Pak. J. Biotechnol. Vol. 14 (3) 317-321 (2017)
www.pjbt.org
ISSN Print: 1812-1837
ISSN Online: 2312-7791

RISK MANAGEMENT ON BOT SCHEME ON POST CONSTRUCTED TOLL ROADS

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Article received 15.7.2017, Revised 24.8.2017, Accepted 6.9.2017

ABSTRACT:

BOT (Build, Operate, Transfer) scheme means the government transfers the concession to private company where the company is responsible for building and operating the project, and transfers the project back to the government when the concession expires. This kind of BOT (Build, Operate, and Transfer) projects is currently fashionable worldwide. The important issues concerning a highway B-O-T project is the risk factors which have been involved on the post constructed toll roads. This paper deals with the factors on risk which have been involved on a constructed toll road. Different toll roads were considered. Risk identification and classification based on risk factors has been done on the toll roads. The risk parameters are measured by the collection of details from various experts from toll road projects. AHP (analytic hierarchy process) is used for analyzing the data to determine the risk factors and their impact at different stages in road project. The comparative study is made between city and highway toll roads where many differences in management of roads were obtained.

Keywords: BOT, Highway, Risk Factors, Toll Roads, AHP Analysis

I. INTRODUCTION

Transferring concession by government to the private company for building and operating the project and again transferring the project back to the government once the concession [Nerija and Audrius, 2012] period expires is termed as BOT (build-operate-transfer). Countries with shortages of funds for the construction of roads are helped in developing by this kind of BOT project. Risk factor with concerns to highway BOT is on post constructed toll roads. [Deepa and Thenmozhi, 2014] This BOT project helps to deal with the risk concerned on a constructed toll road. Risk identification and classification is done on different toll roads. Keen management and studying [Rinaj & Pimplikar, 2013] is required for preventive measures on risk. In order to achieve the goals of this project considering time, cost, quality, safety, management of risk in road construction is highly essential. To measure risk quantitatively it requires the use of arithmetic hierarchical process (AHP). This study emphasis on identifying various risks involved in road project and analysis with regards to impact, severity, and likelihood. This whole idea of risk parameters was on the response of experts who dealt with present project and road projects. Contract value and schedule prepared gives the base cost and base time of this project. Differences in management of city roads and highway toll roads can be found by the comparative study made on both [Rinaj & Pimplikar, 2013].

II. SITEDETAILS

The proposed project analyzes the three toll road construction details. The significant feature of the project is to analyze the risk at NH and SH toll post constructed roads. The sites which are involved in the current project are Paranur Toll Plaza, OMR and ECR Toll Roads.

Paranur Toll Plaza falls under the region of Chengalpattu which comes under NH-45. The toll road ranges from Tambaram to Tindivanam which cover nearly 93Kms. The concessionaire of this project is GMR with the concession period of 17.6 years which has been started from 2001.

OMR Toll road originates at Madhyakailash and terminates at Mahabalipuram. As the name suggests, this toll road fall under the area OMR, this is located in SH-49. The area, it surrounds is about 45.2Kms. Whereas the concessionaire of this project is TNRDC with the concession period of 22 years which has been started from 1998.

ECR Toll road, the most familiar Toll ranges from Kudimiyandithoppu to Koonimedu. As the name suggests, this toll road fall under the area ECR road, this is located in SH-49A which cover nearly 113.3Kms. Theconcessionaire of ECR Toll project is TNRDC with the concession period of 31 years which has been started from 1998.

III.RISKIDENTIFICATION

BOT project is subjected to various risks when compared to different kinds of projects. The different risks that occur in this project are due to the difficulties in the project itself in the terms of providing funds, technical specifications, subordination agreements, official information and incurrect situation in the market.

Regulatory risk: The basic risk that occurs is due to the decision taken by the government for eliminating the project or changing the program of the contract or by not fulfilling its responsibilities. Certain risk will be handled by the government as

signed in the project. Political risk won't be carried by government at any point.

Legal Risk: Deficiency in BOT regarding the standard model, agreements leaves the common and great contract conditions which affects in low implementation of controlling things.

Force Majeure Risk: This risk is outside the scope of project developer. The two parties involved in the finance agreement will not include this risk and will also not change the conditions contained within the contract.

But the organization that lends money will want to change the conditions of the contract and make sure they are in succession with the concession agreement.

Political Risk: Every project is conditional to unjust government interference. Let us take an example that the government will take decision in order to get the ownership of some or the whole project for benefitting the public. This kind of risk is affectted by the political conditions.

Land Acquisition: The important drawback of GQ phase of the NHDP, exceeding the cut-off, during the completion of project and it is due to the problem that occurs in acquisition of the assets like land. This kind of problem can be reduced only if the land has been acquiesced by the government and it should be given with justice.

Environmental risk and social risk: Holding-up in covering the aspects like screening, scoping and evaluation of the upcoming project and contaminants in the natural environment that cause adverse change may affect in the performance of the project. To identify the future consequences of both social and environmental risk, it should be suggested to have functional R&R policy.

Financial Risk: This risk includes the involvement of loan service and then failing to pay sufficient returns. Group of people sharing the same environment depend upon the infrastructure projects especially the delivery of resources like water supply, electricity and land intensive projects for instance toll roads. This can be delayed due to the increased cost of the project implementation.

Funding Risk: This risk is likely affected to the promoters where the conditions of a financing agreement are not fulfilled prior to the initial availability of funds. Also, interest rate risk increases because of changes in interest.

Debt servicing risk: This risk is highly critical. Appropriate capital structure that is the mix of company's financing which is used to fund its day to day operation would help to reduce this risk.

Construction Risk: This risk includes delay in the completion of project, increase in the estimated budget and design failures by the engineers. Effective supervision over contractors can help in reducing such risks.

Termination Risk: BOT Project will be terminated in advance when failed financially or technically. This risk can be reduced by choosing an efficient bidder.

O & M risk: This involves two important factors. Firstly, Maintenance of the assets will be disparate who has assumed. However, unit maintenance cost will undergo many changes. The important risk involved here is performance. Both lenders and investors have chosen experienced people but there will be a risk in key pieces of plant breaking down if they are out of construction warranty period, which may lead to early Termination of the project.

Revenue Risk: Act of compelling for toll collection is the risk involved for instance Coimbatore Bypass project experience. The Provider can be paid for service rendered by the toll collection.

Demand/Market risk: This risk is due to government policy and Movement of Risk over project life. And this occurs due to high estimation by the stakeholders.

IV PREPARATION OF QUESTIONNAIRE

This project relates to a great variety of valuation of the books that were issued for public interest in various areas of finance agreements, construction management, controlling risk and the risks related with the BOT Project. After the evaluation of the selected documents and consulting with skilled persons [Keith, et al., 2006], complete list of relevant actions of risk classification and 41 risk components were selected. This complete list became the underlying support for interview with more skilled persons. Depending on this list survey form was composed. Once done with the preparation, 3 BOT road projects had been selected as detailed account giving information about the development of project.

i. Tambaram–Tindivanam (NH-45) Road (NHAI)
ii. Madhyakailash–Mamallapuram (SH-49) Road (TNRDC)
iii. Kudimiyandithopu – Koonimedu (SH-49A) Road (TNRDC)

V AHP ANALYSIS

The analytic hierarchy process (AHP) analysis used here is a technique for analyzing the complex decisions, based on the survey taken. The decision problem is first decomposed into number of independent sub problems. It uses the actual measures like scores and weight as input into the matrix.

The procedure for using the AHP analysis can be summarized as:

1. Model the scores of the risk into NH and SH that has been taken from survey participants.

2. Convert the scores to the particular range say (0-1) and establish the percentages for each risk in NH and SH Toll Roads.
3. Synthesize these percentages to yield the set of priorities of risk percentage in SH and NH roads.
4. Check the consistency of the synthesized judgments.

VI SURVEY PARTICIPANTS

The survey has been conducted between various people who are involved in BOT projects. The participants are engineers, supervisors, road users and projects managers from government and private sectors. The survey has been directly taken from the people and some of the questionnaires were sent through e-mail.

TABLE 1: Calculation of % of Risk in NH and SH Toll Roads

Risk Factors	Approx. Weight (Range 1-10)	Approx. Weight in %(Normalized Value)
Political Risk	6	9.8%
Regulation, Social and Legal Risk	7	11.4%
Support from Local Government Risk	5	8.1%
Force Majeure Risk	4	6.5%
Construction Risk	7	11.47%
Operational and Maintenance Risk	8	13.1%
Transfer Risk	3	4.9%
Financial Risk	7	11.47%
Commercial Risk	7	11.47%
Lender's Risk	4	6.5%

The approximate weight for the various risk survey has been taken in the range of 1-10. The normalized value has been calculated using AHP,

$$\textbf{Normalized Weight} = \frac{\boldsymbol{Weight}}{\sum \boldsymbol{Sum\ of\ the\ Weight}}$$

Comparing the risk range of two columns in the Table 2 shown above show that the rank of preference change by the way we can compute our risk factors. The judgments may be based on the same score value but it does not reproduce the accurate result [Sharmila and Pimplikar, 2013].

The scores of each risk factor have been transformed in such a way that all factors have the same range value. Say, we choose all factors to have the range to be 0 to 1 which has been shown in Table 2. To convert linearly the scores in the table to scores based on the particular range, we use the following formula which is based on the simple geometric of a line segment,

$$\boldsymbol{newscore} = \frac{\boldsymbol{nub} - \boldsymbol{nlb}}{\boldsymbol{oub} - \boldsymbol{olb}}(\boldsymbol{originalscore} - \boldsymbol{olb}) + \boldsymbol{nlb}$$

TABLE 2: Analysis of % of Risk factors in NH and SH

Risk Factors	Weight in Approx. in %	Risk in NH Road(Range)		Risk in SH Road(Range)	
		Scores	% of Risk in NH Roads	Scores	% of Risk in SH Roads
Political Risk	9.8%	0.496	10.4%	0.61	11.50%
Regulation, Social and Legal Risk	11.4%	0.433	9.12%	0.433	8.10%
Support from Local Government Risk	8.1%	0.375	7.89%	0.375	7.07%
Force Majeure Risk	6.5%	0.331	6.98%	0.375	7.07%
Construction Risk	11.4%	0.916	19.3%	0.958	18.07%
Operational and Maintenance Risk	13.1%	0.661	13.9%	0.943	17.78%
Transfer Risk	4.9%	0.333	7.02%	0.333	6.28%
Financial Risk	11.47%	0.666	14.04%	0.708	13.38%
Commercial Risk	11.47%	0.366	7.72%	0.4	7.50%
Lender's Risk	6.5%	0.166	3.50%	0.166	3.14%

Toll Roads

TABLE 3: Analysis of Risk factors in NH and SH Toll Roads using AHP Analysis

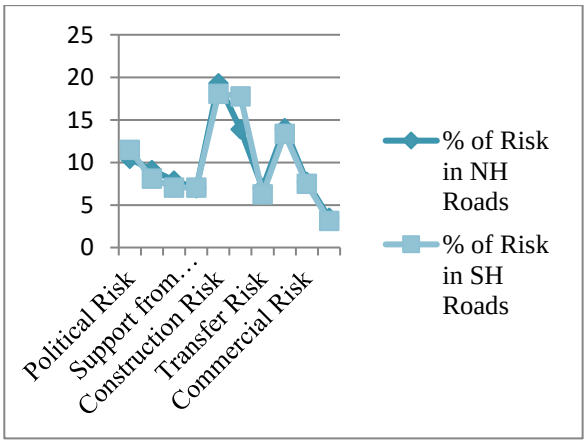
Risk Factors	Risk in NH Road(Range)		Risk in SH Road(Range)	
	Scores	Scores based on range(0-1)	Scores	Scores based on range(0-1)
Political Risk	2.98	0.496	3.66	0.61
Regulation, Social and Legal Risk	2.6	0.433	2.6	0.433
Support from Local Gover-nment Risk	2.25	0.375	2.25	0.375
Force Majeure Risk	1.99	0.331	2.25	0.375
Construction Risk	5.5	0.916	5.75	0.958
Operational and Maintenance Risk	3.97	0.661	5.66	0.943
Transfer Risk	2	0.333	2	0.333
Financial Risk	4	0.666	4.25	0.708
Commercial Risk	2.2	0.366	2.4	0.4
Lender's Risk	1	0.166	1	0.166

Comparing risk factors in NH and SH roads we infer that the maximum risk relies in Construction in both roads. Whereas the next priority goes to the financial risk in NH toll roads and Operational and Maintenance risk in SH toll roads and it has been shown in Graph 1. The risk factors in NH toll roads has been listed based on the higher priority,

1. Construction Risk
2. Financial Risk
3. Operational and Maintenance Risk
4. Political Risk
5. Regulation, Social and Legal Risk
6. Support from Local Government Risk
7. Commercial Risk
8. Transfer Risk
9. Force Majeure Risk
10. Lender's Risk

Whereas the risk factors in SH toll roads has been listed based on the higher priority,

1. Construction Risk
2. Operational and Maintenance Risk
3. Financial Risk
4. Political Risk
5. Commercial Risk
6. Regulation, Social and Legal Risk
7. Support from Local Government Risk
8. Force Majeure Risk
9. Transfer Risk
10. Lender's Risk

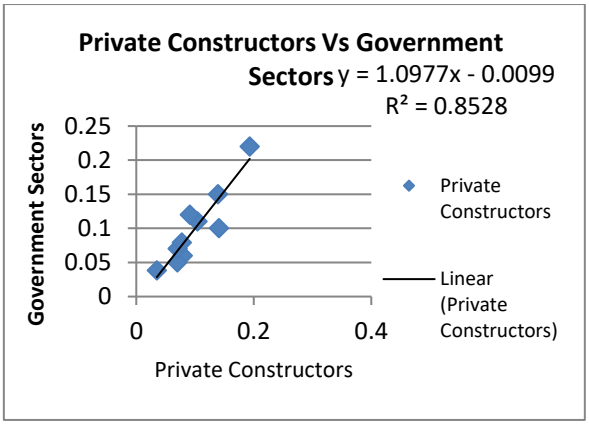


GRAPH 1: % of Risk factors in NH vs SH Toll Roads

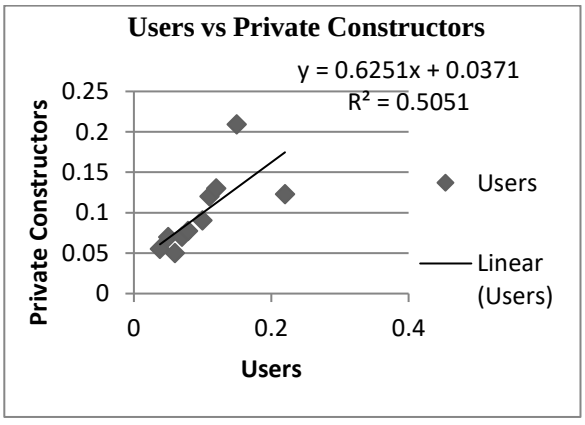
Correlation has been predicted based on the survey taken from Government Sectors, Private Constructors and the Users of the Toll Road which has been shown in Table 4, 5 and the graph has been shown in Graph 2, 3, 4, 5, 6 and 7.

TABLE 4: Calculation of correlation of Risk in NH between Government sectors, Private constructors and the users

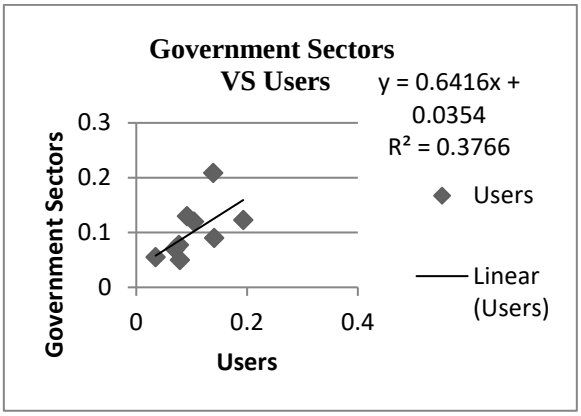
Risk Factors/ Survey Participants	Government Sectors	Private Constructors	Users	Mean Ranking	Correlation
Political Risk	0.104	0.11	0.12	0.111333333	
Regulation, Social and Legal Risk	0.0912	0.12	0.13	0.113733333	0.923457
Support from Local Government Risk	0.0789	0.06	0.05	0.062966667	0.710725
Force Majeure Risk	0.0698	0.05	0.0698	0.0632	
Construction Risk	0.193	0.22	0.123	0.178666667	
Operational and Maintenance Risk	0.139	0.15	0.209	0.166	
Transfer Risk	0.0702	0.07	0.0702	0.070133333	
Financial Risk	0.1404	0.1	0.0904	0.110266667	
Commercial Risk	0.0772	0.079	0.0772	0.0778	
Lender's Risk	0.035	0.038	0.055	0.042666667	



GRAPH 2: Correlation between Private constructorsvs Government Sectors in NH Roads



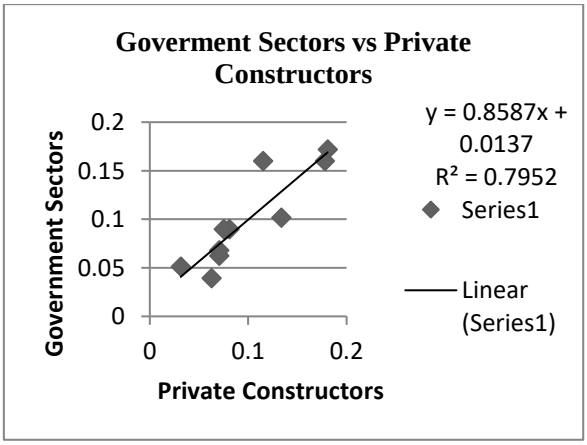
GRAPH 3: Correlation between Private constructor vs the users in NH Roads



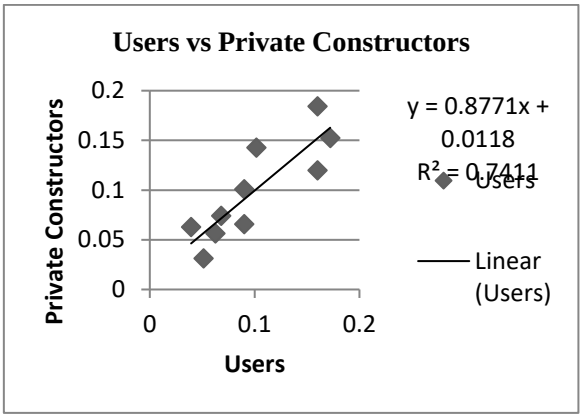
GRAPH 4: Correlation between Government sectors vs the users in NH Roads

TABLE 5: Calculation of correlation of Risk in SH between Government sectors, Private constructors and the users

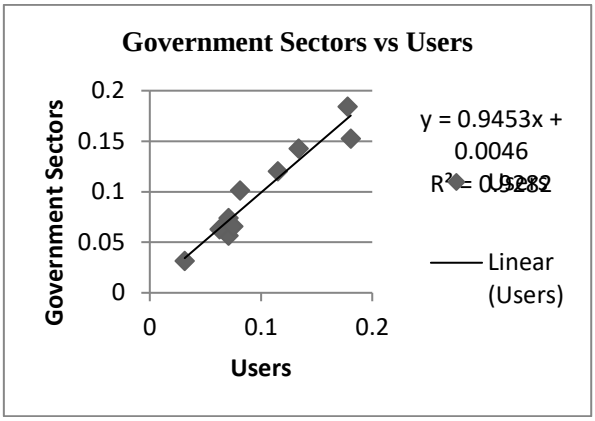
Risk Factors/ Survey Participants	Government Sectors	Private Constructors	Users	Mean Ranking	Correlation
Political Risk	0.115	0.16	0.12	0.131666667	
Regulation, Social and Legal Risk	0.081	0.09	0.101	0.090666667	0.891741
Support from Local Government Risk	0.0707	0.0626	0.0564	0.063233333	0.860885
Force Majeure Risk	0.0707	0.068	0.074	0.0709	
Construction Risk	0.1807	0.1721	0.1524	0.1684	
Operational and Maintenance Risk	0.1778	0.16	0.1841	0.173966667	
Transfer Risk	0.0628	0.0394	0.0628	0.055	
Financial Risk	0.1338	0.1016	0.1427	0.126033333	
Commercial Risk	0.075	0.09	0.0657	0.0769	
Lender's Risk	0.0314	0.0512	0.0314	0.038	



GRAPH 5: Correlation between Private constructor's vs the Government Sectors in SH Roads



GRAPH 6: Correlation between Private constructors vs the users in SH Roads



GRAPH 7: Correlation between Government sectors vs the users in NH Roads

VII. CONCLUSION

Due to various risks involved in this BOT project, it has indeed become essential for the promoter to lessen the risks involved to achieve success of this project by enrolling powerful controlling team.Strong support and assistance is needed by the government and investors in achieving tasks of this project.Government must ensure that the public is favorable by the BOT project. It is advisable for both lender and investor to conduct a checklist on assessment of risks before they get into the project. Hence, it concludes that an efficient risk management for any BOT project must be conducted, also process of developping options and actions to enhance opportunities must be ensured for achieving results of this project.

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