

THE RELATIONSHIP BETWEEN BID PRICES AND PROJECT IMPLEMENTATION PERFORMANCE IN THE NEPAL ROAD INFRASTRUCTURE SECTOR

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1. INTRODUCTION

The construction of public infrastructure by the construction company is usually performed through competitive bidding. The bidder having the lowest bid price fulfilling all the bidding criteria stipulated in the bidding documents enters into an implementation contract. In the competitive market, each bidder intends to get the job and quote their bid price as low as possible. In this situation, the bidders may ignore the future consequences of the low price if the firm enters into an execution contract. Based on the internationally accepted practices, the Government of Nepal has also formulated the public procurement act 2007 and regulation 2008 for selecting the lowest evaluated substantially responsive bid as a successful bid to execute the construction work.

The previous studies on project implementation performance analysis identified low bid prices in comparison to the agency's cost estimate as one of the critical delay factors. This is a pertinent issue in developing countries, and also in Nepal. The research performed in Rural Municipalities of Gandaki Province of Nepal identified low bid prices as the second most critical factor of delay in construction contracts (Bhandari B.R. et al., 2021). Assessment of delay and cost overrun causes in the bridge sector of Nepal also highlighted the key role of the low bid price in project delay. That research basically has analyzed the further consequences of low bids in contract management (Bista, S.B. et al., 2018). Another research on the bidding trend and effects of low bids in the implementation management of road projects in the western part of Nepal also criticizes the low bid practices and highlights the serious consequences for the timely achievement of project objectives (Bista, D.B. et al., 2019). But those all studies are based only on the specific locations and do not represent the road sector bidding trend as a whole and its effect on time overrun. In spite of that previous studies have no assessment of cost effect in financial terms due to delay considering price inflation, administrative cost, supervision cost and lost benefit. Therefore, this study considers the road transport sector as a whole to analyze the effect of low bids on time and cost overrun.

The main objective of this research is to analyze the relationship between bid prices quoted by the bidders and road project implementation performance in terms of time and cost overrun. This research also analyses the underlying reasons beyond the low bidding in road and bridge construction contracts under the Department of Roads (DoR), Nepal. To conduct this research road and bridge construction contracts data were collected from the DoR. The outcome of this research will support the policymaker in making decisions while amending the existing legal provisions.

2. DATA COLLECTION AND METHODOLOGY

The data on road and bridge construction contracts were collected from the Department of Roads, Nepal. Out of a total of 2000 contracts, 886 contracts value more than 100 million NPR were taken for the analysis. Then, road and bridge contracts are separated to find the effect of bid price on road and bridge implementation. To estimate the possible extension (delay) of ongoing contracts, only completed contracts having the information of total delay at the time of substantial completion were used. While calculating cost overrun, the inflation of prices during the delayed period is estimated using inflation index published by the central bank of Nepal. Based on the existing provision in the government's regulation, 1% of contract cost as an administrative cost of a government agency and 4% as supervision cost was added to price inflation for the same period. Further, the lost benefits due to delayed execution of contracts were also considered at 12% which is a minimum value of estimated benefit of the project. Total cost overrun after the addition of all those cost components was the overall effect of delayed performance. The bid price below the agency's estimated cost is calculated using the percentage difference between the bid price and the agency cost estimate. Percentage delay with respect to original contract duration is calculated taking account of the final extension or estimated extended contract period. Then, correlation and regression analysis were performed between bid prices lower than the estimated cost with time and cost overrun. The effect of low bids on time and cost performance of roads and bridges are evaluated and analyzed the underlying causes of the low bid.

3. DATA ANALYSIS

The road and bridge construction contracts were first analyzed using descriptive statistics (Table 1). The correlation between the bid price and time and cost overrun was calculated and analyzed. Finally, the scatter plots of bid price versus time and cost overrun in road and bridge contracts are plotted and analyzed accordingly (Figures 1-4).

4. RESULTS

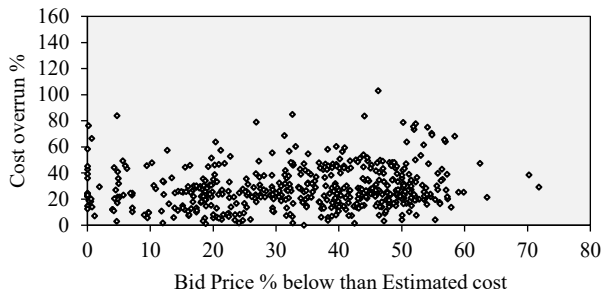
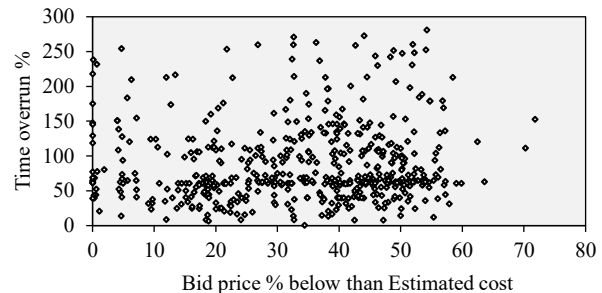
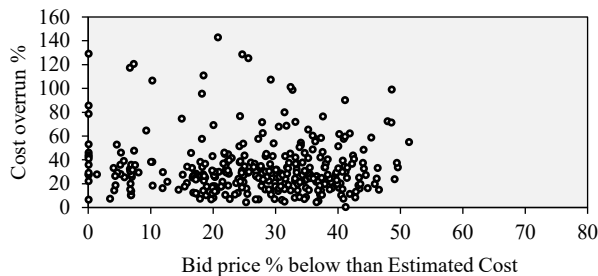
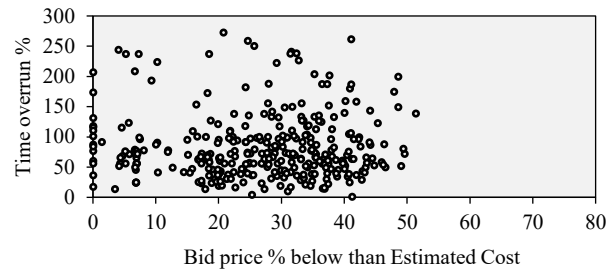
The descriptive statistics showed that the bid price estimates quoted by the bidders for road contracts are lower than for bridge contracts. Roads also have more time overrun but lower cost overrun than bridge contracts. The results showed that bid price and time and cost overrun in both road and bridge contracts are not correlated. In road contracts, the correlation

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Table 1. Descriptive statistics of time and cost overrun and bid price in road and bridge contracts

Category	No. of Contracts	Time overrun			Cost overrun			Bid Price		
		% Overrun	Standard Deviation	Coeff. Variation (%)	% Overrun	Standard Deviation	Coeff. Variation (%)	Bid price % below estimate	Standard Deviation	Coeff. Variation (%)
Road	543	87.04	55.39	63.64	28.10	15.64	55.65	-33.86	15.84	46.77
Bridge	343	82.43	52.55	63.76	33.36	22.70	68.05	-26.16	12.36	47.24

**Fig. 1** Plot of bid price and cost overrun of road contracts**Fig. 2** Plot of bid price and time overrun of road contracts**Fig. 3** Plot of bid price and cost overrun of bridge contracts**Fig. 4** Plot of bid price and time overrun of bridge contracts

coefficient between the bid price and time overrun; $r = 0.061$ and cost overrun; $r = 0.138$ were found. Similarly, in bridge contracts, the correlation coefficient between the bid price and time overrun; $r = 0.004$ and cost overrun; $r = 0.034$ were obtained. The scatter plots also showed that the distribution of bid price vs. time and cost overrun in each case have no specific trend. So it can be concluded that the consequences of low bid price may be there but they are not significantly contributing to the time and cost overrun of road and bridge construction.

5. DISCUSSION AND CONCLUSION

In conclusion, despite the consequences of low bids on project implementation performance, road and bridge construction contracts are not significantly affected by the bid prices quoted by the bidder. However, the results of descriptive statistics showed that road contracts are more prone to low bid prices and higher delays than bridge contracts. The delay and cost overrun are found inverse in average values which gives the idea about the non-uniformity of the original time period of contracts in road and bridge works. Further, while analyzing the underlying cause of low bid price, it can be concluded that based on the scope and criticality of works, the bidders offered their bid prices. The bridge as more specialized work, the bid prices are found higher than road contracts. On the other hand, to engage their manpower and equipment, the bidders do not want to lose the opportunity from the competitive market. Although there is a provision for checking due diligence in the regulation, government agencies are reluctant to take this issue seriously. On this ground, the existing low bid trend should be further scrutinized to improve the situation. Furthermore, for finding the impact of the bid price in all infrastructure sectors, a combined analysis is necessary. After that, recommendations can be made to make necessary amendments to the existing policy to overcome low bidding and its consequences during the implementation of infrastructure projects.

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