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Role of Financing Institutions in the Time and Cost Performance Management of Road Infrastructure Construction in Nepal

Chhabi Lal Paudel[1*], Michael Henry[2]

[1]*Graduate School of Engineering and Science, Shibaura Institute of Technology, Toyosu 3-7-5, Koto-ku, Tokyo, Japan*
[2]*Department of Civil Engineering, Shibaura Institute of Technology, Toyosu 3-7-5, Koto-ku, Tokyo, Japan*

Abstract

Road project financing under the Department of Roads (DoR) is arranged by the Government of Nepal's own funding as well as multilateral and bilateral financing institutions. Those financings have substantial differences in project planning and implementation management approaches. This research analyses implementation management approaches adopted by three financing institutions and their effect on road projects' time and cost performance. First, descriptive statistics were used to analyze the contract implementation performance in each financing arrangement. Then, Kruskal – Wallis test was used to find the differences between the three financing institutions' roles. The data were further analyzed using the Mann – Whitney U test to compare each institution's role in the time and cost performance of road projects. The results showed that those three institutions have significant differences in project implementation management. Further, after comparing each financing arrangement in terms of time and cost overrun risks management, the results of the Mann – Whitney U test also supported the differences in mitigating delay risks. The time overrun was less under multilateral financing institutions financed projects. This result was supported by multilateral financers' involvement in planning, implementation management and capacity development of stakeholders. It can be concluded that the multilateral financing approach support minimizing the time overrun risk. In addition, proper adoption of key measures of multilateral financing is found worthful for the overall improvement of project management under the DoR. This suggests that DoR needs to internalize the best practices of multilateral financing institutions' approaches in project management to improve overall project performance.

Keywords: *Financing institutions; Resource management; Kruskal – Wallis method; Mann-Whitney U test; Project delay.*

1. Introduction

Infrastructure development projects have always the risk of time and cost overrun due to high risk and uncertainty. During the implementation of such projects, proper risk management approaches are incorporated into the system with due consideration of proper resource management. The institution that provides financial resources also has an influence on the implementation process as well as the project planning process. For road infrastructure projects under the central government of Nepal, financing arrangement is usually from the Government of Nepal (GoN), Multilateral Financing Institutions (MFI), or Bilateral Financing Institutions (BFI). Multilateral financing institutions are Asian Development Bank (ADB) and World Bank (WB), and the bilateral financers are the Export-Import (EXIM) Bank of India, China, and the Japan International Cooperation Agency (JICA). In this context, the best practices of multilateral financing institutions are not fully internalized in the GoN system of project management although there is continuous support from them on capacity development and project management. Delay is also common in multilateral and bilateral financed projects.

* *Corresponding Author. Tel: +81-070-8462-6058*
Email Address: na21503@shibaura-it.ac.jp

They are also facing time and cost overrun issues during their implementation. One study in the road sector of Laos identified that contractor's cash flow, delayed payment by the owner, difficulty in financing by the contractor, financial issues related to the owner, and insufficient vehicles and equipment for the work are the top five delay factors (Bounthipphasert, S. et al., 2020). A similar study on public sector infrastructure project delay in Saudi Arabia investigated that training and capacity development, improper supervision arrangement and lack of planning of projects by government agencies are the major contributing factors to time and cost overrun (Alsuliman, J. A., 2019). In developing and least-developed countries, road infrastructure projects are most likely to experience delays due to either financial issues, planning issues, or external influences related to the project's outside agents (Mejia G. et al, 2020).

Road projects around the world have different delay issues based on the country's context. Many of the delay issues are similar in the developing world. One of the studies of delay of road projects in 25 developing countries identified and categorized the delay reasons as owner-related, contractor-related, common and outside the control of the parties. Owner-related causes which are relevant in Nepal's case are delayed decision-making, slow decision and administration in the Client organization, protracted financial procedures, financial difficulties of the owner, low performance of the contractor, delay in progress payment, owner's lack of experience and involvement in the day-to-day activities. Inadequate contractor organization for the specific project and the experience of the contract manager of the contractor are a few highly influential delays causes from the side of the contractor. Changes in the project duration without accessing the proper cause of delay as per the contract and delayed relocation of utilities found during the execution of projects are reasons for the delay which showed they disobey the rule of law as agreed in the contract. Changes in the existing regulations and bureaucracy are found the cause delays which are not under the control of contracting parties (Rivera, L. et al.,2020). This comprehensive research highlighted the institutional and procedural weaknesses of government institutions and contractor organizations. Inadequate financing sources and lack of standardized practices within the contracting parties' institutions are the major problems faced by developing nations in infrastructure project executions.

As a low-income country, Nepal is facing similar kinds of project management-related issues in the road sector. While considering the financing institutions' role, GoN-financed projects are implemented without due consideration of resource management aspects such as financial arrangement and human resource management. Project planning issues and financial assurances are not properly addressed during the implementation as committed during the preparation stage. Human resource management with a capacity development component is somewhat neglected in most of the GoN-financed projects. The final report published by the Office of the Auditor General (OAG), in 2021 highlighted the weaknesses in resource management, planning and coordination issues as the key factors for time and cost overrun of national pride projects in Nepal (OAG final report, 2021, pp. 15). The mid-hill highway project financed by GoN is an example which has faced planning and resource management issues during the implementation of construction works. Past research highlights the factors influencing the time and cost overrun of infrastructure projects. But, it is not assessed from the perspective of financing institutions' role in mitigating or managing time and cost overrun risk. It is because the government in developing countries have their own traditional system of project management while multilateral or bilateral institutions have a more standardized system of project planning and management.

The main objective of this research is to analyze the role of financing institutions in managing the time and cost performance of road infrastructure development projects in Nepal. It is analyzed from the perspective of technical and managerial support, legal and institutional aspects, planning, and standardized procedures. Data were collected from ongoing and completed contracts under the Department of Roads (DoR). The role of financing institutions in the time and cost overrun was analyzed including the government financing arrangement. The Kruskal-Wallis test was first applied to find the differences in project performance between projects with different financing institutions. The Mann-Whitney U test was then applied to examine the contribution of institutions in mitigating the risk of time and cost overrun.

The significance of this research is that project planning, capacity development, resource management and financial assurance aspects are somehow addressed by multilateral financing institutions. Such supports have a wider influence on the capacity development and implementation management of road projects. But, those standard approaches, technical capacity development and planning procedures are not fully internalized in the government management system. The results of hypothesis testing showed that there was a significant impact of financing institutions on time and cost overrun mitigation. Multilateral financing institutions' role was found most significant for mitigating the time and cost overrun risks in road construction contracts. Furthermore, this research suggests implementing the standard practices of project management applied by multilateral financing institutions in future projects so that GoN and bilateral financed projects can get benefit to improve the overall performance of the projects in Nepal. Ultimately, it will help to visualize the financing institutions' involvement towards improving the project performance through capacity enhancement, proper planning, and human and financial resource

mobilization. It will also support for internalization of best practices of multilateral financing institutions in road project implementation under the DoR.

2. Methodology

2.1 Data Collection

This research was performed using the secondary data collected from the DoR under the GoN. The ongoing and completed road construction contracts under the DoR within the period of almost 10 years are considered for the analysis. Those contracts are handled by the central road agency but it includes the works which are the responsibility of the provincial or local government. Ongoing and completed road construction contracts whose original contract cost is greater or equal to NPR 100 million at the time of contract agreement prices are taken as samples for the analysis. Projects are selected from divisions and project offices to include the wider aspects of project delay issues. The collected sample data consists of 462 contracts under government financing, 57 contracts under multilateral financing and 24 contracts under bilateral financing arrangements totaling 543 samples. Accordingly, time and cost overruns in each category were carried out using the original contract duration, revised contract duration and price inflation during the whole period of the contract including scope change cost. In the case of ongoing contracts, the actual time and cost overrun values may change at end of the contract.

2.2 Analysis Method

The time and cost overrun information for each contract after categorization in three financing arrangements were analyzed using descriptive statistics. Maximum, minimum, mean, median, standard deviation and coefficient of variation are calculated in each category and used for analyzing the distribution of the data set. Histograms were prepared to visualize the data distribution and determine the appropriate analytical approach. Considering the distribution of data as non-normal, Kruskal – Wallis test was performed to find the difference in three financing arrangements for time and cost overrun risk management. This test does not differentiate the best alternative. In this context, it is necessary to analyze two financing arrangements one at a time, such as GoN-MFI, GoN-BFI and MFI-BFI. Three hypotheses for time and cost overrun in different financing arrangements are established using Mann – Whitney U test. This test helped to access the best approach to financing and its role in improving project implementation performance. Ultimately, final conclusions were drawn based on planning and implementation approaches adopted by three financing arrangements in road construction contracts.

2.2.1 Kruskal – Wallis H Test

Kruskal – Wallis H test is used to determine whether or not there is a statistically significant difference between the medians of three or more independent groups. It is considered to be the non-parametric equivalent of the One-Way ANOVA. It merely tells that there is somehow a difference exists among the sets of data. So the researchers need to inspect the mean or median values of the dataset and interpret the results accordingly (Ostertagova, E. et al., 2014). In this research, the contracts in three financing arrangements with time and cost overrun values in percentages are compared using this test (Table 1). This test result helps to find the difference between the three types of financing arrangements on time and cost overrun risk management.

Table 1. Hypothesis using Kruskal – Wallis H test

Analysis aspects	Null Hypothesis H_0	Alternative Hypothesis H_1
Time overrun in Government financed, multilateral financial institution financed and bilateral financial institution-financed road construction contracts	No difference between the medians of the three financing arrangement road contracts	Differences exist between the medians of three financing arrangement road contracts
Cost overrun in Government financed, multilateral financial institution financed and bilateral financial institution-financed road construction contracts	No difference between the medians of the three financing arrangement road contracts	Differences exist between the medians of three financing arrangement road contracts

The rank of each data point was calculated in all data sets. Thus calculated rank values were added in each data set separately. Then, the following formula is used to calculate the H value:

$$H = \left[\frac{12}{N(N+1)} * \Sigma \frac{Tc^2}{n_C}\right] - 3 * (N+1) \quad (1)$$

Where,

N:	Total number of samples in all groups (combined)
T_c:	Total value of the rank number in each group of the dataset
n_c:	Number of samples in each group of the dataset

For a sample size larger than five, the H value is treated as a chi-square equivalent and compared to the calculated and critical value from the standard chi–square table at a significance level of 0.05. The degree of freedom is calculated using the number of data sets (in this case number of data set is 3). If the critical value of chi–square is greater than the calculated value, then the null hypothesis is accepted. The follow-up test using Mann – Whitney U test was performed to assess the role of individual financing institutions in handling time and cost overrun risks. The role of each financing institution to mitigate the risk of time and cost overrun is further explained in detail on the result and discussion section.

2.2.2 Mann – Whitney U Test

The Mann – Whitney U test is a non-parametric test applicable for non-normal data distribution. It is used to compare the two independent samples using hypothesis testing. The difference between the two sample sets can be assessed through the difference in medians of those sample sets (McKnight, P. E., & Najab, J., 2010). In this test, the rank of each data point is calculated and summed up the rank values separately in each group of datasets. Thus calculated rank sum was used to calculate the U value of each group of datasets using the following formula:

$$U_1 = (n_1 n_2) + \frac{n_1(n_1+1)}{2} - R_1 \quad (2)$$

$$U_2 = (n_1 n_2) + \frac{n_2(n_2+1)}{2} - R_2 \quad (3)$$

Where,

n_1, n_2:	numbers of data in each group of samples.
R_1, R_2:	summations of the rank of each group of the dataset
U_1, U_2:	Mann-Whitney U values for two sample sets.

The minimum value of U (Min. of U_1 and U_2) is used to calculate the z value. The z value is calculated for a sample size larger than 20 and assuming the normal distribution of the sample. The formula used for the calculation is:

$$z = \frac{U-\mu}{\sigma} \quad (4)$$

Where,

$$\mu = \frac{n_1 n_2}{2} \quad (5)$$

$$\sigma = Sqrt[((n_1 n_2)\frac{(n_1+n_2+1)}{12}] \quad (6)$$

Then, the above-calculated z value is used to test the hypothesis at a significance level of 0.05. The null hypothesis is accepted if the calculated z value is smaller than the critical value.

Three different hypotheses were established to find the significant differences between each two financing institutions' roles in time and cost overrun risk mitigation using Mann – Whitney U test (Table 2). The practices adopted by each financing institution in road project implementation management are assessed thoroughly for finding the role of particular financing arrangements. The details of the analysis results are explained in the results and discussion section.

Table 2. Hypothesis using Mann – Whitney U test

Analysis aspects	Null Hypothesis H_0	Alternative Hypothesis H_1
Time and cost overrun in Government financed and multilateral financial institution-financed road construction contracts	No difference between the medians of the Government financed and multilateral financial institution-financed road construction contracts	Differences exist between the medians of the Government financed and multilateral financial institution-financed road construction contracts
Time and cost overrun in Government financed and bilateral financial institution-financed road construction contracts	No difference between the medians of the Government financed and bilateral financial institution-financed road construction contracts	Differences exist between the medians of the Government financed and bilateral financial institution-financed road construction contracts
Time and cost overrun in multilateral financial institution-financed and bilateral financial institution-financed road construction contracts	No difference between the medians of the multilateral financial institution-financed and bilateral financial institution-financed road construction contracts	Differences exist between the medians of the multilateral financial institution-financed and bilateral financial institution-financed road construction contracts

3. Results & Discussion

3.1. Results of descriptive statistics

At first, time and cost overrun in percentage with respect to original time and cost were calculated. Then, government-financed, multilateral financed and bilateral-financed contracts are separated with their respective statistical values (Table 3). The mean value of cost overrun including the scope change is lowest for government-financed contracts (26.33%) and highest for bilateral financed contracts (37.50%). The mean value of time overrun is also highest in bilateral financing arrangements (123.43%) but lowest in multilateral contracts (53.57%). The maximum cost overrun is 141.19% and the time overrun of 280.82%, and government-financed contracts are the highest among the three. While analyzing the minimum values, the cost overrun of 4.25% is the lowest among the three financing arrangements. On the other hand, the time overrun of zero percent in government-financed and multilateral-financed contracts is the lowest value. The standard deviation and coefficient of variations are smaller in case of cost overrun while time overrun cases are in the higher range.

Table 3. Statistical distribution of data

Data Description (%)	Cost Var_GoN	Time Var_GoN	Cost Var_Multilateral	Time Var_Multilateral	Cost Var_Bilateral	Time Var_Bilateral
Mean	26.33	73.46	35.63	53.37	37.50	123.43
Maximum	141.19	280.82	45.27	188.22	55.39	272.43
Minimum	4.25	0.00	13.61	0.00	18.50	22.78
Median	26.24	60.14	35.30	41.15	39.17	112.30
Standard Deviation	12.01	65.39	8.90	44.13	11.78	89.61
Coeff. Variation	144.26	4276.21	79.25	1947.81	138.81	8030.59

3.2. Distributions of cost overrun

Firstly, the cost overrun pattern has been analyzed using the density histogram. The cost overrun was estimated considering the price inflation percentage from the start of the contract and the cost variation due to scope change during the performance of the contract. In government financed contract case, the distribution is almost normal having largest number of contracts falls within the range of 20-40% price inflation (Figure 1). In case of multilateral financial institutions financed projects, cost overrun pattern is different, with the largest number of contracts have 30-50% price inflation including the price of scope change (Figure 2). Similar to multilateral financing, bilateral financial institutions financed projects having most of the contracts falls in 30-60% price inflation situation during the whole contract duration (Figure 3).

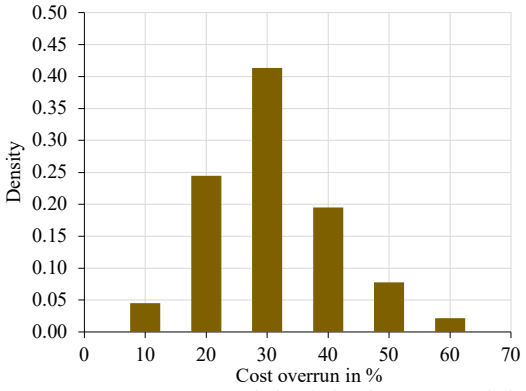

Figure 1. Cost variation during the contract period including scope change in government financed projects

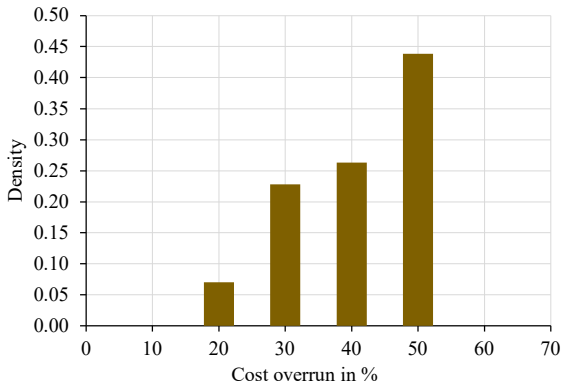

Figure 2. Cost variation during the contract period including scope change in multilateral financed projects

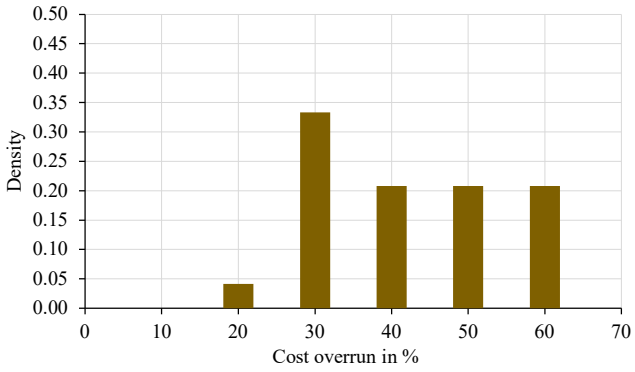

Figure 3. Cost variation during the contract period including scope change in bilateral financed projects

3.3. Distributions of time overrun

The distribution of time overrun in three financing arrangements is different from the cost overrun explained in the previous section. The projects financed by the government have a time overrun ranging from zero to a maximum of 270% of the original contract duration. The distribution is not normal having more proportion of contracts in the left corner of the histogram (Figure 4). The pattern of time overrun in multilateral financial institutions' financed projects is different. The distribution showed that most of the contract's time overrun ranges between 0-90%. Few contracts fall within the range of 90-120% and 190-210% of time overrun. The data distribution is also not normal as in the case of GoN-financed projects (Figure 5). But, the distribution pattern of time overrun in bilateral financial institutions' financed projects is not in a pattern similar to GoN financing or multilateral financing case. The distribution is not following any pattern and is distributed in different spots starting from about 20% to almost 290%. The spot distributions are 20-70%, 80-140%, 160-180% and 240-290% (Figure 6).

3.4. Results of Kruskal – Wallis H test

Based on the non-normal distribution of the dataset, the Kruskal – Wallis H test was performed. The results of this test showed that there are significant differences between the three financing arrangements in managing time and cost overrun issues. The critical value of H for large samples corresponds with the chi-square value. Then, from the standard chi-square table, the calculated value of H is compared with the critical value at a significance level of 0.05. In this analysis, the calculated value of H is larger than the critical value which is the condition to reject the null hypothesis (Table 4). The rejection of the null hypothesis means that there are significant differences between the three financing institutions for mitigating the time and cost overrun risks. But, it does not tell which financing arrangement is best for delay risk minimization. In this case, for the analysis of each individual financing institution's role, Mann – Whitney U test was required. The findings of the Mann – Whitney U test are explained in the next section.

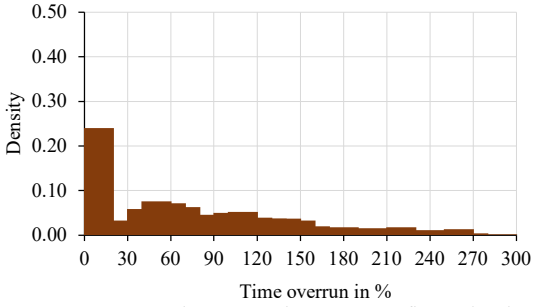

Figure 4. Time overrun in government financed projects

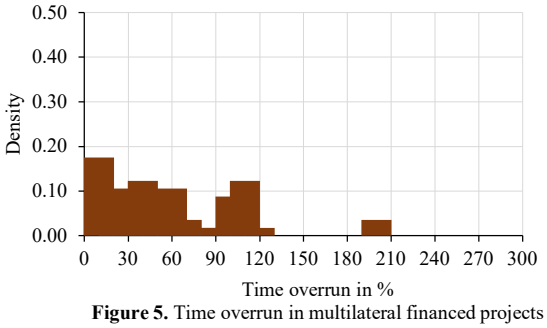

Figure 5. Time overrun in multilateral financed projects

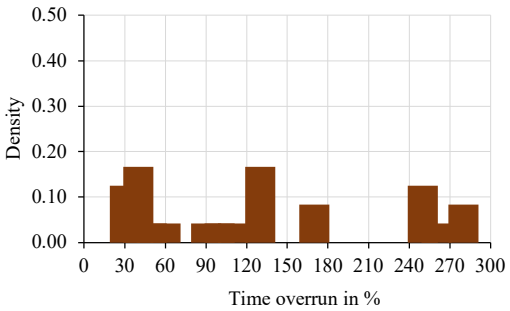

Figure 6. Time overrun in bilateral financed projects

Table 4. Kruskal – Wallis H test results

Analysis aspects	$\chi 2$ values at degree of freedom 2 at significance level 0.05		Decision
	calculated	critical	
GoN_MFI_BFI (N = 462+57+24 = 543) _cost overrun	53.943	5.991	$\chi 2$-calculated> $\chi 2$-critical, Reject H_0
GoN_MFI_BFI (N = 462+57+24 = 543) _time overrun	10.675		$\chi 2$-calculated> $\chi 2$-critical, Reject H_0

3.5. Results of Mann – Whitney U test

For the study of each individual financing institution's role in managing time and cost overrun risk, Mann – Whitney U test was required. This test was performed three times between GoN-financed projects and multilateral financed projects, GoN-financed projects and bilateral financed projects, and finally multilateral financed projects and bilateral financed projects. The critical values of z statistics is lower than the calculated value of z in all three combinations of financing arrangements (Table 5). This is the condition for the rejection of null hypothesis. It

gives the idea that there is significant difference between each combination of financing arrangements in mitigating time and cost overrun risks in road construction contracts. The existence of differences in each combination of financing arrangements while testing Mann-Whitney U test is supported by the descriptive statistics (Table 3).

Table 5. Mann – Whitney U test results

Analysis aspects	z values at significance level 0.05		Decision
	z-calculated	z-critical	
GoN_MFI (n_1 = 462, n_2 = 57) _cost overrun	3.76	1.96	z-calculated> z-critical, Reject H_0
GoN_MFI (n_1 = 462, n_2 = 57) _time overrun	5.32		
GoN_BFI (n_1 = 462, n_2 = 24) _cost overrun	5.37		
GoN_BFI (n_1 = 462, n_2 = 24) _time overrun	4.10		
MFI_BFI (n_1 = 57, n_2 = 24) _cost overrun	85.10		
MFI_BFI (n_1 = 57, n_2 = 24) _time overrun	78.70		

3.6. Discussion

Cost overrun in government-financed projects is on the lower side in comparison to the other two financing arrangements. It is because the collected dataset from the Department of Roads has no information about the price variation due to scope changes in most of the contracts. In the case of the other two financing arrangements, a scope change of almost 15% of the original contract cost and the price inflation during the whole period of the contract is considered. The highest average cost variation in bilateral financial institutions' financed projects indicates that projects are extended haphazardly without assessing the contractual clauses which ultimately adds more cost with time variation (Figure 6). The minimum to a maximum value of the cost overrun range is higher in government-financed projects. It is because few contracts are in the initial stage of implementation having lower price inflation and no scope change issue till the fiscal year 2021-22. The highest value of overrun indicates few contracts have specific site issues such as land acquisition, forest clearance and utility relocation. It is observed that the employer as well as the contractor has not handled those contractual issues properly. Specifically, the employer is more responsible for managing those project planning-related issues. This shows the poor performance of employers during the project planning process.

On the other hand, the time overrun in government-financed projects is in lower than bilateral financing arrangements. It may be due to harsh contractual provisions such as more than 50% of construction material must be from a financing institution/country of origin (Line of Credit Agreement with Export-Import Bank of India dated 25th November 2014) in bilateral financing. On the other hand, there is no direct involvement of financing institutions in capacity development and project planning issues in a comprehensive manner. Although, GoN-financed projects have similar kinds of capacity development and planning-related issues. The main difference between GoN financing with bilateral financing is the involvement of the bilateral financing institution in the certification of funds during the performance of a contract which takes more time for fund release. Poor planning of pre-construction activities and deployment of sufficient technical manpower is also lagging in GoN as well as bilateral financing. But, in the case of multilateral financing, those institutions have a robust system of project appraisal, planning of pre-construction activities and technical support for the implementation management through national and international experts (RSDP financing agreement, 2008). This differentiation can be seen in the lower range of average time overrun among the three financing arrangements (Table 3). Time overrun of minimum value zero indicates that few contracts are in the early stages of implementation or there is a lack of updated information on particular contracts. The maximum value of time overrun in GoN-financed projects indicates site-specific contractual and project planning-related issues in the specific locality which are not properly handled by the contracting parties. Furthermore, GoN central-level road department has additional work volume beyond its jurisdiction. It is because the institutions whose primary role is maintenance management are also involved in new construction. The additional work handled by the central government department is due to political influence in project planning (OAG final report, 2021). Almost 40% of the central road agency projects are within the jurisdiction of provincial and local governments (DoR annual program, 2022-23). The diversity of data distribution indicates that each project has specific issues of time delay. In certain circumstances, each project's critical risk factors are totally different from the other projects. Differing with the monitoring, human and financial

resource management, and risk management capability of the project manager and contractor's resource mobilization capabilities differs in the time overrun values (Rivera, L. et al.,2020).

The results of hypothesis testing using the Kruskal – Wallis H test indicates that there is a significant difference exists between the three financing institutions' roles in project delay risk mitigation. Meaning that there is the role of financing institutions in the planning and implementation management of road projects. It means that they are supporting for mitigating the risk of time and cost overrun. Then, Mann-Whitney U test was used to compare the two financing arrangements once at a time. While performing Mann – Whitney U test, it was found that there is significant difference between GoN financing and multilateral financing. Similarly, the difference between multilateral financing and bilateral financing is found significant with the rejection of null hypothesis. Furthermore, the significant difference is observed between GoN-financed and bilateral financed projects in mitigating time and cost overrun risks. All six hypothesis support for the rejection of null hypothesis having calculated z value greater than the critical value of z at significance level 0.05 (Table 5). While comparing GoN and multilateral financing, the descriptive statistics showed that cost variation in GoN-financed projects is less. But, time overrun risk mitigation, multilateral financing institutions' role is found more effective with lower value of average delay time (Table 3). The cost overrun in GoN financed project was found less than the multilateral financing project may be due to a lack of updating of contract information by the department regarding price variation due to scope change. In comparing multilateral and bilateral financing, multilateral financing institutions' role is found more efficient in mitigating the time and cost overrun risks. While comparing GoN financing and bilateral financing, GoN financed projects were more efficient than bilateral financing institutions' financed projects to mitigate the time and cost overrun risks. Out of three financing arrangements, multilateral financing institutions have a long history of planning and capacity development support and continuation to date (SRCTIP, financing agreement, 2020). This supports project management capacity development in the road sector. The results also support for better management approach and standardized procedures of multilateral financing institutions in human and financial resources management as well as the planning of projects.

Finally, multilateral financing institutions provide financial support as well as the capacity development and planning of projects in a standardized manner applicable in the international sector. The road sector connectivity sector I project financed by ADB has capacity development, planning support and contract management support during the planning and implementation of the project (ADB, Project completion report, 2016). A similar kind of arrangement can be found in WB-financed projects. The engagement of WB in the road sector of Nepal through the Road Sector Development Project (RSDP) for the period of more than 12 years supported the institutional capacity development and standardization of contract management approaches (WB, Project completion report, 2020). They also used standardized procedures and guidelines which supersede the provisions of GoN (Public Procurement Act 2007, Clause 67). This provision makes use of well-established approaches adopted by multilateral financing institutions. They use well-defined procedures in every stage of project management, from the project conception to the project handover, and government regulations are often superseded by the regulations of multilateral financing institutions, which makes it easier to take prompt action when implementation issues arise. The establishment of project management institutions, continuous support for capacity development, development of social and environmental management frameworks, financial assurances, procurement transparency and project preparation technical supports are some significant contributions of multilateral financing institutions in road sector development (RSDP financing agreement, 2008). The effect of those contributions is visible in the policy, the legal and institutional arena of project management in Nepal. The evidence in policy and regulatory support for enhancing the procurement environment in Nepal is the support for e-GP system development (Electronic government in Nepal, 2003). Although, the effect of those contributions is not significant due to the lack of internalization of improvement measures in the DoR overall management system.

But, in the case of bilateral financing institutions finance projects have only financial support. Bilateral funding only provides financial support with complicated contractual provisions for implementation (Line of Credit Agreement with Export-Import Bank of India dated 25th November 2014). In some instances, those provisions are difficult to implement and negatively affect the time and cost performance relative to projects financed by multilateral institutions or the government of Nepal. This leads to poor performance due to a lack of capacity development and planning of projects.

However, government-financed projects are not free of issues, as those projects tend to experience clashing activities during the preparation stage, as well as face human and financial resource constraints because of the simultaneous implementation of multiple projects (DoR annual program, 2022-23). These situations occur mainly due to political pressure, which interferes with proper planning and creates time-consuming activities during the project preparation stage. Those misleading activities ultimately affect the project's performance once it enters the implementation stage. The poor performance of GoN-financed projects may be due to a lack of internalization of key aspects of multilateral financing arrangements towards the improvement of project performance. A report

published by the McKinsey Global Institute (MGI) (Dobbs et al., 2013) highlights the importance of making the most of infrastructure investment by increasing the productivity of infrastructure. The report argues that by improving and adopting the best practices in selecting and delivering new infrastructure projects and by effectively managing the existing infrastructure, countries could obtain the same amount of infrastructure for 40% less investment.

In overall, the government should learn from the best practices of multilateral financing institutions' standardized practices, planning approaches, human and financial resource management and capacity-building approaches and replicate them in future projects. It will help to develop the capacity of the institution for improving the project's overall performance.

4. Conclusion

In conclusion, the descriptive statistics showed that time overrun risk is lower in the multilateral financing arrangement in comparison to the other two financing arrangements. While testing the hypothesis using Kruskal – Wallis H test, it was found that there are significant differences between the three financing arrangements in mitigating road construction project delay risks. On evaluating GoN-multilateral, GoN-bilateral and multilateral-bilateral financing and their roles in delay risk mitigation, hypothesis testing using the Mann – Whitney U test found significant differences between each combination of financing arrangements. It means that the role of financing institutions significantly differs in mitigating the time and cost overrun risks. Among of them, multilateral financing institutions' support for project planning, implementation management and capacity development has contributed more to reducing delay risk. The approaches adopted by multilateral financing institutions are more robust, internationally accepted and transparent (Procurement Regulations for IPF Borrowers, 2020). Its support is not only on the project basis but also in overall DoR's capacity development in project management (ADB, Project completion report, 2016). But, the results of descriptive statistics do not support the improved status of DoR in delay risk mitigation using its own financial resources. It may be due to a lack of proper utilization of international best practices and standards adopted by multilateral financing institutions and their internalization in the overall project management system of DoR. This research suggests adopting best practices of project planning and implementation for mitigating the time and cost overrun risks. At last, it can be concluded that proper planning and human and financial resource management in any type of financing arrangement will definitely contribute to improving the project implementation performance.

The findings of this research are equally applicable to other developing nations using similar kinds of financing arrangements in the infrastructure development sector. The learning and sustainable capacity development of institutions for proper project management is a key lesson from this research. It will help to open the eyes of policy maker managing road project financing arrangements within the country. The main limitation of this research is that there is no assessment of underlying delay factors which may be more serious than the financing institutions' role. This is only focused on planning, human and financial resource management and a capacity-building component of road project implementation. So the inclusion of other delay factors with a detailed assessment of road projects will be the further research area for mitigating the time and cost overrun risk.

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