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An extensive examination of the barriers faced by contractors leading to project delays

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Abstract

Delays in the construction industry have continued over time, and its dynamics evolve with each generation, leading to significant differences in the sector. These delays stem from many factors disaggregated across various stakeholders, including contractors, owners, consultants and the workforce. However, this particular study focuses on the challenges and barriers faced by contractors specifically, which contribute significantly to project delays and, in some cases, even lead to project disruption. To comprehensively address this problem, a rigorous scientific research paper has been established. This paper aims to identify the key factors that contribute to project delays. It involved an extensive review of existing research, accumulating a wealth of data regarding the root causes of delay, and creating a comprehensive table highlighting 17 underlying factors commonly cited in previous studies. The factors affecting the construction industry were described and discussed. As this problem continued and worsened over time, this research effort was ultimately concluded by recommended to conduct another research study for more in-depth investigation and an attempt to confirm the provenance of those factors that constitute a major obstacle to contractors and project delays and to try to reach solutions. Radically to prevent these obstacles in the future to ensure the presence of those factors that were extracted and discussed through the research studies presented. The overarching goal was to reveal the underlying foundations of this major challenge facing the construction industry, enabling more effective mitigation and resolution strategies.

Keywords: Construction industry delays; Contractor challenges; Factor investigation; Comparative analysis

1. Introduction

Construction projects are complex undertakings with long timetables, conducted in difficult conditions, utilizing advanced techniques, and including substantial financial risks. The inherent complexities lead to various hazards, such as delays and cost overruns, as emphasized by [1]. Construction project delays are usually measured by the time that goes beyond the originally set completion date, which is a crucial factor in assessing project efficiency. Timely project execution is crucial and serves as a benchmark of effectiveness for all stakeholders. The building process is prone to several unexpected occurrences from different sources, as highlighted by Fashina et al. [2].

This research aims to fill the current gap in the literature by examining the complexities of delay analysis in infrastructure and construction projects. The main goal is to identify the many variables causing delays and understand how they impact the project's length, costs, and quality requirements. Essential to this initiative is the involvement of engineers from contractor companies, who possess substantial influence and competence in building projects [3].

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This research aims to uncover the root reasons of delays in building projects through a thorough delay analysis, and aims to identify and analyze the various complex elements that cause delays, including logistical obstacles and regulatory impediments. Evaluate stakeholders' effect on project deadlines, costs, and quality indicators to decrease delays and enhance project performance [4].

This study effort to draw attention to the widespread problem of delays in building projects. The research aims to enhance the existing knowledge in the construction area by working with industry experts and carefully examining real-life case studies, with the goal of improving project delivery efficiency and effectiveness. Empower stakeholders by tackling the challenges of construction projects and offering practical solutions to ensure successful project outcomes [5].

2. Overview of construction project delays

The issue of delay holds significant gravity within the construction sector, resulting in substantial costs for both project owners and contractors involved. Owners bear financial losses through missed revenue opportunities and increased administrative and supervisory expenses. Similarly, contractors face heightened overhead costs and tied-up capital, potentially impacting their ability to secure new projects. Public projects exacerbate these problems, affecting the community with postponed facility utilization and prolonged inconveniences like traffic disruptions [6].

Given the far-reaching implications, addressing delay is of paramount importance to the construction industry. A thorough examination of this concern becomes imperative to adeptly manage delays and alleviate their negative outcomes. Evaluating the frequency, potential extent, and culpability of delays can furnish valuable insights for proactive planning, facilitating control over these variables and ultimately enhancing project performance [4].

2.1 Factors contributing to project delays

Systematic management of delays is essential to identify and mitigate the factors contributing to delays. The management process entails recognizing and documenting the sources of delays as soon as they manifest in construction projects. Delays emanate from a myriad of sources, encompassing innovation, management, physical, social, and financial elements [7].

Numerous research endeavors have pinpointed diverse factors responsible for project delays. Table 1 succinctly presents the challenges encountered by contractors, which impede project progress. These obstacles encompass logistical, resource-related, administrative, and unforeseen issues.

Table 1 Contractors' Challenges Leading to Project Delays

No.	Factors	References
1	Administrative difficulties	[3] [4] [8] [9] [10] [11]
2	Alternative suppliers	[3] [10] [12] [13] [14] [15]
3	Contract design precision	[3] [4] [10]

		[12] [14] [15]
4	Contractor procrastination	[4] [16] [17] [18]
5	Cost estimation errors	[3] [19] [20]
6	Geological site conditions	[10] [13] [14] [20] [21]
7	Government procedures	[3] [8] [12] [14] [15] [22]
8	Insufficient experience	[3] [4] [10] [12] [21]
9	Issues with financial resource	[6] [10] [13] [21]
10	Labour availability	[11] [13] [15] [21]
11	Project progress monitoring	[3] [4] [14] [15] [20] [21]
12	Project requirements changes	[4] [10] [13] [15] [17]

		[23]
13	Project schedule accuracy	[4] [9] [13] [17] [24]
14	Quality and detail neglect	[3] [8] [10] [17] [22] [25]
15	Specialized project experience	[4] [9] [14] [25]
16	Strategic planning weakness	[3] [21] [24]
17	Unexpected circumstances	[10] [11] [13] [21]

3. Previous studies on contractors' challenges and project delays

Numerous articles and research endeavors exploring the origins of delays in construction projects, both at local and global scales, have been thoroughly examined. A study undertaken by Assaf et al. delineated 56 primary delay triggers in large-scale construction endeavors [13]. These triggers were classified into nine main categories, each holding varying degrees of significance to different stakeholders.

In a Hong Kong context, A survey conducted by Chan & Kumaraswamy, to rank the significance of 83 potential delay factors [26]. Their findings highlighted five principal triggers: deficient risk management and supervision, unforeseen site conditions, sluggish decision-making, client-initiated modifications, and work variances.

Through analyzed 31 high-rise projects in Indonesia by Kaming et al. determining that cost overruns outweighed time overruns in frequency and impact [27]. Key cost overrun factors included material cost escalation due to inflation, inaccurate material estimates, and project complexity. Meanwhile, time overrun factors centered on design alterations, subpar labor productivity, inadequate planning, and resource scarcities.

Examining the Hong Kong construction landscape through Kumaraswamy & Chan, unearthed divergent perceptions of delay causes among different industry segments in building and civil engineering [28]. These differences could potentially stem from biases and might lead to blame-shifting between industry factions.

Scrutinized 130 public projects in Jordan pinpointing causes including design-related issues, user changes, weather, site conditions, late deliveries, economic factors, and quantity fluctuations [29]. The study recommended focused attention on these factors to reduce contract disputes and improve industry performance.

After conducted a study in a rapidly growing Thai economy, pinpointing 26 distinct reasons for construction delays [30]. These factors were categorized into six distinct groups. The researchers employed a combination of site visits and

mailed surveys to gather data, targeting 17 contractors, 18 consultants, design firms, and one project owner. Approval was obtained from 8 contractors and 6 consultants, leading to the selection of 12 projects for in-depth examination. On-site interviews were carried out using both structured and unstructured interview schedules. This involved engaging with a total of 30 individuals, averaging 2.5 persons per project. The study's findings were compared with research findings from other developing economies, revealing a common pattern in construction industry challenges. The results highlighted three interconnected layers of issues prevalent in developing economies: (a) shortages or insufficiencies in industry infrastructure, particularly resource supply; (b) challenges stemming from clients and consultants; and (c) problems arising from contractor incompetence or inadequacies.

In their research Odeh & Battaineh, investigated 28 causes of delays in construction projects using traditional contract types in Jordan [31]. Their methodology involved two key steps. First, they developed a survey questionnaire to gauge how contractors and consultants perceived the relative significance of these delay causes. Subsequently, this questionnaire was distributed to a random sample of contractors and consultants engaged in large projects across Jordan. To analyze the data, the researchers employed the Spearman's rank correlation coefficient to assess the relationship between the rankings provided by contractors and consultants. The study's outcomes unveiled significant findings. According to contractors, key delay factors included owner interference, inadequate contractor experience, challenges related to financing and payments, labor productivity issues, slow decision-making processes, improper planning, and problems with subcontractors. Among these factors, labor productivity emerged as the most crucial contributor to delays, as indicated by contractors. Conversely, consultants identified inadequate contractor experience as the leading cause of project delays.

3.1 Research objectives

3.1.1 Identify and analyze key factors

The primary objective of this research is to identify and analyze the key factors contributing to project delays and stumbling for contractors. By conducting an in-depth investigation through analyzing existing literature and case studies, we aim to uncover the common challenges faced by contractors during project execution. This aids in uncovering the fundamental reasons for project delays and setbacks [8].

3.1.2 Depth investigation and comparison of key factors

The second objective is to examine and contrast the hindrances and difficulties encountered by contractors, which frequently result in timetable disruptions, project delays, and hinder overall project success. Through data gathering and analysis, we will conduct an in-depth exploration of these causes and also draw comparisons among them. The discoveries, comparisons, and debates offer a thorough examination that aids in comprehending these elements [26].

4. Research methodology

The flowchart in Figure 1 will strictly follow a research strategy known for its effectiveness in thoroughly analyzing real-world occurrences within their specific contexts. Pertinent information will be carefully collected from the database to start the data gathering phase, guaranteeing a thorough grasp of the issue. An in-depth analysis of the collected data will be conducted to reveal trends and identify the main reasons of project delays. A detailed factor comparison study will be conducted after the first research to identify the main issues present in the project framework. This analysis will illuminate how different factors interact and their individual impacts on the highlighted difficulties. An in-depth evaluation of how these problems affect project schedules and results will be carried out to gain a comprehensive grasp of their consequences.

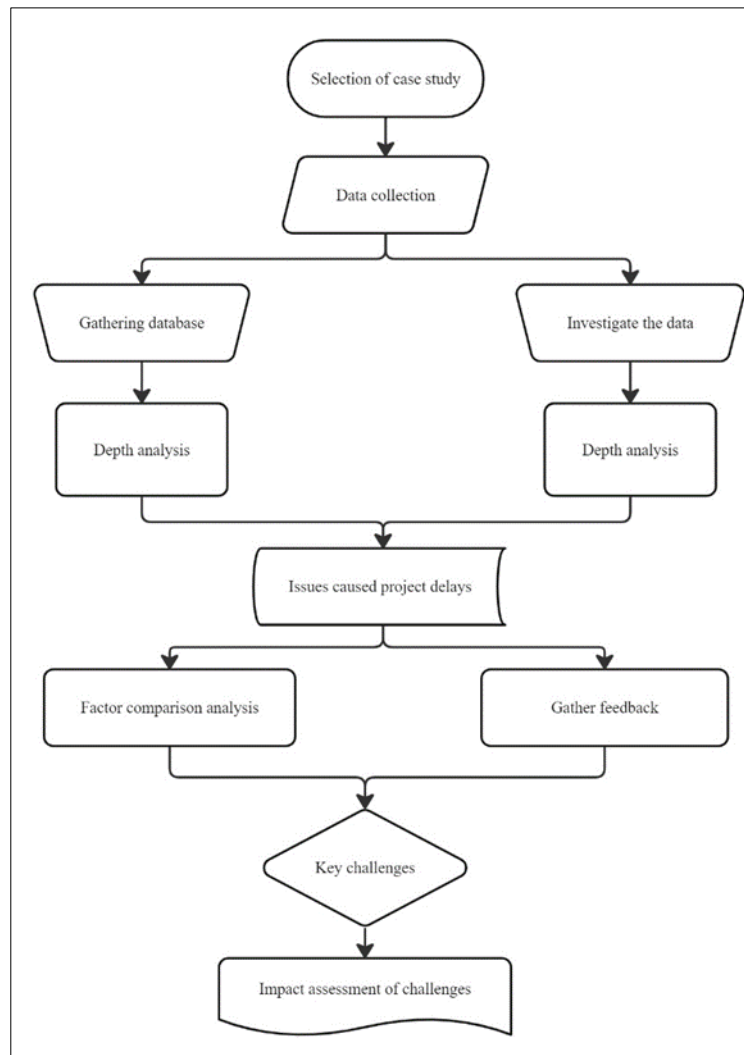


Figure 1 Flowchart for developing and selecting data

4.1 Factor investigation to identify key challenges

An in-depth investigation of these elements is crucial to properly understand their significant impact on contractors' ability to deliver projects on schedule. This thorough examination explores the details and impacts of each element, offering useful insights into the numerous obstacles and complexity that contractors face during project implementation. By carefully examining these difficulties, we can gain a detailed knowledge that allows us to create creative and efficient solutions to reduce delays and improve project delivery efficiency in future projects. This thorough investigation provides us with insights into present challenges and establishes the groundwork for innovative developments in project management methods in the construction sector. This comprehensive method of investigation enables stakeholders to actively tackle difficulties, promote increased resilience, and promote ongoing enhancement, thereby raising the standards of project delivery excellence [10].

4.1.1 Administrative Difficulties

Administrative challenges provide a major obstacle in the execution of construction projects, involving various bureaucratic obstacles, regulatory intricacies, and administrative inefficiencies that contractors need to overcome. Challenges may occur at several points in the project's lifetime, such as acquiring permits, adhering to zoning restrictions, construction codes, and environmental requirements. Administrative procedure delays or complexities can hinder project advancement, escalate expenses, and result in project interruptions. Contractors can encounter significant administrative challenges due to the lengthy process of acquiring essential permissions and approvals from governmental entities [4]. Complex bureaucratic procedures, legal frameworks, and varying interpretations of legislation can cause delays in starting and carrying out projects. Additionally, alterations in governmental rules or laws

while a project is ongoing may need modifications to project plans, designs, or permissions, leading to increased complexity in administrative procedures and extending project schedules.

Administrative issues may arise in project documentation, contract administration, and adherence to legal and contractual obligations. Accurate and full paperwork, current record-keeping, and compliance with contractual commitments are crucial for project success [11]. Inadequate document management systems, misunderstanding, or contradictions in contract terms can cause disputes, claims, and legal problems, worsening administrative burdens.

To overcome administrative challenges, it is essential to actively involve regulatory authorities, stakeholders, and project partners in order to simplify administrative procedures and promote teamwork and coordination. Contractors need to develop effective communication channels with government authorities, be informed about regulatory mandates, and foresee any obstacles in the permission procedure. Utilizing digital technologies like online permit application systems, Building Information Modeling (BIM), or project management software may optimize administrative procedures, simplify document management, and improve communication and cooperation among project stakeholders. Creating a culture of openness, accountability, and compliance in the business may reduce administrative risks and assure compliance with legal and contractual obligations [8]. Contractors may improve project delivery efficiency by focusing on effective administrative operations, investing in personnel training and development, and utilizing technological solutions to address and prevent delays and complexities.

4.1.2 *Alternative Suppliers*

The presence of other suppliers is crucial in construction project delivery, affecting procurement methods, supply chain management, and project results. Alternative suppliers are other sources of supplies, equipment, or services that contractors might use to meet project needs and reduce supply chain risks. Securing access to dependable and varied supplier networks is crucial for sustaining project flow, controlling expenses, and reducing interruptions [10]. Contractors often struggle with the task of identifying, evaluating, and qualifying alternative suppliers to ensure they align with project specifications, quality standards, and delivery needs. Performing due investigation, evaluating supplier skills, and negotiating advantageous terms are crucial stages in choosing alternative suppliers. Building strong supplier relationships founded on trust, communication, and collaboration is essential for guaranteeing punctual and dependable delivery of supplies and services.

Moreover, alternative suppliers can assist contractors in reducing risks related to supply chain interruptions, market changes, or geopolitical instabilities. Contractors can strengthen resilience to external shocks by diversifying supplier networks and sourcing sites geographically, reducing dependence on single-source providers. Furthermore, developing strategic alliances with suppliers, enacting backup plans, and storing surplus supplies of essential goods can reduce the effects of supply chain interruptions on project timelines and finances [14].

To overcome difficulties related to alternative suppliers, it is essential to implement proactive supply chain management strategies, risk mitigation measures, and foster collaboration with suppliers and project partners [15]. Contractors need to create strong procurement rules and processes, set specific criteria for selecting and evaluating suppliers, and consistently monitor and communicate with suppliers to guarantee adherence to contractual commitments and performance standards. Utilizing digital technologies like supply chain management software, e-procurement platforms, and real-time tracking systems may optimize procurement procedures, provide insight into supplier performance, and strengthen decision-making and risk management skills. Contractors can reduce risks related to alternative suppliers and improve project outcomes by focusing on key supplier relationships, diversifying supplier networks, and utilizing technological solutions.

4.1.3 *Contract Design Precision*

Design accuracy in contracts is crucial for construction project delivery, impacting project results, stakeholder connections, and risk mitigation. Contract design involves creating and recording the terms, conditions, rights, and responsibilities outlined in a contract that regulate the interactions of project stakeholders such as owners, contractors, subcontractors, and suppliers. Contract design precision is crucial for defining project scope, assigning roles, setting expectations, and resolving disputes [12]. Contractors often struggle with assuring the clarity, completeness, and enforceability of contract terms and conditions while designing contracts. Ambiguities, inconsistencies, or omissions in contract wording can cause misunderstandings, disputes, and conflicts among project stakeholders, putting project progress and outcomes at risk. Insufficient risk distribution, vague deliverables, or impractical performance goals can heighten project risks and liabilities for contractors.

Contract design accuracy is essential for effectively handling modifications, variations, and unexpected occurrences that may arise during project implementation [14]. Established change management procedures, conflict resolution methods, and contract administration protocols are crucial for handling variations from the initial contract scope, specifications, or timeframes. Furthermore, including clauses for force majeure events, delays, or pricing modifications helps safeguard contractors from unexpected situations and reduce project risks.

To overcome issues related to contract design accuracy, it is essential to implement proactive contract management strategies, foster communication among project stakeholders, and adhere to industry best practices and standards. Contractors should use skilled legal counsel or contract administrators to create, assess, and discuss contract terms and conditions. Moreover, participating in open and transparent communication with project partners, clients, and subcontractors is crucial for establishing mutual understanding and alignment of contractual expectations. Furthermore, utilizing digital technologies such as contract management software, electronic signature platforms, and document management systems may assist speed contract administration operations, increase document control, and boost visibility into contract performance and compliance. Contractors may reduce risks, settle disputes, and improve project outcomes by focusing on precise contract design, efficient contract administration, and building cooperative relationships with project stakeholders [4].

4.1.4 Contractor Procrastination

Contractor procrastination is when contractors postpone important jobs and duties, causing inefficiencies, setbacks, and project delays. This phenomena may arise from a variety of circumstances such as poor time management, lack of enthusiasm, inadequate planning, or underestimating of project difficulties. Contractor procrastination presents major obstacles to construction project completion by disrupting productivity, hindering progress, and jeopardizing project timetables and quality. The main issue with contractor procrastination is its effect on project timing and sequencing. Delays in completing important tasks or milestones can have a domino effect, leading to future activities being delayed and upsetting the project timetable [17]. Procrastination can result in hurried or inferior work, which might jeopardize the quality and safety requirements of a project. Procrastination can damage relationships with customers, subcontractors, and project stakeholders, leading to a loss of trust and confidence in the contractor's capability to complete tasks.

To tackle contractor procrastination, one must take proactive steps to pinpoint root reasons and use ways to reduce its impact. Contractors need to focus on efficient project management, set precise project goals, and create practical timetables and timeframes. Encouraging accountability, professionalism, and proactive communication within the project team may reduce procrastination and enhance a feeling of ownership and responsibility [18]. Moreover, introducing performance incentives, penalties for delays, and accountability procedures can motivate contractors to follow project timetables and meet deliverables. Consistent monitoring, tracking progress, and reviewing milestones can help detect procrastination early, enabling prompt interventions and remedial measures. Furthermore, offering sufficient resources, support, and training to project staff can improve their abilities, confidence, and motivation, decreasing the chances of procrastination.

Contractor procrastination poses a substantial danger to construction project completion, diminishing productivity, efficiency, and project results [16]. Contractors may improve project delivery efficiency and success by using proactive management tactics, promoting responsibility, and addressing the root reasons of procrastination.

4.1.5 Cost Estimation Errors

Cost estimation mistakes are flaws or disparities in projecting project costs, budgets, and financial resources needed for building projects. These mistakes may arise from issues such as insufficient data, faulty assumptions, imprecise scope specification, or unanticipated project complexity. Inaccuracies in cost estimation provide substantial hazards to construction projects, potentially resulting in exceeding budgets, financial insecurity, and project delivery delays [20]. The main issue with cost estimating inaccuracies is how they affect project budgeting and financial planning. Incorrect cost estimates can lead to underestimating project expenditures, causing financial deficits and financing limitations throughout project implementation. Furthermore, inaccuracies in cost prediction can diminish stakeholder trust, strain client connections, and put project feasibility and profitability at risk.

To correct cost estimating mistakes, a methodical strategy is needed to collect, evaluate, and confirm project data, assumptions, and variables. Contractors should utilize historical data, benchmarking studies, and industry standards to enhance cost estimate procedures and guarantee precision and dependability. Interacting with project stakeholders such as clients, designers, and suppliers may offer useful information about project needs, limitations, and anticipated outcomes, which can help improve cost projections. Utilizing risk management methods like sensitivity analysis, Monte

Carlo simulations, and contingency planning helps address uncertainties and reduce the effects of inaccuracies in cost prediction. Contractors can reduce the risk of cost overruns by recognizing possible risks and uncertainties early, developing mitigation methods, and allocating adequate reserves [19].

Cost estimation inaccuracies are a major difficulty in construction project delivery, affecting financial planning, project viability, and stakeholder relationships [3]. Contractors may reduce the risks of cost estimating errors and improve project delivery efficiency and success by employing thorough cost estimation techniques, utilizing data-driven methods, and incorporating risk management tactics.

4.1.6 *Geological Site Conditions*

Geological site conditions encompass the inherent features, structures, and engineering aspects of a project site, such as soil composition, rock formations, water table levels, and seismic hazards. These conditions are essential in construction project delivery, impacting foundation designs, material selection, building methods, and project expenses. Geological site characteristics can differ greatly between locations, presenting distinct difficulties and dangers to project planners and engineers [10]. The main problem of geological site circumstances is the ambiguity and fluctuation in subsurface conditions. Inadequate data and partial comprehension of underlying geology may result in unexpected difficulties and dangers during construction, such as soil instability, water infiltration, or geological threats. Changes in site conditions during project execution, including unanticipated soil or rock formations, may require adjustments to project plans, designs, or building processes, resulting in delays and extra expenses.

Comprehensive site investigations, geotechnical surveys, and risk assessments are necessary to evaluate subsurface conditions and identify possible hazards at geological sites. Contractors need to work along with geotechnical engineers, hydrologists, and other professionals to collect precise data, assess site conditions, and create suitable mitigation strategies. Furthermore, integrating contingency plans, allowances, and risk management measures into project budgets and schedules helps mitigate risks related to geological site conditions [13]. Implementing advanced construction methods like ground improvement, deep foundation systems, or soil stabilization technology can reduce hazards related to difficult site conditions and improve project resilience. Contractors can reduce the effect of site-related issues on project deadlines and costs by addressing geological conditions and incorporating risk management measures into project planning and execution.

Geological site conditions are a crucial factor in construction project delivery, impacting project planning, design, and execution [21]. Contractors can overcome geological site obstacles and improve project efficiency and success by performing comprehensive site investigations, consulting geotechnical specialists, and employing risk management measures.

4.1.7 *Government Procedures*

Government procedures include bureaucratic processes, laws, and legal requirements that contractors must follow to start and finish building projects. The procedures include acquiring permits, licenses, approvals, and adhering to zoning laws, construction rules, environmental restrictions, and safety requirements. Government procedural delays or inefficiencies can greatly hinder project advancement and affect delivery schedules. Contractors sometimes struggle with the time-consuming process of acquiring essential clearances and permits when dealing with government procedures [22]. Bureaucratic procedures and intricate regulatory systems can cause extended processing periods, leading to delays in starting projects. Furthermore, discrepancies or uncertainties in rules among several jurisdictions might complicate the procedure, necessitating contractors to maneuver through many levels of administrative obstacles.

Moreover, alterations in governmental rules or laws while a project is ongoing might disturb construction timelines and need adjustments to project blueprints and designs. Sudden changes to zoning laws or environmental restrictions may necessitate contractors to modify project plans or get extra licenses, leading to extended project timeframes and higher costs [4]. To overcome delays caused by government procedures, it is essential to actively communicate with regulatory bodies, possess a deep comprehension of relevant legislation, and participate in strategic planning. Contractors need to create effective communication channels with pertinent government entities, be informed about regulatory mandates, and foresee any obstacles in the permitting procedure. Using digital technology like online permit application systems or Building Information Modeling (BIM) can simplify administrative processes and speed up approvals.

Engaging with lawmakers, industry associations, and advocacy groups can help promote discussions and support for reforms to simplify regulatory frameworks and streamline administrative procedures [15]. Contractors can reduce

delays related to government procedures and improve project delivery efficiency by supporting regulatory reforms and forming relationships with government stakeholders.

4.1.8 *Insufficient Experience*

Inadequate experience among contractors and project teams can also lead to delays in project completion. Novice contractors may not possess the necessary knowledge, skills, and competence to efficiently design, carry out, and oversee construction projects, resulting in mistakes, delays, and inefficiencies [12]. Novice contractors may face difficulties in precisely predicting project schedules, financial plans, and resource needs, leading to delays and exceeding budget limits. Inexperienced project managers may have difficulty coordinating project operations, allocating resources, and resolving difficulties promptly, which might worsen delays.

Inadequate experience can result in poor decision-making, insufficient risk management, and inefficient communication with project stakeholders. Contractors may face difficulties in foreseeing and addressing unforeseen obstacles, resulting in interruptions and setbacks during project implementation if they lack a strong base of expertise and knowledge [4]. Contractors should promote professional development, training, and mentorship programs for their staff to tackle delays caused by lack of expertise. Continuing education and skill development may improve the talents and skills of project workers, allowing them to address difficult difficulties and manage project intricacies successfully.

Contractors may utilize the knowledge and skills of seasoned experts and consultants to enhance their teams and receive advice on project design, implementation, and supervision. Working with experienced industry professionals may provide essential knowledge, proven methods, and important lessons, assisting novice contractors in avoiding typical mistakes and enhancing project efficiency [21]. Implementing strong quality assurance and quality control procedures can reduce risks related to lack of expertise by guaranteeing compliance with industry standards, specifications, and best practices. Contractors can improve project delivery efficiency by focusing on professional growth, utilizing external knowledge, and employing strict quality assurance techniques to tackle delays caused by lack of experience.

4.1.9 *Issues with Financial Resources*

Financial resource challenges are a major aspect that can cause delays in project completion for contractors [13]. Sufficient financing is necessary to support project operations, acquire supplies and equipment, compensate labor costs, and manage administrative expenditures. Challenges including budget limits, financing shortages, cash flow concerns, and cost overruns might impede contractors from completing projects on time. Contractors often struggle to obtain adequate funds to start and maintain building projects, which is a key difficulty they have regarding financial resources. Securing funding from lenders, investors, or project sponsors may need thorough paperwork, financial forecasts, and collateral, thereby causing delays in starting the project. Fluctuations in interest rates, lending requirements, and market conditions can affect the availability and cost of finance, making funding procurement more challenging.

Cash flow problems may occur during project implementation, especially when client payments are delayed or costs surpass revenue. Inadequate cash flow can interrupt project operations, hinder procurement efforts, and obstruct progress on crucial tasks, resulting in project delivery delays. Cost overruns caused by unexpected costs, changes in scope, or inefficiency can put pressure on project budgets and exhaust financial reserves, making financing issues worse [10]. Contractors should use proactive financial management tactics and strong budgeting, forecasting, and cash flow processes to tackle delays caused by financial resource problems. This involves creating accurate project budgets, doing comprehensive financial analysis and risk evaluations, and setting up contingency funds to address unexpected costs. Contractors might also consider alternative financing alternatives including project finance, lines of credit, or venture capital to broaden funding sources and lessen dependence on conventional bank loans or client payments. Securing advantageous payment terms with customers, subcontractors, and suppliers helps enhance cash flow and ease financial pressure during project implementation.

Implementing strict cost control measures, closely monitoring project expenses, and utilizing digital technologies like construction management software can identify cost-saving opportunities, streamline financial processes, and improve transparency and accountability in financial management. Contractors can increase project delivery efficiency by employing proactive financial management techniques, diversifying financing sources, and enforcing strict cost control procedures to resolve delays related to financial resource constraints [6].

4.1.10 *Labour Availability*

Labor availability pertains to the presence of both skilled and unskilled personnel necessary for carrying out a construction project. Having a sufficient supply of skilled labor is crucial for keeping project timelines on track, maximizing efficiency, and achieving project goals. Labor availability can be affected by variables such as seasonal variations, demographic changes, labor market circumstances, and competition from other sectors. The main issue related to labor availability is its effect on project timing and resource planning. Shortages of trained labor or changes in workforce availability can cause disruptions in construction timelines, postpone project milestones, and result in inefficiencies in project execution [15]. Labor shortages can lead to greater labor expenses, since contractors may have to vie for limited talent, offer larger compensation, or give extra incentives to attract and keep workers.

To tackle labor availability issues, it is essential to engage in proactive workforce planning, implement effective recruitment techniques, and foster partnerships with labor unions, trade groups, and educational institutions. Contractors need to forecast labor needs, evaluate skill deficiencies, and create recruiting and training initiatives to draw in and keep skilled people [21]. Additionally, establishing collaborations with vocational schools, apprenticeship programs, and workforce development organizations can assist in nurturing a proficient talent pipeline and tackling enduring labor supply challenges.

Using technological solutions like construction management software, workforce management systems, and mobile applications may improve labor allocation, communication efficiency, and productivity at construction sites. Contractors can reduce the risks related to labor shortages and guarantee successful project completion by utilizing effective labor management strategies. Labor availability is a crucial aspect in construction project execution, impacting project schedules, expenses, and results [11]. Contractors may improve project delivery efficiency and success by using proactive workforce planning tactics, investing in training and development programs, and utilizing digital solutions to solve labor availability concerns.

4.1.11 *Project Progress Monitoring*

Project progress monitoring is the methodical process of recording, analyzing, and evaluating project performance in comparison to predetermined goals, timetables, and milestones. Efficient project progress monitoring is crucial for assuring project success, detecting deviations from the plan, and promptly adopting corrective steps to maintain project alignment. Monitoring project progress entails gathering and evaluating data on several facets of project performance, such as schedule adherence, budget compliance, quality assurance, and risk management [4]. The main difficulty in project progress monitoring is the intricate task of handling and analyzing project data from many sources. Construction projects entail several stakeholders, subcontractors, suppliers, and tasks, resulting in extensive data that has to be gathered, consolidated, and evaluated to correctly evaluate project performance. Furthermore, various data sources, different reporting formats, and data silos can make it difficult to monitor project progress and impede decision-making.

To overcome obstacles related to monitoring project progress, it is essential to have strong project management systems, tools, and procedures to aid in data collecting, analysis, and reporting. Contractors need to define specific project goals, performance measures, and Key Performance Indicators (KPIs) to evaluate advancement and monitor performance compared to set standards. Utilizing technological solutions like project management software, dashboards, and reporting tools may optimize data collecting, automate reporting procedures, and improve insight into project performance [3].

It is crucial to promote openness, accountability, and communication within the project team to effectively monitor project progress. Regular project meetings, progress reviews, and stakeholder engagement sessions may help promote open communication, detect problems at an early stage, and encourage teamwork in adopting necessary improvements. Regular risk assessments and scenario analysis may assist predict issues and provide backup plans to reduce risks and assure project success [20]. Project progress monitoring is crucial in construction project delivery since it allows stakeholders to evaluate performance, spot patterns, and make educated choices. Contractors may improve project progress monitoring and increase project delivery efficiency and success by using strong project management processes, utilizing digital solutions, and promoting openness and cooperation within their organization.

4.1.12 *Project Requirements Changes*

Project requirements adjustments are alterations made to the project scope, specifications, or deliverables during a construction project. Project needs may vary due to customer demands, design alterations, regulatory updates, unexpected circumstances, or input from stakeholders. Effectively managing project requirements changes is crucial for sustaining project scope, budget, and schedule adherence, while fulfilling stakeholder expectations and project

objectives [10]. The main difficulty with project requirements modifications is how they affect project scope, budget, and schedule management. Modifications in project requirements may bring about ambiguities, intricacies, and risks that have the potential to disturb project schedules, escalate expenses, and extend project durations. Ineffective change management practices, scope creep, or lack of stakeholder alignment can worsen the difficulties of managing project needs changes.

To handle issues related to changes in project requirements, it is essential to establish strong change management processes, procedures, and controls to efficiently handle modifications in scope and reduce their effects on project completion. Contractors need to create precise procedures for recording, assessing, and authorizing project modifications, such as change requests, change orders, and scope adjustments [23]. Furthermore, creating thorough change impact evaluations, estimating costs, and adjusting schedules helps quantify the impacts of project requirement changes and guide decision-making. It is crucial to promote proactive communication, cooperation, and stakeholder involvement to effectively manage changes in project needs. Contractors need to uphold clear communication channels with clients, designers, subcontractors, and other project stakeholders to guarantee agreement on project goals, expectations, and modifications. Creating change review boards, steering committees, or project governance structures can help in making decisions promptly, building agreement, and resolving conflicting agendas or interests.

Project demand changes provide a substantial problem in construction project delivery, affecting project scope, budget, and schedule management. Contractors may improve project delivery efficiency and success by developing strong change management systems, promoting proactive communication, and engaging stakeholders effectively to handle difficulties related to project needs changes [15].

4.1.13 Project Schedule Accuracy

Project schedule accuracy is the extent to which the anticipated project timetable matches the actual time needed to finish project activities and milestones. Accurate project timelines are crucial for efficient project planning, resource allocation, and risk management [9]. Errors in project timelines can result in delays, increased costs, and interruptions in project completion. To ensure project schedule accuracy, careful planning, realistic scheduling, and proactive schedule management are essential throughout the project lifetime. The main difficulty with achieving accurate project schedules is in properly predicting project durations and dependencies due to their complexity. Construction projects are complex due to the interdependence of operations, uncertainties, and external influences that might affect project timetables, making it difficult to create precise schedules. Insufficient comprehension of project scope, lack of data, or incorrect assumptions might result in overly optimistic or pessimistic predictions, which can compromise schedule accuracy.

To improve project schedule accuracy, it is essential to use best practices in project scheduling, utilize historical data, and employ sophisticated scheduling approaches. Contractors need to perform thorough project planning by dividing project operations into smaller parts, recognizing relationships, and calculating durations using actual productivity rates and resource availability [17]. Furthermore, adding buffers, contingencies, and slack to project schedules can assist in handling uncertainties and reducing the likelihood of timetable delays.

It is crucial to establish strong schedule management procedures, including consistent progress monitoring, milestone evaluations, and schedule revisions, to ensure timetable precision over the project's duration. Contractors are required to oversee project advancement, detect any deviations from the plan, and promptly take corrective measures to manage schedule discrepancies and ensure the project stays on course. Encouraging accountability, communication, and collaboration within the project team can help ensure agreement on project goals and priorities and improve proactive schedule management [24]. Project schedule accuracy is crucial for effective construction project delivery as it impacts project results, stakeholder satisfaction, and project profitability. Contractors may improve project schedule accuracy and boost project delivery efficiency and success by following strict project scheduling methods, utilizing historical data, and adopting proactive schedule management techniques.

4.1.14 Quality and Detail Neglect

Quality and detail neglect is the inability to prioritize and maintain high standards and attention to detail throughout the building project lifecycle. Maintaining high quality and meticulous attention to detail are crucial for successfully completing projects that satisfy stakeholder expectations, adhere to regulatory standards, and have long-lasting durability [25]. Ignoring quality and detail can result in faults, rework, safety risks, and customer unhappiness, which can jeopardize the success and reputation of a project. The main problem of neglecting quality and detail is the push to prioritize money and timetable above quality concerns. Contractors in competitive construction markets may encounter constraints such as limited project budgets, demanding timetables, and customer requests for cost reductions, which

can result in sacrifices in quality and attention to detail. Poor quality control procedures, limited resources, or lack of monitoring can lead to substandard workmanship and quality problems throughout project implementation.

To overcome issues related to neglecting quality and detail, it is essential to promote a culture inside the business that values quality, responsibility, and ongoing progress. Contractors need to set precise quality standards, specifications, and inspection methods to guarantee adherence to industry standards, rules, and laws [8]. Furthermore, by investing in training and development programs, adopting quality assurance methods, and performing frequent quality audits, a dedication to excellence and attention to detail may be strengthened. Emphasizing cooperation and communication among project stakeholders, such as clients, designers, subcontractors, and suppliers, is crucial for ensuring quality and attention to detail throughout the project's lifespan. Contractors should involve stakeholders at the beginning of the project planning stage to set common quality goals, expectations, and criteria. Building relationships with reliable suppliers, subcontractors, and industry professionals may guarantee access to top-notch supplies, resources, and knowledge to successfully complete high-quality projects.

Quality and detail neglect in construction projects can significantly effect project outcomes, customer satisfaction, and reputation [22]. Contractors may boost project delivery efficiency and success by emphasizing quality, adopting strong quality management systems, and promoting collaboration and communication among project stakeholders to solve difficulties related to quality and detail neglect.

4.1.15 Specialized Project Experience

Specialized project experience involves the specific knowledge, skills, and ability needed to effectively organize, carry out, and oversee intricate or specialized construction projects. Specialized projects may provide distinct obstacles, technological specifications, or industry-specific rules that require specialized expertise and experience to handle efficiently [9]. Contractors with specific project expertise are more prepared to handle project intricacies, reduce risks, and achieve successful results. The main problem of specialized project experience is the scarcity of skilled experts with the necessary skills and competence to manage such projects. Specific projects may need expertise in fields like healthcare facilities, industrial plants, infrastructure projects, or sustainable building procedures, which might be limited or highly sought for in the market. Additionally, entrance hurdles, qualification requirements, or regulatory limits might also restrict access to specialized project expertise.

To overcome difficulties related to specialized project experience, strategic workforce planning, talent development, and knowledge transfer activities must be implemented inside the business. Contractors should provide resources to training and development programs to improve the skills and knowledge of their employees in specific areas that align with their company goals [14]. Furthermore, forming alliances with industry groups, professional networks, and educational institutions can offer opportunities to gain specialized training, certifications, and resources for developing expertise in specific projects.

It is crucial to develop a culture that promotes continuous learning, creativity, and knowledge sharing to enhance specialized project experience in the business. Contractors should motivate staff to seek professional development, participate in cross-functional cooperation, and engage in industry forums and conferences to remain updated on current trends and best practices in specialized project delivery. Creating mentoring programs, information repositories, and communities of practice can help employees transfer knowledge and build skills. Specialized project experience is crucial for handling the distinct problems and demands of intricate building projects. Contractors may increase their organization's skills to effectively deliver specialized projects by investing in talent development, encouraging teamwork, and supporting a culture of continuous learning to create specialized project experience [25].

4.1.16 Strategic Planning Weakness

Strategic planning weakness pertains to shortcomings in the development, implementation, or oversight of strategic plans for building projects. Strategic planning is crucial for establishing precise project objectives, outlining practical tactics, and distributing resources to accomplish project goals. Weaknesses in strategic planning can result in misalignment of project objectives, insufficient resource allocation, and inability to foresee and manage developing difficulties, putting project success at risk. A key difficulty of strategic planning deficiency is the absence of congruence between project objectives and corporate goals. Construction projects need to be in line with the organization's overarching strategic goals and priorities to maintain consistency and coherence in decision-making and resource distribution [3]. Strategic planning shortcomings, such as ambiguous or impractical project goals, lack of stakeholder involvement, or insufficient risk evaluation, can lead to a disconnect between project goals and corporate strategy.

To overcome issues related to strategic planning weaknesses, a methodical approach is needed to recognize, examine, and rectify shortcomings in strategic planning procedures and methods. Contractors need to thoroughly assess their strategic planning frameworks, techniques, and governance structures to pinpoint areas that may be improved and strengthened [21]. It is crucial to cultivate a culture of strategic thinking, creativity, and responsibility in the business to enhance successful strategic planning.

Utilizing external expertise, such as management consultants, industry experts, or strategic advisers, may offer useful insights and views to guide strategy planning. Contractors can get valuable insights from other viewpoints to question assumptions, uncover overlooked areas, and consider different strategy choices to improve project results. Investing in training and development programs to enhance strategic planning capabilities among project teams and organizational leaders can improve strategic planning procedures and practices. Strategic planning weaknesses provide a substantial risk to construction project delivery by affecting project alignment, resource allocation, and decision-making [24]. Contractors may improve their strategic planning skills and boost project delivery efficiency and success by rectifying weaknesses in strategic planning procedures, promoting a culture of strategic thinking, and utilizing external knowledge.

4.1.17 *Unexpected Circumstances*

Unexpected circumstances are unplanned occurrences, changes, or interruptions that occur during construction projects, affecting project timetables, costs, and outcomes. Even with careful planning and risk management, building projects can be affected by several unforeseen conditions such as weather delays, material shortages, regulatory changes, labor strikes, or force majeure occurrences [11]. Managing unforeseen events well is critical for preserving project resilience, responding to changing conditions, and minimizing the impact on project execution. One of the key issues connected with unforeseen situations is the ambiguity and unpredictability of their occurrence and influence on building projects. Contractors face a constantly changing and unpredictable operational environment influenced by external factors that are difficult to predict and prepare for in advance. Moreover, unanticipated occurrences can interrupt project timelines, raise expenses, and strain relationships with customers, subcontractors, and other project stakeholders.

To overcome obstacles related to unforeseen situations, it is essential to implement a proactive and flexible strategy in risk management, contingency planning, and crisis response. Contractors need to do comprehensive risk assessments, scenario planning, and sensitivity analysis to pinpoint possible sources of risk and vulnerability in building projects. Furthermore, creating strong risk mitigation methods, backup plans, and emergency response protocols may aid in preparing for and dealing with unforeseen situations efficiently. Furthermore, creating agility, adaptability, and resilience within the company is critical for handling unforeseen events and sustaining project delivery continuity. Contractors should enable project teams to promptly make choices, adjust to changing situations, and execute different methods to reduce the effects of unforeseen occurrences on project results [21]. Building cooperative connections with project stakeholders, suppliers, and subcontractors can offer access to extra resources, knowledge, and assistance to deal with unforeseen issues.

Unexpected situations provide a major difficulty in construction project delivery, necessitating contractors to foresee, plan for, and address various potential interruptions. Contractors may improve their capacity to handle unforeseen situations and guarantee project success by using proactive risk management strategies, promoting organizational resilience, and establishing collaborative relationships [10].

5. Conclusion

The thorough investigation focused on carefully examining and thoroughly exploring various reasons that cause delays and setbacks in project execution, especially related to contractors. This study involved a comprehensive examination of previous research studies to extract significant insights and data on the root causes of project delays. A detailed table was created using a methodical approach to list and classify 17 key criteria that are obstacles for contractors in following project schedules accurately and efficiently. After creating the detailed table, thorough debates and considerations took place, utilizing a wide range of study samples. The discussions were crucial for creating a detailed diagram that outlined the study framework with great care. The graphic clarified the methods used for data collecting and explained the strategies used for analysis, giving a comprehensive understanding of the study process.

A complete and exact description was carefully created based on this basis, including the 17 key causes identified as causing delays in project completion. This explanation emphasized the importance of these issues and set the foundation for future efforts to confirm their influence on contractors and project delays. It was suggested to conduct

more research studies with more in-depth investigations to confirm these characteristics as significant obstacles to project completion. The main goal of future research would be to provide innovative methods to successfully reduce these impediments in order to improve project efficiency and timeliness.

The research was a comprehensive and detailed investigation aimed at understanding the complex causes causing delays in project completion. This project seeks to stimulate future research in order to tackle difficulties and drive the construction sector towards increased efficiency and success by offering a strong base of insights and suggestions.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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