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論　文　要　旨
Thesis Abstract

2024 年 09 月 09 日

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主論文題名　（Title）Evaluation of factors affecting implementation delay of highway infrastructure projects and its consequences in Nepal

The construction of public infrastructure is essential for the economic growth of nations. Effective planning and sustainable utilization of resources pose significant challenges, particularly in the developing world. Among various infrastructures, highways are seen as foundational for socio-economic development. Countries like Nepal face difficulties in resource management, planning, and policy implementation to meet infrastructure demands. Infrastructure projects are designed to meet development goals, such as the Sustainable Development Goals (SDGs), within set timelines, employing resources to achieve these objectives. However, highway infrastructure projects in Nepal frequently experience schedule overruns, impacting investment costs, institutional efficiency, and future benefits. Identifying critical factors affecting project timelines is crucial for addressing these project management challenges.

Data-driven analysis of Nepal's project management environment has been limited, especially in the road and bridge construction sectors. This research aimed to identify key project management issues in highway infrastructure implementation that cause delays and quantify their impacts on project execution, the economy, and institutional capacity. Various analytical approaches were employed to achieve this objective. The first step was to examine the current highway infrastructure management environment, including contracting approaches, financing, and resource management. The study evaluated the effectiveness of Design-Build (DB) and Design-Bid-Build (DBB) contracting methods, as well as the roles of financing institutions (government, multilateral, and bilateral). Resource management by construction companies was assessed through different partnership arrangements. The findings highlighted institutional arrangements, resource management, risk-sharing mechanisms, project governance, and planning issues as areas for improvement in project implementation.

Furthermore, this research was focused on identifying critical delay factors and developing a delay prediction model using multivariate linear regression, decision tree, and random forest algorithms. These algorithms were applied separately to road and bridge construction projects to identify critical factors and predict delays. For road construction, critical factors included project preparation status before the award of the contract, institutional capacity, financial constraints, lack of supervision arrangements, and work volume with the institutions. For bridge construction, factors included contracting and supervision arrangements, number of contracts with the implementing institutions, institutional capacity, and project preparation status before the award of the contract. This

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methodology aids decision-makers in planning and evaluating strategies to mitigate delay risks.

Based on the delayed execution of highway projects, it was aimed to evaluate the consequences of delays on cost overruns, contractor performance, and future benefits. Linear regression was used to establish the relationship between delays and their impacts. Delays were found to significantly increase investment costs, reduce contractor performance, and affect the institutional capacity of construction companies. Factors influencing contractor performance in road construction included the economic condition of the project area, financing arrangements, original contract duration, work volume, number of contracts, bid prices, management institution type, project priority selection, and environmental and social considerations. In bridge construction, the original contract duration was the key factor affecting the performance of construction companies. The impact of delays on benefit achievement was also evaluated, showing a significant association between delays and the percentage rate of reduction in benefits due to increased project costs.

The final stage of the research compared data-driven analysis findings with stakeholder perspectives, validating the findings of data-driven analysis. The identified critical aspects of implementation management through questionnaire survey were distribution of limited resources to multiple projects, construction work started without addressing land acquisition and utility relocation, lack of risk sharing mechanism, financial constraints of client, project implementation without assured resources, low capacity of construction companies and low bid price. Data-driven findings have covered those critical issues through variables representing multiple issues by a single variable. Therefore, combining data-driven and social perspectives has created a new approach to study in the field of construction management providing in-depth explanation of delay issues.

The methodologies used in this thesis have developed a quantitative evaluation approach to examine the existing project management environment and its impact on project implementation time performance. The developed methodologies support countries to review the policies for minimization of delay risk and its adverse impact on socio-economic development. It has significance for enhancing the infrastructure implementation management approaches measuring the quantified impact of policy alternatives. The methodologies can support planning and implementing institutions for evaluating existing policies related to project implementation management and developing future strategies. The approach of analysis using data-driven and social perspectives can benefit the nations to build infrastructure implementation management frameworks, aiding in evidence-based decision-making to improve resource optimization, project governance, and institutional capacity, thereby contributing to the achievement of SDGs.

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