RISK MANAGEMENT IN CONSTRUCTION FIRMS IN NEPAL

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Abstract

The main purpose of this study is to identify and focus on major factors that affect risk management in construction sites in developing countries like Nepal. Relative Importance Index (RII) analysis is carried outto rank major factors that affect risk management. Besides, ANOVA analysis is carried out to test the hypothesis. Findings show that there is no difference between small and large-scale project groups in their perception of the significance level of factors affecting Project Risk Management. Moreover, "a) payment delay b) project funding problem, and c) defective design" were top three major factors that affect risk management in developing countries like Nepal. The managerial level of construction firms mainly in developing countries, should focus on the top ten critical factors for better improvement of risk management no matter its size- be it ~~is~~ small- or large-scale construction firms.

Keywords: Risk management, RII and ANOVA analysis, Nepal, Construction industries

1. Introduction

Project Risk Management (PRM) is a critical component of project management as risks that are not well-managed may lead to project failures (Zhao et al., 2014). Risk management is an important field of construction industry and has gained more importance internationally due to the latest researches carried out on a large scale. However, this relatively new field requires more attention to bring some benefits. Construction projects are facing several risks which have negative effects on project objects such as time, cost, and quality. Project Risk management (PRM) should be assuring the completion of project objectives, regardless of project size (Kalkhoran et al., 2014). A risk-free project results in a zero-dispute situation so that there is a reasonable profit for the parties involved in a project. Construction Managers need to know how to balance the contingencies of risk with their specific contractual, financial, and organizational requirements. To achieve this balance, proper Risk identification and Risk analysis are required at any stage of a life cycle as a project is plagued with various risks due to its complex and dynamic nature (Zhao et al., 2009). Thus, Project Risk Management (PRM) should be emphasized and implemented in construction projects, regardless of the project size, to assure the completion of project objectives. In addition, project risk is an uncertain event that, if it occurs, risk identification impacts at least one project objective (e.g. quality, cost, time, etc.), and PRM intends to increase the probability and impact of positive events and decrease the probability and impact of negative events in the project. Thus, PRM implementation would improve project performance by assuring the completion of project objectives and pursuing opportunities to increase the positive impacts on these objectives. The PRM process consists of qualitative and quantitative risk analysis, risk response planning, and control. In addition, PRM has been considered as project management knowledge and it enables stakeholders to understand risk impacts on project performance (Chapman & Ward, 2003).

1.1. Objectives

The objectives of the study can be highlighted as follows:

- To identify major factors that affect risk management in construction site.
- To find out if there is any difference between small and large-scale project groups in their perception of the significance level of factors affecting Project Risk Management. (Here, small project is considered to consist of one or two teams and a large project to consist of 10 or more

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teams).

1.2. Background

1.2.1. Benefits of Project Risk Management

Construction firms should implement PRM because construction businesses are usually plagued with complex and diverse risks (Deng et al., 2014) and they mainly depend on construction projects to earn revenue and profits. Previous studies indicated that PRM can bring about some benefits. The researcher revealed that the benefits of project risk analysis and management included the formulation of more realistic plans, an increased understanding of the risks in a project, the assessment of contingencies that reflected the risks, the increased benefits from more rational risk-taking, as well as the identification of the party best able to handle a risk (Simister, 1994).

Also, the researcher pointed out that PRM allowed decision-makers to confront risks in a more realistic manner and thus improved decision-making (Mok et al., 1997). The authors indicated that in addition to helping projects completed on time and within budget, PRM could develop different scenarios with different impacts, clarify the importance of project risks, and make management aware of possible project outcomes (Ali, 2000).

The researcher found that proper PRM can reap great benefits in terms of reducing technical and programmatic risks (Pennock & Haimes, 2002). In addition, the author believed systematic risk management could produce a series of benefits, including a cost-benefit assessment of risk control actions, removal of unnecessary contingency, clear recognition and acceptance of risk at an early stage to avert risks at the minimum cost, and achievement of realistic cost estimating by itemizing and quantifying risks (Mills, 2001).

Moreover, researcher argued that PRM should become fully integrated into both the management of projects and into the organizational culture, and then projects teams can gain full benefits from PRM. Furthermore, researcher proposed a co-operative risk management model and indicated that construction projects can benefit from this model in the form of shorter decision-making, less transaction costs or better allocation of risks to the parties that can best handle them. To implement PRM properly, reduce losses, and obtain the potential benefits, various resources should be invested. In the long run, the benefits can far outweigh the resources invested in PRM (Klemetti, 2006).

Thus, the resources invested can be justified by the benefits and PRM becomes convincing. However, few studies have investigated the amount of resources invested in construction PRM. Hence, this study attempts to investigate the resources distributed to PRM and the association between these resources and PRM effectiveness and impact on project outcomes

1.2.2. Project Risk Management in the Construction Industry

A study from Nepal (Koirala, 2014) identifies the risks involved in housing and real estate construction projects in Nepal and ranks them as per the severity. Housing and real estate act and policy, socio-economic and political stability should be in favor of housing and real estate for minimizing the risk and professional practice that can mitigate the risk, which is a good practice of project management, and management-based collaboration is a tool that can mitigate the risk against some of the most common causes of loss, disputes, delays and quality issues which potentially undermine the success of a project (Koirala, 2014).

Researchers from Pakistan (Iqbal et al., 2015) enlisted top ten risks which have been highlighted and discussed in detail: a) payment delays; b) project funding problems; c) accidents/safety during construction; d) defective design; e) inaccurate execution plan/schedule; f) poor performance of subcontractors; g) exchange rate fluctuation and inflation; h) improper scope of work definition in a contract; i) poor quality of materials and equipment, and j) shortage/delay of material supply. A contractor is responsible for most of the risks under his direct responsibility (Iqbal et al., 2015). Similarly, a study in Lithuania enlisted from risk matrix that D1 (design errors and omissions), C1 (construction cost overruns), and PM2 (scheduling errors, contractor delays) are required further analysis, including quantification, and aggressive risk management (Banaitiene & Banaitis, 2014).

Mania et al. (2016) concluded that a low level of top management support in risk commitment led to insufficient allocation of resources for risk management. Lack of effective decision-making and stakeholder involvement by top management affected effective risk management. The study

established that poor project management skills in project teams affected effective risk management (Maina et al., 2016).

A study carried out in Singapore (Deng et al., 2014) concluded that a higher proportion of costs was invested in PRM than time and labor resources and that more resources invested would not necessarily lead to a higher level of PRM effectiveness and greater assurance with the achievement of project objectives (project constraint i.e. time, cost and quality). A research from India pointed 13 general types of risk and rank with environmental risk, design risk, and financial risk as 1st, 2nd, and 3rd major risk factors in risk management (Vidivelli & Surjith, 2014). Researchers from Poland concluded that construction companies and investors started to appreciate the tools in the form of schedules or computer analysis for effective investment planning (Hola et al., 2017). It was realized that a correctly executed project plan and risk identified at the outset may at a later stage turn into success for the project. Such measures have become necessary, taking into account at least the delays in the implementation of many key investments (Hola et al., 2017). A study from Finland pointed out network relationship primarily between a contractor, client, and sub-contractor, and risks are related to both project success factors, and problems in project risk management (Klemetti, 2006).

2. Research Methodology

2.1. Questionnaire Design

Based on the above-mentioned previous works, overall 20 attributing factors for risk in construction questionnaires is designed with the hope for extraction of respondents' opinion or perception on different attributes of major 5 latent within recent practices of safety in a construction site. Five-point Likert type scale ranging from 1 (strongly agree) to 5 (strongly disagree) is selected. Taking item R1 as an example which states that "Poor quality of material and equipment", the respondent can frankly choose a number from 1 to 5 based on his/her understanding and working experience. The higher the agreement of statement of attributes, the lower the number will be chosen by respondent. Relative Important Index (RII) by and ANOVA analysis is used with the help of Excel 2017 and SPSS 23 respectively.

Moreover, the project is divided as small/large on the basis of number of team members on each project during the study time. Here, a small project consists of one or two teams, and a large project consists of 10 or more teams (Lindsjørn et al., 2018).

Hypothesis:
Ho: There is no difference between small and large-scale project groups in their perception of the significance level of factors affecting Project Risk Management.

2.2. Questionnaire response

Although 50 samples of questionnaires had been sent, only 33 candidates responded to the questionnaires. Out of these 33 feedbacks, 3 were incomplete making the number of valid responses to 30; or 60 percentage of the total questionnaire sent. The percentage of total replies is 66% out of the total 50 sent. Similarly, out of 33 filled, 16 are large-scale project respondents and 17 are small-scale project respondents. The division of different group of respondents is shown in Fig. 1.

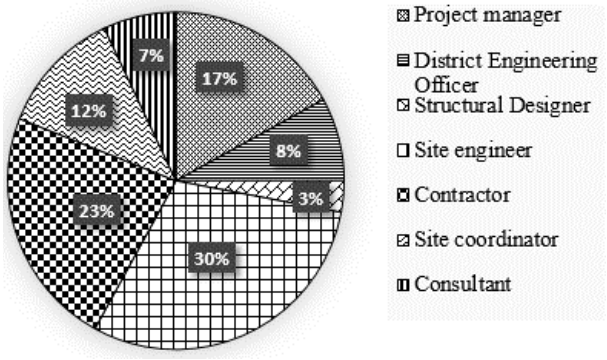

Fig 1: Division of a different group of respondents

2.3. Data analysis

Generally, RII is used to evaluate attitude by using the equation (1).

$$\textit{Relative Importance Index} = \frac{\sum w}{B.N}, (0 \leq index \leq 1) \quad (1)$$

Here, w = weighting of each factor by respondents from 1 to 5. Where 1 is for very low significance and 5 for very highly significance. B = highest weight (5). N= total number of respondents.

2.3.1. Ranking by RII for Overall Response

The output of ranking for all factors is shown in the Table 1 and it shows that the following four factors are very high significant factors for risk management: payment delay, project funding problem, defective design, and accident/safety during construction.
Table 1: Ranking by RII technique of significant

factors for overall respondents

Code	Factors	RII Index	Rank	Adjust ranking
R2	Payment delay	0.842	1	1
R5	Project funding problem	0.822	2	2
R3	Defective design	0.789	3	3
R6	Accident /safety during construction	0.769	4	4
R4	Inaccurate execution plan/ schedule	0.762	5	5
R1	Poor quality of material and equipment	0.756	6	6
R20	Delay in material supply	0.742	7	7
R19	Poor performance of sub-contractor	0.729	8	8
R7	Risk of insufficient technology	0.709	9	9
R18	Shortage of plant and equipment	0.696	10	10
R17	Improper scope of work definition in a contract	0.696	10	11
R8	Exchange rate fluctuation and inflation	0.689	12	12
R16	Lack of qualified staff	0.669	13	13
R9	Poor competent and productivity of labor	0.656	15	14
R15	Risk of change in codes and regulation	0.656	15	15
R10	Delay in availability of drawing	0.642	16	16
R14	Political instability	0.636	17	17
R13	Inadequacy of insurance	0.589	18	18
R11	Risk of different site condition	0.542	19	19
R12	Risk of changes in the scope of work	0.536	20	20

Ranking by RII for Small-scale Project:

The output of ranking for all factors for small scale project are shown in the Table 2 and it shows that the very high significant factor risk management are:1) payment delay 2) accident /safety during construction 3) Project funding problem and 4) inaccurate execution plan.

Ranking by RII for large scale project:

The output of ranking for all factors for large-scale projects is shown in the Table 3 and it can be seen that very high significant factors for cost overrun are:1) accident /safety during construction 2) project funding problem 3payment delay and 4) poor quality of material and equipment.

Table 2: Ranking by RII technique of significant factors small scale project

Code	Factors	RII Index	Rank	Adjust Ranking
R1	Payment delay	0.8455	1	1
R6	Accident /safety during construction	0.8092	2	2
R5	Project funding problem	0.7546	3	3
R4	Inaccurate execution plan	0.7365	4	4
R3	Defective design	0.7183	5	5
R1	Poor quality of material and equipment	0.7183	6	6
R18	Shortage of plant and equipment	0.6637	7	7
R17	Improper scope of work definition in a contract	0.6455	8	8
R16	Lack of qualified staff	0.6455	11	9
R15	Risk of change in codes and regulation	0.6455	11	10
R19	Poor performance of sub-contractor	0.6455	11	11
R8	Exchange rate fluctuation and inflation	0.6274	12	12
R7	Risk of insufficient technology	0.6092	13	13
R9	Poor competent and productivity of labor	0.5910	15	14
R18	Shortage of plant and equipment	0.5910	15	15
R10	Delay in availability of drawing	0.5728	16	16
R14	Political instability	0.5546	18	17
R12	Risk of changes in scope of work	0.5546	18	18
R11	Risk of different site condition	0.4819	19	19
R13	Inadequate of insurance	0.4637	20	20

Risk types variables R1, R3, R4, R5, R6, R18, and R16, are found in the top ten ranking between small and large-scale projects. It means that the factors that

are very significant to the small and large-scale project are similar.

Variables R2, R5, and R9 null hypotheses are rejected because their value is less than 0.05 (significant level) (Table 4). So, our hypothesis "Ho=0, There is no difference between small scale project groups and large-scale project groups in their perception of the significance level of factors affecting risk management in the construction site." is true.

Table 3: Ranking by RII technique of significant factors for large scale project

Code	Factors	RII Index	Rank-ing	Adjust ranking
R6	Accident /safety during construction	0.855	1	1
R5	Project funding problem	0.819	2	2
R2	Payment delay	0.764	3	3
R1	Poor quality of material and equipment	0.746	4	4
R18	Shortage of plant and equipment	0.728	6	5
R4	Inaccurate execution plan / schedule	0.728	6	6
R3	Defective design	0.674	7	7
R9	Poor competent and productivity of labor	0.655	11	8
R10	Delay in the availability of drawing	0.655	11	9
R16	Lack of qualified staff	0.655	11	10
R11	Risk of different site conditions	0.655	11	11
R13	Inadequate of insurance	0.637	12	12
R12	Risk of changes in the scope of work	0.619	13	13
R14	Political instability	0.601	15	14
R15	Risk of change in codes and regulation	0.601	15	15
R20	Delay in material supply	0.583	16	16
R19	Poor performance of subcontractor	0.564	18	17
R7	Risk of insufficient technology	0.564	18	18
R8	Exchange rate fluctuation and inflation	0.492	19	19
R6	Accident /safety during construction	0.474	20	20

Table 4: Comparing variables between small-scale projects and larger-scale projects by one-way analysis.

Code	Risk factor	Asymp. Sig
R1	Poor quality of material and equipment	0.408
R2	Payment delay	0.049
R3	Defective design	0.776
R4	Inaccurate executive plan/ schedule	0.279
R5	Poor funding problem	0.0063
R6	Accident/safety during construction	0.284
R7	Risk of insufficient technology	0.090
R8	Exchange of rate fluctuation and inflation	0.065
R9	Poor competent and productivity of labor	0.0068
R10	Delay in availability of drawing	0.889
R11	Risk of different site condition	0.872
R12	Risk of change in scope of work	0.182
R13	Inadequacy of insurance	0.109
R14	Political instability	0.383
R15	Risk of change in codes and regulation	0.194
R16	Lack of qualified staff	0.151
R17	Improper scope of work definition in a contract	0.377
R18	Shortage of plant and equipment	0.136
R19	poor performance of subcontractor	0.345
R20	Delay in material supply	0.517

3. Discussion

The findings of the study provided a major critical risk factor that makes a huge impact on the success of any project in the context of developing countries like Nepal. The project manager and managerial level staff need to focus on major factors during the implementation of the project. Moreover, this study

also provides information to the managerial level that policy needs an equal level for risk management in a construction firm regardless of the project size.

4. Conclusions

This study describes the way respondents perceive different types of risk particularly to a construction project in Nepal. Out of 20 risks incorporated into a questionnaire, the top ten risks have been highlighted and discussed in detailed: a) payment delay b) project funding problem c) defective design d) accident /safety during construction e) inaccurate execution plan/ schedule f) poor quality of material and equipment g) delay in material supply h) poor performance of sub-contractor i) risk of insufficient technology and j) shortage of plant and equipment. Many prime factors that affect risk management in a construction site is pointed from the literature review. Data analysis shows that there is no difference between small-scale project groups and large-scale project groups in their perception of the significance level of factors affecting risk management in construction sites. RII method also supports our hypothesis showing similar factors affecting risk management in construction sites in both small and large organizations.

5. Limitation

This study used a cross-sectional study so further research is expected to implement interview or longitudinal data analysis. Moreover, more empirical detail studies can be carried out to determine mediator and moderator factors that can play an important role in risk management in a construction firm. In addition, the study area only covered the construction sites of Kathmandu valley and further research including sites all over the country is recommended.

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