Risk Factors and its Impact on the Success of Construction Firms: Comparative Study between Pakistan and Nepal

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Abstract— **The main purpose of this research is to identify major risk factors that impact the success of any project. Besides, this study tries to present the real state of risk management of all categories of construction (Private, Public, INGOs) in developing countries. Conceptual SEM path model is considered, and a comparative study is made between Nepal and Pakistan by using SPSS and AMOS software for analysis. A total of 300 complete responses were collected from professional technical workers via structural questionnaires in both nations. "Design Risk" and "Fraudulent Practice and Security Risk" are important predictors, which influence significantly the success of construction firms in both nations. Moreover, from the evaluation process with the application of the Maximum Degree of Membership (MDM) principle, we identified that in both countries all nature of construction firms is in poor range in terms of risk management. The study also organizes an innovative contribution to risk management literature and fills a methodology gap in developing countries in South Asia. Moreover, the finding of our research can be fruitful to formulate risk management policy, strategy, and planning for developing countries in the future.**

Keywords— **Risk causing factor; Risk management; the success of a project; AMOS; SPSS**

I. INTRODUCTION

Risk is a measure of the possibility and result of not achieving a defined project aim [1], that can be distributed, diminished, managed, handover or accepted and if not huge impact, can be overlooked [2].

Similarly, the risk is an introduction to a condition that drags to unfavorable results while project risk can be categorized into the positive and negative aspects of risk [3]. Moreover, the risk is defined as a situation where projects need to suffer a destructive result [4].

Factors of risk can be overlying as the impact of one risk factor can generate another risk [3]. To achieve the success of the project, an investigation of risk is a vital aspect of construction project risk management. In construction, project risk cannot be removed but can be transferred or diminished [5-7]. Proper handling of project risk in each stage of the project life cycle is vital to upgrade project success rates [7, 8]. Unluckily, compared to other industries, the construction industry has a tag name to have a weak risk investigation [9]. Various construction project suffers from insufficient and poor identification of risk investigation [10]. So, effective project risk management should be implemented by which any project would be able to identify various obstacles in risk management along with its strategies to defend these risk factors [11, 12].

Identifying new risks, in a new environment and a politically unstable country like Nepal and Pakistan is difficult for a new professional. Such threats and impacts of relationships within them are more challenging to determine. Many previous works of literature pointed out various risk factors with different natures of the project in various countries around the world as shown in Appendix C. We are using 6 risk factors among them in our research, which are pointed as a factor by various literature reviews namely; designer risk, logistic risk, management risk, government risk, legal and regulation risk, fraudulent practice, and security risk.

Safety is a vital problem for various projects in the construction firms pragmatically and conceptually [1]. Each construction project needs to face various nature of risk and variation in risk depending on technology in use, construction place, legal status, the magnitude of the project, etc. However, if we try to summarize, we can identify some critical risks that are common for all nature construction projects. So, proper risk management aspects should be wisely implemented to gain success in any project. Thus, to make the benefit of risk management to the front-line leader of a construction project, a model or framework need to be investigated on the critical risk factors and their impact on project success. The core objective of this research is to provide information about critical risk factors along with their indicators, which affect the success of the project in the estimated time, targeted cost by forming a conceptual SEM-PLS model. The finding of this research provides ideas on the critical risk factor that has been a barrier to the success of the project for project frontline practitioners (mainly contractors, consultant and manager level) so that they can make policy and strategy during the implementation of risk management with the focus of critical risk factors. Moreover, a comparative study between two developing countries will show the real state of risk management in concerned countries.

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II. LITERATURE REVIEW

A. Designer risk

Designer risk is a condition where designers are unable to design as per the obligation of the project. Many previous researchers have pointed out many indicators under designer risk that impact the success of the project. Some of the grave indicators identified from earlier literature are: inappropriate specification design [2-4], variation in design [4-6], insufficient site investigation [2, 5, 6], inaccurate cost estimation [5, 7, 8], construction design time delay [5, 6, 9, 10] and unfamiliarity with standards and codes [7, 11] are major critical risk pointed by earlier pioneers.

B. Logistic Risk

Risk on the total method of managing project resources from purchase, store, and delivery to the final destination can be termed as logistic risk. Through literature reviews, some logistic risk factors are identified, which is taken as a major risk in a construction firm. Insufficient equipment accessible [2, 12, 13], inadequate operators and qualified workers [2, 12, 13], weak communication between head and site office [3], the indeterminate scope of working [3], inadequate transportation facility [2] and non-available of maintenance [2] are threatening logistic risk pointed out from previous studies.

C. Management risk

Management risk is among the critical construction risk of firms that affect the success of the project. This research tries to diagnose various critical indicators of managing risk and identified some major indicators that impact success of project namely uneven management [13, 14, 22, 36], uncertain or low productivity [13, 16, 22, 36], labor arguments and strikes [17], the inadequate standard of quality [17, 28], safety and health problems [17, 36], lack of inspiring attitude [28] and poor site administration and supervision [20]. These are major indicators of management risk identified by many previous researchers in their research work.

D. A legal and regulation related risk

The government has not developed a clear policy structure because of constantly shifting government structure and thus, legal and political risk factors play a significant role in the success of the project [37]. Authorities and regulation requirement [25, 38], altered contract form or breach of contract claims and disputes [22, 25], change in rules and regulation or unstable legal framework [16, 24], lack of legal infrastructure (training scheme, intellectual property protection) [21, 22, 25], lack of historical records about accidents and risk registration [21, 39, 40] and insufficient legal system [41] are main risks under legal and regulatory risk.

E. Government Risk

From the conceptual phase of the project, political risk starts [42]. Donation to a political party, strike, interfering by the political parties, and certificates and licenses postponement due to political changes are critical political risk in the context of Nepal [37]. The bureaucracy of government [17, 27], extreme dealings for government approvals [17, 27], relations with the government [26, 27, 30, 43], government instability [30, 44], taxation on imported material [26, 45] and inconsistency of government policies [22, 46] are serious government risk indicator indicated by many researchers in their study which is suitable, too, in the context of Nepal.

F. Fraudulent practice and security risk

The term ‘fraud’ usually includes events such as theft, corruption, conspiracy, misuse, money laundering, bribery and extortion. Fraudulent practice and security risk contain major critical risk. Corruption including bribery at sites [21, 30], education level and poverty [21, 47], terrorism and sabotage [21, 48, 49], leakage of sensitive information [21, 50, 51], theft [21, 26, 39] and a threat to stamp (kidnap or murder) [21] are critical fraudulent practice and security risk pointed by numerous researcher.

G. Success factor

The efficiency of the project, influence on the purchaser, preparing for the upcoming days, and success of the business are four aspects of project success [52]. Traditionally, general conditions of project success were calculated by time, quality, and cost namely the iron triangle [53]. Lim and Mohamed [54] discussed that project success should be observed from a macro point such as time, satisfaction, effectiveness, and strategy. The following indicators were used in the questionnaire for study; support from the government sector [32, 55, 56], clear responsibility and role [32, 55], appropriate resource allocation [32, 57], innovative and critical thinking [32, 55], appropriate risk allocation and management [55, 57, 58] and top management commitment and support [55, 59].

III. METHODOLOGY

The application of Structural Equation Modeling (SEM) is very famous in construction management associated studies as it gives casual and effects connections between several dependents and independent variables [60]. Covariance Based SEM is used in this research as it is useful when the sample size is large, normality assumption meets and for the confirmatory study of theory as it uses ML estimation procedures in the SEM study [61, 62]. IBM SPSS statistic v.23 along with AMOS software is used for analysis.

A. Questionnaire design

To evaluate the model and study the hypotheses, reflective constructs were extracted from numerous previous researches and some mandatory modifications were made to indicators to make them suitable for the research framework; 33 items were identified under six risk factors construct and 1-project success factors as shown in Appendix C. Likert scale with five range were 1 as (completely agree) and 5 as (completely disagree) was used to obtain respondents’ view/attitude.

B. Questionnaire participants profile

The participants of the survey are leadership and frontline employer on construction sites. We collected the responses from two countries Nepal and Pakistan. The dilemma of translating the questionnaire into the native language and simultaneous translation was avoided because it was needless to translate the questionnaire since the medium of teaching instruction was English in both countries. Besides, 330 participants in each country were approached and received the same number of responses. The final study maintained 300 available questionnaires for review after the deletion of incomplete answers. Table I displays the features of the participants.

TABLE I
SOCIO-DEMOGRAPHIC STATUS OF PARTICIPANTS

Variable and dimension	Nepal		Pakistan	
	No.	%	No.	%
Age				
20-25	100	33.33	97	32.33
26-35	167	55.67	153	51.00
36-45	19	6.33	37	12.33
46+	14	4.67	13	4.33
Work experience				
1-4 yrs.	107	35.67	148	49.33
5-8 yrs.	119	39.67	103	34.33
9-12 yrs.	42	14.00	25	8.33
13+ yrs.	32	10.67	24	8.00

Variable and dimension	Nepal		Pakistan	
	No.	%	No.	%
Education				
Higher Secondary	75	25	69	23.00
Undergraduate	168	56	143	47.67
Graduate	51	17	77	25.67
Post graduate	6	2	11	3.67
Construction nature				
Private	85	28.33	90	30
Public	117	39.00	111	37
INGOs	98	32.67	99	33

IV. RESULT

SPSS 23 was used for preliminary analysis to confirm the suitability of the data for SEM. Moreover, AMOS 23 software was used to examine the model fit and our hypotheses. Similarly, the measurement model was tried to guarantee the legitimacy of the construct. At last structural model was utilized to test the hypotheses theories.

A. Preliminary analysis

The sample of 300 arrangements of response was esteemed satisfactory for SEM investigation as it surpassed the edge level of 200 [64]. Besides, g-power analysis (Appendix D, Fig 1) also showed that number of respondent for SEM modeling should be greater than 225, which also justified that the respondent size is sufficient for further analysis. During exploratory factor analysis, pioneer researcher indicated that the KMO value should be more than 0.7 indicated that there were enough items for each model component , and the Bartlett value should be meaningful for p-values less than 0.005 indicated that the matrix of correlation was substantially different from the matrix specified [14] as shown in Appendix B.

Moreover, all skewness values of each indicator of all constructs in all models were between +1.96 to -1.96 confirmed that the data were normally distributed [65]. Similarly, Variance Inflation Factor (VIF) was below the cutoff value 10 along with all tolerance values were more than cutoff value 0.1 as soon in Appendix G. This rationalize that respondent data were acceptability absence of multi-collinearity problem **[66]**. The HTMT ratio of correlations between the model constructs is expressed in Appendix A. Heterotrait-Monotrait Ratio (HTMT) value is below the threshold of 0.9. This confidential data is discriminant validity [67] as soon in Appendix A.

All the Durbin-Watson esteems value was near 2, showing that the data were free from autocorrelation [68]. Common Method Bias (CMB) was checked by the implementation of SPSS by Harmon's one-factor test. The resulting output confirmed that data were free from CMB as the first factor described only 16.28% for Nepal, 14.65% for Pakistan, which is less than the cutoff variance of 50% [69].

B. Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was carried out to examine standardized factor loading, reliability, and validity for the variable as shown in the fig 2 and Fig 3 in Appendix H.. Where, Cronbach's alpha, average variance extracted (AVE), and composite reliability (CR) is used to access the validity and reliability of the latent construct. Some items are removed out which had outer loading (0.4 to 0.6) as shown in Appendix E to improve the reliability and validity of the construct [66]. Moreover, the Correlation matrix in Appendix E and F illustrated that the correlation among the independent variable didn't surpass the critical level of 0.90 or was not less than the cutoff value of 0.7[66].

Appendix E and F demonstrate descriptive statistics, discriminant validity, AVE value, and CR values for constructs. All construct Cronbach's alpha values which measured internal consistency of construct were above 0.7, showing good reliability [70]. CR values were also used to assess the internal consistency of the constructs. As all constructs had CR values above the threshold of 0.7 [66], we determined that they were internally consistent with the measurement model.

Moreover, all the construct AVE values surpass the minimum value of 0.5 as suggested by pioneers in research [71]. Besides, the square root of AVE was larger than the intersecting value of the variable and other variables in the measurement model represents satisfactory discriminant validity of the measurement model [66]. Moreover, model fit outputs for Pakistani construction firm showed that model is in good acceptance fit, in terms of the indicators: X2 = 790.680, df (Degree of Freedom) = 467, X2/df =1.693, goodness-of-fit index (GFI)= 0.871, comparative fit index (CFI) = 0.942, Tucker–Lewis index (TLI) = 0.935, and root mean square error of approximation (RMSEA) = 0.048, PCLOSE =0.696 and Standardized RMR =0.0503.

Similarly, model fit outputs showed that model is in good acceptance fit, in terms of the indicators: X2 = 726.700, df (Degree of Freedom) = 472, X2/df =1.540, goodness-of-fit index (GFI) = 0.875, comparative fit index (CFI) = 0.965, Tucker–Lewis index (TLI) = 0.960, and root mean square error of approximation (RMSEA) = 0.042, PCLOSE =0.981 and Standardized RMR = 0.0394 in context of Nepalese construction firms. The values obtained from the analysis meet all the cutoff criteria and fulfills the model fit indices [72].SEM applied in AMOS was used to examine the direct hypotheses. We created a 5000 sub-sample at a 95% level of significance by bootstrapping technique. For Pakistan, the output was X2/df =1.935, CFI= 0.957, TLI = 0.919, P close= 0.035 and RMSEA = 0.056. Similarly, the output for Nepal was X2/df =1.630, CFI= 0.926, TLI = 0.954, P close= 0.879 and RMSEA = 0.046, that demonstrates support of model fit as suggested by pioneers [15].

TABLE II
SUMMARY OF HYPOTHESIS TESTING IN CONSTRUCTION FIRMS IN PAKISTAN

Hypothesis	Relationship			Estimate	Standard error	Critical ratio	P	Test results
H1	SF	<---	MR	0.096	0.048	1.998	0.022**	Supported
H2	SF	<---	GR	0.135	0.046	2.966	0.041**	Supported
H3	SF	<---	DR	0.170	0.049	3.503	0.005***	Supported
H4	SF	<---	LR	0.093	0.048	2.894	0.015**	Supported
H5	SF	<---	FR	0.139	0.048	2.894	0.000***	Supported
H6	SF	<---	FP	0.118	0.048	2.467	0.005***	Supported

Note: *** indicates that p<0.001, ** indicate p<0.05

TABLE III
SUMMARY OF HYPOTHESIS TESTING IN CONSTRUCTION FIRMS IN NEPAL

Hypothesis	Relationship	Estimate	Standard error	Critical ratio	P	Test results
H1	SF <--- MR	0.16	0.047	3.414	0.000***	Supported
H2	SF <--- GR	0.126	0.042	2.987	0.003***	Supported
H3	SF <--- DR	0.128	0.042	3.035	0.002***	Supported
H4	SF <--- LR	0.231	0.044	5.266	0.000***	Supported
H5	SF <--- FR	0.092	0.041	2.226	0.026**	Supported
H6	SF <--- FP	0.156	0.047	3.309	0.000***	Supported

Note: *** indicates that p<0.001, ** indicate p<0.05.

We tested six hypotheses for the study. The output showed that Legal and Regulation related Risk (FR) had strong direct relation with project Success Factor (SF) with ($\beta = 0.139$, $p < 0.001$). Similarly, FP (Fraudulent Practice and Security Risk) and DR (Designer Risk) had second strong direct relationship with Project Success Factor (SF) with ($\beta= 0.188$, $p < 0.001$) and ($\beta = 0.17$, $p < 0.001$) respectively. Moreover, LR (Logistic Risk), MR (Management Risk) and GR (Government Risk) show moderate significant only at 5% level of significant with ($\beta = 0.093$, $p < 0.05$), ($\beta = 0.096$, $p < 0.05$) and ($\beta=0.135$, $p<0.05$) respectively as shown in table II.

Similarly, we tested six hypotheses presented in table III. The output showed that all construct except legal and regulation related risk (FR), supported at 1% level of significant. FP (Fraudulent Practice and security risk), MR (Management Risk) and LR (Logistic Risk), had strong direct relation with project Success Factor (SF) with ($\beta = 0.156$, $p < 0.001$), ($\beta = 0.16$, $p < 0.001$) and ($\beta = 0.231$, $p < 0.001$) respectively. Similarly, DR (Designer Risk) and GR (Government Risk) had second strong direct relation with Project Success Factor (SF) with ($\beta = 0.128$, $p < 0.001$) and ($\beta = 0.126$, $p < 0.001$) respectively. Moreover, legal and Regulation related Risk (FR), had moderated direct relation with project Success Factor (SF) with ($\beta = 0.092$, $p < 0.05$) as shown in table III.

C. Evaluation process

The Personal Safety Education Program (PSEP) looks like a difficult assessment issue since the analysis includes thicknesses and influential variables. Various scholars used numerous assessment processes, but we used a systematic approach in this research to evaluate safety efficiency that is based on SEM. This assessment process consists of three phases (evaluation matrix, weight determination and analysis of result).

Evaluation matrix

PSEP's main goal is to improve safety performance by risk management at the construction site by identifying the issue and correct solution to remove it and enhance the success of the project. There is no question that frontline workers will only identify a big issue in the site with real experience of safety results. The ability of construction company evaluation can be upgraded by reuse of collected data from respondents (2 countries), as we do not need to invest and invite experts for performance evaluation by reuse of data from respondents. Data is analyzed with the use of thirty-three indicators from seven constructs. In the questionnaire, we opposed the same number of decisions as in the questionnaire of each indicator of each latent construct factor, which is represented by:

$$B_{ij}^{ln} = (i=1,2,3,4,5;\ j=1,2,3,4,5;\ l=1,2,3;\ n=1,2,3,4,5) \quad (1)$$

Here, i represent a number of predictor constructs and j represent several items of each construct. Similarly, n represent the base of judgment ranging from 1 (completely agree) to 5 (completely disagree). Higher the judgment better will be the safety performance in the site. Evaluation of safety performance is divided into 5 segments “I (excellent), II (good), III (fair), IV (poor) and V (very poor)”. Moreover, l stands for the construction firm category. The fraction sharing of each indicator is represented by B_{ij}^{ln} is calculated by eqn (2). The evaluation matrix for the fraction sharing of ith from regarding lth construction type is represented by the vectorB_i^l, is as shown in eqn (3).

$B_{ij}^{ln} = \frac{a_{ij}^{ln}}{\sum_{n=1}^{5} a_{ij}^{ln}}$i= 1, 2, 3, 4, 5; j=1, 2, 3, 4, 5; l=1, 2, 3; m = 1, 2, 3 ….5 (2)

$$B_i^l = \begin{bmatrix} B_{i1}^{l1} & B_{i1}^{l2} & B_{i1}^{l3} & B_{i1}^{l4} & B_{i1}^{l5} \\ B_{i2}^{l1} & B_{i2}^{l2} & B_{i2}^{l3} & B_{i2}^{l4} & B_{i2}^{l5} \\ B_{i3}^{l1} & B_{i3}^{l2} & B_{i3}^{l3} & B_{i3}^{l4} & B_{i3}^{l5} \\ B_{i4}^{l1} & B_{i4}^{l2} & B_{i4}^{l3} & B_{i4}^{l4} & B_{i4}^{l5} \\ B_{i5}^{l1} & B_{i5}^{l2} & B_{i5}^{l3} & B_{i5}^{l4} & B_{i5}^{l5} \end{bmatrix} \quad (3)$$

Weight determination

After verification of supportable discriminant and convergent validity (Appendix A,B,E and F), path coefficient value from the PLS model is implemented. By multiplying the ordinary regression coefficient by the standard deviation of the corresponding variable, the path coefficient performance resemblance grows. Assuming σij= (i=1,2,3,4,5; j=1,2,3,4,5) which shows value of path coefficient of j^{th} indicator in i^{th} form (model 1 and 2). The j^{th} indicator weight in the i^{th} indicator is represented by βij, obtained by eqn (4). All indicators wherein the ith form is given by eqn (5). Similarly, let xi (i=1,2,3,4,5) symbolize the value of path coefficient in ith form, ith form weight symbolized by wi can be gained by eqn (6). All the aspects of weight can be obtained by eqn (7).

$$\beta ij = \frac{\sigma_{ij}}{\sum_{j=1}^{5} \sigma_{ij}}, \text{ i=1, 2...5; j=1,2…5} \quad (4)$$

$$\beta i = [\beta i1\ \beta i2\ \beta i3\ \beta i4\ \beta i5] \quad (5)$$

$$wi = \frac{x_i}{\sum_{i=1}^{5} x_i}, \text{ i=1,2…5} \quad (6)$$

$$W= [w1\ w2\ w3\ w4\ w5] \quad (7)$$

Calculation and result

The efficient measurement of risk management helps in deciding to encourage the courage of obtaining the success of the project in construction sites. On the base of evaluation matrix P and weight matrix W, the extensive evaluation vector of the ith indicator regarding l^{th} construction group, denoted by Pi^l is calculated by eqn (8). Similarly, the extensive evaluation vector of the l^{th} construction stands as Pl, which is calculated by eqn (9). The Maximum Degree of Membership (MDM) principle [73] is implemented where the level of risk management evaluation is identified in such a way that maximum value within five-level is taken as a final result. For example, P1 with distribution (0.2, 0.3, 0.25, 0.27, 0.28), is rated as II (Good) as in the second level it has maximum value among all five-level.

$$P_i^l = \beta_i \, x \, B_i^l = [P_i^{l1}\ P_i^{l2}\ P_i^{l3}\ P_i^{l4}\ P_i^{l5}], i\text{=1,2…5; } l\text{=1,2,3} \quad (8)$$

$$Pl = W \text{ x } \begin{bmatrix} P_i^{l1} \\ P_i^{l2} \\ P_i^{l3} \\ P_i^{l4} \\ P_i^{l5} \end{bmatrix} \quad (9)$$

Analysis of results

To clarify the detailed calculation process, the collected data of the first indicator (MR: Management Risk) of a public construction firm of P is used as an example. There are altogether 111 respondents and its judgment are shown in Appendix C. Eqn (3) is manipulated to evaluate matrix B_i^l of Management Risk of a public construction firm. Weight of all indicator of MR construct are calculated to be βi [0.195 0.212 0.1613 0.239 0.190] and weight of all five constructs in study is calculated as W [0.1695 0.1441 0.1441 0.2712 0.1102] from eqn (5) and (7). Similarly, application of eqn (7) and eqn (8) final evaluation result of safety performance for public construction is calculated as Pl = [0.0307 0.0608 0.2094 0.3721 0.1634]. As per the MDM principle, it is the fourth (IV) level that is Poor level.

TABLE IV
THE FINAL OUTPUT OF RISK MANAGEMENT CONCERNING 3 VARIOUS CONSTRUCTION INDUSTRY TYPES IN PAKISTAN

Category	Evaluation distribution				
	I (Excellent)	II (Good)	III (Fair)	IV (poor)	V (Very Poor)
Private construction	0.0486	0.0935	0.1696	**0.3371**	0.1903
Public construction	0.0307	0.0608	0.2094	**0.3721**	0.1634
INGOs construction	0.0240	0.0536	0.1692	**0.3890**	0.2034

TABLE V
THE FINAL OUTPUT OF RISK MANAGEMENT CONCERNING 3 VARIOUS CONSTRUCTION INDUSTRY TYPES IN NEPAL

Category	Evaluation distribution				
	I (Excellent)	II (Good)	III (Fair)	IV (poor)	V (Very Poor)
Private construction	0.0276	0.0475	0.2625	**0.3567**	0.1238
Public construction	0.0218	0.0583	0.2215	**0.3424**	0.1742
INGOs construction	0.0202	0.0478	0.2153	**0.3614**	0.1735

V. DISCUSIION

A. Discussion of the Finding

The persistence of this study was to inspect and to make a comparative study between two developing countries (Nepal and Pakistan) on risk factors affecting the project success factor. Moreover, this study also tries to find the real state of nature of construction firms (Private, Public & INGOs) in both developing countries (Nepal and Pakistan). After a thorough analysis of the literature, we established a conceptual framework and proposed six hypotheses, which would form the foundation of this research. The results indicated that all risk factors had a direct relationship with project success factors in both developing countries. Moreover, the evaluation distribution result showed that none of the nature of construction firms (Private, Public, and INGOs) in both developing countries was able to gain a good range as shown in Table II and Table III.

In the context of Nepal, A legal and Regulation related Risk (FR), MR (Management Risk), and LR (Logistic Risk) showed a strong direct positive relationship for the success of construction projects is trustworthy with the finding of M.P.

Koirala [16]. Considering the β value, it is obvious that the predictor (FR, MR, and LR) causes the variation of 0.231, 0.16, and 0.231 respectively, on the success of the project in case of a single unit deviation from the standard. Similarly, DR (Designer Risk) and GR (Government Risk) had also positive significance which is supportive of the previous finding by the older researcher[5]. Considering the β value, it is obvious that the predictor (DR and GR) causes a variation of 0.126 and 0.126 respectively, on the success of the project in case of a single unit deviation from the standard. Moreover, FP (Fraudulent Practice and security risk) shows moderated direct positive association for the success of the project, our findings are consistent with older researcher [17]. Considering the β value, it is obvious that the predictor (FP) causes a variation of 0.092, on the success of the project in case of single unit deviation from the standard.

In the context of Pakistan, A legal and Regulation related Risk (FR) found a robust strong direct positive connection for the success of project confidence with the result shown by earlier scholars [18]. Considering the β value, it is obvious that the predictor (FR) causes a variation of 0.139, on the success of the project in case of a single unit deviation from the standard. Similarly, FP (Fraudulent Practice and security risk) and DR (Designer Risk) had a direct positive association with Project Success Factor (SF), where earlier author outcome coincident similar finding [16]. Considering the β value, it is obvious that the predictor (FP and DR) causes a variation of 0.188 and 0.17 respectively, on the success of the project in case of a single unit deviation from the standard. Moreover, LR (Logistic Risk), MR (Management Risk) and GR (Government Risk) showed a moderate direct positive link with Project Success Factor (SF) these results are consistent with previous researchers' results[19]. Considering the β value, it is obvious that the predictor (LR and MR) causes a variation of 0.093, 0.096 and 0.135 respectively, on the success of the project in case of a single unit deviation from the standard.

Secondly, from the evaluation process with the application of the Maximum Degree of Membership (MDM) principle, we identified that in both countries no nature of construction firm can meet a good range. Which expressed that the above major risk factor is not focusing much in both countries to achieve the success of a project or in next word, which is a major reason for the accident, hazard in the construction sites. Similarly, risk reduction requires resources that are perceived to be a sense of scarcity of capital as the greatest obstacle to successful risk management implementation. In terms of money

Lastly, a legal and Regulation related Risk is the most significant risk to both nations which influence greatly for success of any construction project. Furthermore, table IV and table V showed crystal clear output that risk management in both nations in any nature of construction unable to meet even fear level of risk management level. The earlier researcher suggested that risk transparency and the capacity to cope with risk directly impact the success of the project portfolio[20]. So studied critical risk factors need to identify and immediate elimination of such risk is required for upgrade project success by management level manpower in the project planning stage. As the previous scholar identified that project planning has a statistically significant influence on success of project when most risks actually occur[21]. Moreover, in order to manage risks effectively and to achieve project success, it is essential to manage and mitigate risks in implementation stage too when most risks actually occur [22]. Therefore, construction management level in both nations need to from proper policy from output of our study to manage risk in both planning and implementation level to achieve success of project.

B. Theoretical implications

This research has described the structural relationship between the major six risk factors that impact the success of the project in developing countries. Moreover, we reused structurally valid respondents for the evaluation process by application of Maximum Degree of Membership (MDM) to present the real state of all nature of construction (Private, Public and INGOs) firms in both developing countries. Furthermore, the continuity of our results and that of earlier research in developing and developed countries suggests that risk management is not a context-specific phenomenon but a universal term.

The application of SEM (Structural Equation Modeling) to study the risk management for the success of a project of construction firm along with different natures of the project by the application of the evaluation process also organizes an innovative contribution to literature and fills a methodology gap. Moreover, this is the first comparative study of risk management for the success of the project in developing countries to be conducted in Nepal and Pakistan using SEM.

C. Implication for Managers

The managerial level should focus on risk management, as it is critical to the sustainability of project success of any firm. From the evaluation process analysis, we came to know that both the developing countries have similar risk management states in all nature of construction firms (Private, Public ad INGOs) i.e. poor, which affect deeply in success of the project.

The faulty procurement strategy, lack of appropriate government action with required legislation, a leadership philosophy that does not think internationally and function locally, incompatible human resources, the weak output of the contractor and consultant, incompetence of the project manager and improper budget allocation and the trend of one authority building some constructions where other authority immediately dig the trench are major obstacles for appropriate risk management. Therefore, risk management workshops, risk management training and safety seminars by capable headship to progress the risk management of construction firms should be well planned globally and their proper implementation with appropriate government action mainly to contractor, consultant and project manager of the construction project is a prime need in the present context. Moreover, compatible human resources, appropriate procurement policy along with a supply of capital resources for successful risk management implementation are an additional requirement for risk management, which ultimately gives the success of the project.

Risk management policy, strategy and planning of any one country of our study can be implemented to the next one as from the finding we came to know that both the nations are in the same state to risk management for the success of the project. Moreover, the finding of our research can be fruitful to formulate risk management policy, strategy and planning to developing countries in the future.

Lastly, in the case of Nepal, FR & DR highly impact risk factors and in the context of Pakistan, FR, MR, GR & DR highly impact risk factors. The concerned country should focus on corresponding risk factor as these risk factors have a significant effect on the success of the project.

VI. LIMITATION AND FUTURE DIRECTION

While this work does subsidize the risk reduction literature in developing countries, it has certain limitations. Firstly, the survey is taken from three provinces in each nation where the majority of construction companies exist. Extending the survey to include the entire nation will have a more representative image. Secondly, this study does not create cause and effect association among the construct investigated as it is a cross-sectional design.

Future researchers are urged to look at the casual associations connecting all constructs consider in the study through longitudinal research. Thirdly, in this study, we only investigate the direct relationship of a risk factor to the success of the project along with the evaluation process. Future scholars are encouraged to make a study with additional other mediators and moderators construct to improve risk management for project success.

VII. CONCLUSION

This study attempted to answer, "Which risk factor impact much to the success of construction project? "and "What is the real state about risk management of all nature of construction (Private, Public & INGOs) in developing countries? Besides, the model was tested with data collection of 300 respondents from each country construction firms (Nepal and Pakistan) via a structural questionnaire. We used SPSS for preliminary analysis and AMOS to test our hypotheses. The result determines that in Nepal, FR, MR, GR, FP & DR are important predictors, which impact for success of construction firms. Similarly, in Pakistan, DR, FR & FP are major predictors, which impact for success of the project firm. All the managerial level should focus above mentioned predictor construct during the decision making for future risk management in a construction firm.

Moreover, from the evaluation process, we identified that none of the construction category firms (Private, Public & INGOs) in both developing countries (Nepal & Pakistan) range to a good level. Therefore, the managerial level of each nature of construction firms should pay more concentration on the corresponding country's prime risk factor predictor for risk management. In doing such, the present construction risk management level will upgrade from poor to a good and ultimately excellent level. Lastly, we strongly assume that this study would enhance work into risk assessment literature in developing countries

APPENDIX A

Discriminant validity: heterotrait-monotrait ratio (htmt) - Pakistan

	DR	**FFR**	**FR**	**GR**	**LR**	**MR**	**SF**
DR							
FFR	0.097						
FR	0.066	0.230					
GR	0.122	0.066	0.067				
LR	0.065	0.201	0.213	0.055			
MR	0.095	0.086	0.103	0.064	0.052		
SF	0.208	0.240	0.286	0.182	0.208	0.130	

Discriminant validity: heterotrait-monotrait ratio (htmt) - Nepal

	DR	**FFR**	**FR**	**GR**	**LR**	**MR**	**SF**
DR							
FFR	0.127						
FR	0.096	0.219					
GR	0.152	0.055	0.055				
LR	0.095	0.190	0.201	0.052			
	0.125	0.075	0.091	0.061	0.040		
SF	0.238	0.229	0.229	0.179	0.196	0.162	

APPENDIX B

KMO and Bartlett's Test		Pakistan	Nepal
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.795	0.860
Bartlett's Test of Sphericity	Approx. Chi-Square	6313.093	7419.34
	Df	528	528
	Sig.	0	0

APPENDIX C

Cross loading of each indicator of each construct

Construct	Code	Indicator	CFL Nepal	CFL Pakistan	References
Designer Risk	DR1	Inappropriate specification	0.87	Omitted	[2-4]
	DR2	Variation in design	0.82	0.72	[4-6]
	DR3	Insufficient site investigation	0.90	0.81	[2, 5, 6]
	DR4	Inaccurate cost estimation	0.83	0.80	[5, 7, 8]
	DR5	Construction design time delay	0.87	0.75	[5, 6, 9, 10]
	DR6	Unfamiliarity with standards and codes	Omitted	0.77	[7, 11]
Logistic Risk	LR1	Insufficient of equipment accessible	0.80	Omitted	[2, 12, 13]
	LR2	Inadequate of operators and qualified worker	0.81	0.87	[2, 12, 13]
	LR3	Weak communication between head and site office	0.83	0.91	[3]
	LR4	Indeterminate scope of working	0.87	0.81	[3]
	LR5	Inadequate transportation facility	0.87	0.70	[2]
	LR6	Non-available of maintenance	Omitted	0.74	[2]
Management Risk	MR1	Unstable management	0.75	Omitted	[2, 3, 23, 24]
	MR2	Uncertain or low productivity	0.82	0.84	[2, 4, 23, 24]
	MR3	Inadequate of quality	0.78	0.87	[5, 25]
	MR4	Safety and health problems	0.88	0.66	[5, 23]
	MR5	lack of inspiring attitude	0.81	0.98	[25]
	MR6	the poor site administration and supervision	Omitted	0.78	[6]
A legal and regulation related risk	FR1	Authorities and regulation requirement	0.84	Omitted	[26, 27]
	FR2	altered contract form or breach of contract claims and disputes	0.84	0.87	[24, 26]
	FR3	change in rules and regulation or unstable legal framework	0.83	0.91	[4, 28]
	FR4	Lack of legal infrastructure (training scheme, intellectual property protection etc.)	0.81	0.81	[17, 24, 26]
	FR5	lack of historical records about accidents and risk registration	0.85	0.70	[17, 29, 30]
	FR6	insufficient legal system	Omitted	0.74	[31]
Government Risk	GR1	Bureaucracy of government	0.84	Omitted	[5, 10]
	GR2	Extreme dealings for government approvals	0.77	0.73	[5, 10]
	GR3	Relations with government	0.86	0.72	[7, 10, 32, 33]
	GR4	Government instability	0.88	0.78	[7, 34]
	GR5	Taxation on imported material	0.81	0.80	[32, 35]
	GR6	Inconsistency of government policies	Omitted	0.85	[24, 36]
Fraudulent practice and security risk	FP1	Corruption including bribery at sites	0.82	0.72	[7, 17]
	FP2	Education level and poverty	0.85	0.78	[17, 37]
	FP3	Terrorism and sabotage	0.82	0.84	[17, 38, 39]
	FP4	Leakage of sensitive information	0.83	0.81	[17, 40, 41]
	FP5	Thieves	0.83	0.80	[17, 29, 32]
	FP6	The threat to stamp (kidnap or murder)	Omitted	Omitted	[17]
Success factor	SF1	Support from the government sector	0.78	0.68	[9, 42, 43]
	SF2	Clear responsibility and role	0.91	Omitted	[9, 42]
	SF3	Appropriate resource allocation	0.82	0.85	[9, 44]
	SF4	Innovative and critical thinking	Omitted	Omitted	[9, 42]
	SF5	Appropriate risk allocation and management	Omitted	Omitted	[42, 44, 45]
	SF6	Top management commitment and support	Omitted	0.86	[42, 46]

APPENDIX D

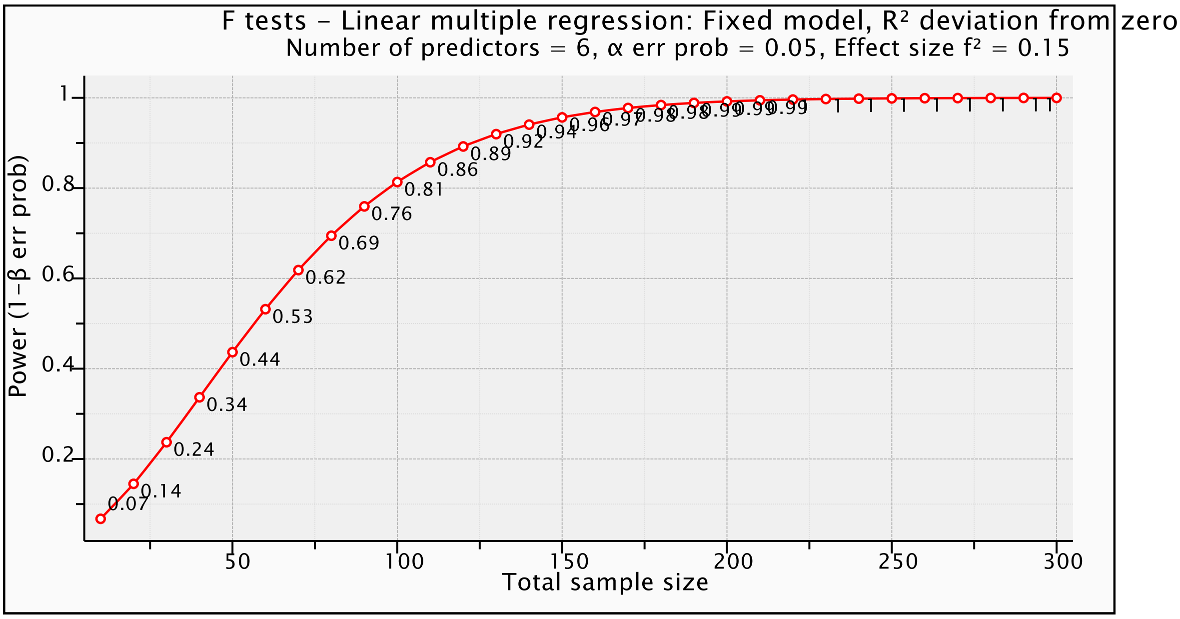

Fig 1: Sample size adequacy

APPENDIX E

MEASUREMENT MODEL'S CORRELATION MATRIX, CR, AVE, AND DESCRIPTIVE STATISTICS IN PAKISTAN

	CR	MaxR(H)	DR	LR	MR	FP	GR	FR	SF
DR	0.872	0.881	**0.760**						
LR	0.900	0.930	0.036	**0.805**					
MR	0.897	0.960	0.018	0.021	**0.801**				
FP	0.892	0.896	-0.036	0.179	0.053	**0.790**			
GR	0.882	0.889	0.150	-0.010	-0.041	-0.029	**0.775**		
FR	0.883	0.887	0.052	0.188	0.086	0.243	0.059	**0.776**	
SF	0.848	0.870	0.194	0.179	0.165	0.242	0.146	0.296	**0.808**
Mean			2.1547	2.33	2.2987	2.2487	2.3233	2.2513	1.85
Standard deviation			0.90236	0.89833	0.84861	0.87715	0.8903	0.89527	0.72186
Cronbach's α			0.931	0.92	0.911	0.916	0.922	0.919	0.882

APPENDIX F

MEASUREMENT MODEL'S CORRELATION MATRIX, CR, AVE, AND DESCRIPTIVE STATISTICS IN NEPAL

	CR	AVE	MR	DR	GR	LR	FR	FP	SF
MR	0.905	0.658	**0.811**						
DR	0.932	0.732	0.054	**0.855**					
GR	0.918	0.693	0.092	0.15	**0.832**				
LR	0.921	0.7	0.088	0.062	0.056	**0.837**			
FR	0.919	0.695	0.078	0.074	0.094	0.246	**0.834**		
FP	0.917	0.689	0.099	0.041	0.059	0.292	0.276	**0.83**	
SF	0.888	0.726	0.261	0.228	0.238	0.408	0.273	0.325	**0.852**
Mean			2.2327	2.3193	2.312	2.3133	2.2813	2.2473	2.03
Standard deviation			0.76574	0.75387	0.80499	0.79123	0.7845	0.78226	0.68876
Cronbach's α			0.903	0.891	0.878	0.91	0.882	0.891	0.843

APPENDIX G

Factor	Nepalese Construction Respondent Collinearity Statistics		Pakistani Construction Respondent Collinearity Statistics	
	Tolerance	VIF	Tolerance	VIF
MR	0.994	1.006	0.98	1.02
GR	0.986	1.014	0.968	1.033
DR	0.986	1.014	0.974	1.026
LR	0.952	1.051	0.921	1.086
FR	0.933	1.072	0.921	1.086
FP	0.937	1.067	0.945	1.074

APPENDIX H

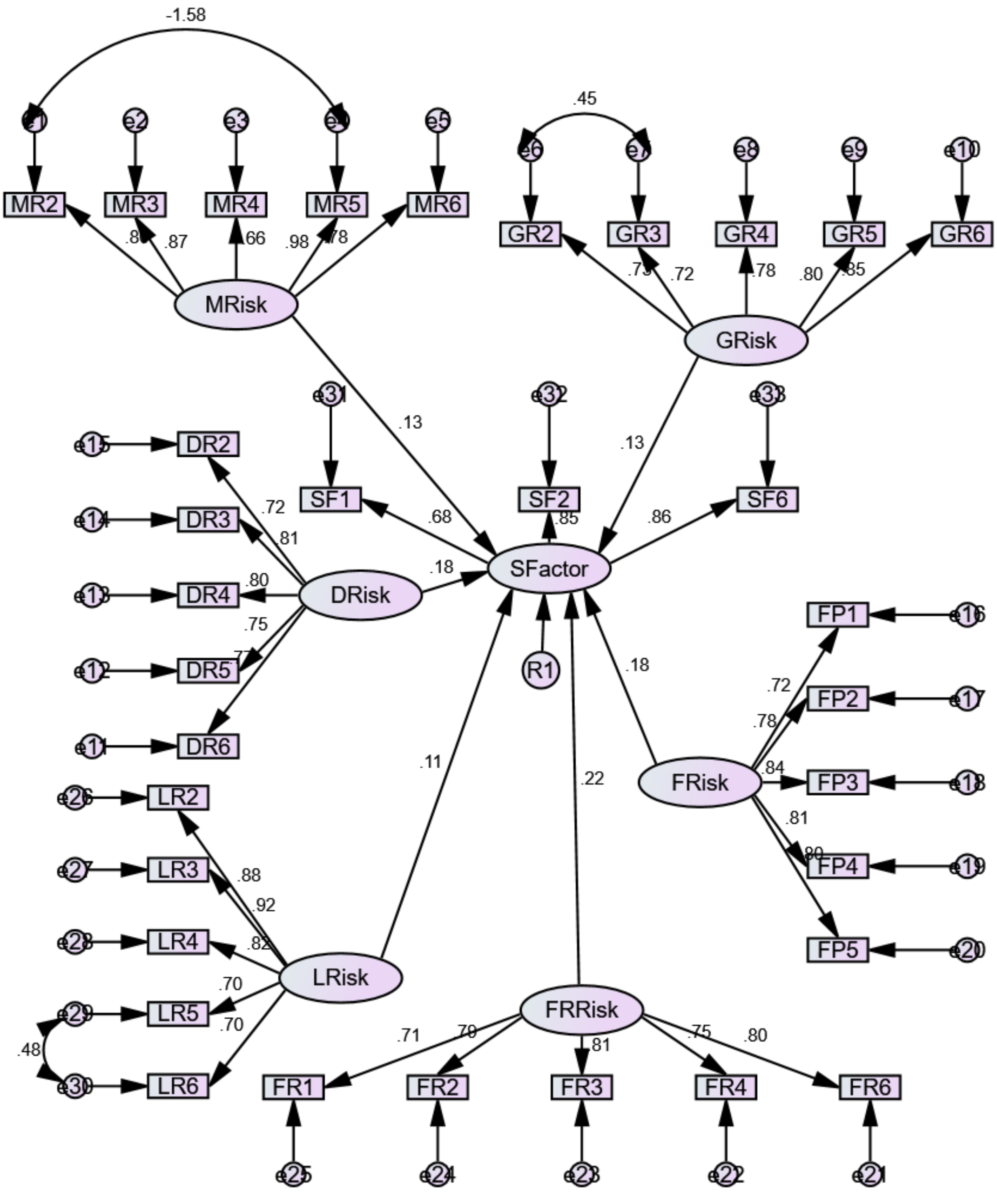

Fig 2: Structural equation model for PSFE on construction firms in Pakistan

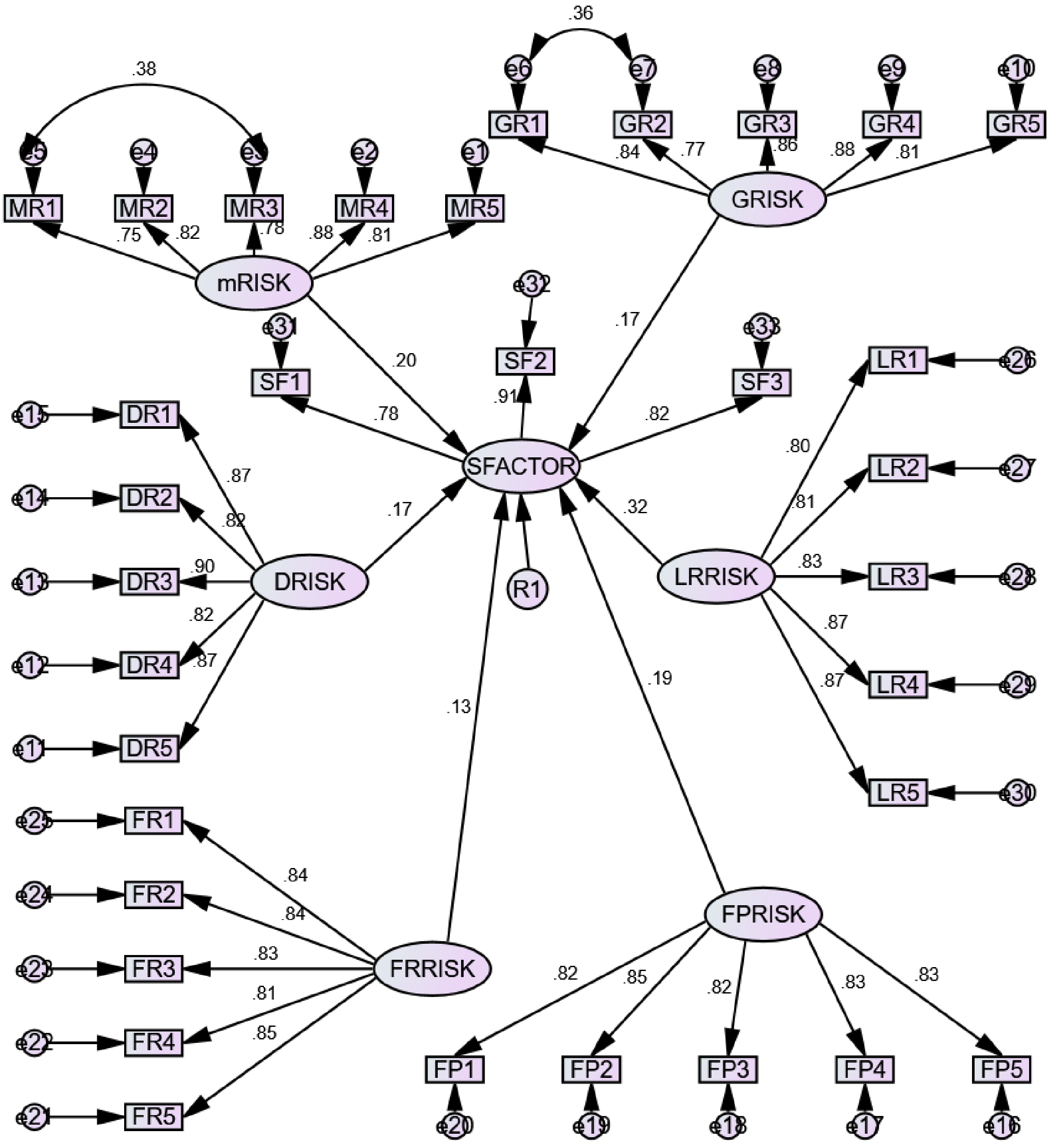

Fig 3: Structural equation model for PSFE on construction firms in Nepal

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