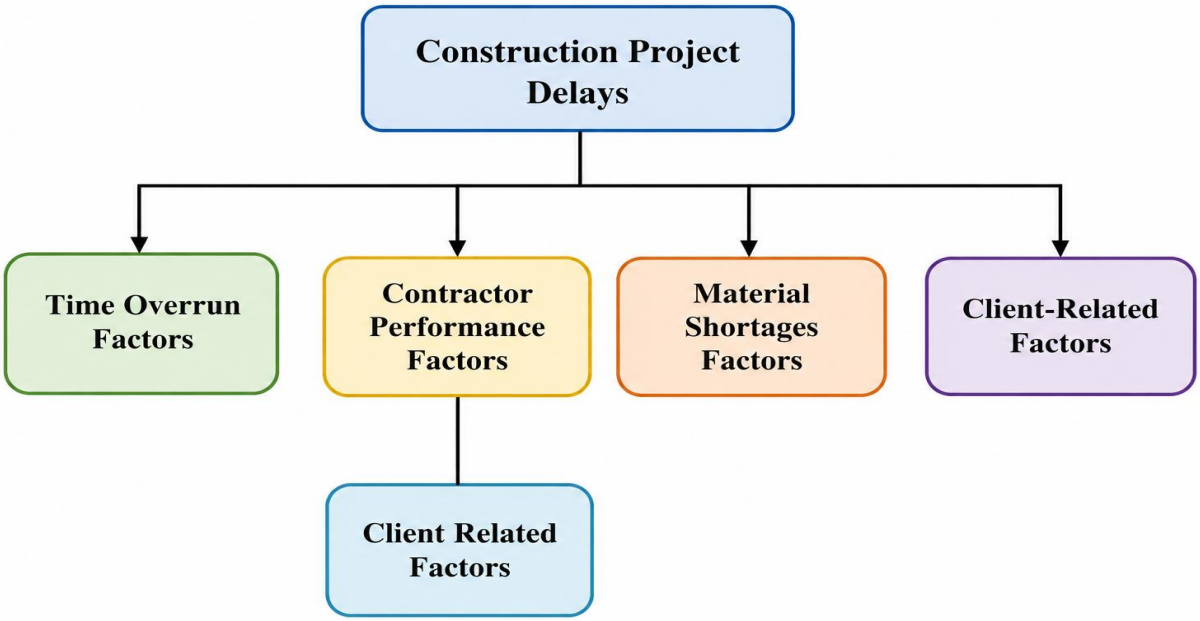

Figure 1: Major Categories of Delay Factors

3.1 Time Overrun Factors

The actual completion period of a project may differ from the planned completion period. Time performance is one of the most widely used project performance indicators. When project activities require more time than planned, delays occur. Several factors contribute to time overruns in construction projects. Poor planning during the pre-construction phase causes unrealistic schedules that fail to account for resource constraints, procurement lead times, and site conditions. Poor scheduling practices can make it difficult to maintain progress.

Time overruns are also caused by ineffective monitoring and control. Construction projects require continuous tracking of progress against planned schedules. Minor delays can accumulate if deviations are not identified and corrected. Quality issues, changes in project scope, and design errors can increase project duration. Chan and Kumaraswamy reported that time overruns are caused by poor coordination and variation orders [1]. Assaf and Al-Hejji found that insufficient planning and management practices were among the leading causes of schedule extensions [2]. Effective planning, scheduling, and monitoring are therefore needed to minimize time overruns.

3.2 Contractor Performance Factors

Contractor performance is one of the most important determinants of project success. The contractor is responsible for executing the project work. Contractor performance can directly affect project schedule, cost, and quality. Poor planning, inadequate supervision, insufficient technical expertise, and weak resource management are some of the causes of delay. Difficulties in coordinating project activities, managing labour productivity, and controlling site operations can be encountered by an inexperienced contractor. These deficiencies result in slower project progress.

Financial capability also plays a critical role in contractor performance. Contractors may not be able to procure materials, hire skilled labour, or maintain equipment if they are experiencing cash flow problems. Construction activities may therefore be interrupted. Contractor-related issues were identified as among the most significant contributors to project delays [3]. Another important aspect of contractor performance is subcontractor management. Multiple subcontractors are responsible for specialized works on modern building projects. Ensuring smooth project execution depends on effective coordination. Poor subcontractor management can cause scheduling conflicts, productivity losses, and project delays. The timely completion of building projects is therefore greatly influenced by contractor performance and deserves special attention.

3.3 Material Shortage Factors

Construction materials represent a fundamental input for project execution. Maintaining construction progress depends on the availability of materials. Project schedules can be significantly affected by material supply disruptions. There are a number of reasons why material shortages can occur. Careful planning is required throughout the project lifecycle, as materials constitute a substantial portion of project cost. Kaming et al. reported that the duration of high-rise construction projects can be significantly affected by material shortages [5]. Similarly, Le-Hoai et al. found that delays in material procurement and delivery contributed to project delays [7]. Delayed delivery of critical materials can subsequently delay other project activities.

Material price fluctuations also influence project performance. Procurement decisions can be affected by unexpected increases in material prices. Schedule delays can occur when contractors postpone purchases while seeking alternative suppliers or negotiating revised prices. Effective material management includes procurement planning, supplier selection, inventory control, and logistics coordination. Delays can be reduced through proper implementation of these practices.

3.4 Client-Related Factors

The client is one of the most influential stakeholders in a construction project because they provide project financing, establish project requirements, and approve key project decisions. Consequently, client-related actions have a substantial impact on project schedules. Slow decision-making is a common cause of delay. Construction projects require approval of drawings, specifications, materials, and design changes in a timely manner. Project schedules can be disrupted by delays in obtaining these approvals.

Another major issue is delayed payment. Timely payments help contractors finance their work. Delays in payment can create cash flow problems. Delays in progress payments have been identified as one of the major causes of construction delays [2]. Changes in scope and project requirements can also cause project delays. Modifications may be requested after construction has started. Such changes often increase project duration and create scheduling challenges. Misunderstandings and project inefficiencies can be caused by unclear project objectives and inadequate communication between the client and the project team. Effective communication, active client involvement, and timely decision-making are therefore important for project completion.

3.5 Conceptual Framework of the Study

There are four dimensions to construction project delays: time overrun factors, contractor performance factors, material shortage factors, and client-related factors. Project completion time and overall project performance can be affected by these factors.

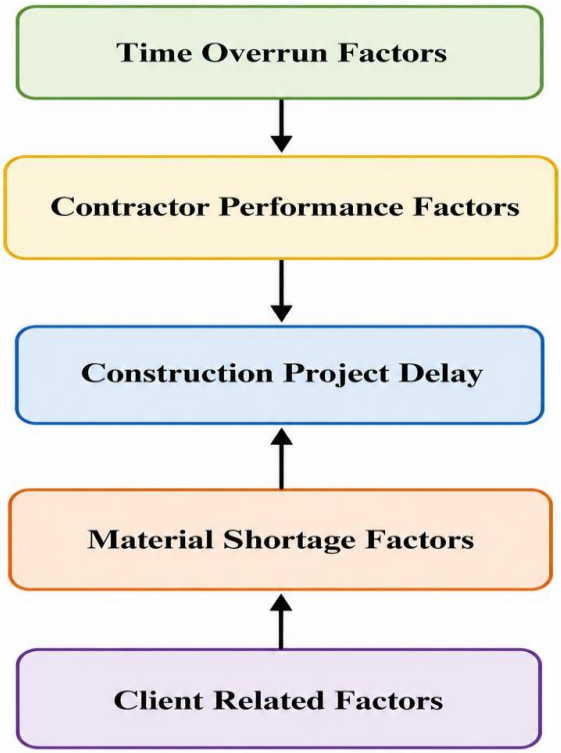

Figure 2: Conceptual Framework

In the conceptual framework, the relationship between the selected independent variables and the dependent variable is shown. The framework forms the basis for the research methodology and analysis presented in the later sections of the study.

IV. RESEARCH METHODOLOGY

A framework for conducting a study is provided through research methodology. Ensuring the reliability and validity of research findings depends on selecting an appropriate methodology. The major factors affecting delays in building construction projects have been identified using a quantitative research approach. The methodology focuses on collecting opinions from construction professionals and analyzing the importance of delay factors.

Multiple stakeholders and project-related variables influence construction delays. There is a need for a structured approach to evaluate the relative importance of delay factors. The methodology used in the study includes literature review, identification of delay factors, questionnaire development, data collection, data analysis, and ranking of factors.

4.1 Research Design

The research follows a descriptive and analytical design. A review of published literature was conducted to identify the causes of delays. The findings of previous studies were used to select the delay factors.

1. Time Overrun Factors
2. Contractor Performance Factors
3. Material Shortage Factors
4. Client-Related Factors

These categories were chosen because they are significant contributors to project delays. The purpose of the research design is to determine the relative importance of these factors. The research framework is shown in Figure 3.

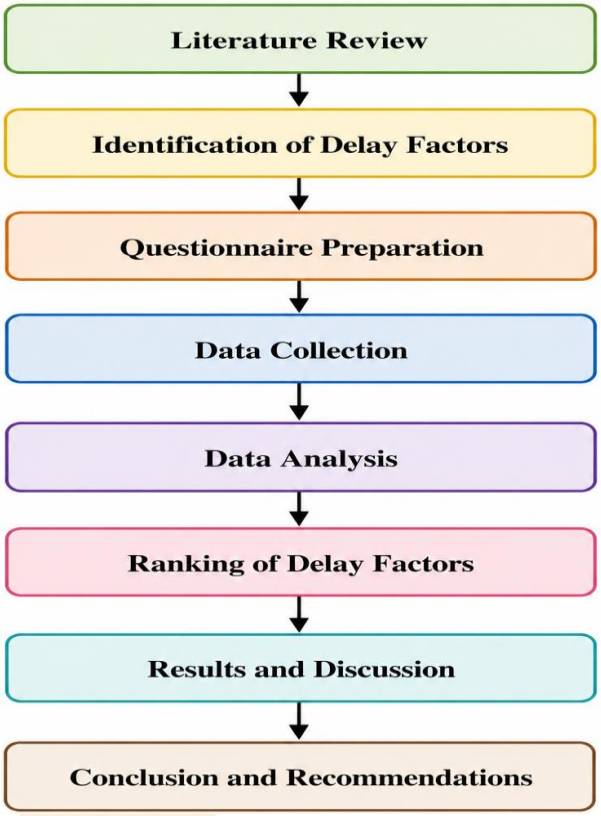

Figure 3: Research Flow Diagram

4.2 Identification of Delay Factors

A review of published research articles, conference papers, and construction management studies was used to identify delay factors. In previous studies conducted in Hong Kong, Saudi Arabia, Jordan, Malaysia, Indonesia, Vietnam, and India, the causes of construction delays were identified. The delay factors were grouped under four categories. The factors reflect practical challenges encountered during the execution of building projects.

Table 2: Classification of Delay Factors Considered in the Study

Category	Delay Factors
Time Overrun Factors	Poor planning, unrealistic schedules, inadequate monitoring, rework, coordination issues
Contractor Performance Factors	Poor site management, lack of experience, weak supervision, labour productivity issues, financial difficulties
Material Shortage Factors	Material shortages, procurement delays, supplier issues, transportation delays, inventory problems
Client-Related Factors	Delayed payments, change orders, slow decision-making, delayed approvals, scope modifications

A structured questionnaire was used.

4.3 Data Collection Method

The quality of a research study is determined by the quality of information obtained. A structured survey was used to collect primary data. The questions in the questionnaire were designed to obtain the opinions of construction professionals. Respondents may include:

- Project Managers
- Site Engineers
- Construction Managers
- Contractors
- Consultants
- Quantity Surveyors
- Project Coordinators

Reliable information about the causes of project delays can be provided by professionals with practical experience in project execution. The questionnaire consists of two sections. Information about the respondents' professional background is included in the first section. The importance of identified delay factors is assessed using a rating scale.

Table 3: Likert Scale Used for Evaluation

Scale	Interpretation
1	Very Low Impact
2	Low Impact
3	Moderate Impact
4	High Impact
5	Very High Impact

A Likert scale can be used to assess delay factors.

4.4 Sample Size

A sample of industry professionals is required for survey-based research. Sample sizes generally range from 30 to 200 respondents depending on the project scope. Responses from construction professionals are used for the study. The respondents have practical experience in project planning, execution, supervision, and management. Their professional expertise ensures the credibility of the collected data. The sample includes both contractors and consultants.

4.5 Relative Importance Index (RII)

The importance of delay factors is determined using the Relative Importance Index (RII) method. The RII technique allows ranking of factors according to their significance in construction management research. The Relative Importance Index is calculated using the following equation:

$$RII = (\Sigma W)/(A \times N)$$

Where:

- **RII** = Relative Importance Index
- **W** = Weight assigned by respondents (1 to 5)
- **A** = Highest possible weight (5)
- **N** = Total number of respondents

The value of RII ranges between 0 and 1. A higher RII value indicates greater importance of the factor.

Table 4: Interpretation of RII Values

RII Range	Interpretation
0.80 – 1.00	Very High Significance
0.60 – 0.79	High Significance
0.40 – 0.59	Moderate Significance
0.20 – 0.39	Low Significance
Below 0.20	Very Low Significance

The RII method helps prepare a ranked list of delay causes.

4.6 Data Analysis Techniques

The collected data are analyzed using descriptive statistical methods. The delay factors are evaluated using frequency distribution, mean values, and Relative Importance Index values. The analysis is intended to identify the most significant causes of delays. The findings are presented through tables, charts, and comparative analysis. Delay factors with higher RII values are considered more important.

V. RESULTS AND DISCUSSION

The purpose of this chapter is to evaluate the impact of the identified delay factors on building construction projects. The analysis is based on responses from construction professionals. Construction delays are rarely caused by a single issue. They are influenced by managerial, technical, financial, and operational factors. Understanding the relative importance of these factors is important for improving project performance. Time overrun factors, contractor performance factors, material shortage factors, and client-related factors are some of the factors identified.

5.1 Ranking of Major Delay Factors

The major delay factors were ranked based on responses and findings from previous studies.

Table 5: Ranking of Major Delay Factors

Rank	Delay Factor	Category
1	Poor Planning and Scheduling	Time Overrun
2	Delayed Progress Payments	Client Related
3	Material Procurement Delays	Material Shortage
4	Poor Site Management	Contractor Performance
5	Frequent Design Changes	Client Related
6	Contractor Financial Difficulties	Contractor Performance
7	Material Shortages	Material Related
8	Slow Decision-Making by Client	Client Related
9	Labour Productivity Issues	Contractor Performance
10	Rework Due to Errors	Time Overrun

Poor planning is one of the most influential contributors to construction delays.

5.2 Analysis of Time Overrun Factors

Time overrun factors affect project completion. The main reason for delays was poor planning and scheduling. Resource availability, procurement lead time, and project risks are not adequately considered during schedule preparation. Consequently, project activities require more time than anticipated. Time overruns are also caused by insufficient monitoring and control. Monitoring helps project managers identify schedule deviations. When project progress is not regularly reviewed, small delays accumulate. Design errors, construction errors, and quality deficiencies are some of the causes of time overruns. Rework can adversely affect productivity. Schedule overruns are often caused by poor planning and coordination [1].

5.3 Analysis of Contractor Performance Factors

Contractor performance was one of the major reasons for project delays. Poor site management, inadequate supervision, and weak resource planning affect construction productivity. Contractors coordinate labour and subcontractors. Deficiencies in contractor management can have a significant impact on project progress. Projects managed by experienced contractors generally have better schedule performance than those managed by inexperienced organizations.

Contractor performance also depends on financial capability. When contractors face financial difficulties, they encounter challenges in procuring materials, paying workers, and maintaining project operations. Such challenges can disrupt construction activities and extend project duration. The findings are in agreement with previous studies conducted by Odeh and Battaineh and Sambasivan and Soon [3].

5.4 Analysis of Material Shortage Factors

Material-related factors are a major challenge in construction projects. Delays in material procurement, transportation, and delivery affect project schedules. Material procurement delays were identified as one of the top factors. Supplier inefficiency, inadequate planning, transportation constraints, or market shortages are some of the causes of procurement delays. Even short procurement delays may affect project performance.

Labour productivity can be affected by material shortages. This situation increases project costs and negatively affects schedule performance. The findings are consistent with the studies conducted by Kaming et al. [5] and Le-Hoai et al. [7]. These studies highlighted the importance of effective material management.

5.5 Analysis of Client-Related Factors

Client-related factors significantly influence construction project delays. Delayed progress payments are one of the most significant causes of delays. Changes in project scope and design requirements are major contributors to delays. Such changes may require redesign, additional approvals, and rework, all of which increase project duration.

Slow decision-making by clients can also cause delays. Delays in approving drawings, materials, and technical submissions can disrupt project schedules. The findings support the conclusions of Assaf and Al-Hejji, who identified owner-related issues as major causes of construction delays [2].

5.6 Discussion of Findings

The analysis shows that construction delays are multidimensional. Contractor performance factors and time overrun factors appear to have the greatest impact on project completion. Delays can be caused by poor planning, ineffective management, and delayed decision-making. Material shortages and procurement difficulties can also cause disruption of construction workflow. The findings indicate that coordinated efforts from clients, contractors, and project managers are required. Ensuring timely project completion requires effective planning, financial management, procurement control, and stakeholder communication.

VI. Recommendations and Delay Mitigation Strategies

Construction delays are among the most challenging issues affecting the successful delivery of building projects. Poor planning and scheduling, inadequate contractor performance, material procurement difficulties, and client-related issues are some of the factors that lead to delays. A comprehensive approach is needed since construction delays are caused by multiple factors. The following recommendations are proposed for reducing delays in building construction projects. These recommendations are based on the findings of previous research. Improving project planning, enhancing contractor performance, strengthening material management practices, and promoting effective client participation are some of the measures suggested.

6.1 Improving Project Planning and Scheduling

Effective planning is the foundation of successful project execution. Insufficient planning is one of the main causes of delays. Project stakeholders should therefore improve planning and scheduling practices. Project schedules should include realistic assumptions regarding resource availability, procurement lead times, labour productivity, and site conditions. Unrealistic schedules often cause schedule overruns and project disruptions.

Modern scheduling techniques such as Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), and project management software tools should be used by project managers. These tools help identify critical activities, evaluate project risks, and implement corrective actions before delays become significant. Schedule reviews should be conducted throughout the project. Monitoring actual progress against planned schedules helps project managers identify deviations early. Effective planning and continuous monitoring can reduce the likelihood of time overruns.

6.2 Enhancing Contractor Performance

According to the findings of the study, contractor-related factors are among the most significant contributors to construction delays. Improving contractor performance can significantly improve project outcomes. Technical expertise, previous project experience, and organizational capability should be considered when selecting a contractor. The risk of delays increases if contractors lack adequate resources.

Project management systems should effectively coordinate labour, equipment, materials, and subcontractors. Project activities should be executed according to approved schedules. Regular training programs can help improve the skills of the construction workforce. Financial management is another critical aspect of contractor performance. If contractors do not have sufficient financial resources to support their activities, disruptions may occur. Proper financial planning allows timely procurement of materials, payment of labour wages, and maintenance of equipment resources. Effective communication mechanisms should be implemented by contractors. Improved communication reduces misunderstandings, minimizes rework, and enhances project coordination.

6.3 Strengthening Material Management Systems

Many project delays are caused by material shortages and procurement delays. Maintaining project schedules depends on the timely availability of materials. Material procurement planning should begin during the early stages of project development. Construction schedules should be integrated with procurement schedules. Delays in the delivery of long-lead items can significantly affect project progress.

Good relationships with suppliers can improve supply chain performance. Delivery reliability, quality performance, and financial stability should be considered when selecting suppliers. Choosing dependable suppliers can reduce the risk of procurement-related delays. Material availability and delivery should be continuously monitored. Proper inventory control reduces the likelihood of shortages. Modern inventory management software can be used to track material movement. Transportation planning is another important aspect of material management. Effective logistical coordination can help minimize delays.

6.4 Improving Client Participation and Decision-Making

Delayed payments, design changes, and slow decision-making are some of the client-related factors that cause construction delays. Clients play a critical role in project initiation and funding. One of the best ways to reduce delays is to establish clear project objectives and requirements. Clear requirements reduce the likelihood of scope changes. The approval process for drawings, material submissions, and design changes should be clearly established by clients. Construction schedules can be affected by delays in obtaining approvals. Timely review and approval processes can significantly improve project performance.

Regular communication between clients and project stakeholders is equally important. Progress meetings provide opportunities to discuss project issues and make decisions. Effective communication promotes collaboration and reduces misunderstandings among project participants. Timely release of progress payments is another critical requirement. Contractors depend on regular payments to finance their work. Delays in payment can cause cash flow problems. Payment processes should therefore be efficient.

6.5 Risk Management and Delay Prevention

Project schedules can be affected by various risks. Risk management helps identify, assess, and mitigate potential delay factors. Project teams should conduct risk assessments during the planning phase to identify potential threats. Risks should be prioritized according to their impact on the project schedule.

Contingency plans should be developed for critical project activities. These plans help project teams respond effectively to unforeseen events. Risk management should be viewed as a continuous process. Stakeholders can adapt to changing project conditions and maintain control over project schedules.

6.6 Integrated Approach to Delay Mitigation

The study indicates that construction delays are not always caused by a single factor. Delays are usually the result of planning deficiencies, contractor performance issues, material shortages, and client-related problems. All stakeholders should be involved in efforts to reduce project delays. The integrated framework is designed to reduce construction delays.

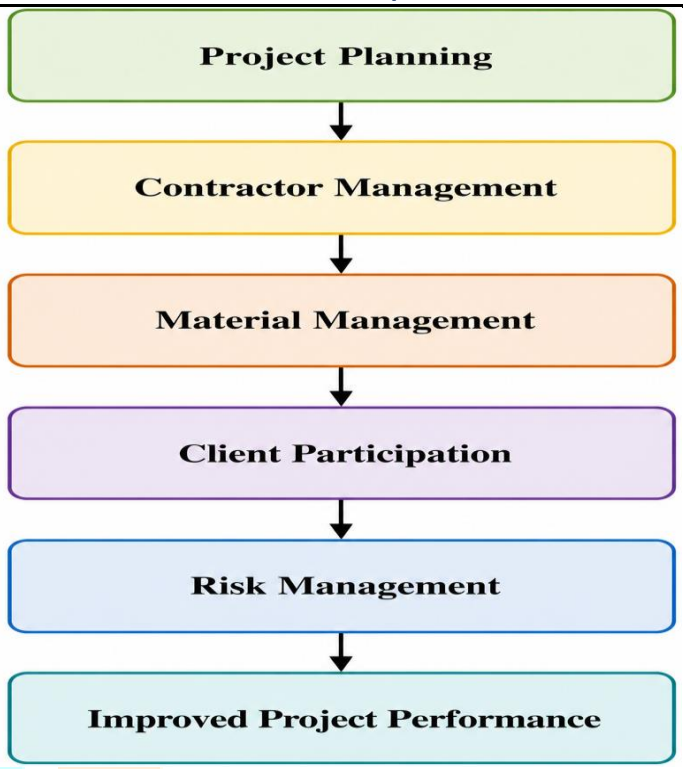

Figure 4: Integrated Delay Mitigation Framework

Collaboration among clients, contractors, consultants, and suppliers is essential.

6.7 Summary

Recommendations were presented to reduce delays in building construction projects. Improving planning and scheduling, enhancing contractor performance, strengthening material management systems, promoting effective client participation, and implementing proactive risk management practices were among the key recommendations. Successful implementation of these measures can improve project performance and reduce schedule overruns.

VII. CONCLUSION

7.1 Overview of the Study

Construction delays are one of the most significant challenges facing the construction industry. Delays not only affect project completion time but also contribute to cost overruns, productivity losses, and reduced stakeholder satisfaction. Time overrun, contractor performance, material shortage, and client-related factors are some of the major factors affecting delays in building construction projects.

A comprehensive review of published literature examined the causes of construction delays in different countries. The findings from previous studies were used to build a theoretical foundation. A framework was developed to investigate the influence of the selected factors. The importance of identified delay factors was evaluated using a quantitative research approach. The results determined the relative importance of different causes of delay and their impact on project performance.

7.2 Major Findings

Construction delays involve a combination of managerial, financial, technical, and organizational factors. Project delays are often caused by poor planning and scheduling. Poor planning results in unrealistic schedules, inefficient resource allocation, and difficulties in project coordination. Contractor performance was found to be a major component in project success. Poor site management, inadequate supervision, financial difficulties, and ineffective coordination were found to contribute to project delays. The central role of contractor performance in achieving timely project completion has been highlighted in previous studies.

Material-related issues were another important source of delays. Material shortages, procurement delays, and supply chain inefficiencies disrupt construction activities. The study showed that effective material management is essential for project progress. Client-related factors were similarly found to influence project performance. Delayed progress payments, slow decision-making, frequent design changes, and delayed approvals created challenges for project execution. Effective communication and active client participation are emphasized in the findings.

7.3 Achievement of Research Objectives

The purpose of the study was to identify and rank the causes of delays. A systematic analysis of selected delay factors was used to achieve this objective. The study examined the influence of time overrun, contractor performance, material shortage, and client-related factors on project delays. These factors significantly influence project performance. The ranking of delay factors provided insights into the causes and highlighted critical areas for improvement.

The study also aimed to provide recommendations for reducing construction delays. Practical recommendations relating to planning, contractor management, material procurement, client participation, and risk management were proposed. These recommendations are intended to improve project performance and reduce schedule overruns.

7.4 Practical Implications

The findings of this study have implications for construction professionals, project managers, contractors, consultants, and clients. Stakeholders can identify potential risks during the early stages of project development.

Project managers can use the findings to improve their management practices. Contractors can improve subcontractor coordination. Clients can improve project outcomes by ensuring timely decision-making, efficient approval processes, and prompt release of progress payments. The study provides a structured analysis of delay factors affecting building projects and contributes to the growing body of knowledge in construction management. Future researchers may use the findings to investigate project performance in greater detail.

7.5 Limitations of the Study

The study provides valuable insights into construction project delays; however, some limitations should be acknowledged. The research focuses primarily on building construction projects and may not fully represent conditions encountered in infrastructure, industrial, or specialized engineering projects. The study does not examine all possible variables influencing delays. Future research may include factors such as labour productivity, consultant performance, regulatory approvals, and environmental conditions.

7.6 Scope for Future Research

Future studies could examine delay factors in specific project sectors. Such studies may provide valuable insights into the influence of local conditions on project performance. Modern technologies such as Building Information Modelling (BIM), Artificial Intelligence (AI), Machine Learning (ML), and advanced project management systems may be further investigated by researchers. These studies could contribute to the development of more effective delay mitigation strategies.

7.7 Final Conclusion

Construction delays significantly affect the completion of building projects. The most significant contributors to project delays are time overruns, contractor performance deficiencies, material shortages, and client-related factors. Poor planning and scheduling, delayed payments, poor site management, and frequent design changes are among the critical factors.

The study concludes that construction delays result from the combined influence of multiple stakeholders and project conditions. Effective coordination among clients, contractors, consultants, and suppliers is essential for successful delay mitigation. Stakeholders can significantly reduce delays and improve project performance by implementing effective planning and management practices. The findings and recommendations presented in this study provide a framework for enhancing project performance and achieving timely completion of building construction projects.

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