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Research Article

Strategic Risk Management Practice in Urban Road Construction Project of Nepal

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A B S T R A C T

Risk management effectiveness assures project success. The overall objective of this research is to analyze the risk management practice in an urban road construction project with a case of Shiddharthanagar Municipality, Rupandehi, Nepal from contractor's and client's perspective. This research is based on a scheduled questionnaire survey to collect the primary data using convenient sampling of the partially or fully completed project.

Contractors are quite aware of risk management and the percentage of awareness is even higher among the clients. The feedback from a similar project was used as the main method to identify the potential risk of the project from both contractor's and client's perspective. Direct judgment method is used maximum to the analyzed risk of the project from the contractor's perspective as well as scenario analysis from the client's perspective. Monitor the risk and prepare a contingency plan is used mostly for risk response of the project from both contractor's and client's perspective. An alternative plan, subjective judgment, close supervision, increment of resources and change in construction methods were applied as a preventive and remedial strategy.

Risk should be managed by the one who is capable of managing the particular risk by managing contractual obligation with proper contract administration practices for ensuring the project objectives. There should be a risk register at the site and a frequent meeting should be conducted to identify the risks. These identified risks should be documented properly to ensure expertise for future projects.

Keywords: Practice, Identification, Analysis, Response, Perspective

Introduction

Nepal is a South Asian country that lies between India and China. In the last few years, there has been sufficient increment in the construction sector that is mainly focused on the capital city of Kathmandu. Nowadays, construction companies are facing more risk than ever before. Even after the approval from the concerned ministry, some of the projects have not started yet due to the associated risk and uncertainties. Most of the construction companies do not make any risk management teamwork before the startup of the construction project. There is no provision of the scientific method of risk management but uses their thumb method, common sense, sharp judgment, trial and error method.

Risk is an abstract term which signifies an uncertain event, situation, or condition which may occur. It may have either a positive or negative effect on the project objectives. Some risks may pose a threat to the achievement of project objective while some other risks may enhance it. Positive events are called opportunities and negative events are classified as threats (Chitkara, 2011).

Statement of Problems

After the federalism in Nepal, there are lots of infrastructure works going on a rapid pace in all parts of the country. From the entire infrastructure works construction of the road plays a vital role in the development of the country. However, Shiddharthanagar Municipality is not far away from the construction of roads. Most of the construction of the road is targeted in the Siddharthanagar Municipality, Rupandehi, Nepal. The success of these road projects determines the growth and development of the municipality. To ensure the success of these projects risk management should be effectively implemented. It will result in the successful development of the municipality. Risk management determines the success and failure of the project. So, the researcher is interested in studying the research risk management practice of Siddharthanagar Municipality which if found to be satisfactory can be implemented in other municipality to manage the risk effectively.

Based on the discussion above, the purpose of this research is to study various risk factors and to minimize that risk by various risk management practice in the urban road construction project of Siddharthanagar Municipality, Rupandehi, Nepal.

Research Objectives

The main objective of this research is to assess top management awareness level about risk management practice along with various strategies for risk management practice in the urban road construction project in Siddharthanagar Municipality, Rupandehi, Nepal.

Literature Review

Risk and Uncertainties

According to the Oxford Dictionary, "Risk is a chance or possibility of risk or loss, injury or other adverse consequences".

Risk is defined as the exposure to gain/loss or the probability of occurrence of gain/loss multiplied by respective magnitude (Jafari, 2001).Risk and uncertainties affect all the fundamental variables that determine planning, implementing, monitoring, adjustment, behaviour and explain choices, and bring about decisions. (Okema,2001)

Risk Management Process

Several variations of the risk management process have been proposed. Boehm (Razand Michael, 2001) suggested a process consisting of two main phases: risk assessment, which include identification, analysis and prioritization, and risk control which include risk management planning, risk resolution and risk monitoring planning, tracking and corrective action. Chapman (1998) identified risk management approach as a multiphase 'risk analysis' which covers identification, evaluation, control and management of risks. Simmons (2002) defined risk management as the sum of all proactive for the risk management-directed activities, within a program that is intended to acceptably accommodate the possible failures in the elements of the program. "Acceptably" is as judged by the customer in the last analysis, but from the firm's perspective, failure is anything accomplished in less than a professional manner or with the less adequate result**.** Al-Bahar cited in (Ahmed et al., 1999) defined the risk management is a formal process for systematically identifying, analyzing and responding to risk events throughout the life of a project to obtain the optimum or acceptable elimination or control.

It is the possibilities that are being accommodated, and it is the responsibility of the management to plan accordingly. The customer is the final judge, but internal goals should be higher than customer expectations. Risk management as shared or centralized activity must accomplish by identify concerns, identify risks and risk owners, evaluate the risks as to likelihood and consequences, assess the options for accommodating the risks, prioritize the risk management plans, authorize the implementation of the risk management plans, track the risk management efforts and manage accordingly (Simmons, 2002).

The generic risk management process consisting of nine phases defines the key aspects of the project: focus on a strategic approach to risk management, identify where risks may arise, structure the information about risk assumptions and relationships, assign ownerships of risks and responses, estimate the extent of uncertainty, evaluate the relative magnitude of the various risks,plan a response and manage by monitoring and controlling the execution (Chapman, 1998).

According to the Project Management Body of Knowledge (PMI, 1996), risk management forms one of the so-called nine functions of project management (the other eight being integration, communications, human resources, time, cost, scope, quality and procurement management). The traditional views are that these function should form the basis of planning and that each should be the focus of attention in each phase. In PMBOK, (PMI, 1996) presents four phase of risk management process: identification, quantification, response development and control. Risk management covers the process of identification, assessment, management and allocation of all the project risks (APM, 2000).

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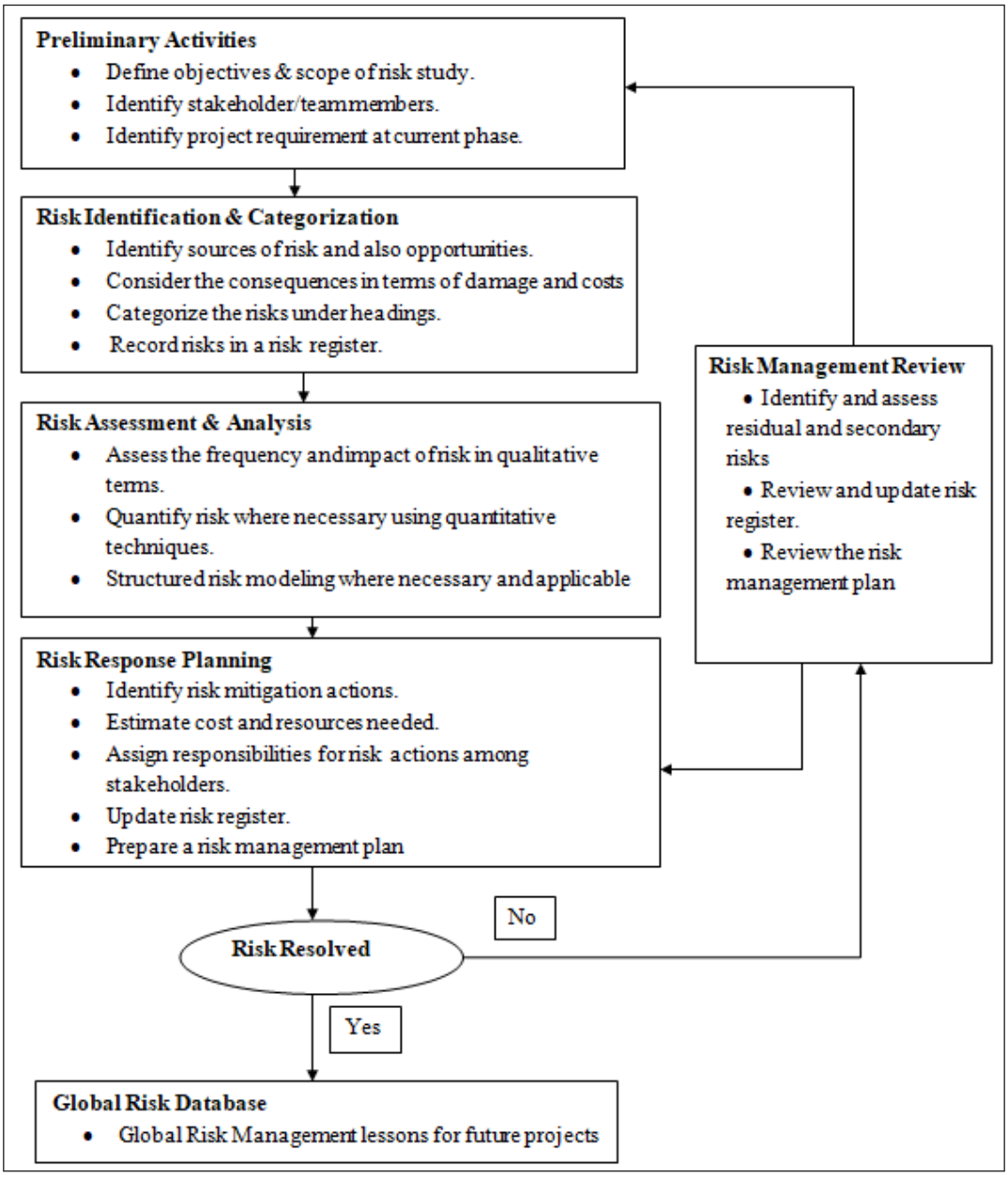
Risk management is not synonymous with insurance, nor does it embrace the management of all risks to which a project is exposed. In practice, the truth lies between the two extremes. A risk management system must be practical, realistic and should be cost-effective. The depth to which you analyze risk depends upon your circumstance. Only you can judge the importance to be placed on a structural risk analysis. Conventional education does little to foster awareness of how unpredictable reality can be (Flanagan and Norman, 1993). Risk management measures the potential change in value that will be experienced in a portfolio as a result of differences in the present and the future environment (Demboand Freeman, 1998). The process of risk management can be better understood with a flowchart (Mishra and Malik, 2017) (Figure 1).

Risk management practices in Nepal

Malik and Mishra (2017) in their study "Factor and impact of risk management practices on the success of construction project of housing developers, Kathmandu Nepal" have set insights into the significant factors of risk in construction projects of housing in Kathmandu are time overrun, project scope risks, financial and economic risks, organization risks, safety and health risks and leadership risks and leadership risks.

This research includes that more than 80% of respondents believe that their top management is highly aware of risk management, which means a score of 4.03. Further, it also found that risk management is being practised either formally or informally by housing projects in Kathmandu



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valley with a mean score of 3.83. The research shows a slight decrease in informal risk management practice mean score was found to be only 3.36 and around only 43% of respondent reported that risk management is being formally followed in their project. This research mentions the status of Kathmandu valley following the risk management and is practising it with their experience, knowledge to some extent but not in the full package. Generally, they are found to be focused on the risk of scheduled time and cost. Very less response, among the received, were found confident that their organization is following the risk management informal ways.

The research also includes all three independent variables: risk identification, risk assessment and risk response have a significant impact on 8 out of 10 success criteria viz. scope well defined, technical specification, compliance, planned budget, achieving the quality standard, adhere to schedule, overcome financial and economic risk, overcome of safety, health and environmental risks, overcome leadership risks. And also found that all three independent variables do not have an impact on 2 out of 10 success criteria viz. overcome contractual risks and overcome organizational risk. Researchers concluded that there is a high impact of risk management practice in the success of the project.

Shakyaand Mishra (2019) in their paper "Risk assessment in construction of Gautam Buddha International Airport" research that out of 96 risk factors, the researcher found that 33 significant risks from employer's perspective, 41 significant risks from consultant perspective and 72 significant risks from contractor's perspective. The researcher also found that design, specification, estimation and scheduling are found to be the highly significant risk factors. According to Shakya et al. (2020), there was no proper risk the board plan in this development venture, there was a decent act of risk relief for some potential risk factors, for example, those identified with Quality. Some significant moderation recommendations found by the inquiry were executing solid Coordination between working gatherings, Review of Design, Drawings and Specifications in detail, Endorsement of Efficient Cash Management System, Appointment of Competent Consultant in the site and Follow of Safety Manuals. The discoveries from this exploration will be the learning focuses for the up and coming other two worldwide air terminals of Nepal.Mishra 2018 found from the risk evaluation of Salyankot Water Supply Project, the huge risk was found from avalanche, water quality testing and spillage at transmission-conveyance pipelines. The medium risk was found from the administration. The irrelevant risk was found from the dry spell and seepage close to the pipeline. The risk was discovered questionable with sullying by flood, human exercises at source and piping. To defeat the risk because of spillage in transmission and circulation pipeline, fittings ought to be supplanted and high thickness polythene pipe (HDP) ought to be grounded appropriately. To feel served to society, duty ought to be gathered from all water client family unit and establishment ought to be additionally accused of view to moderated water utilized and upgraded budgetary condition. The nature of water was found inside the endorsed furthest reaches of National Drinking Water Quality Standard (NDWQS) given physical, concoction and microbial boundary. The normal separation for the recipients' family unit to get drinking water was found inside the scope of 100 m. Performance of the venture has diminished regarding physical structure record, workableness condition, usefulness list, and the executives' framework because of tremor (Mishra andAcharya, 2018).

Methodology

This study examined the various risk management practice and various risk response strategies on the urban road construction project.

To fulfil the objectives of this research, a questionnaire survey was carried out where the respondents were provided with a list of the questionnaire that intended to know the risk management practice and various risk response strategies that the construction company follow. Response choices on the questionnaire were coded as 1 (Highly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree) and 5 (Highly Agree).

Study Area

The studies were conducted in Siddharthanagar Municipality, Rupandehi, Nepal, which is located in the southern part of Rupandehi District and the border of India and western part of Nepal. It lies on 27º 30' North latitude and 83º27' East longitudes. It covers an area of 36.03 sq.km.

Population and Sample Size

The population consists of the 118 urban roads in the Siddharthanagar Municipality, Rupandehi, Nepal constructed by approximately 30 Construction Companies. The 29 urban roads are taken as the sample size constructed by 21 Construction Company. The sample size was selected by the convenient sampling technique. The population consists of 3 clients (Municipality, FPIU and RUDP) from which 12 responses were received out of 14 respondents. The schedule questionnaire was carried out with the employees of the contractor as well as the client.

Data Collection

Data collection plays a vital role in statistical analysis. Primary data were collected through field studies, questionnaire and interviews with the project manager and site in charge of contractors as well as clients. Secondary data were collected through literature review, journals and expert advice.

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Data Analysis

An analysis is an interactive process by which answer to be examined to see whether these results support the hypothesis underlying each question. The qualitative statistical analysis for the questionnaire was carried out in MS-Excel. The risk management practice and its risk response strategy with their preventive and remedial methods were analyzed based on the application of those methods.

- The following analysis steps were done:
- Coding and defining each variable.
- Summarizing the data on recording scheme.
- Entering data to a work sheet
- Analyzing the Mean score and Standard Deviation for each risk management practice of construction project by Likert Scale i.e. MS=∑ (f×s)/ N (1≤MS≥ 5), where's' is core given to each research variable by the respondents and ranges from 1 to 5 where 1 is "Strongly disagree" and 5 is "Strongly agree"; f is the frequency of responses to each rating (1-5) for each research variable, and N is the total number of responses (Chan andKumaraswamy, 1997).
- Analyzing the risk response strategies with preventive and remedial methods for contractor's and client's perspectives which range from never to always.

Result and Discussion

This research survey was one of the first steps towards exploring the study of risk management on the urban road construction project in Siddhartha Nagar Municipality, Rupandehi, Nepal.

Risk Management Practice

Risk management practice of urban road construction project in Siddharthanagar Municipality, Rupandehi, Nepal has been obtained from the contractor's and client's perspective.

Risk Management Practice, Contractor's Perspective

Risk management practice of urban road construction projects from contractor's perspective has been obtained from the statistics of management awareness regarding risk management, statistics of management practising risk management formally or informally, statistics of management practising the risk management formally, statistics of management analyzing various risk management techniques.

- Management Awareness Regarding Risk Management

As per the 29 responses received during the research, it was found that the management are often aware regarding the risk management with the mean score of 3.44 on the Likert scale and standard deviation (S.D) of 0.90 (Table 1).

Table 1.Management awareness regarding risk managementfrom contractor's perspective

Rate	Frequency	Percentage
1 (Least Aware)	0	0
2	4	13.80
3	12	41.37
4	9	31.03
5 (Most Aware)	4	13.80
Total	29	100

- Management Practicing Risk Management Formally or Informally

From the response received, found that the managements practising the risk management formally or informally are often with the MS of 3.06 on the Likert scale and SD of 0.79 (Table 2).

Table 2.Management practicing risk management formally or informallyfrom contractor's perspective)

Rate	Frequency	Percentage
1 (Least Practice)	0	0
2	6	20.68
3	17	58.62
4	4	13.80
5 (Most Practice)	2	6.90
Total	29	100

- Management Practicing the Risk Management Formally

From the total responded received, it was found that the management practising the risk management formally are some time with the MS of 2.79 on theLikert scale and SD of 0.94 (Table 3).

Table 3.Management practicing risk management formallyfrom contractor's perspective

Rate	Frequency	Percentage
1 (Least followed)	1	3.44
2	11	37.94
3	12	41.38
4	3	10.34
5 (Most followed)	2	6.90
Total	29	100

- Management Analyzing Various Risk Management Techniques

From the response received during the research, it was found that the management analyzing various risk

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management techniques are rarely with the MS of 1.96 on the Likert scale and SD of 0.77 (Table 4).

Table 4.Management analyzing various risk management techniques from contractor's perspective

Rate	Frequency	Percentage
1 (Least analyzed)	9	23.25
2	12	44.20
3	8	25.60
4	0	0
5 (Most analyzed)	0	0
Total	29	100

Risk Management Practice, Client's Perspective

Risk management practice of urban road construction projects from the client's perspective has been obtained from the statistics of management awareness regarding risk management, statistics of management practising risk management formally or informally, statistics of management practising the risk management formally, statistics of management analyzing various risk management techniques.

- Management Awareness Regarding Risk Management

As per the 12 responses received during the research, it was found that the managements are highly aware regarding the risk management with the mean score of 4.08 on the Likert scale and standard deviation (S.D) of 0.79 (Table 5).

Table 5.Management awareness regarding risk management from client's perspective

Rate	Frequency	Percentage
1 (Least Aware)	0	0
2	0	0
3	3	25
4	5	41.67
5 (Most Aware)	4	33.33
Total	12	100

- Management Practicing Risk Management Formally or Informally

From the response received and Appendix, it was found that the managements practising the risk management formally or informally are often with the MS of 4.0 on the Likert scale and SD of 0.60 (Table 6).

- Management Practicing Risk Management Formally

From the total responded received, found that the managements practising the risk management formally are often with the MS of 3.66 on the Likert scale and SD of 0.88 (Table 7).

Table 6.Management practicing risk management formally or informally from client's perspective

Rate	Frequency	Percentage
1 (Least Practice)	0	0
2	0	0
3	2	16.67
4	8	66.66
5 (Most Practice)	2	16.67
Total	12	100

Table 7.Management practicing risk management formally or informally from client's perspective

Rate	Frequency	Percentage
1 (Least followed)	0	0
2	1	8.33
3	4	33.33
4	5	41.67
5 (Most followed)	2	16.67
Total	12	100

- Management analyzing various risk managements techniques

From the response received, found that the managements analyzing various risk management techniques are some time with the MS of 2.88 on the Likert scale and SD of 1.19 as shown in Table 8.

Table 8.Statistics of management analyzing various risk management techniques from client's perspective

Rate	Frequency	Percentage
1 (Least analyzed)	0	0
2	7	58.33
3	2	16.67
4	1	8.33
5 (Most analyzed)	2	16.67
Total	12	100

Risk Response Strategy

Risk response strategy are analyzed by identifying potential risk of the project, analyzing the various methods of risk of the project, various method to response risk of the project, various preventive and remedial methods.

Various Methods to Identify Potential Risk of the Project, Contractor's and Client's Perspectives.

The various factors to identify the potential risk of the project are contract document, risk register, expert opinion, brainstorming and feedback from a similar project.

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Contractors used feedback from the previous similar project i.e. 89.65% out of total percentage to identify the potential risk of the project and clients used only 83.33% from the previous similar project (Figure 2). Contractors used 68.96%, 3.44%, 44.82% and 13.79% from the contract document, risk register, expert opinion and brainstorming to identify the risk of the project. Clients used 75.00%, 33.33%, 50.00% and 50.00% from the contract document, risk register, expert opinion and brainstorming to identify the risk of the project. Contractors never used any other methods different to identify the risk of the project, but the client used others 8% (i.e. site register) to identify the risk of the project.

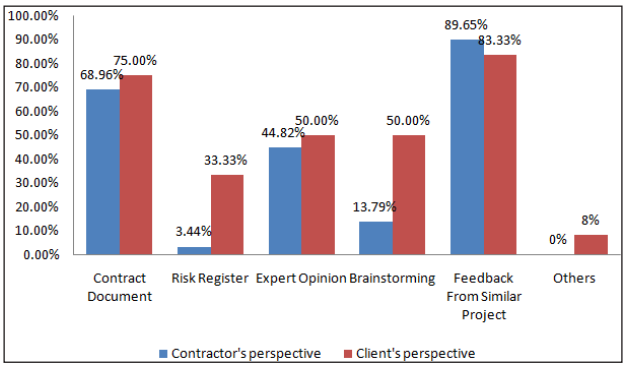

Figure 2.Risk identifying methods from contractor's and client's perspectives

Various Methods to Analyze Risk of the Project, Contractor's and Client's Perspective.

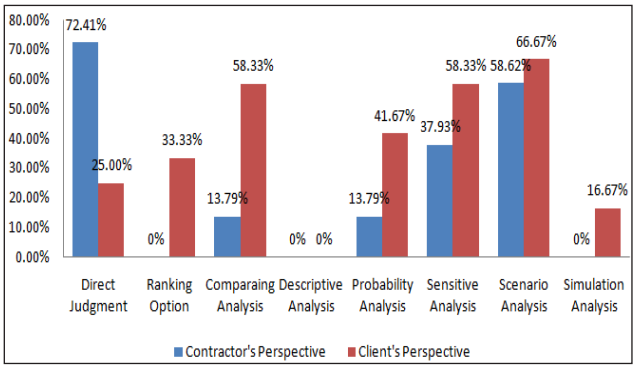

Figure 3.Risk identifying methods from contractor's and client's perspectives

The various methods to analyze the risk of the project are direct judgment, ranking option, comparing analysis, descriptive analysis, sensitive analysis, scenario analysis and simulation analysis.

The contractors used direct judgment i.e. 72.15% out of a total % to analyze the risk of the project and clients used only 25.00% from direct judgment (Figure 3). The contractor used 13.79%, 13.79%, 37.93% and 58.62% from the comparing analysis, probability analysis, sensitivity analysis and scenario analysis to analyze the risk of the project. Clients used 33.33%, 58.33%, 41.67%, 58.33%, 66.67% and 16.67% from the ranking option, comparing analysis, probability analysis, sensitive analysis, scenario analysis and simulation analysis to analyze the risk of the project. Contractors and clients both never used descriptive analysis to analyze the risk of the project. Clients used ranking option and simulation analysis but contractors do not use ranking option and simulation analysis to analyze the risk of the project.

Various Methods to Response Risk of the Project, Contractor's and Client's Perspectives.

The various methods to response risk of the project are accepting the risk, avoiding the risk, monitor the risk and prepare the contingency plan, transfer the risk, and mitigation the risk.

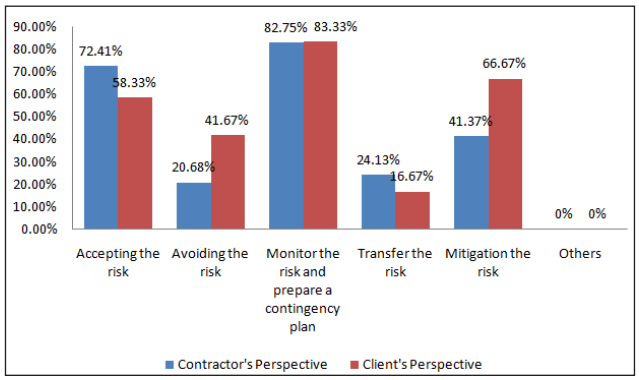

Figure 4.Risk response methods from contractor's and client's perspectives

The clients used 83.33% out of total and by monitoring the risk and prepare a contingency plan to risk response of the project but contractors used only 82.75% by monitoring the risk and prepare a contingency plan (Figure 4). Contractors used 72.41%, 20.68%, 24.13% and 41.37% by accepting the risk, avoiding the risk, transfer the risk and mitigation the risk to risk response of the project. Clients used 58.33%, 41.67%, 16.67% and 66.67%by accepting the risk, avoiding the risk, transfer the risk and mitigation of the risk to response risk of the project. Contractors and clients do not use any other methods to response risk of the project.

Preventive Methods, Contractor's and Client's Perspectives

Results in Figure 5 show that the contractors used the most, 70.35% out of total % through transfer or share the risk to/with other parties regarding previous and ongoing similar projects to prevents the risk of the projects but clients used only 63.33% through transfer or share the risk to/with other parties regarding previous and ongoing projects. Contractors used 68.96%, 62.75%, 58.30% and 29.65% through depending on subjective judgment to produce a proper program, produce a proper schedule by getting updated project information, utilize qualitative risk analysis techniques for an accurate time estimate

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and plan alternative methods as stand by to prevents the risk of the project. Clients used 65.00%, 56.66%, 55.00% and 55.00% through depending on subjective judgment to produce a proper program, produce a proper schedule by getting updated project information, utilize qualitative risk analysis techniques for an accurate time estimate and plan alternative methods as stand by to prevents the risk of the project.

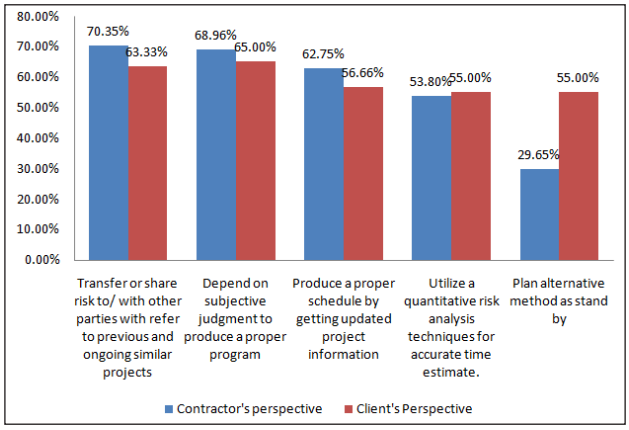

Figure 5.Preventive methods from contractor's and client's perspectives

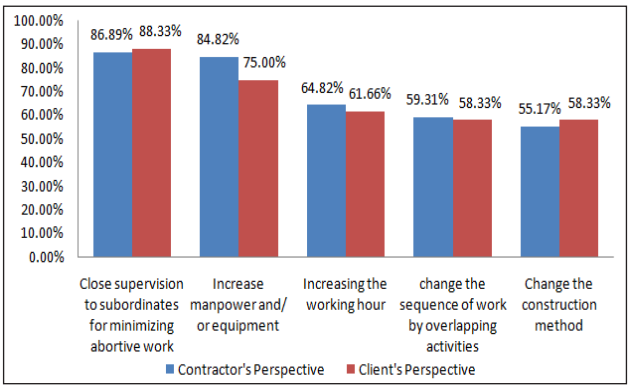

Figure 6.Remedial methods from contractor's and client's perspectives

Remedial Methods, Contractor's and Client's Perspectives

Results from Figure 6 show that the clients used most 88.33% out of total % through close supervision to subordinates for minimizing abortive work for remedial risk of the project but the contractors used only 86.89% through close supervision to subordinate for minimizing abortive work. Contractors used 84.82%, 64.82%, 59.31%, 55.17% through increase manpower and or equipment, increasing the working hour, change the sequence of work by overlapping activities and change the construction method for remedial risk of the project. Clients used 75%, 61.66%, 58.33% and 58.33% through increase manpower and or equipment, increasing the working hour, changes the sequence of work by overlapping activities and changes the construction method for remedial risk of the project.

Conclusion

This study indicates that from the contractor's perspective more than 60% of the respondents believe that their top managements are average aware regarding the risk management with a mean score of 3.44. Further, it was also found that risk management is being averagely practised either formally or informally by the urban road construction projects with a mean score of 3.06. The research shows a slight decrease in informal risk management practice with a mean score of 2.79. Further, it also found that various risk management techniques followed are very less with a mean score of 1.96. From the client's perspective, more than 80% of the respondents believe that their top managements are highly aware regarding the risk management with means score of 4.03. Further, it also found that risk management is being highly practised either formally or informally with a mean score of 4.0. The research shows a slight decrease in informal risk management practice with a mean score of 3.66. Further, it also found that various risk management techniques followed are average with a mean score of 2.66.

The research also showed that the risk response strategy from the contractor's perspective for various methods to identify the potential risk of the project, feedback from a similar project plays the most significant role with 89.65%. Furthermore, for various methods to analyze the risk of the project, direct judgment has the highest significant with 72.41%. Also for various methods to response risk of the project, monitoring the risk and preparing the contingency plan plays the most significant role with 82.75%. On the other hand from the client's perspective for various methods to identify the potential risk of the project, feedback from a similar project plays the most significant role with 83.33%. Furthermore, for various methods to analyze the risk of the project, scenario analysis has the highest significant with 66.67%. Besides various methods to response risk of the project, monitoring the risk and preparing the contingency plan plays the most significant role with 83.33%.

Recommendation

- Risk should be managed by one who is capable of managing the particular risk by managing contractual obligation with proper contract administration practices for ensuring the project objectives.
- There should be risk register at the site and frequent meetings should be conducted to identify the risks. This identified risk should be documented properly to ensure expertise for future projects.
- Effective cash flow management should be enforced based on schedule and resource planning with agreements including suppliers.
- Clients and contractors should conduct continuous training programs to advance managerial and financial practices to explain the internal and external risk

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affecting the construction industry and to initiate the proper ways to deal with such factors.

- The government, non-government, clients as well as contractors should develop a risk management manual so that probable risks are mitigated before and during construction.

Limitation of Research

The limitation of this study was that the research was limited only to the Siddharthanagar Municipality, Rupandehi, Nepal. Only contractor's and client's perceptions were considered for the study as consultants were considered as the client's representative.

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