



# Risk Factors Contributing to Time Delay and Cost Overruns in Bridge Construction Projects on Prithvi Highway in Nepal

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## Abstract

This study purpose to identify the fundamental factors that causes delay in bridge construction project at Mugling to Dharke section (68 KM) of Prithive Highway in Nepal, which results risk factor contributing to delay and cost overrun allocated for this type of engineering project and cause major issues for both the client and the contractor. The difference between the cost at completion and that originally estimated, known as cost overrun. The construction of bridge is often beset by challenges like time delays and cost overruns, resulting in addition of project cost and decreased public satisfaction. This study's research methodology involves a literature review and a questionnaire survey. Thoroughly literature review, thirty-nine common risk factor causes of delay were identified. Questionnaire survey is accomplished among construction professionals and technical expert of bridge project. Drawing upon existing literature and case studies, the abstract highlights key factors contributing to delays and overruns, including design changes, unforeseen site conditions, regulatory problems, and inadequate project management practices.

## Keywords

Time delay, Cost overrun, Land acquisition, Bridge construction

## 1. Introduction

This study intention to identify the most significant factors causing delays in the bridge construction project along the Mugling to Dharke section (68 KM) of the Prithvi Highway in Nepal. These delays lead to both time and cost overruns, creating critical problems for both the client and the contractor. The difference between the originally estimated cost and the final completion cost is known as a cost overrun bridge construction projects often face challenges like as delays and cost overruns, which lead to increased project costs and decreased overall project efficiency and stakeholder confidence. Infrastructure is crucial for economic development (Prasad et al., 2018). The research methodology use for this study includes a literature review and a questionnaire survey. Through an in-depth literature review, thirty-nine common factors of delay were identified. Questionnaire survey was also conducted among construction professionals and bridge expert involved in the bridge project. Economic and social losses for governments, contractors, and communities (Khair et al., 2016). Drawing from existing literature and case studies, the study highlights key factors contributing to delays and overruns, including design changes, unforeseen site conditions, regulatory issues, and inadequate project management practices.

Time delays and cost overruns are common challenges in modern bridge construction projects. Delays can result from poor planning, unexpected site conditions, weather disruptions, and social issues. Cost overruns typically arise from market price fluctuations, unforeseen contingencies, design changes, and extended project timelines, which increase financial stress. Terrain conditions, weather conditions, variation orders, labour availability are major factor (Al-Hazim & Salem, 2015). These issues can have unfavourable impacts on stakeholders, investors, and the company as a whole. The consequences of time delays and cost overruns extend beyond the construction phase, affecting project stakeholders such as government agencies, contractors, designers, local communities, and road users. Financial implications include budget overruns, contractual disputes, and potential penalties for missed deadlines. Furthermore, delays in completing Bridge projects can lead to increased traffic congestion, safety hazards, and negative economic impacts on surrounding areas.

## 2. Literature Review

Bridge construction projects are often complex, large-scale undertakings that involve multiple stakeholders, resources, and technical challenges. Timely and budget completion is a key performance indicator that frequently arise during such projects (Idrees, & Shafiq, 2021). These factors not only impact the financial success of the project but also affect public trust, user satisfaction, and the overall viability of infrastructure development. Contractor's financial difficulties, inadequate planning, client's financial difficulties, and delayed client payments (Akhund et al., 2018). In bridge construction, delays are common due to various factors such as poor planning and scheduling, weather conditions, design changes, and environmental challenges.

Cost overruns occur when the actual cost of a project exceeds the original budget. This issue is widespread in bridge construction and arises from various causes, such as inflation and price fluctuations. Effective handling of unforeseen situations, monitoring of activities, collaboration among staff, and training programs (Sohu, & Chandio, 2019). Design changes can lead to additional costs, as modifications to the original scope of work often require increased labor, materials, and time, all contributing to budget overruns. Culture, geography, political and legal systems are also affected overall construction (Edison, & Singla, 2020). Manpower issues are a significant cause of delay and cost overrun. Sufficient skilled labor and motivation can mitigate this (Gupta & Kumar, 2020). Initial cost estimates frequently fail to account for contingencies, inflation, or unforeseen conditions, resulting in financial shortfalls during construction. Additionally, poor coordination between contractors, suppliers, and other stakeholders often leads to resource wastage and further budget overruns.

Several studies have attempted to identify and categorize the major factors contributing to time delays and cost overruns in bridge construction:

- i. Kamala River Bridge Previous studies on the Kamala Bridge in Nepal, particularly the incomplete Bansbittaghat Bridge, reveal multiple key factors contributing to delays and cost overruns. One of the primary reasons is poor project management and inadequate contractor performance. The contractor failed to meet design standards and only completed 30% of the work by the original deadline, which led to multiple extensions. Design modifications, such as reducing the depth of bridge pillars, also worsened delays and increased costs. Other factors identified include environmental challenges, such as frequent flooding of the Kamala River, which damaged construction works and temporary supports. Additionally, there has been inadequate coordination among stakeholders and poor oversight during construction, which has further delayed progress
- ii. The Mahesh Khola Bridge in Dhading, Nepal, failed primarily due to a combination of geological instability, poor design, and insufficient maintenance. The region's susceptibility to seismic activity and landslides undermined the bridge's foundations, while inadequate engineering assessments likely overlooked critical environmental factors. Additionally, the use of substandard materials and lack of regular inspections contributed to the deterioration of the structure, ultimately leading to its collapse.
- iii. The Thimura Bridge in Nepal failed primarily due to a combination of geological instability and inadequate engineering practices. Located in a seismically active area, the bridge was vulnerable to earthquakes, while landslides and erosion weakened its foundations. Additionally, design flaws and the use of substandard materials contributed to its inability to withstand environmental stresses. The lack of regular maintenance further exacerbated these issues, ultimately leading to the bridge's collapse.
- iv. The Samrong Khola footbridge in Nepal failed due to several interrelated factors. Primarily, the region's geological instability, topographic of site, hydrology condition, road alignment, characterized by frequent landslides and erosion, undermined the bridge's foundations. The design did not adequately account for these local conditions, and there were issues with the quality of materials used during construction. Additionally, insufficient maintenance and inspections allowed minor structural weaknesses to go unnoticed, ultimately leading to the bridge's collapse. These challenges highlight the need for more robust engineering and maintenance practices in vulnerable areas.

## 3. Research Methodology

The methodology for examining time delays and cost overruns in bridge construction projects involves a mixed-methods nearer that associate qualitative and quantitative research techniques (Iqbal et al., 2019). Initially, a comprehensive literature review is conducted to identify existing studies and frameworks related to time delays and cost overruns. This informs the development of a structured questionnaire designed to gather data from construction professionals, including project managers, engineers, and contractors involved in bridge projects. The questionnaire focuses on factors contributing to delays and cost overruns, such as design changes, unforeseen site conditions, and project management practices. Questionnaires and interviews with project engineers, five top factors are finding (Thapanont, Santi et al., 2018). Once data is collected, quantitative analysis is performed using statistical methods to identify correlations and trends. Additionally, in-depth interviews with key stakeholders provide qualitative insights into the specific challenges faced during bridge construction. This combined approach allows for a thorough understanding of the issues, enabling the identification of key factors and the development of recommendations to mitigate delays and cost overruns in future projects.

#### 4. Conclusion

In conclusion, time delays and cost overruns are significant challenges in bridge construction projects that can severely impact their success and sustainability. This research has identified key contributing factors, including inadequate planning, design changes, unforeseen site conditions, and poor coordination among stakeholders. The consequences of these issues extend beyond financial implications, affecting public trust and satisfaction with infrastructure development. To mitigate these challenges, it is essential to adopt robust project management practices, improve risk assessment and contingency planning, and ensure effective communication among all parties involved. By addressing these factors, future bridge construction projects in Nepal can achieve more efficient outcomes, ultimately enhancing the reliability and quality of infrastructure development.

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The authors declare no conflict of interest.

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#### Authors' contributions

B.L. Dhungana developed the research conceptualization and wrote the original draft. V. Muchhara guided and corrected the manuscript and both authors contributed to the review and editing process. Both authors read and approved the final manuscript.

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