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An assessment of construction delay management: A Nepalese perspective

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Abstract: Delays are a significant issue in the global construction industry, and Nepal is no exception. Both private and government construction projects in Nepal face delays, leading to cost overruns, disputes, and compromised project outcomes. This research explores the causes, impacts, and mitigation strategies of delays in private residential construction projects in Pokhara Valley. This research utilizes a mixed-methods approach, combining primary data through questionnaires distributed to contractors, consultants, and project stakeholders in Pokhara Valley, and secondary data from the Pokhara Metropolitan City. The study categorizes delay factors into Production, Internal, and External environments, analyzed using the Relative Importance Index (RII). The major findings include socio-economic, regulatory, environmental, and technical issues such as poor planning, labor shortages, bureaucratic hurdles, weather challenges, and supply chain disruptions, leading to multifaceted project delays. Delays in private residential construction projects in Pokhara Valley significantly impact developers, contractors, homeowners, and the community, causing increased costs, missed deadlines, reduced investor confidence, and hindering regional development. To address these issues, this research proposes tailored mitigation strategies, including proactive project planning, strengthened stakeholder collaboration, improved regulatory frameworks, investment in workforce skills, and the adoption of innovative construction technologies. These solutions aim to enhance efficiency, minimize delays, and promote sustainable growth in Pokhara Valley's construction sector. This research offers practical insights to improve construction project management by minimizing delays, reducing costs, and enhancing efficiency. It aids stakeholders in fostering collaboration, compliance, and innovation, supporting sustainable growth in Pokhara Valley and similar contexts in developing countries.
Keywords: *Construction delays, Mitigation strategies, Sustainable growth.*

1. Introduction

The construction industry is a vital economic sector with a rich history and significant size. It plays a crucial role in boosting the nation's economy by generating employment, and income, driving demand for materials, and contributing to infrastructure development and growth [1]. This stimulates other sectors, fostering overall economic development and infrastructure expansion [2]. Despite its importance for overall national development, project delays remain a major challenge and overall project success [3].

Construction delays are primarily caused by inadequate project management, a shortage of skilled personnel, and material procurement challenges, all of which significantly impact project timelines, efficiency, and overall success [4]. Delays in construction projects are a critical problem in Nepal, significantly affecting the country's economic growth and development. A large proportion of projects fail to meet their contract deadlines, impeding progress in infrastructure and public services [5]. These delays are primarily driven by security concerns, which disrupt construction schedules and hinder the smooth execution of projects. As a result, the nation's development process faces setbacks, limiting opportunities for job creation, economic advancement, and overall improvement in living standards [6].

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Effective measures to mitigate delays in construction projects include respecting payment schedules, honoring payment certificates promptly, ensuring clear contract provisions, managing the supply chain successfully, training site workers, implementing project management best practices, and educating clients on the impact of change orders [7]. Similarly, the success of a project hinges on efficient programming, scheduling, and resource control, prioritizing time, cost, and utility. Alongside cost and quality, the project schedule is a critical factor in construction management [7].

Delays are a major issue in the global construction industry, and Nepal is no exception, affecting both private and governmental projects. These delays arise from contractor, client, and consultant-related factors, as well as external influences. Identifying the causes of delays in private residential construction is crucial to maximizing project scope. In Nepal, building projects often face delays and cost overruns, impacting economic efficiency. Delays lead to compounded cost overruns, limiting reinvestment opportunities and causing financial losses for stakeholders. This study aims to identify key delay factors from the perspectives of clients, consultants, and contractors and to propose effective solutions.

2. Literature Review

Construction projects are unique, one-time endeavors that take place on specific sites with circumstances that won't be repeated. They are complex, requiring coordination of people, materials, and resources, often starting with unknowns like incomplete designs, uncertain site conditions, or unreliable suppliers. The success of construction projects largely depends on meeting the objectives outlined in the project specifications, ensuring that quality, cost, and schedule requirements are satisfied to achieve desired outcomes [8]. Challenges such as insufficient worker experience, material supply issues, last-minute changes, and fluctuating labor costs delay the project, often resulting in claims for cost compensation and time extensions [9].

Viles, et al. [9] identified key delay causes in building projects, including design changes, poor management, errors, financial issues, conflicts, and inexperience. Similarly, Mohammed and Bello [10] highlighted delays in projects due to inaccurate estimates, equipment shortages, extended timelines, weak legal frameworks, and ineffective approval enforcement. Effective risk management connects risk information to the baseline schedule, improving project success and minimizing delays [11]. Managing delay significantly impacts construction project performance by ensuring timely delivery and avoiding cost overruns. Pre-planning is essential to address potential issues before work begins.

Delays in progress payments, lack of employee training, poor waste management strategies, unrealistic contract durations, rework due to construction errors, excessive subcontracting, permit delays, ineffective planning and scheduling, poor collective planning, and an unskilled workforce all contribute to construction project delays [12]. Delayed construction projects often lead to increased costs, decreased quality, and compromised safety. These delays can also result in cash flow issues, mistrust among stakeholders, and the potential for arbitration and adversarial relationships, further complicating project completion and outcomes [13]. Unrealistic contract durations, incomplete designs at tender, excessive scope changes and change orders, inadequate planning and scheduling, and poor project control are major factors contributing to delays and inefficiencies in construction projects [13]. Difficulties in financing, manpower shortages, poor coordination, delays in design documents, late progress payments, improper planning, poor communication, low labor productivity, an unqualified workforce, and ineffective contract management all contribute to construction project delays and inefficiencies [14].

Schedule delays are a common issue in construction projects worldwide. In Zimbabwe, the most significant factors causing construction project delays include delayed progress payments by the owner, financing difficulties, and frequent change orders [15]. Late payment remains a persistent issue in the UK construction industry, despite regulatory and contractual measures. Subcontractors often struggle to rely on these measures, prompting them to incorporate late payments into their cash flow planning to mitigate financial challenges [16]. In Morocco, the top causes include delayed progress payments, insufficient employee training, lack of waste management strategies, unrealistic contract durations, construction errors, excessive subcontracting, permit delays, poor planning and scheduling, lack of collective planning, and an unskilled workforce [12]. A study in Bangladesh identified poor project management, inadequate planning, and unskilled labor as top delay causes. Key issues include insufficient project manager training, poor coordination during planning, and a shortage of skilled workers [17]

Construction delays occur globally across all project types, leading to significant impacts such as time and cost overruns, disputes, and reduced efficiency, ultimately affecting project success and stakeholder satisfaction [18]. Similarly, factors contributing to delays arise from issues like claim resolution difficulties, contractor financial struggles, delayed payments for extra work, late reimbursements, client-initiated variation orders, and design modifications, all disrupting project timelines and workflow efficiency [19]. Critical factors affecting delay include poor contract management, client fund shortages, late drawing submissions, land acquisition issues, and inadequate pre-construction surveying. For cost, factors include delayed client payments, skilled worker shortages, design changes, construction errors, and changes in top management [20]. Effective communication in construction is crucial as it fosters stakeholder cooperation, enhances collaboration, and ensures smooth project execution, minimizing misunderstandings and delays [21].

3. Methodology

The questionnaire was designed to evaluate the frequency and importance of identified delay causes in construction projects. It was developed based on the frameworks of Assaf and Al-Hejji [22] and Giri [23]. The questionnaire consisted of two sections: the first gathered demographic data, and the second assessed delay factors using a 5-point Likert scale, ranging from strong disagreement to strong agreement. The design emphasized clarity, simplicity, and ease of interpretation for respondents and researchers.

The study focused on private residential building construction projects in the Pokhara Valley of Nepal, spanning 33 wards under Pokhara Metropolitan City guidelines. Projects registered in the Electronic Building Permit System (e-BPS), an online system governed by Nepal's Building By-laws, were considered. In the fiscal year 2078/2079, a total of 4,478 projects were registered, marking a period when the pandemic significantly impacted the country's economy. These projects formed the study's total population. A purposive sampling technique was employed to target specific participants, ensuring relevant data for in-depth analysis. Purposive sampling offers advantages like justifying generalization from targeted samples, enabling in-depth analyses, flexibility, cost and time efficiency, and identifying extreme perspectives, reducing margins of error through direct data collection from relevant sources [24]. A sample of 365 questionnaires was distributed, yielding 361 responses from individuals involved in construction projects completed or nearing completion during this fiscal year. The study utilized the Relative Importance Index (RII) method to analyze the quantitative data collected. Respondents' ratings for each delay factor were recorded, evaluated, and ranked.

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

Where:

W – is the weight given to each case by the respondents

A – is the highest weight

N – is the total number of respondents

These indexes were subsequently ranked for clients, consultants, contractors, and external-related delay factors. Data were analyzed using SPSS.

4. Result and Discussion

4.1. Design (Consultant) Related Causes

Table 1 highlights consultant-related causes of construction delays, ranked by their Relative

Importance Index (RII). The top-ranked issue is the delay in inspection, testing, and performance by consultants (RII = 0.234), followed by late responses to contractor inquiries (RII = 0.233). Poor qualifications of engineers are ranked third (RII = 0.231), while non-availability of timely designs and drawings is fourth (RII = 0.220). Inadequate investigations during the design phase (RII = 0.221) and project design complexity (RII = 0.217) are ranked fifth and sixth, respectively.

Table 1.
Design (consultant) related causes of construction delay.

Criteria	Satisfaction Level						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	RII	Rank
Inadequate investigations by the designer during the design phase	3.93	4.49	17.7	35.96	37.92	0.221	5
Non-availability of drawing/design on time	7.02	2.81	11.8	41.85	36.52	0.22	4
Project design complexity	6.18	4.21	13.76	42.98	32.87	0.217	6
Poor qualification of engineers staff assigned to the project	3.93	4.21	6.74	41.57	43.54	0.231	3
Delay in inspection, performing, and testing by the consultant	4.21	3.65	6.18	38.2	47.75	0.234	1
Late response from the consultant to contractor inquiries	4.21	5.34	4.49	37.36	48.6	0.233	2

4.2. Client Related Causes

Table 2 outlines client-related causes of delays in project durations, ranked by their Relative Importance Index (RII). The most significant cause is the delay in settling contractor claims by the owner (RII = 0.233), followed by slowness in the owner's decision-making process and delays in progress payments by clients, both ranked second with an RII of 0.230. Disputes between neighbors and clients are ranked third (RII = 0.218). The satisfaction levels reveal that most respondents agree or strongly agree with these issues, indicating their impact on project timelines. Payment delays, indecisiveness, and claim settlements by owners are key contributors to construction delays, emphasizing the need for proactive client engagement to mitigate these problems.

Table 1.
Causes due to client-related issues in the Project duration.

Heading	Satisfaction Level						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	RII	Rank
Delay in Progress of payments by the clients	1.97	6.46	9.55	37.64	44.38	0.230	2
Disputes between neighbors and clients.	2.81	4.78	20.22	41.01	31.18	0.2177	3
Slowness in the decision-making process by the owner	2.81	6.18	9.83	35.67	45.51	0.230	2
Delay in settlement of contractor claims by owner.	1.97	5.9	10.39	33.15	48.6	0.2330	1

4.3. Contractor Related Causes

Table 3 presents contractor-related causes of construction delays, ranked by their Relative Importance Index (RII). The most critical cause is the lack of motivation for contractors to complete projects early (RII = 0.240), followed by the lack of proper equipment and technicians (RII = 0.238). Poor site supervision and management by contractors ranks third (RII = 0.234), highlighting its significant contribution to delays. Inadequate experience and poor communication with project stakeholders share the fourth rank (RII = 0.232). Improper construction techniques (RII = 0.226) and lack of technical/management professionals in contractors' organizations (RII = 0.227) are ranked fifth and sixth, respectively. Strikes by the contractor workforce (RII = 0.225) and failure to apply safety rules and regulations (RII = 0.217) are less critical but still contribute to delays. The satisfaction levels indicate that most respondents either agree or strongly agree with these issues, emphasizing the importance of addressing contractor inefficiencies. Enhancing motivation, improving site management, ensuring access to adequate equipment, and fostering better communication are crucial steps to mitigate these contractor-related delays and ensure smoother project execution.

Table 2.
Contractor-related causes for construction delay.

Heading	Satisfaction Level					RII	Rank
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
Poor site supervision and management by the contractor.	1.12	2.25	9.55	46.63	40.45	0.234	3
Improper construction techniques implemented by the contractor	0.84	3.65	14.61	47.75	33.15	0.226	6
Inadequate experience of the contractor.	1.4	3.37	11.52	42.42	41.29	0.232	4
Lack of motivation for contractors to early finish.	1.12	3.37	7.87	36.52	51.12	0.240	1
Poor communication with parties involved in the project (consultant, client, and vendors)	1.4	2.81	5.9	55.06	34.83	0.232	4
Failure to apply safety rules and regulations within the contractor's organization	3.37	5.06	17.7	44.66	29.21	0.217	8
lack of proper equipment and technicians	1.69	3.65	4.49	43.54	46.63	0.238	2
Lack of technical/management professionals in the contractor's organization	1.97	5.62	8	45.51	38.2	0.227	5
Lack of technical/management professionals in the contractor's organization	1.97	5.62	8	45.51	38.2	0.227	5
Strikes by the contractor workforce	3.65	4.78	11.52	41.29	38.76	0.225	7

4.4. External Factors Related Causes

Table 4 summarizes external factors contributing to construction delays, ranked by their Relative Importance Index (RII). The top causes include delays in the supply of raw materials, changes in specifications and materials during construction, and extreme weather conditions (RII = 0.245 each). Manpower shortages rank second (RII = 0.241), reflecting the significant impact of labor availability on project timelines. Improper functioning of equipment is ranked third (RII = 0.240), followed by delays in obtaining government permits (RII = 0.236). The pandemic ranks fifth (RII = 0.234), highlighting its disruptive effect on the construction sector. A lack of laws or regulations specific to the private construction sector is ranked sixth (RII = 0.228), while changes in material prices follow closely in seventh place (RII = 0.225). A short original contract duration (RII = 0.221) and inaccessibility of utilities on-site (RII = 0.193) are the least critical factors. Most respondents agree or strongly agree with these issues, indicating their widespread impact. Addressing material supply chains, labor availability, and regulatory frameworks, along with effective risk management strategies for extreme weather and pandemics, is essential to mitigate delays caused by external factors.

Table 3.
External factors related to causes of delay.

Variables	Satisfaction Level					RII	Rank
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
The original contract duration is too short	3.65	7.02	11.24	42.13	35.96	0.221	8
Change in Material Prices	1.97	5.62	14.89	39.33	38.2	0.225	7
Delays in the supply of raw materials	1.12	2.25	3.37	39.89	53.37	0.245	1
Changes in specifications and material types during construction	0.84	2.53	4.21	38.2	54.21	0.245	1
Improper functioning of the equipment while working.	1.12	3.37	8.15	36.24	51.12	0.240	3
No specific laws or regulations in the Private Construction sector.	4.49	4.78	9.55	36.52	44.66	0.228	6
Manpower Shortage (skilled and unskilled Labor)	1.12	2.81	3.09	45.79	47.19	0.241	2
Pandemic	0.84	1.97	12.92	42.7	41.57	0.234	5
Extreme weather conditions (too hot or too rainy)	0.56	2.53	4.78	38.76	53.37	0.245	1
Delay in getting permits from government office.	3.09	4.49	6.18	36.52	49.72	0.236	4
Inaccessibility of on-site utilities (telephone, water, electricity, etc.)	3.09	2.53	2.64	30.89	41.85	0.193	9

4.5. T-test

4.5.1. Analysis of Correlation Results in Construction Project Delays

The presented correlation data identifies various factors contributing to construction project delays, exploring the relationships between these factors. This analysis is vital for stakeholders to understand interdependencies and prioritize strategies to mitigate delays effectively.

4.5.2. Design and Planning-Related Issues

Several issues arise during the design phase. For instance, inadequate investigations during the design phase (Q1) show a strong correlation with the nonavailability of drawings or designs on time (Q2, r = 0.778). This suggests that poorly conducted investigations lead to subsequent delays in design availability. Moreover, project design complexity (Q4) demonstrates a moderate to strong relationship with factors like the original contract duration being too short (Q3, r = 0.701) and delays in progress payments by the client (Q5, r = 0.462). These correlations emphasize the effects of incomplete planning and design on project execution.

4.5.3. Owner and Consultant-Related Issues

Delays caused by the owner and consultants significantly affect project timelines. Late responses from consultants to contractor inquiries (Q17) correlate strongly with delays in inspection and testing by consultants (Q16, r = 0.824). This highlights inefficiencies in consultant operations. Similarly, the owner's slow decision-making (Q7) has a strong connection to delays in settling contractor claims (Q8, r = 0.795). These findings reveal the important role of proactive communication and decision-making by owners and consultants in avoiding delays.

4.5.4. Contractor Related Issues

Contractor-related issues are vital to project delays. Poor site management by contractors (Q9) correlates strongly with improper construction techniques (Q10, r = 0.662). Additionally, inadequate experience of contractors (Q11) demonstrates moderate correlations with poor communication with

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parties (Q13, r = 0.452) and failure to apply safety rules (Q14, r = 0.488). These relationships indicate that contractor inefficiencies not only delay timelines but also compromise project quality and safety.

Workforce-related challenges also play a significant role. Manpower shortages (Q26) exhibit a strong correlation with a lack of competent professionals in the contractor's organization (Q27, r = 0.559). Strikes by contractor workforces (Q28) are also closely linked to these shortages (Q27, r = 0.602). Addressing these issues requires improving workforce availability and professional competency.

4.5.5. Material and Equipment-Related Delays

Material shortages and price fluctuations are significant contributors to delays. Changes in material prices (Q18) are strongly correlated with delays in the supply of raw materials (Q19, r = 0.502) and changes in specifications during construction (Q20, r = 0.375). These relationships underscore the need for stable supply chains and clear specifications during planning. Similarly, equipment-related issues significantly impact timelines. The improper functioning of equipment (Q22) strongly correlates with frequent damage to equipment (Q23, r = 0.835). This emphasizes the need for regular maintenance and strong equipment management practices.

4.5.6. External and Environmental Factors

External factors like pandemics (Q29) and extreme weather conditions (Q30) also influence delays, though their correlations with other factors are relatively moderate. Extreme weather conditions correlate with delays in obtaining permits from government offices (Q31, r = 0.595), highlighting how external factors can intensify administrative inefficiencies.

4.5.7. Interdependencies and Practical Implications

The correlation analysis highlights interdependencies between various delay factors. Disputes between neighbors and clients (Q6) correlate with the slowness of the owner's decision-making process (Q7, r = 0.613), indicating that poor stakeholder relationships can compound delays. Similarly, issues with utility access on-site (Q32) are moderately related to delays in obtaining permits (Q31, r = 0.451), suggesting the importance of addressing regulatory and infrastructure challenges collectively. The correlation data provides valuable insights into how different factors interact to cause construction project delays. Addressing these issues requires a multifaceted approach. Enhancing initial design investigations, improving owner and consultant responsiveness, ensuring contractor competence, and mitigating workforce shortages are critical steps. Additionally, stable material supplies, effective equipment management, and preparedness for external disruptions, such as extreme weather or pandemics, are essential. By prioritizing these areas based on their interdependencies, stakeholders can minimize delays and improve project outcomes effectively.

Table 4.
Correlations table.

		Q1	Q2	Q3	Q4	Q5
Q1. Inadequate investigations by the designer during the design phase	Pearson Correlation	1	.778**	.565**	.558**	.267**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	361	361	361	361	361
Q2. Nonavailability of drawing/design on time.	Pearson Correlation	.778**	1	.615**	.656**	.323**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	361	361	361	361	361
Q3. The original contract duration is too short.	Pearson Correlation	.565**	.615**	1	.701**	.453**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	361	361	361	361	361
Q4. Project design complexity.	Pearson Correlation	.558**	.656**	.701**	1	.462**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	361	361	361	361	361
Q5. Delay in progress payments by the client.	Pearson Correlation	.267**	.323**	.453**	.462**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	361	361	361	361	361
		Q6	**Q7**	**Q8**	**Q9**	**Q10**
Q6. Dispute between neighbors and client.	Pearson Correlation	1	.613**	.528**	.218**	.179**
	Sig. (2-tailed)		.000	.000	.000	.001
	N	361	361	361	361	361
Q7. Slowness in the decision-making process by the owner	Pearson Correlation	.613**	1	.795**	.169**	.018
	Sig. (2-tailed)	.000		.000	.001	.731
	N	361	361	361	361	361
Q8. Delay in settlement of contractor claims by owner	Pearson Correlation	.528**	.795**	1	.253**	.082
	Sig. (2-tailed)	.000	.000		.000	.120
	N	361	361	361	361	361
Q9. Poor site management by the contractor	Pearson Correlation	.218**	.169**	.253**	1	.662**
	Sig. (2-tailed)	.000	.001	.000		.000
	N	361	361	361	361	361
Q10. Improper construction techniques by the contractor	Pearson Correlation	.179**	.018	.082	.662**	1
	Sig. (2-tailed)	.001	.001	.000	.000	
	N	361	361	361	361	361
		Q11	**Q12**	**Q13**	**Q14**	**Q15**
Q11. Inadequate experience of contractor	Pearson Correlation	1	.320**	.452**	.488**	.363**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	361	361	361	361	361
Q12. Lack of motivation for contractors to early finish	Pearson Correlation	.320**	1	.357**	.098	.142**
	Sig. (2-tailed)	.000		.000	.01	.007
	N	361	361	361	361	361
Q13. Poor communication with parties	Pearson Correlation	.452**	.357**	1	.512**	.307**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	361	361	361	361	361
Q14. Failure to apply safety rules and regulations within the contractor's organization	Pearson Correlation	.488**	.098	.512**	1	.616**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	361	361	361	361	361
Q15. Poor qualification of engineer's staff assigned to the project	Pearson Correlation	.363**	.142**	.307**	.616**	1
	Sig. (2-tailed)	.000	.007	.000	.000	
	N	361	361	361	361	361
		Q16	**Q17**	**Q18**	**Q19**	**Q20**
Q16. Delay in inspection, performing, and testing by the consultant	Pearson Correlation	1	.824**	.393**	.305**	.477**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	361	361	361	361	361
Q17. Late response from the consultant to contractor inquiries	Pearson Correlation	.824**	1	.428**	.336**	.442**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	361	361	361	361	361
Q18. Change in material prices	Pearson Correlation	.393**	.428**	1	.502**	.375**

	Sig. (2-tailed)	.000	.000		.000	.000
	N	361	361	361	361	361
Q19. Delays in the supply of raw materials	Pearson Correlation	.305**	.336**	.502**	1	.579**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	361	361	361	361	361
Q20. Changes in specifications and material types during construction	Pearson Correlation	.477**	.442**	.375**	.579**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	361	361	361	361	361
		Q21	**Q22**	**Q23**	**Q24**	**Q25**
Q21. Lack of proper equipment and technicians	Pearson Correlation	1	.642**	.555**	.419**	.401**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	361	361	361	361	361
Q22. Improper functioning of the equipment while working.	Pearson Correlation	.642**	1	.835**	.376**	.417**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	361	361	361	361	361
Q23. Frequent damage to the equipment while working.	Pearson Correlation	.555**	.835**	1	.467**	.470**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	361	361	361	361	361
Q24. Too much of dispute and arbitration between Client and Contractor.	Pearson Correlation	.419**	.376**	.467**	1	.640**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	361	361	361	361	361
Q25. No specific laws or regulations in the Private Construction sector.	Pearson Correlation	.401**	.417**	.470**	.640**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	361	361	361	361	361
			Q26	**Q27**	**Q28**	**Q29**
Q26. Manpower Shortage (skilled and unskilled labor)	Pearson Correlation		1	.559**	.310**	.327**
	Sig. (2-tailed)			.000	.000	.000
	N		361	361	361	361
Q27. Lack of competent professionals in the contractor's organization	Pearson Correlation		.559**	1	.602**	.406**
	Sig. (2-tailed)		.000		.000	.000
	N		361	361	361	361
Q28. Strikes by the contractor workforce	Pearson Correlation		.310**	.602**	1	.582**
	Sig. (2-tailed)		.000	.000		.000
	N		361	361	361	361
Q29. Pandemic	Pearson Correlation		.327**	.406**	.582**	1
	Sig. (2-tailed)		.000	.000	.000	
	N		361	361	361	361
				Q30	**Q31**	**Q32**
Q30. Extreme weather conditions (too hot or too rainy)	Pearson Correlation			1	0.595**	0.437**
	Sig. (2-tailed)				.000	0.000
	N			361	361	361
Q31. Delay in getting permits from different government offices	Pearson Correlation			0.595**	1	.451**
	Sig. (2-tailed)			.000		.000
	N			361	361	361
Q32. Inaccessibility of on-site utilities (telephone, water, electricity, etc.)	Pearson Correlation			.437**	.451**	1
	Sig. (2-tailed)			.000	.000	
	N			361	361	361

Note: **. Correlation is significant at the 0.01 level (2-tailed).

5. Discussion

Construction delays are a persistent challenge influenced by safety rule violations, workforce shortages, and external disruptions. Addressing these issues requires a multifaceted approach. Improved design and planning can prevent delays by ensuring thorough initial investigations and timely provision of drawings and designs. Efficient client practices, such as streamlined decision-making, prompt payments, and quick claim resolutions, are equally critical. Contractors must focus on workforce training, upgrading equipment, and adopting better management practices to enhance productivity and

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safety. Furthermore, implementing robust risk management strategies can help mitigate external disruptions like material shortages, weather conditions, and regulatory delays, fostering timely project completion. Key factors causing construction delays identified by Sanni-Anibire, et al. [25] include financial issues among suppliers, approval delays, late material delivery, poor site coordination, inadequate resource allocation, and inaccurate project duration estimates [25]. Similarly, construction project delays are often caused by ineffective site supervision, unrealistic planning, skilled labor shortages, worker absenteeism, design changes, construction errors, and accidents due to poor site safety oversight [26]. Improving project governance, strengthening planning processes, streamlining financial management, and enhancing stakeholder collaboration are key strategies for ensuring efficient project execution, minimizing delays, and achieving successful outcomes [27].

6. Conclusion

Construction project delays are a persistent challenge that affects project timelines, budgets, and stakeholder satisfaction. This study investigated the key factors contributing to construction delays by analyzing data from 361 valid responses and using statistical techniques such as RII rankings and correlation analysis. The study revealed that the most significant consultant-related issues were delays in inspections, testing, and performance by consultants, along with late responses to contractor inquiries. Poor qualifications of engineering staff and the untimely provision of designs and drawings also played critical roles. Client-related issues were dominated by delays in settling contractor claims, indecisiveness in decision-making, and payment delays. Disputes between neighbors and clients also emerged as notable contributors. Among contractor-related causes, a lack of motivation to complete projects early and insufficient access to proper equipment and skilled technicians were the most critical. Poor site supervision and communication, inadequate contractor experience, and failure to implement safety rules were also significant. Delays in raw material supply, changes in specifications during construction, and extreme weather conditions were the most impactful external causes. Manpower shortages, poor supply chain management, improper equipment functioning, and delays in obtaining government permits also contributed significantly.

Furthermore, the correlation analysis revealed interdependencies between various delay factors. For instance, inadequate investigations during the design phase were strongly linked to the late availability of designs, while slow decision-making by owners correlated with delays in settling contractor claims. Contractor inefficiencies, such as poor site management and communication, were also intertwined with safety rule violations and workforce shortages. To mitigate construction delays, stakeholders should enhance design and planning by improving initial investigations and ensuring the timely availability of drawings and designs. Clients must streamline decision-making processes, ensure timely payments, and resolve claims promptly. To boost efficiency and safety, contractors should invest in workforce training, advanced equipment, and better management practices. Effective risk management strategies are also crucial to address external disruptions, including material shortages, adverse weather conditions, and regulatory delays, ensuring smoother project execution and timely completion. By addressing these factors, construction projects can achieve improved timelines, cost management, and stakeholder satisfaction. Future research could explore the long-term impacts of these delays on project outcomes and the effectiveness of proposed mitigation strategies.

This study's findings have a wide range of practical implications, such as researchers, academic institutions, universities, policymakers, planners, engineers, construction enterprises, and regulators. Future research can therefore take advantage of larger sample sizes, variables, causal relationships, and methodologies that encompass different educational paradigms and geographic settings.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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