Analysis of Construction Delay Factors: A Case Study of Ghiring Rural Municipality, Nepal

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Abstract

This study investigates the primary causes and effects of construction delays in public infrastructure projects executed under National Competitive Bidding (NCB) in Ghiring Rural Municipality, Nepal, from fiscal years 2074/75 to 2080/81. The objective was to identify and prioritize delay factors and their consequences on project performance using a quantitative, stakeholder-centered approach. Data were collected through structured surveys administered to 70 respondents, including contractors, consultants, engineers, and municipal officials. The Relative Importance Index (RII) was applied to rank delay causes and effects from the perspectives of all stakeholders. The analysis identified 14 critical delay factors, with the most significant being shortage of necessary equipment (RII = 0.974), low bidding of contracts (RII = 0.971), material unavailability on site (RII = 0.966), and ineffective contractor planning and supervision (RII = 0.963). Consultant-related issues—such as delayed inspections, poor communication, and incomplete feasibility studies—also scored high across all groups. Seven dominant delay effects were identified, including project time overruns, increased costs, service stagnation, and accumulation of interest on project capital. The findings highlight a systemic performance gap across all actors in the project lifecycle. These insights provide an evidence base for targeted interventions aimed at minimizing future delays in rural infrastructure development.

Key words: *construction delay, RII analysis, project performance, stakeholder-based ranking*

1. Introduction

Construction delays represent a pervasive challenge in the global construction industry, affecting both developed and developing nations. In developing countries like Nepal, these delays are particularly problematic due to their far-reaching consequences on infrastructure development, local economies, and community welfare. Construction projects in rural municipalities, such as Ghiring Rural Municipality, Tanahun District in Gandaki Province, are particularly vulnerable to delays. These delays result in cost overruns, project inefficiencies, and missed developmental milestones. Nepal's construction sector has long struggled with project delays. Nepal Development Forum (2019) highlighted that, on average, construction projects in rural regions face delays of up to 18 months beyond their planned completion dates. This phenomenon is compounded by factors such as poor project management, inadequate resources, regulatory bottlenecks, lack of skilled labor, and frequent environmental and weather-related disruptions.

In Ghiring Rural Municipality, a specific example can be seen in the delays experienced in road construction projects, a key component of the municipality's infrastructure development plan. A local survey revealed that nearly 70% of road projects in the region have faced time extensions beyond their initial schedules, impacting rural communities' access to essential services and economic opportunities. This is particularly concerning because Ghiring relies heavily on improved roads to support agriculture, trade, and education. The core issue of this research is to understand why these delays occur despite increasing investments and efforts to improve the construction process. Are these delays due to internal inefficiencies such as contractor performance, project planning, and resource management, or are they more linked to external factors such as weather, political instability, and social factors? Identifying these causes is crucial to formulating effective solutions and improving the overall project delivery process.

1.2 Objectives of the Study

The overarching goal of this study is to identify, assess, and prioritize the causes of construction project delays in Ghiring Rural Municipality, and to evaluate their impact on project performance. The specific objectives of the research are:

1. To identify the primary causes of construction delays and its effects in the context of Ghiring Rural Municipality
2. To rank the relative importance of delay factors and its effects using the Relative Importance Index (RII), based on stakeholder perceptions, including contractors, engineers, and municipal officials.

1.3 Research Questions

To guide the investigation, the study seeks to answer the following research questions:

1. What are the key factors contributing to construction project delays in Ghiring Rural Municipality?
2. How do these delays affect the overall project performance, particularly in terms of cost overruns and extended completion times?
3. What are the effects caused by project delay?

1.4 Scope of the Study

This study focuses on construction projects in Ghiring Rural Municipality that have faced delays during the period between fiscal year 2074/75 and 2080/81. The projects covered in this study are primarily those funded by the government through National Competitive Bidding (NCB), with a focus on road construction, school buildings, and other critical infrastructure projects. The scope is limited to projects that experienced significant delays beyond the original completion schedule and does not include projects that were completed on time or within the budget. The research will also exclude projects conducted by private contractors or municipalities outside Ghiring Rural Municipality. The survey sample consists primarily of contractors, engineers, and government official.

2. Literature Review

Construction delay is a complex issue that involves multiple interacting variables, including managerial capacity, resource availability, and environmental challenges. To examine this issue in the context of Ghiring Rural Municipality, two theoretical perspectives are particularly relevant: Project Management Theory (PMT) and the Resource-Based View (RBV). Project Management Theory provides a structured approach to understanding how projects are planned, executed, and monitored. According to Kerzner (2013), the failure to align project scope, time, and resources often results in inefficiencies that cause delays. This theory emphasizes that poor planning, ineffective communication, and lack of proper risk identification are recurring issues in project management. In the case of Ghiring Rural Municipality, where many infrastructure projects are handled by local authorities with limited technical expertise, PMT helps explain how inadequate scheduling and monitoring contribute to delays. The Resource-Based View, on the other hand, focuses on the availability and management of essential resources within an organization or project. Barney (1991) argues that a project's success depends on the strategic use of valuable, rare, and well-organized resources. In rural construction, this often translates into challenges related to skilled labor, equipment, and financial support. Ghiring Municipality faces shortages in both technical personnel and equipment, which delays project execution and reduces efficiency.

Bhattarai et al. (2024) analyzed 11 public retrofitting projects in Kathmandu Valley using document review and surveys, finding schedule overruns of 42% to 167% due to issues like unrealistic scheduling, labor shortages, and design coordination failures. Nepal (2024), in a mixed-method study in Butwal, identified poor planning, political interference, and weak labor productivity as primary delay factors, while Dhakal et al. (2021) ranked political influence, delayed payments, and communication gaps as top causes using Relative Importance Index (RII) analysis in Bharatpur. Similarly, Paudel et al. (2024) examined 61 road projects in Surkhet and reported that administrative inefficiencies and documentation issues disrupted project timelines, particularly when compounded by cash-flow problems due to delayed payments. A sector-wide analysis by Bhattarai et al. (2024) further identified impractical drawings and logistical issues in public building projects. Nepal et al. (2024), using Principal Component Analysis (PCA) in Kageshwori Manohara Municipality, categorized delays into design-related issues, execution faults, and external factors like land acquisition problems, with high statistical reliability. The impacts of these delays were consistently found to include budget overruns, stakeholder disputes, and public dissatisfaction. In broader context, Islam et al. (2018) reported similar causes of delay in Bangladesh, such as financial constraints, contractor underperformance, and poor supervision, reinforcing the notion that many of Nepal's issues mirror common structural problems in developing nations' construction sectors. Overall, these studies collectively provide a strong, evidence-based understanding of the delay mechanisms in Nepal's public infrastructure projects, highlighting key areas for administrative reform, capacity building, and procedural streamlining.

3. METHODOLOGY

3.1 Research Design

This study employs a quantitative research design to systematically examine the factors contributing to construction delays in Ghiring Rural Municipality, Nepal.

3.2 Data Collection

The study focuses on collecting quantitative data through a structured survey administered to construction professionals, including contractors, consultants, engineers, and municipal officials who have been directly involved in construction projects within Ghiring Rural Municipality. A purposive sampling method was adopted to select participants based on their direct experience with the subject matter. The sample comprises 70 professionals who represent both local and external stakeholders. This inclusion of diverse respondent groups ensures a more representative understanding of the delay factors specific to the local construction context.

The survey questionnaire was designed in two main sections. The first section collected demographic and professional background information of the respondents, such as their role in the project and years of experience. The second section focused on identifying potential causes of construction delays, derived from an extensive review of existing literature on delay factors in similar rural or infrastructure development contexts. Respondents were asked to rate the significance of each factor using a five-point Likert scale, where 1 indicated "not significant" and 5 indicated "extremely significant." The survey was administered manually in paper format to ensure accessibility.

3.3 Data Analysis

Quantitative data collected from the survey were analyzed using the Relative Importance Index (RII), a widely recognized method for ranking factors based on respondents' perceptions. The RII was calculated using the following formula:

$$\text{RII} = \frac{\Sigma(W_i \times f_i)}{A \times N} \quad (1)$$

Where W represents the weight assigned to each factor by respondents (ranging from 1 to 5), f is the frequency of each weight, A is the highest possible weight (which is 5 in this study), and N is the total number of respondents.

The RII values were then used to rank the delay factors, allowing for an understanding of which causes were considered most significant by the construction professionals in the study area. The RII method is appropriate for this type of analysis as it allows for prioritization based on perceived importance, and it has been extensively applied in previous construction delay studies (Enshassi et al., 2009; Frimpong et al., 2003). Although the emphasis of the study is on quantitative analysis, open-ended feedback from respondents and informal discussions with a small subset of participants also contributed qualitative insights. These inputs were used to better interpret some of the numerical results and highlight issues specific to the socio-economic and administrative conditions of Ghiring Rural Municipality.

4. RESULTS AND DISCUSSION

The internal consistency of the survey instrument was assessed using Cronbach's alpha for each category of delay factors and effects in Table 1. All eight categories exceeded the conventional threshold of .70 for acceptability, indicating that the items within each scale reliably measure the same underlying construct (Kline 1999)

Table 2: Calculation of Cronbach's Alpha for Survey Instrument

S.N.	Category	k	α
1	Project Related Factors	4	**0.828**
2	Client Related Factor	5	**0.816**
3	Material and Equipment Related	5	**0.745**
4	Contractor Related Factor	5	**0.801**
5	Labor Related Factor	5	**0.920**
6	Consultant Related Factor	3	**0.883**
7	External Factors	6	**0.867**
8	**Effects**	**17**	**0.886**

The Labor Related Factor scale demonstrated the highest reliability (α = .920), suggesting very consistent responses across its five items. The Material and Equipment Related category yielded the lowest alpha (.745), though still within acceptable limits, which may reflect greater heterogeneity in how respondents perceive those items. Overall, these results support the use of the questionnaire data for subsequent Relative Importance Index calculations and correlation analyses.

4.1 RII Rankings by Stakeholder

4.1.1 Client

The following Fig. presents the ten highest-ranked causes of project delay according to client responses, using the Relative Importance Index (RII) metric. Clients were asked to rate each factor on a five-point Likert scale.

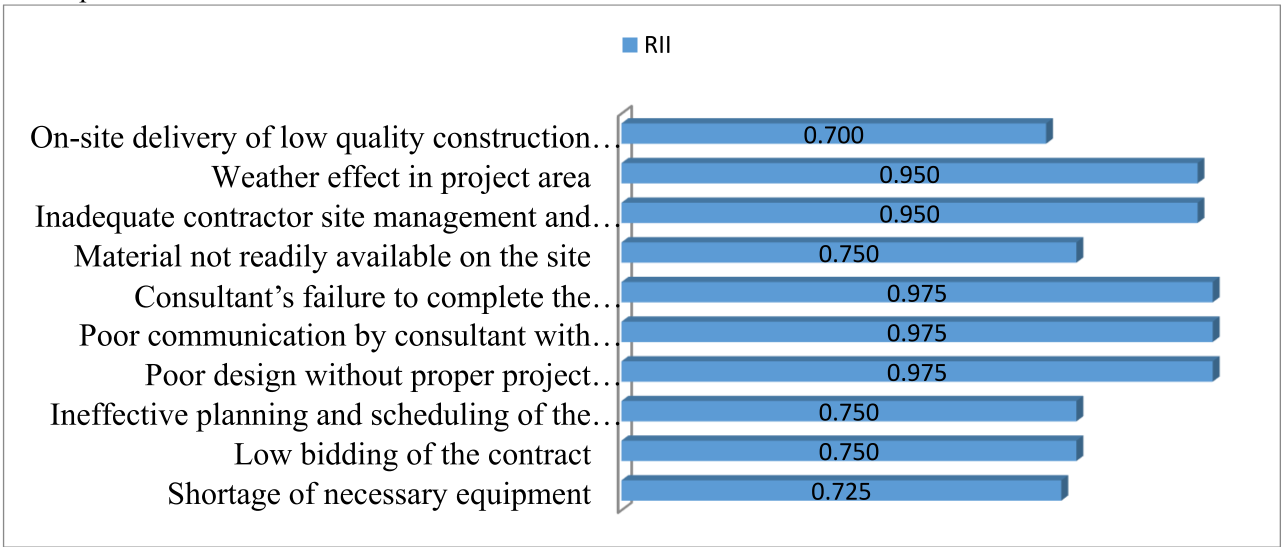

Fig. 23: RII Rankings of Top Ten Delay Causes (Client Perspective)

As shown in Fig. 1, three consulting-related items occupy the highest RII values (α = .975), namely "Poor design without proper project feasibility study," "Poor communication by consultant with other construction parties," and "Consultant's failure to complete the inspection on time." These results indicate that clients perceive consultant performance as the most influential source of delays. The "Inadequate contractor site management and monitoring" and "Weather effect in project area" factors follow closely (RII = .950), suggesting that both organizational oversight and environmental conditions are viewed as critical challenges. Traditional contractor issues such as "Low bidding of the contract," "Ineffective planning and scheduling," and "Material not readily available on site" all share mid-range RII values (0.750), reflecting moderate concern. The lowest client-rated issue was "On-site delivery of low-quality construction materials" (RII = .700), which nonetheless remains notable. Overall, the prominence of consultant-related delays underscores the need for strengthened design review and inspection protocols in Ghiring Rural Municipality project.

4.1.2 Contractor

The contractor respondents identified their ten most significant delay factors using the Relative Importance Index (RII), calculated as described in the methodology.

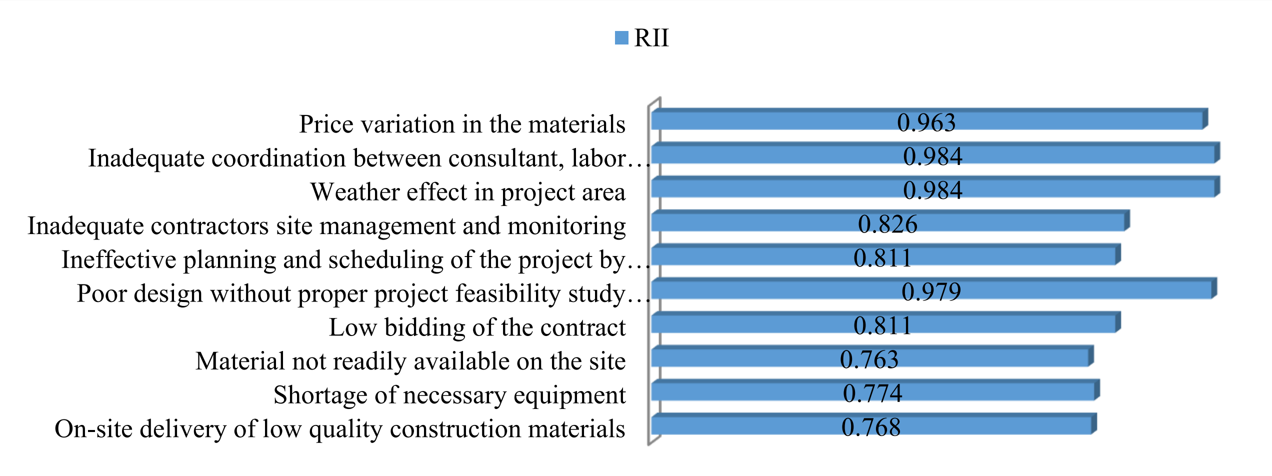

Fig. 24: RII Rankings of Top Ten Delay Causes (Contractor Perspective)

As shown in Fig. 2, two factors received the highest RII scores (0.984): "Weather effect in project area" and "Inadequate coordination between consultant, labor, and client." This finding suggests that contractors view both environmental disruptions and poor stakeholder collaboration as the foremost impediments to timely completion. Consultant-related delays—namely, "Poor design without proper project feasibility study" (RII = 0.979)—also ranked prominently, reinforcing the critical influence of design-stage accuracy on construction schedules. Material and equipment issues appeared in the mid-to-high range: "Price variation in materials" (RII = 0.963), "Inadequate contractor site management and monitoring" (RII = 0.826), and "Low bidding of the contract" alongside "Ineffective planning and scheduling" (each RII = 0.811). The lowest-ranked factors were "Material not readily available on the site" (RII = 0.763) and "On-site delivery of low quality construction materials" (RII = 0.768), indicating that, while still problematic, these issues are perceived as slightly less severe compared to coordination and environmental challenges.

Overall, contractors place greater weight on dynamic and interpersonal factors—weather variability and coordination than on the more static issues of material quality and availability, suggesting that improvements in communication protocols and risk management processes may yield the most benefit in reducing project delays.

4.1.3 Consultant

Consultants rated the same set of delay factors using the Relative Importance Index (RII). Each bar in Fig. 3 reflects the average weight assigned by consultant respondents.

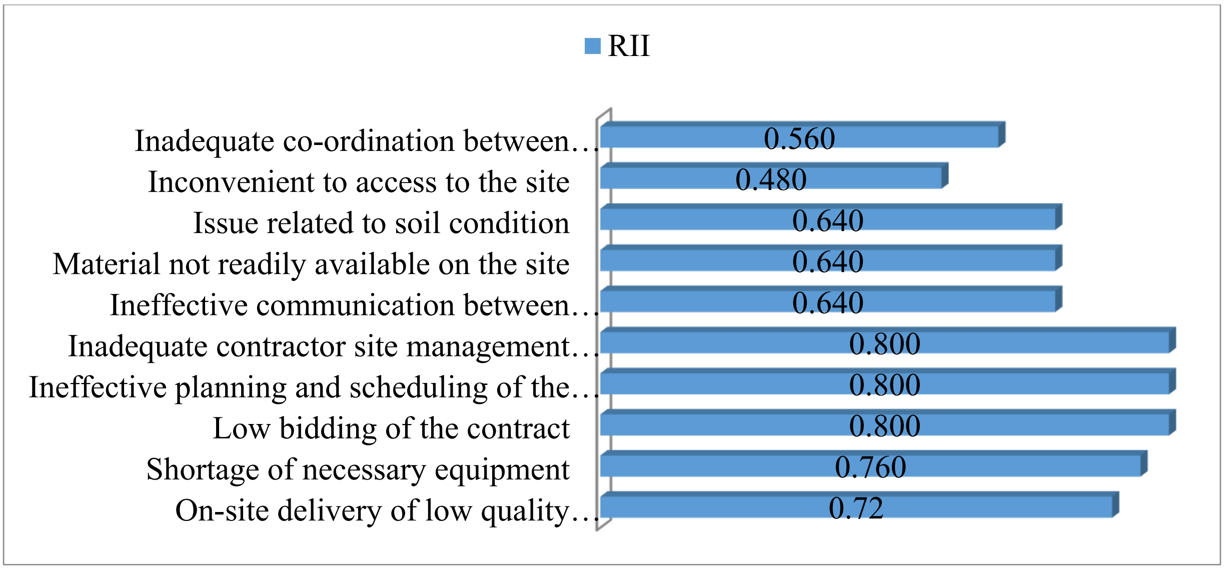

Fig. 25: RII Rankings of Top Ten Delay Causes (Consultant Perspective)

The leading concern for consultants was "Shortage of necessary equipment" (RII = 0.760), closely followed by "Low bidding of the contract," "Ineffective planning and scheduling of the project by contractor," and "Inadequate contractor site management and monitoring" (each RII = 0.800). These results indicate that consultants perceive contractor competency and resource availability as the primary drivers of delay. Material handling issues"On-site delivery of low quality construction materials" (RII = 0.720) and "Material not readily available on the site" (RII = 0.640) were seen as moderately important, whereas site access problems ("Inconvenient access to the site," RII = 0.480) ranked lowest. Interestingly, "Ineffective communication between clients and construction parties" and "Issue related to soil condition" shared an RII of 0.640, suggesting that both interpersonal coordination and geotechnical uncertainties weigh equally on consultants.

Overall, the consultant perspective emphasizes equipment readiness and contractor performance over environmental or client-related issues. These insights highlight the need for improved resource planning and contractor oversight to align consultant expectations with execution capacity.

4.1.4 User/Public

The end-user or general public group evaluated delay factors using the Relative Importance Index (RII) method outlined previously. Fig. 4 shows their top ten concerns.

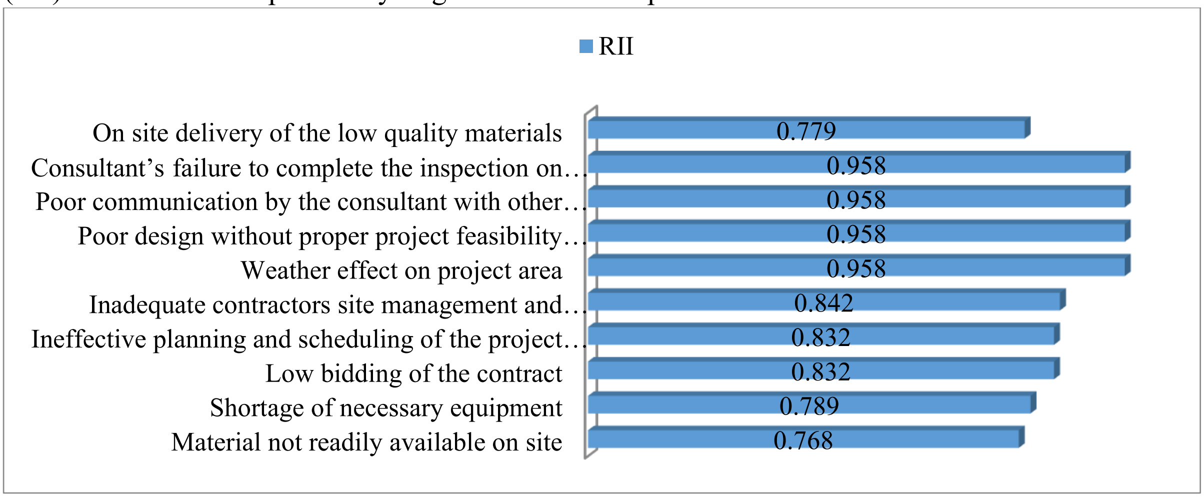

Fig. 26: RII Rankings of Top Ten Delay Causes (End-User/Public Perspective)

From this viewpoint, environmental and consultant-related issues share the highest priority (RII = 0.958): "Weather effect on project area," "Poor design without proper project feasibility study by consultants," "Poor communication by the consultant with other construction parties," and "Consultant's failure to complete the inspection on time." These results imply that the public perceives both natural disruptions and consultant performance as equally critical. Next, "Inadequate contractor's site management and monitoring" (RII = 0.842) and twin contractor process issues—"Low bidding of the contract" and "Ineffective planning and scheduling" (each RII = 0.832)—reflect substantial concern over execution reliability. Equipment and material availability factors—"Shortage of necessary equipment" (RII = 0.789) and "On-site delivery of low-quality materials" (RII = 0.779)—rank in the middle of the spectrum, while "Material not readily available on site" (RII = 0.768) is seen as the least severe among the top ten.

Overall, the end-user perspective aligns closely with contractor and consultant views on the importance of weather and consultant performance, but places slightly higher emphasis on public-facing consultant activities (design, communication, inspection). This suggests community engagement and transparent consultancy processes may help mitigate perceptions of delay and improve public trust

4.1.5 Overall Perspective

The overall Relative Importance Index (RII) aggregates ratings from all four stakeholder groups (clients, contractors, consultants, and end users) to identify the foremost causes of delay across Ghiring Rural Municipality projects. By combining the weighted responses, this composite measure highlights the factors that consistently rank highest regardless of perspective.

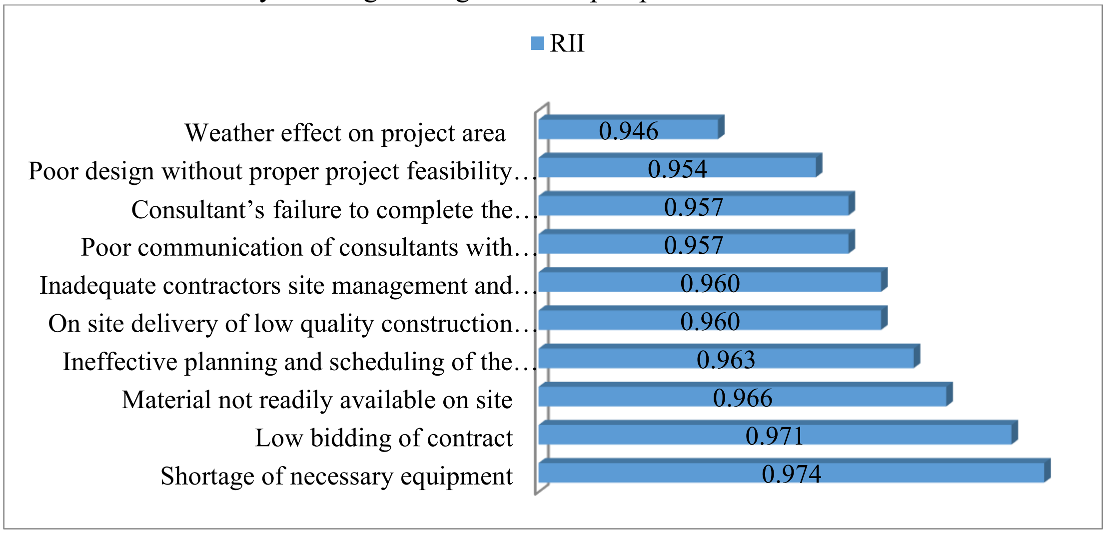

Fig. 27: Overall RII Rankings of Top Ten Delay Causes

Fig. 5 shows that "Shortage of necessary equipment" is the most critical delay factor (RII = 0.974), underscoring the essential role of resource availability. Close behind are "Low bidding of contract" (RII = 0.971) and "Material not readily available on site" (RII = 0.966), which reflect financial planning and logistical challenges. "Ineffective planning and scheduling of the project by the contractor" (RII = 0.963) and "On-site delivery of low-quality construction materials" (RII = 0.960) indicate persistent issues in execution and quality control. The pairing of "Inadequate contractor site management and monitoring" (RII = 0.960) reinforces the need for stronger oversight, while the next three consultant-related items— "Poor communication of consultants with other construction parties" (RII = 0.957), "Consultant's failure to complete the inspection on time" (RII = 0.957), and "Poor design without proper project feasibility study" (RII = 0.954)—highlight ongoing deficiencies in the design and inspection phases. Finally, "Weather effect on project area" (RII = 0.946) rounds out the top ten, confirming that environmental factors remain a constant threat to project schedules.

Together, these findings point to a multifaceted set of challenges—spanning resource management, contractor practices, and consultant performance—that must be addressed in a coordinated manner to reduce delays in future infrastructure initiatives.

4.2 RII of According to Delay Categories

Table 2 Summarizes the RII values for seven categories of delay factors as rated by four stakeholder groups—clients, contractors, consultants, and end users—along with the overall RII and rank. Each RII score represents the mean weighted response divided by the maximum possible score, reflecting the relative significance of each category.

Table 3: Relative Importance Index (RII) by Delay Category and Stakeholder Group

S.N.	Group of Factor Causing delay	RII Client	Rank Client	RII Contractor	Rank Contractor	RII Consultant	Rank Consultant	RII User	Rank User	Overall RII	Overall Rank
1	Consultant Related Factor	0.975	1	0.965	1	0.853	1	0.958	1	0.956	**1**
2	Contractor Related Factor	0.845	3	0.945	2	0.848	2	0.916	2	0.919	**2**
3	Material and Equipment Related Factor	0.865	2	0.925	3	0.848	2	0.884	3	0.902	**3**
4	External Factor	0.700	5	0.801	4	0.760	4	0.816	4	0.790	**4**
5	Client Related Factor	0.680	7	0.743	5	0.704	5	0.792	6	0.746	**5**
6	Labor Related Factor	0.695	6	0.737	6	0.656	6	0.800	5	0.743	**6**
7	**Project Factor**	**0.719**	**4**	**0.729**	**7**	**0.790**	**3**	**0.745**	**7**	**0.736**	**7**

The Consultant Related Factor category consistently achieved the highest RII across all groups (overall RII = .956, rank 1), indicating that deficiencies in design, communication, and inspection are viewed as the most critical source of delay. Next, Contractor Related (overall RII = .919, rank 2) and Material and Equipment Related factors (overall RII = .902, rank 3) were also rated as highly influential, underscoring the importance of contractor capability and resource availability. External Factors (overall RII = .790, rank 4) such as weather and site conditions were seen as moderate risks, while Client Related (overall RII = .746, rank 5) and Labor Related factors (overall RII = .743, rank 6) ranked lower, suggesting comparatively less impact on project schedules. The Project Factor category—including site access and administrative pressures—received the lowest overall score (RII = .736, rank 7), implying that procedural or contextual issues are less dominant contributors to delay in the Ghiring context. These patterns highlight where targeted interventions—especially in consultant performance, contractor management, and logistical planning—are most likely to reduce construction delays.

4.3 Spearman's ρ Correlation Matrix

Spearman's rank-order correlations were computed to assess the degree of agreement among clients, contractors, consultants, and end users in ranking the seven categories of delay factors in Table3.

Table 4: Spearman's Rho Correlation Matrix for Category Rankings (N = 33)

	Rank_Client	Rank_Contractor	Rank_Consultant	Rank_User
Rank_Client	1	.989**	.987**	.986**
Rank_Contractor		1	.989**	.990**
Rank_Consultant			1	.978**
Rank_User				1

Note: ** $p < .01$ (two-tailed)

The sample size for each correlation was 33. All four stakeholder ranking pairs showed very strong, positive associations, with ρ values ranging from .978 to .990, all significant at the .01 level (two-tailed). This pattern of results indicates a high level of consensus across groups regarding which categories most strongly contribute to project delays in Ghiring Rural Municipality.

4.4 Effect of Delays

Fig. 6 illustrates how four stakeholder groups—clients, contractors, consultants, and end users—rated sixteen possible effects of construction delays using the Relative Importance Index (RII). Each bar cluster shows the RII for one effect across the four groups.

Overall, Time overrun of the project and Increase in overall project cost both received top scores from consultants (RII = 1.000) and near–top scores from all other groups (RII ≥ 0.975), indicating unanimous agreement that these are the most severe outcomes of delay. Similarly, Service stagnation of local people, Accumulation of interest rate on the capital, and Late return of the security deposit rank highly (RII ≥ 0.950) across all perspectives.

Mid-range effects include Rescheduling (RII 0.825–0.984) and Wastages and underutilization of human resources (RII 0.874–1.000), reflecting moderate concern about operational disruptions. Cost inflation for equipment and material and Increment of wages of laborers each scored perfect RII (1.000) among consultants but slightly lower among other groups (RII 0.900–0.979), highlighting financial pressures tied to extended durations. Lower-rated effects—though still important—are Suspension (RII 0.700–0.880), Termination (RII 0.705–0.920), and Litigation (RII 0.768–0.880), suggesting that while projects do sometimes stop or face legal action, these are less common than cost and time impacts.

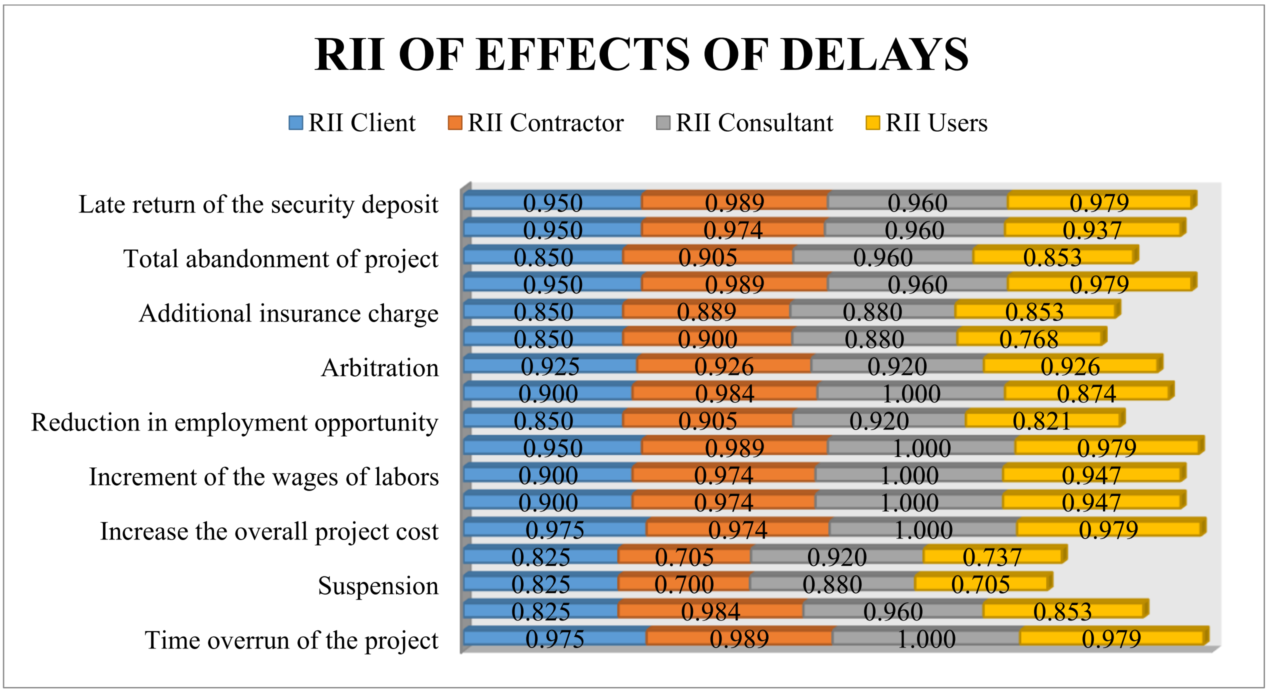

Fig. 28: RII Rankings of Delay Effects

The consistency in high RII values for time and cost impacts underscores the critical need for schedule control and budget safeguards in Ghiring Rural Municipality projects. Lower concerns about termination or legal processes may indicate that most delayed projects remain active through extensions rather than facing outright cancellation or court proceedings.

4.5 Discussion

The analysis of nineteen construction projects in Ghiring Rural Municipality highlights a pervasive issue of project delays, with time overruns reaching extreme levels—such as a 1,437.5% delay in the Ward Office Building, Ghiring-1—indicating deep-rooted systemic inefficiencies in contractor and consultant performance. The widespread practice of low bidding, with offers averaging 19.47% below estimated costs, particularly in road projects, reflects a strategic yet detrimental approach to contract acquisition that often compromises execution due to insufficient resources and delayed mobilization. These findings are consistent with those of (Acharya, Bhandari, and Timilsina n.d.) who reported similar causes of delay—abnormally low bids, multi-project engagement by contractors, and limited site supervision—in Syangja's rural municipalities. (Koirala and Shahi 2024) further corroborate this trend, identifying weak contractor mobilization and unqualified consultants as key delay factors in national rural construction projects. Comparable issues were also noted in Kageshwori Manohara Municipality, where (Nepal et al. 2025) emphasized design, scheduling, and consultant-related inefficiencies, echoing Ghiring's top-rated delay causes based on Relative Importance Index scores. (Bhattarai 2023)national-level study adds a broader perspective, highlighting recurring delays due to poor planning, weak coordination, and resource shortages. Collectively, these findings underscore a consistent pattern across Nepal's rural construction sector: systemic weaknesses in contractor planning, consultant oversight, and institutional procurement practices are central to chronic delays, necessitating targeted reforms in contractor selection, consultant accountability, and project governance mechanisms.

5. Conclusion and Recommendations

This study concludes that the most critical factors contributing to delays in construction projects within Ghiring Rural Municipality are rooted in equipment shortages (RII = 0.974), low bidding practices (RII = 0.971), and inadequate planning and monitoring by contractors (RII = 0.963). Consultant-related shortcomings—particularly poor communication and delayed inspections—also significantly impact timelines. These issues collectively lead to severe effects, such as time overruns (RII = 1.000), increased overall project costs (RII = 1.000), and delayed public service delivery.

Based on these findings, it is recommended that contractors focus on aligning bids with actual capacity and improve site-level planning. Consultants must strengthen feasibility assessments and enforce timely inspections, while municipal authorities should adopt stricter contractor qualification criteria and enforce continuous monitoring. These stakeholder-specific measures, grounded in quantitative analysis, are essential to improving future project delivery outcomes in Ghiring and similar rural municipalities.

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