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Risk management in highways projects in Pakistan

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ABSTRACT: ***To flourish and sustain economic growth of any country requires good combination of infrastructure network and their related services. The economic growth is essential for social development of a society. The emerging countries of third world face scarcity of capital for such expenditures thus lack capability for adequate provision of infrastructure network. In many developing countries of world like Malaysia, Thailand, Philippines, Turkey and India, the governments have turned towards build opiate transfer (BOT) project delivery method. The concept was applied by Turkey in 1984. In Pakistan, BOT concept is yet at its embryonic stage, especially in highways sector. The national roads / highways fall under jurisdiction of National Highway Authority (NHA), lacks vast experience in BOT. Many highways projects were conceptualized to be undertaken through BOT method; very few achieved success to be implemented and now are in operational phase. Majority of others couldn't reach construction phase. The unsuccessful project indicate that the investors, concessionaires have not got the expected response from public sector and at the same time public sector also faced problems in supporting such projects through grantees. The risks are present as deterrents for both public and private sectors. These risks are required to be evaluated, identified and allocated to the best suitable partner. For this purpose a questionnaire survey was conducted of 53 identified risks through literature review faced in BOT practicing developing countries. The survey was conducted from the respondents who had some exposure about BOT and Highways. The main respondents were concessionaires', consultants, government departments and investors. The response rate was encouraging being 71.8%, indicating keen interest of respondents. The results for ranking of risks according to mean score (MS) and relative importance index (RII), perception of respondents about identified risks preferred risk allocation / sharing were extracted through statistical methods applied on data. The top two of the risks identified were law and order situation and political instability in Pakistan followed by others according to RII. The critical phase was found to be initiation phase which indicates that the respondents were well aware of the questions asked. The preferred allocation of risks was done according to maximum frequency allocation by respondents. The study recommends development of supportive environment for private investment which requires bureaucratic support, political will, public acceptance and acceptable return on investment. Future research is required for analysis of initiation and implementation phase of BOT highways projects in detail.***

I. INTRODUCTION

Public sector projects delivered through the private sector normally involve private sector funding. As a result, the government funding required for public services can be minimized and shifted to sustain projects of more importance, e.g., education, healthcare, and community services (Li et al 2005). Pakistan is an emergent country. It is deficient of infrastructure facilities more or less in every field. Transportation projects are usually mammoth-projects. These are normally owned and financed by federal/provincial governments. Due to lack of resources governments are unable to start such infrastructure project on a faster pace to meet the demands. To counter the dearth of funds in public sector, many governments around the world have engaged the private sector to develop their infrastructure .This is a new approach that through privatization by encouraging the private sector to be actively involved in the development of road and highway projects .In developing countries like Pakistan participation of private sector can play important role in infrastructure development. In Pakistan this concept is in its embryonic stage and not very popular. By making combination of private investment and management and their operational skill, Public Private Partnership (PPP) can relieve financial restrictions and improve efficiency to provide good infrastructure services to public. . Build, Operate and Transfer (BOT) project delivery method can assist progress public infrastructure and its related services within lesser time, for good money value thus causing innovation in future projects. Apart from benefits, BOT contracts may be complicated due to its long term contractual obligations and multi party involvement. For that purpose legal, economical and technical framework needs to be developed on large scale for successful execution of BOT projects.

In Pakistan the risk management in BOT, Highways construction is almost nonexistent. In emergent countries like Pakistan, BOT delivery method can help to relieve the burden of the government having paucity of funds for financings public sector projects. The need of the time is to analyze that despite planning various projects could not be initiated. Moreover in BOT delivery method the risk sharing is to be done rationally. It is difficult from the typical methods where it is established by experience and time, which is going to do what. This particular method also necessitates changing the typical mood at both ends, keeping the basics in front i.e Government is to provide basic amenities and private sector has to earn its profit.

II. METHODOLOGY

This research study consists of combinations of methods and procedures based on thorough literature review and BOT constructional experiences in Pakistan. To reach on the logical conclusions, research study can be broadly divided into seven stages. The first stage was going through comprehensive literature review comprising BOT roads related articles, papers and journals from renowned institutions and professionals to find out the assessment and allocation of risks in BOT Highways constructional projects. In second stage, the critical risks were selected pertaining only to Pakistan BOT road constructional

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projects environments. In third stage, a comprehensive questionnaire was developed to find out the risk assessment and allocation preferences of various BOT roads related respondents across the country. In fourth stage, respondents who have experience in construction of highways were selected on merit to get the balanced, practical and on ground risk perception ideas related to BOT Highways projects. In fifth stage, questionnaires were distributed among all respondents along with carrying out of interviews of various BOT highways professionals including public, private and academics sectors. In sixth stage, survey data was collected from respondents and organized for its statistical analysis and scientific evaluation. In seventh stage, data analysis was carried out to reach on the logical and practical conclusions and recommendations.

III. IDENTIFICATION OF RISKS

The first step in risk assessment is identification of critical risks related with BOT Highway projects in Pakistan. Therefore to find out this answer, an extensive literature review was carried out from international and local related papers and journals followed by carrying out of fifteen personnel interviews, with BOT highways professionals belonging to different departments and institutions from the country. Officials, contractors and professors from renowned institutions were also selected for interview like Ministry of finance, IPDF, Planning commission, Provincial government PPP cells/ ministry of finance, FWO, NHA, NLC, NUST, and other universities. Finally based on the literature study and experience / knowledge of BOT Highways construction professionals, 53 risk factors grouped into six major categories were identified for thesis research survey.

Sample Size; The sample size was selected as per Table-1

Table-1Selection of sample size

POPULATION				
S/ No	**Category**	**No**	**Source**	**Remarks**
1	Contractors	**140**	PEC website	CA
2	Consultant Firms	**125**	PEC website	1215
3	State departments	**25**	PPRA website	
4	Financial institutions/ Banks	**25**	SBP website	DFI's, Large and medium banks
5	Total	**315**		

Response Rate of Respondents; four types of categories of respondents have been taken i.e. client, consultant, financer and concessionaries. In order to maintain uniformity for getting equal no of responses from each category, 160 questionnaire forms were circulated (Table-2). Owen and Jones (1994) emphasized that an average of 20% of questionnaires returned should be considered satisfactory, and in the construction industry, a good response rate is around 30% (Black et al. 2000).

Criteria of Respondents for Data Collection

The respondents from whom the questionnaire forms were filled belonged to different sectors including the public, private, finance and consulting. Target respondents were selected on any of the two criterions, they must possess adequate knowledge in the area of PPP/BOT or they must have hands-on experience with BOT projects, experience in conducting BOT research, or have followed very closely with the development of BOT.Maximum of the survey questionnaires were filled by the respondents during personal visit, with intent of getting personal experiences and information on BOT. 160 survey questionnaires were floated for response, out of which fifteen were forwarded via e-mail or by hand. A total of 115 filled questionnaires from the respondents who have experience all over Pakistan were received.

IV. RESEARCH INSTRUMENT

After identification of 53 risk factors associated with BOT Highways constructional projects of Pakistan, a detailed questionnaire was prepared for conducting empirical research survey and finding out the perception of BOT Highways professionals towards the assessment and allocation of risks associated with BOT Highway in Pakistan. The research instrument was divided into three parts. One was regarding gathering of personnel information of the respondent and to gauge BOT experience and background constructional engineering knowledge, part two consisted of instructions regarding filling of the questionnaires, and part three consisted of the 53 identified risks into six categories. Each category had its own risks which were required to be assessed and allocated through three tables. One was regarding to give the likelihood of occurrence of a risk, another was to know the impact value of that risk if it occurs and last one was to find out the allocation perception of a risk of respondents to state, concessionaries and investors.

Risk Rating

A five point Likert scale was used for the measurement of data. A Likert scale is a type of psychometric response scale often used in questionnaires, and is the most widely used scale in survey research. When responding to a Likert questionnaire item, respondents specify their level of agreement to a statement (A.Deviprashad, 2007). To analyze the probability of occurrence of risk, the five point Likert scale represents 1 = Very Low, 2 = Low, 3 = Medium, 4 = High, 5 = Very High and to measure the impact value of risk if it occurs, five point Likert scale

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denotes 1 = Very Low, 2 = Low, 3 = Medium, 4 = High, 5= Very High. Regarding the risk allocation, three options were given to the respondent to allocate the risks i.e. State, concessionaire and investor.

V. RESULT AND DISCUSSION

Sample and respondent characteristics, frequencies and percentages

The first section of the questionnaire was about collection of data for profile of the respondents and their firms/organizations. Its basic purpose was to establish that the responses were coming from the qualified respondents with sufficient professional and working experience or knowledge about BOT highways from reputable firm / departments / organization.

Response Rate

There were 115 valid responses out of total 160, indicating a response rate was 71.875% .The response rate has been encouraging although BOT highway delivery method is new concept in Pakistan. The details are shown in Table -2

Table-2 Response rate

Responses	Sent	Received	Invalid	Valid	Response rate (%)
Online	110	97	14	83	75.45
By hand	50	37	5	32	64.04
Total	160	134	19	115	71.87

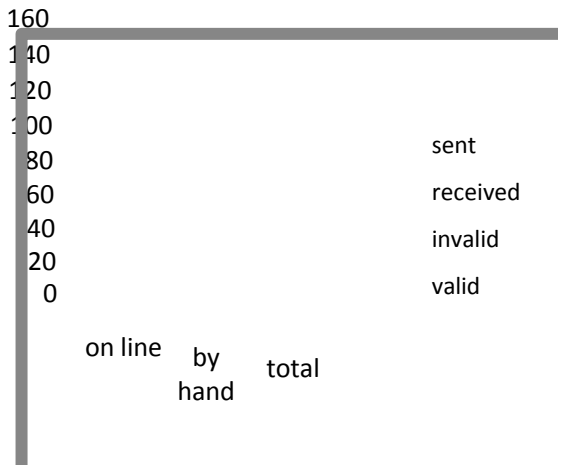

Fig-1 Response rate

Respondents' Grouping

Respondents chosen were contractors / concessionaires, Engineers / Consultants, state departments/clients and Financers. The respective contribution for survey was 30.4%, 26.09%, 21.73%, and 27.73% for each respectively (Table-3).

Table-3 Respondent's grouping

Respondents	Frequency	%	Cumulative (%)
Contractors / Concessionaire	49	42.6	42.6
Consultants/Engineers	46	40	82.6
Clients/State departments	12	10.43	93.03
Financers/Banks/Investors	8	6.95	100
Total	115	100	

Fig-2 Respondent's grouping

Respondent's Professional Experience

The recorded percentage of professional experience of the respondents was 17.39%, for 0 to 5 years, 21.73 for 5 to 10 years, 34.7 for 10 to 15 years, 17.39 for 15 to 20 years and 8.6 % for more than 20 years. Respondents were having varying experiences. The data collected was a combination of different exposures. The respondents, which had up to 10 yrs of exposures were 38% (45 respondents) meaning thereby BOT concept awareness is low. The details with frequencies and percentages are shown in Table -4 and Figure -3

Table -4 Respondent's professional experience

Respondent's experience (in years)	Frequency	%	Cumulative (%)
5-10	25	21.73	21.73
10-15	45	39.13	60.86
15-20	35	30.43	91.29
>20	10	8.69	100
Total	115	100.0	

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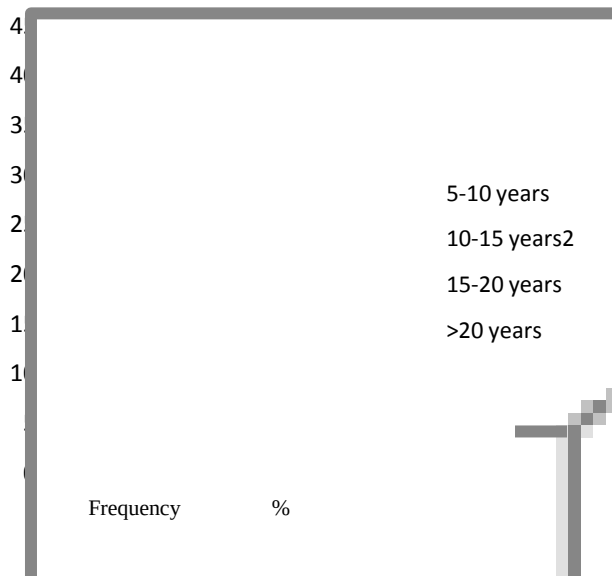

Fig- 3 Respondent's professional experience

Respondent's Role/Designation in Organization

The recorded percentage of the respondent's role/ designation in the Firm/Organization was 8.6 % for General Manger, 17.39% for Senior Manger / Engineer, 26.08% for Project Director / Manger, 21.7% for Finance Manger / Adviser / Bank Manger 21.7% for Projector Manager, 4.3% for Others including Operators. The collected data reveals that most of the respondents' belonged to middle and upper hierarchy of an organization. It is reflected by the data that the upper hierarchy is interested that BOT method for infrastructure development be utilized to the best. Details are shown in Table-5 and Figure- 4

Table-5 Respondent's role / designation in the organization

Respondent's Job Title	Frequency	%	Cumulative (%)
General/Regional Manager	5	4.34	4.34
Director/ Senior Engineer	15	13.04	17.38
Project Director/ Resident Engineer	37	32.17	49.55
Finance Manager / Adviser	15	13.04	62.59
Project /Field Manager	35	30.04	92.63
Commercial/Marketing Manager	8	6.95	100
Total	115	100.0	

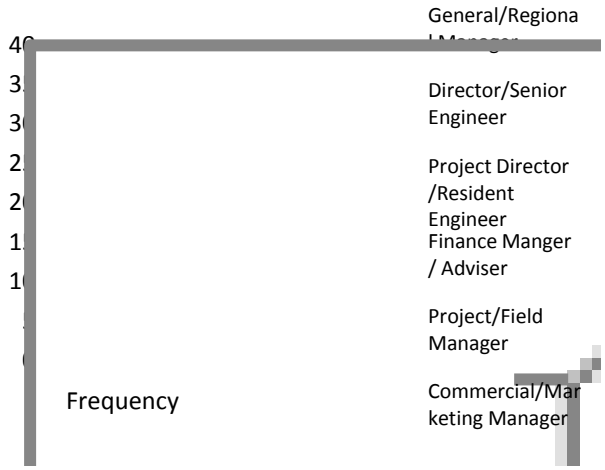

Fig-4 Respondent's designation in the organization

Respondent's Experience of BOT Highways

The respondent's experience with BOT Highways was indicated as 26.08% for having no working experience with BOT Highways, 47.82% for 0 to 5 years, 9.5% for 5 to 10 years, 6.0%for 10 to 15 years and 1.7% for more than 15 years where as 8.6% respondents replied with no answer. The details with frequencies are shown in Table-6 and Figure-5

Table-6 Respondent's experience of BOT Highways

Respondent's experience (in years) with BOT highway	Frequency	Percent	Cumulative Percent
No experience	30	26.08	26.08
0-5	55	47.82	73.9
5-10	11	9.5	83.4
10-15	7	6.0	89.4
>15	2	1.7	91.11
No answer	10	8.6	100.0
Total	**115**	**100.0**	

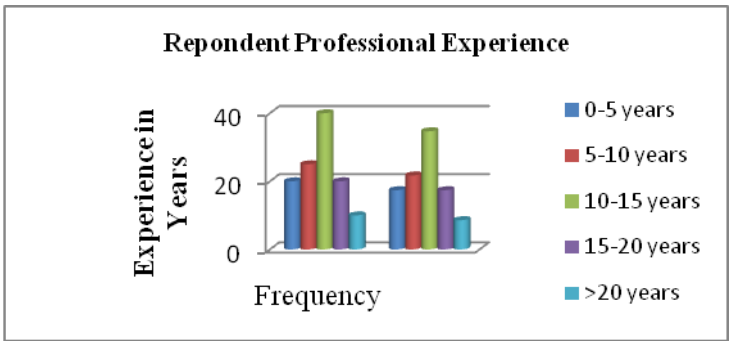

Fig-5 Respondent's experience of BOT Highways

A very large number of percent of respondents do not have exposure to BOT highways projects. The percent touches the tone of 76%. The respondents which have exposure to BOT highways projects is about 25%.

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Although the BOT projects are being executed in Pakistan in power sector, telecommunication sector but highways sector is yet facing scarcity of BOT delivery method.

VI. STATISTICAL ANALYSIS

Statistical tests were applied to collected data through the questionnaire to check the normality, validity and reliability of the data for further analysis to achieve the results of the objectives of the research variables.

Reliability Test

When using Likert scales it is essential to calculate and account Cronbach's alpha coefficient for internal consistency and reliability for any scales being used. The analysis of the data then must use these summated scales and not individual items. This method was used to measure the reliability of the collected data and to check the internal consistency of all the research variables. The normal range of Cronbach's coefficient alpha value is between 0 and 1, and the higher values reflect a higher degree of internal consistency (Gliem and Gliem 2003).

The Table -7 shows Cronbach's Coefficient Alpha values as 0.748 for over all likely hood of the questionnaire, 0.841 for overall impact data of the questionnaire and 0.785 for overall risk significance value of questionnaire data. The values are close to 1 and shows high reliability for the data.

Table-7 Cronbach's Coefficient (Alpha)

	No of Items	Cronbach Alpha
Likelihood	53	0.748
Impact	53	0.841
Risk Significance	53	0.785

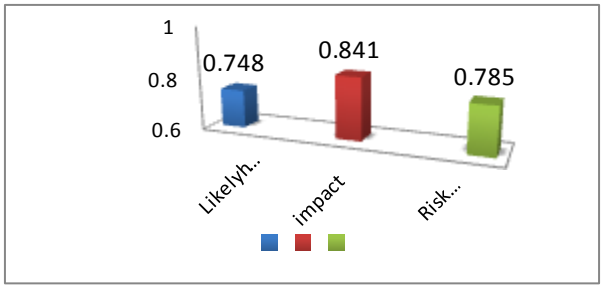

Fig -6 Cronbach Alpha Values.

Measurement of Level of Correlation between Likelihood, Impact and Risk Significance

This procedure is useful for studies in which three or more groups create rankings of items. The resulting statistic represents the level of agreement among the various groups in ranking the items. Kendall Coefficient of Concordance (W) extends Spearman Correlation Coefficient to more than two groups. The values of the W extend between -1 to +1. Negative values indicate negative association among groups, zero value indicate no correlation between groups whereas positive value and close to one indicates stronger correlation between the groups in ranking of the items.

To measure the level of agreement between risk Likelihood, impact and significant values in ranking of 53 risks associated with BOT highway projects of Pakistan, values of Kendall Coefficient of Concordance were calculated by using the Statistical Package for the Social Sciences (SPSS). The values of "W" and are as shown in Table-8 and Figure-7 which shows that there is strong correlation between risk Likelihood, impact and significant values

Table -8 Kendall Correlation (W)

			Likelihood	Impact	Risks significance
Kendall's tau b	likelihood	Correlation Coefficient	1.000	.497**	.752**
		Sig. (2-tailed)	.	.000	.000
		N	53	53	53
	Impact	Correlation Coefficient	.497**	1.000	.732**
		Sig. (2-tailed)	.000	.	.000
		N	53	53	53
	Risks significance	Correlation Coefficient	.752**	.732**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	53	53	53

**. Correlation is significant at the 0.01 level (2-tailed).

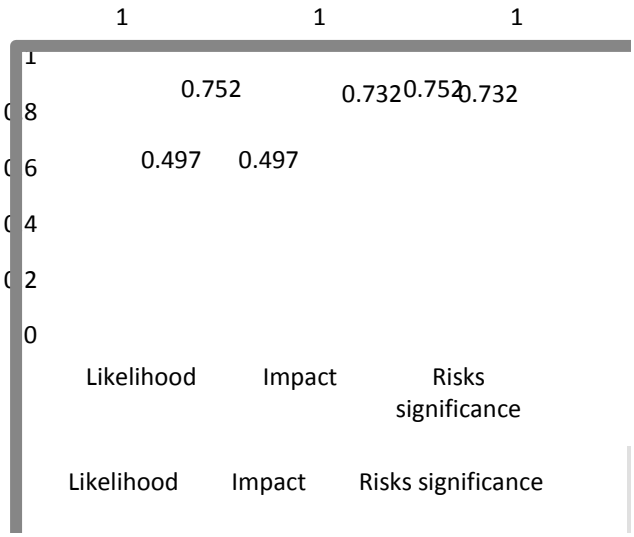

Fig -7 Correlation of Likelihood, Impact &Risk significance

Measurement of level of correlation between the groups which create ranking of items, It means that likelihood of occurrence of risk and its impact value contributes to the risk significance. The values Kendall's coefficient of concordance "W" among the groups is positive and close to 1 which indicates strong

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correlation of the groups in ranking of risk significances. This also validates that instrument for the survey was able to get desired results.

Normality Test

'Shapiro Wilk normality test' was conducted to check whether the collected data is normally distributed or otherwise. This test was conducted because of the fact that the sample size was less than 2000. The significance values were found 0.000 which were less than 0.05 indicating that the collected data is not normally distributed or the data is non-parametric in nature and non-parametric tests were required for further analysis. The values obtained after tests for likelihood impact and risk significance were less than 0.05. This revealed that the data collected is not normally distributed and non parametric tests were applied for further analysis of data.

Kruskal-Wallis Test for all Research Variables

This was concluded that the significance values were 0.000 which were less than 0.05 indicating the collected data is not normally distributed or the data is non-parametric in nature. Therefore, Kruskal-Wallis test was conducted for further analysis.

Table -9 Kruskal-Wallis Test for Perception of Respondents

Serial no	Group	df	Kruskall-Wallis Test (Perception Sig.)
1	Overall Perception	3	0.874
2	Concessionaires-Engineers	1	0.932
3	Concessionaires-State(departments)	1	0.747
4	Concessionaires-Financers	1	0.559
5	Engineers-State(departments)	1	0.825
6	Engineers-Financers	1	0.788
7	State(departments)-Financers	1	0.489

Overall perception of identified risks in BOT highways in Pakistan was found similar. The significance value was 0.874which was greater than 0.05. Then further examination of perception of individual stakeholder's i.e contractor/concessionaire, Engineers/consultants, state departments / client and financers / investors was carried out.

Kruskal-Wallis Test—Perception of Concessionaires-Engineers

Kruskal-Wallis test was conducted to compare the perception of respondents from concessionaire,(Contractor) and engineers. The value of risk significance was compared. The output value of the test was observed as 0.932 which was greater than 0.05 (p>0.05) thus there was no significant difference between the two groups. The result shows that the two stake holders have similar perception about scaling of risks. Concessionaire and engineer perception was found similar in visible strength as the value for of Kruskall-Wallis test was closer to 1.

Kruskal-Wallis Test—Perception of Concessionaires-State

Kruskal-Wallis test was conducted to compare the outcome of respondents from concessionaire,(Contractor) and State departments. The value of risk significance was compared. The output value of the test was observed as 0.747 which was greater than 0.05 (p>0.05) thus there was no significant difference between these stakeholders. The result shows that the two stake holders have similar perception about scaling of risks. Concessionaire and State perception was also obtained with strong similarity.

Kruskal-Wallis Test—Perception of Concessionaires-Financers

Kruskal-Wallis test was conducted to compare the outcome of respondents from concessionaire,(Contractor) and Financers**.** The value of risk significance was compared. The output value of the test was observed as 0.559 greater than 0.05 (p>0.05) thus there was no significant difference between the groups. The result shows that the two stake holders have similar perception about scaling of risks. The perception of concessionaires and bankers was found similar but weak as compared to other stakeholders. It depicts that the concessionaire and financers have different priorities for risks

Kruskal-Wallis Test—Perception of Engineers-State

Kruskal-Wallis test was conducted to compare the outcome of respondents from Engineers-State The value of risk significance was compared. The output value of the test was observed as 0.825 was greater than 0.05 (p>0.05) thus there was no significant difference between the groups. The result shows that the two stake holders have similar perception about scaling of risks. The perception of engineer and state was found similar and strong for ranking and signifying the importance of identified risks in BOT highways.

Kruskal-Wallis Test—Perception of Engineers-Financers

Kruskal-Wallis test was conducted to compare the outcome of respondents from Engineers-Financers. The value of risk significance was compared. The output value of the test was observed as 0.788 was greater than 0.05 (p>0.05) thus there was no significant difference between the groups. The result shows that the two stake holders have similar perception about scaling of risks. The perception of engineer and finances was also found similar and strong for the identified risks.

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Kruskal-Wallis Test—Perception of State-Financers

Kruskal-Wallis test was conducted to compare the outcome of respondents from State-Financers. The value of risk significance was compared. The output value of the test was observed as 0.489 was greater than 0.05 (p>0.05) thus there was no significant difference between the groups. The result shows that the two stake holders have similar perception about scaling of risks. The perception of clients and financers was observed similar but the most weak among the groups. This means that financers expect that state should a lot more to make environment favorable in Pakistan for private investment.

Ranking of Risks and Phases by MS and RII

The ranking of the research objectives was analyzed individually and collectively through Mean Score and Relative Importance Index (RII) by using MS Excel and SPSS to compare the perception of the stakeholders from each other and the overall, and the level of importance they had attached to them through their responses.

Mean Scores of Risks in Phases and Risk Rankings

The mean rating for 53 BOT highway constructional risks in Pakistan was calculated on the basis of risk significance value (Shen et al,. 2001). Where risk significance for each risk factor was calculated through the following formula:-

Risk Significance = Risk likelihood x Risk Impact _____(4.1)

The mean score ranking technique was used to obtain the values of risk likelihood and impact, which is also a common technique used to analyze the results obtained by questionnaire surveys (Chan et al., 2009). The mean score for each risk factor was calculated separately for risk probability and risk impact factor through the summation of scores given by the respondents according to Likert scale divided by the number of respondents. The formula used was: -

Ms = ~ s / n _____(4.2)

Where Ms = Mean score of each risk

s = Score given by respondent as per Likert Scale

n = Number of respondents

Relative Importance Index (RII) of Risks in Phases and Risk Rankings

The responses to each statement or research variables were then used to calculate Relative Importance Index (RII). The RII value had a range from 0 to 1 (0 not inclusive), higher the value of RII, more important was the cause or the effect (Sambasivan and Soon 2007), (Chan and Kumaraswamy 1997). In this research, the perception level of construction industry stakeholders about the potential, competitiveness and implementation strategies for BIM adoption was measured by using relative importance index (RII) and it was also used for comparing the perception of the stakeholders from each other and the overall through their responses.

Relative Importance Index (RII) = ~ w / (A*N)(0~ RII ~ 1)_____(4.3)

$$RII = \frac{(1n1+2n2+3n3+4n4+5n5)}{(A*N)}$$

When

w = Weighting given to each research variable by the respondents from 1 to 5

n1 = Number of respondents for Very low

n2 = Number of respondents for Low

n3 = Number of respondents for Medium

n4 = Number of respondents for High

n5 = Number of respondents for Very High

A= 25 is the highest weight

N = Number of respondents (sample size) was taken as 115

Table-10 shows the "53 risk" associated with BOT highway constructional projects in Pakistan based on the mean values of risk significance given by the respondents. The top 15 risks shows that "Law and order situation" has been viewed as overall "No 1 Risk" by the respondents from all over the country belonging to public, private and finance sectors with the mean value of 17.69, which is quite high;

Table-10 Risk Significance and RII of Risk

Serial	Description	Mean Score	RII
	INITIATION PHASE		
R-1	Selection of project by government not in public interest.	9.095	0.363
R-2	Defects in feasibility studies, their corrections and delay in approvals.	15.23	0.609
R-3	Too optimistic and poorly compiled demand projection.	6.6	0.264
R-4	Hasty government approval of project without sufficient assessment	15.23	0.609
R-5	Delay in environment approvals, utilities shifting and interdepartmental issues.	14.91	0.596
R-6	Delay in land acquisition due to procedural issues, nonpayment of compensations etc.	17.28	0.691

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R-7	Technical defects in preliminary designs, drawings etc.	9.026	0.361
R-8	Lack of awareness of complex structure of BOT delivery method.	16.2	0.648
	IMPLEMENTATION PHASE		
R-9	Project too large for a single enterprise.	7.756	0.310
R-10	Delays and problems in forming of consortium / SPV/Project company.	7.643	0.305
R-11	Lack of creditworthiness and threat of bankruptcy of consortium.	5.113	0.204
R-12	Participation of consortium without careful consideration.	6.373	0.254
R-13	Lack of credibility of bidding process.	9.808	0.392
R-14	Failure of negotiations between client and concessionaire.	9.417	0.376
R-15	Project cost increases due to market changes.	8	0.32
R-16	Threat from other competitors and alternatives (facilities).	14.43	0.577
R-17	Inability of consortium to reach Financial close.	9.495	0.379
R-18	Inadequacy / defects/ problems in concession contract drafting.	9.930	0.397
R-19	Influence of any sort by state to restrict freedom of action of concessionaire.	9.226	0.369
	CONSTRUCTION PHASE		
R-20	Delay in availability of land (ROW, additional land) to proceed with the project.	15.35	0.614
R-21	Inadequate / absence of access to project location.	5.721	0.228
R-22	Project site unsafe / unsecure for men and material.	5.086	0.203
R-23	Unpredictable site conditions(differing site conditions).	14.608	0.584
R-24	Delay in completion due to existing traffic, design faults, incompetency of project management team, output of sub contractors	8.278	0.331
R-25	Cost over runs due to inflation, design changes, mismanagement of project team	15.13	0.605
R-26	Costs arising due to variations in scope of work.	9.652	0.386
R-27	Failure in disputes resolution among participants of the project.	8.173	0.326
R-28	Costs arising due to third party damages and compensation.	7.678	0.307
R-29	Arising of disputes among consortium members / arising of mistrust / conflict of interests.	9.460	0.378
R-30	Delays in decision / approvals by engineers on site.	5.469	0.218
R-31	Labor issues: quality, availability, disputes.	5.156	0.206
R-32	Material issues: quality, availability costs.	7.252	0.290
R-33	Interferences like strikes, protests, agitation etc.	5.4	0.216
	OPERATIONAL PHASE		
R-34	Reduction in anticipated traffic flow	16.00	0.640
R-35	Increase in actual operating costs higher than anticipation.	8.104	0.324
R-36	Increase in maintenance cost due to overloaded / high pressured tires/ leakage of dangerous materials on pavement surface.	5.695	0.227
R-37	Sudden increase in toll tariff by state.	7.4	0.296
R-38	Lack of performance of project according to technical specifications.	5.252	0.210
R-39	Utilization of other competitive routes (facilities) by users.	8.913	0.356
	TRANSFER PHASE		
R-40	Arising of disputes for possession, valuations and transfer of project assets.	6.573	0.262
R-41	Replacement of machinery/ equipment.	4.582	0.183
R-42	Arising of costs due to major repairs of pavement / structures to make project good for transfer.	7.747	0.309
R-43	End of economic life of project	5.434	0.217
R-44	Delays in closing of concession and other deed agreements.	9.591	0.383
R-45	Involvement of participants in litigation during contract period.	5.860	0.234
	COMMON TO ALL		
R-46	Political instability: changes in government, disputes between organs of state	17.69	0.707
R-47	Changes in laws and implementation by government.	14.61	0.584
R-48	Corruption: demand of bribes/ unjust rewards by officials.	9.608	0.384
R-49	Changes in taxation policies / rates by state.	14.61	0.584
R-50	Instability in interest / inflation / currency exchange rates	15.45	0.618
R-51	Law and order situation / terrorism / war / hostilities /embargoes	17.97	0.718
R-52	Natural disasters like floods / earthquakes/ epidemic breakouts etc.	9.426	0.377

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R-53	Unpredictable events like fires, fog, storms cyclones etc	6.234	0.249

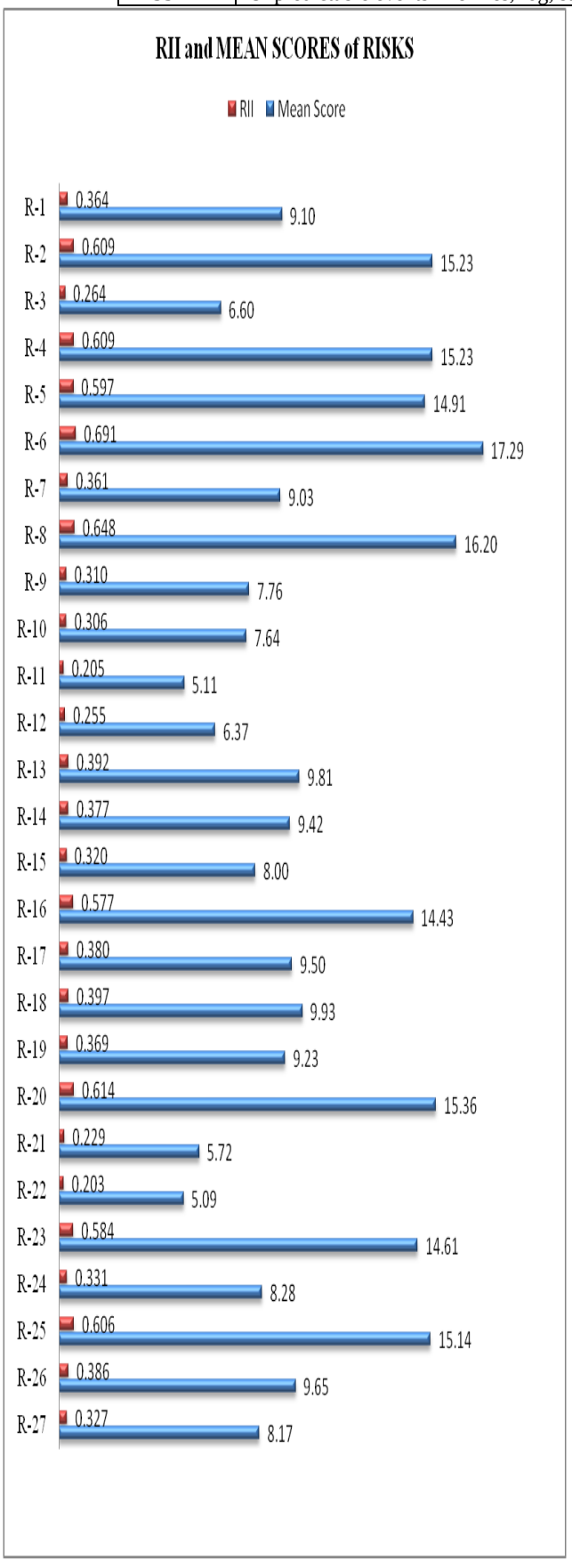

Fig -8 Risk Significance and RII of Risk

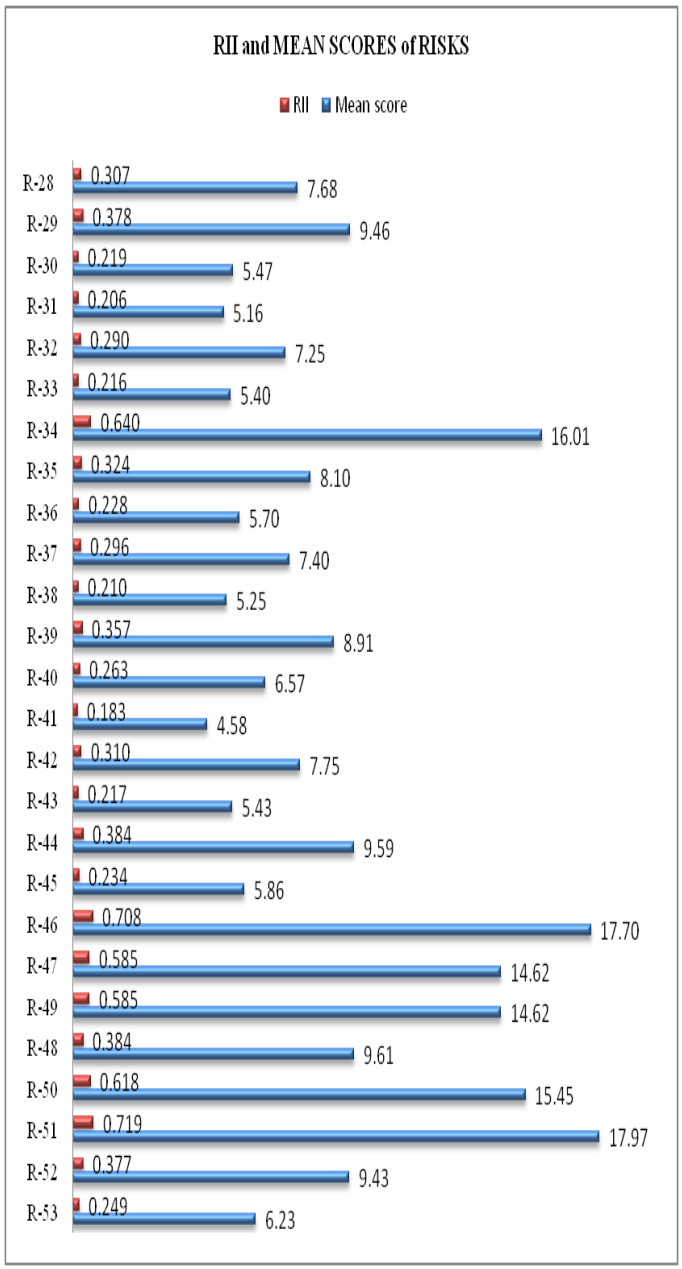

Fig 9 Risk Significance and RII of Risk

Ranking of BOT Highway Projects Phases

The Ranking of phases in BOT highways projects is also an interesting factor depicted out of the respondent's data. The top most risks were the risks included in category of common to all. This category has mean score of 13.20 of risk significance. The common to all category risks affect all phases in any time frame and space. The risks significance score of this category has been higher than other risks. The second ranked phase is initiation phase. There are four risks in top 10 risks of this category in which is more than any other phase. It reveals that the respondents are aware the BOT highways projects have not crossed the

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Ser no	PHASE	Mean Score(MS)	RII
1	Initiation	12.948	0.517
2	Implementation	8.836	0.353
3	Construction	8.745	0.605
4	Operational	8.562	0.342
5	Transfer	6.631	0.265
6	Common to All Category	13.203	0.528

implementation phase yet. Many projects were conceptualized but not contracted, or constructed.

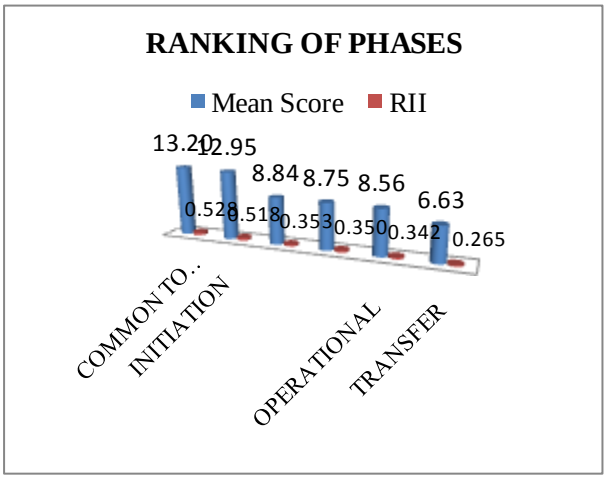

Fig -10 Ranking of Phases

Ser no	PHASE	Mean Score(MS)	RII
1	Common to All Category	13.203	0.528
2	Initiation	12.948	0.517
3	Implementation	8.836	0.353
4	Construction	8.745	0.605
5	Operational	8.562	0.342
6	Transfer	6.631	0.265

Table-11 MS and RII of BOT Highway Project Phases

Table-12 TOP TEN RISKS -- RELATIVE IMPORTANCE INDEX (RII) AND MEAN SCORES (MS)

Risk	Description	Mean score	RII	Phase
R51	Law and order situation / terrorism / war / hostilities /embargoes	17.973	0.718	common to all
R46	Political instability: changes in government, disputes between organs of state	17.695	0.707	common to all
R6	Delay in land acquisition due to procedural issues, nonpayment of compensations etc	17.286	0.691	initiation
R8	Lack of awareness of complex structure of BOT delivery method	16.2	0.648	initiation
R34	Reduction in anticipated traffic flow	16.008	0.640	operational
R50	Instability in interest / inflation / currency exchange rates	15.452	0.618	common to all
R20	Delay in availability of land (ROW, additional land) to proceed with the project	15.356	0.614	construction
R2	Defects in feasibility studies, their corrections and delay in approvals.	15.234	0.609	initiation
R4	Hasty government approval of project without sufficient assessment	15.234	0.609	initiation
R25	Cost over runs due to inflation, design changes, mismanagement of project team	15.139	0.605	construction

Law and order / Terrorism have been overall ranked 1st of the 53 identified risks in BOT highways projects. Law and order situation in the back ground of war on terror is the top most concern of all groups. There is a perception among the respondents the law and order situation has impact on men and monetary dimensions. Interviews revealed that stakeholders are reluctant to work especially in federally administered tribal areas (FATA) and Baluchistan due to risks to human lives and business. Those who demonstrated some willingness to operate conditioned on dedicated security and risk premium. Statistics of the recent years have revealed that Pakistan has suffered huge human and material losses which touch the tone of #US70 billion, surfaced by many agencies like M o F (Pakistan), World Bank, ADB and other reliable agencies.

Political Instability was ranked 2nd among 53 risks. The concern arises because the BOT delivery method demands involvement for long term commitment even up to 30 years. In Pakistan such assurance does not exist. Private sector is reluctant to invest for such a long time where political stability does not make certain return on venture. Political instability including disputes among different organs of state has direct affect on progress of nation. Growth and success require politically stable systems. The respondents were of the view that instability of government, inefficiency of political leadership and weak political structure make basis for politically instable society. The political instability becomes a serious issue for countries like Pakistan which consists of different culture behavior. The people feel dissatisfied and helpless, loose trust on government institutions and the civilization gets crack .The government changes frequently and in multi party political culture, the interests become diversified. This difference in interests break steadiness in policies which become disastrous for private sector and its investments. BOT contracts are long term contracts and sudden

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changes in political scenario in Pakistan is deterrent for private sector investment.

TOP TEN RISKS

	RII	Mean Score
	0.719	17.97
246 Political instability	0.708	17.70
R6 Delay in land acquisition	0.691	17.29
R Lack of awareness of complex BOT delivery…	0.648	16.20
R34 Reduction in anticipated traffic flow	0.640	16.01
R50 Instability in interest/inflation/currenc…	0.618	15.45
	0.614	15.36
	0.609	15.23
	0.609	15.23
R25 Cost over runs:- inflation, design…	0.606	15.14

Fig-11 Top Ten Risks

Delay in land acquisition due to procedural issues, nonpayment of compensation is ranked 3rd risk. The highways sector involves massive land acquisition for ROW and even additional land. This land has to be arranged by the state or government department. The delay occurs due to long procedural issues and delay of payments to land owners. Land acquisition become complex because a long strip involves many owners and their willingness for compensation the location of the project in geographical area of Pakistan is yet another factor for consideration.

Lack of awareness of complex structure of BOT delivery method is ranked 4th risk. The BOT delivery method is yet in its embryonic phase in Pakistan. Although the BOT delivery method has been working in other sector like power, telecommunication but the concessionaires are foreigners. The M-1 Motorway was in the beginning a BOT project contracted to the Baynder a Turkish firm. Due to disputes the company abandoned and the project has to be executed on typical public sector financing.

Reduction in anticipated traffic flow is ranked 5th in risks. The ranking of this risk in top ten risks reveals that the private investor has concern about its revenue return. Operational period is the time when revenue starts. The revenue depends upon the utilization of facility and traffic flow on road is the revenue generator. If the traffic flow is less than the anticipated revenue becomes less The risk seems to be read foresightedly by contractors and financers.

Instability in interest / inflation / currency exchange rates is ranked 6ht risk. Interviews reveal that inflation and price hike is the major concern. The consumer price index (CP1) is a measure principle at retail level. It represents the inflation. The inflation increases due to government borrowings and fiscal deficit. The construction industry is directly influenced by the prices of cement steel and oil. The CP1 raise the inflation which reduces the power of purchasing of consumer which creates low economic activity. The inflation directly brings changes in currency rates.

Delay in availability of land (Row or additional Land) *to proceed with the project* is ranked 7th in ranking of risks. This has been a delaying factor in various projects and sector. Highways are most effected sector. In BOT method this delay becomes very serious. Recently Banipuri a Malaysian company left and abandoned M-9 Motorway project on plea that ROW land was not made available by NHA. Although NHA tried to clarify that 90% of the land was available but the project had been abandoned. The project could not enter into construction. The project had suffered delays earlier. Banipuri Enterprise was successful in Financial close and was awarded concession contract.

Defects in feasibility studies, delays in approvals was ranked 8th among risks. The projects which are intended to be delivered though BOT basis have to be studied in detail and correctly. Political situation and interests definitely influence the results of the studies which cause failures to the projects. The interviews revealed that the private sector involvement has been encouraged in development of different sectors but still the typical approach of departments requires change.

Hasty approval of projects on BOT method by government and cost overruns due to inflation, *design changes* are ranked 9th and 10th respectively among the risks. The risks are linked to the political stability and situation. Interviews revealed that the BOT projects need heavy investment so stakeholders of construction industry don't desire to put their investment at risk. It becomes a challenging effort for convincing private sector investment. The upfront costs are high and lead time is long, participants are more thus BOT method becomes complex. The corresponding contracts are many and require being interlocked. Performance of one party affects others.

Allocation of Top Ten Risks

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The preferred risks allocation was solicited from respondents. It was decided upon the maximum frequency of allocation to a stake holder by respondents. The top ten then risks are allocated by respondents to concessionaire and state. The political instability along with delays in availability of land, law and order situation is allocated to state. Whereas concessionaire has to mitigate the risks like reduction in anticipated traffic flow, inflation and cost overruns.

Table-13 Allocation -- Top Ten Risks

Risk	Description	Mean score	RII	Preferably attributable to
R51	Law and order situation / terrorism / war / hostilities /embargoes	17.973	0.718	Concessionaire
R46	Political instability: changes in government, disputes between organs of state	17.695	0.707	State
R6	Delay in land acquisition due to procedural issues, nonpayment of compensations etc	17.286	0.691	Concessionaire
R8	Lack of awareness of complex structure of BOT delivery method	16.2	0.648	Concessionaire
R34	Reduction in anticipated traffic flow	16.008	0.640	concessionaire
R50	Instability in interest / inflation / currency exchange rates	15.452	0.618	Concessionaire
R20	Delay in availability of land (ROW, additional land) to proceed with the project	15.356	0.614	Concessionaire
R2	Defects in feasibility studies, their corrections and delay in approvals.	15.234	0.609	State
R4	Hasty government approval of project without sufficient assessment	15.234	0.609	State
R25	Cost over runs due to inflation, design changes, mismanagement of project team	15.139	0.605	Concessionaire

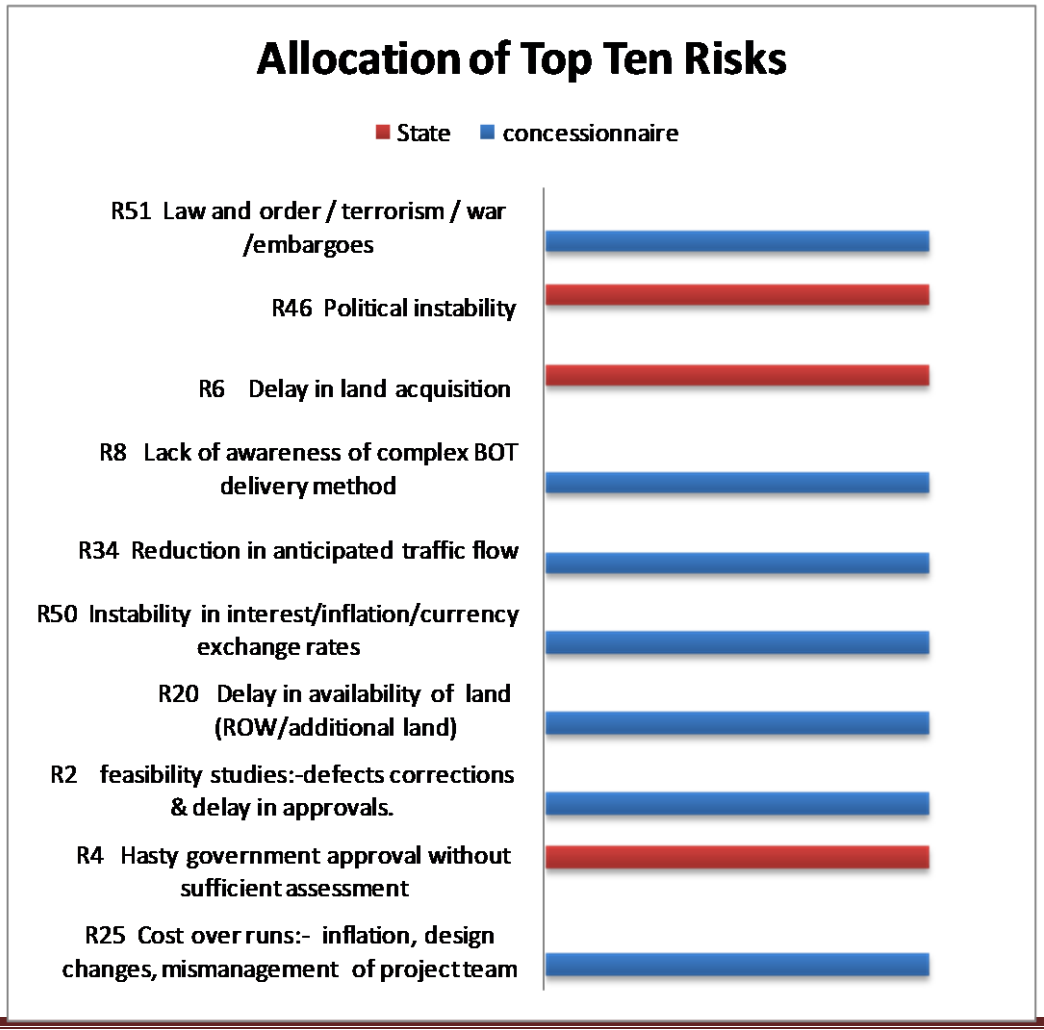

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Fig-12 Allocation of Top Ten Risks

VII. CONCLUSION

Paper work reveals numerous risks which need mitigation for successful implementation of BOT delivery method in highway sector. The indentified risks affect various phases of a BOT highway projects. It provides an opportunity to investors, construction companies and government departments to monitor risks closely and mitigate these at right time for success in highways sector. Awareness of BOT method in highways sector is comparatively less than other sectors. The analysis of sample and respondent's characteristics confirm that the BOT method is at embryonic stage. The response rate depicts that there is an increasing interest to know about risks in BOT highways sector. Thorough knowledge and experience in construction industry is available in Pakistan. This knowledge and experience needs to be transformed towards BOT method for better results.