



Risk Factors Affecting PPP Project of Highway by Using Analytical Method

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Abstract— PPP Highway construction projects is highly considered in current construction situation as per the work intensity and budget of the project it is observed that there is a lack in government programs due to which they are giving construction work to PPP sector and on the second-hand PPP construction have shown very high quality of work in any scenario as compared to Government. PPP is having full strength of skilled labour, quick release of payment, and mainly Quality work and against all these there are weak area which PPP construction needs to clear up. And into this One of the Area come i.e. Risks. Risk in construction is very common but to avoid those risks is a challenging stage. And for this we had collected information from outer sources and from literature review we got 187 factor that affect this area but in this also we seen many factor that are same so we have validated the factor and after that we got 35 factors of Risk area that must be considered and after validating, we used Analytical method to give ranking by using Likert scale.

Keywords—PPP (Public Private Partnership), Developing Countries, Highway Construction Projects, Risks Analysis, Quantitative Perspective.

I. INTRODUCTION

In construction industry we are all directly connected with the development of country in different ways like Building Construction, Infrastructure construction, Industrial Construction, Heavy Construction, etc. In which infra construction plays a major role in development of the country in fact it is seen that Indian Government is paying **24.6% of budget to Road Transport & Highways** <https://prsindia.org/> as per the report 2023. Into which Highways Construction plays a vital role for the developing nations to connect two states, different cities, Various Road and making the road transportation through easy access. But with easy access we have also seen major problems occurs during the development phase/ Implementation phase of the road construction some of the factors we have seen commonly during the development phase are financial problem, Muddy land, Land acquisition, Improper planning, etc. but all these factors which are arise is due to avoiding risks factors during pre-construction, during construction and post construction period so basically avoiding Risks factors of the projects causes cost over-run, timely delay. In all these everyone is responsible who are working in this project Owner, supervision consultants, Designers,

Government, contractors, sub-contractors, suppliers, and manufactures.

Firstly, there is need to understand risk factors that in which part of construction there are Major risk and in which area risks factors can be avoided. Then there is a need to divided all the risks factors in different categories and provide them stages which stage of risks is mandatory. And to know all this we have to define risks: Risk is defined as a situation or chances of possibility which may or may not affect. It often involves certainty or Un-certainty sometimes it is predictable sometimes not. The Success and failure of Risk is seen during the construction stage it is predictable how often you have taken risks factors seriously.

In addition of all this it is seen that many studies are conducted to identify risks, asses its chances and how it can be ignored the study are conducted in many different methods, various software are used. Risk are prioritized generally with Qualitative and Quantitative analysis. And each method carries their own objective-Formula-methodology to know the risks range.

The main objective of this paper is to identify or assess the risks factors with the help of literature review. Then divide the identified risks in different categories as per the highest range of risks or probability and impact of risks which we received through construction professional, Engineers, Consultants, Project Managers, Contractors, Owner and all the other person who are involved in the project and the survey. Finally Proper Risks allocation is done with the contracting party who are involved in the project.

II. LITERATURE REVIEW

Literature review helps in finding the problem and the solution through the reference of the various different papers related to the topics. The literature review helps in knowing the common factors which are regularly seen during construction. For PPP projects there are many research papers to know the route of findings, the papers help to identify the best way to reach the results. With the help of paper, we are able to see various challenges which is faced by during their research. It also helps in knowing different methods which are used to solve PPP projects which are related to risk in Highway constructions Projects. In total there are 10 main factors 35 sub factors on to which total risks of construction affects and if these factors are

minimized / Solved then major revolution we can see in Highway Constructions Projects. The previous studies says that the research of any projects majorly depends on stages particularly the 3 stages of research.

“First Stage” is about the literature reviews, Findings from multiple online platforms related to the topic, personal interviews, experts Point of view and their knowledge which depends on their years of experience, Etc. Summarizing the problems collecting the data and many more.

“Second Stage” is to review the collected data, identify the factors – Preparing Methodology, analyzing of data, Preparing the Questionnaire survey with the help of previous literature reviews and to distribute the Questionnaire survey to company experts, Site Engineers, Site Supervisor, Consultant, Architecture, Project Managers and also from the owner.

“Third Stage” is to distribute the results into different categories which helps in analyzing the collected data according to methodology onto which we are performing. And helps to reach to the result in best and the easiest way.

III. RESEARCH METHODOLOGY

“First step” is to know about the research in very clear way with the references of Literature review which will help for further research which is connected to this study “PPP Risks in Highway Construction Projects” and helps in collecting the factors due to which people are facing risk in highway projects.

“Second step” is to prepare the data and Questionnaire survey so that it helps in reaching the half of the way of research. After preparing the questionnaire survey the further step is to distribute the survey to the company experts, researchers and the people who are directly or indirectly connected to the Highway construction projects.

“Third step” is to analyzed the data which is collected with the help of various surveys through different platforms and reach to the results of which Risk factor affects the most in Construction of highway projects.

The Same methodology is performed in this survey and the method used in this project is Importance Index Method (IMPI) which is dependent on two Indexes F.I and S.I which is then divided by 100 where F.I Stands for Frequency Index and S.I stands for Severity Index: For each results IMPI is calculated with the formula and then it provides the range of index, Higher rate indicate Very High Potential of risk and Lower rate indicates very Low Potential of risks.

$$\text{Important Index\%} = [F.I\% \times S.I\%] / 100$$

Were,

$$F.I\% = \frac{\sum a(n/N) \times 100}{4}$$

$$S.I\% = \frac{\sum a(n/N) \times 100}{4}$$

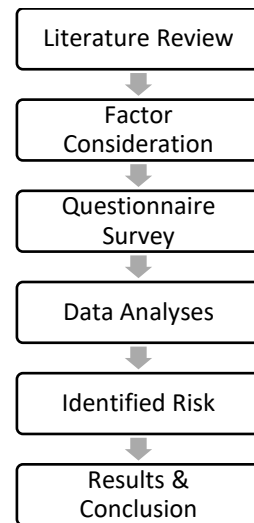


Fig.1 Research Methodology

In this Research we are going with Quantitative Analysis method which helps in distributing the questionnaire survey in Ranking Method i.e.

1:- Very Low and 5:- Very High for analysis of data Likert scale is used which is particularly based on Ranking method. In most of the researches Likert Scale is only used mostly for the surveys which are done by Quantitative method. Likert scale is easy to understand and also to perform surveys it is also helpful for the surveyor who are helping by giving the results through their years of experience in the Selected field.

A. Data Collection

Data Collection is defined as a method which helps to collect the Data that is required to perform the survey. For Collection of data, questionnaire survey is done in which 1st section is for the personal information who is giving the survey and in 2nd section, we have considered 35 Main factors on to which survey is performed out of 187 Factors which we received with the help of Literature Review. Firstly, we have done factor consideration through company experts and from the researchers who have already done the research on the similar study. The Questionnaire Survey is distributed to Site supervisor, Site Engineer, Project Manager, Researchers, Architecture, Consultants etc. who are involved in Construction of highway projects. Also, data is collected by both the ways Online and Offline whichever is suitable. The selection criteria for online and offline surveys were consider on the basis was Distance and Time Availability. Likert Scale was used for collection of Data. Also attaching the list of factors which are considered for the survey.

B. Data Analysis

The survey was conducted in Gujarat region (INDIA) and Project manager, Project head, Site supervisor, Site in-charge, Site engineer, Owner, Architect, Consultant were included during the survey. Mainly we have considered only 35 factors out of the list of 187 factors which we have

received from literature review. Out of 35 factors we have seen there are 5 major factor which affect the PPP Highway construction and increases the risk by Delaying the project, Accidents, Un-Predictable risks etc...and to avoid such challenges this survey is conducted. The 5 factor which are majorly seen while construction of PPP Highway Project is... **1.) Failure in major construction equipment & non-availability of spare parts, 2.) Construction cost overrun, 3.) Unstable government, 4.) Land acquisition and Negotiation problems, 5.) Lack of quality control and monitoring.** Also, in some Paper we have seen same challenges that have been faced by Practioners during their research study in different State, City and in other countries. So, we can also say, these are the common problem while construction of PPP Highway Projects. For the better understanding, we have attached the table of the results that we have received by using Likert scale and IMPI method.

Table I. Data Analysis Results.

Sr. No	Data Analysis			
	<i>Risk factors that affect the performance of PPP highway projects in India.</i>	FI	SI	IMPI
1.	Failure in major construction equipment & non-availability of spare parts.	69.83	81.90	57.19
2	Land acquisition and Negotiation problems	63.79	73.28	46.74
3	Unstable government	63.79	64.66	41.25
4	Construction cost overrun	70.69	71.55	50.58
5	Lack of quality control and monitoring	56.03	71.55	40.09
6	Project being cancelled due to change in state government after every 5 years of term period.	57.76	73.28	42.32
7	Strong political interference Act	56.90	61.21	34.82
8	Expropriation Risks	56.03	62.07	34.78
9	Poor relationship with community	61.21	61.21	37.46
10	Lack of legal regulatory framework.	66.38	69.83	46.35
11	Exchange in rate of fluctuation	64.66	74.14	47.93
12	Non-availability of special equipment	58.62	70.69	41.44
13	Government officials asking for bribe /un adjustable rewards	53.45	60.34	32.25
14	Public opposition to projects	46.55	64.66	30.10
15	Inflation/interest rate of fluctuation	55.17	55.17	30.44
16	Owner are not ready to sell	58.62	60.34	35.37
17	Improper ground conditions	61.21	67.24	41.16
18	Weak monitory & regulatory	52.59	60.34	31.73
19	Challenge in Project funding	61.21	68.10	41.68
20	Delay due to time overrun	68.10	61.21	41.68
21	Improper design, error and rework	58.62	53.45	31.33
22	Improper procurement methods	53.45	52.59	28.11
23	Delay in the availability of design details	75.00	73.28	54.96
24	Weak communication with different parties	62.93	70.69	44.49
25	Maintenance cost is high	63.79	64.66	41.25
26	Subcontractors' incompetence	66.38	63.79	42.35
27	Poor competence of labourers	63.79	64.66	41.25

Sr. No	Data Analysis			
	<i>Risk factors that affect the performance of PPP highway projects in India.</i>	FI	SI	IMPI
28	Shortage of experts in highways	56.03	65.52	36.71
29	Shortage of skilled labourers	64.66	56.90	36.79
30	Shortage of materials	58.62	59.48	34.87
31	Lack of joint risk mechanism by parties	53.45	56.03	29.95
32	Lack of commitment between parties	58.62	58.62	34.36
33	Terrorist attack	68.97	72.41	49.94
34	Climatical Changes	62.07	73.28	45.48
35	Floods	62.07	68.10	42.27

RESULTS & CONCLUSION

According to the study which we had perform we came to know that there are five factor which highly affects the PPP highway construction sector or Infra-structure projects. If these factors are resolved then we can assume that Risk in highway construction industry will get minimized to many extents.

According to the study that we carried with different partners of highway construction projects by using Likert Scale and IMPI method we came across that Highway construction sector is very vast and its work goes beyond our imagination there are many sub-factors in PPP highway construction project to which the further research can be considered like Design, Auditing, Bids, etc. the sector which we have consider is construction sector and according to the study results and conclusion which he have received from Construction team is mostly there are 5 factors (1.) Failure in major construction equipment & non-availability of spare parts, 2.) Construction cost overrun, 3.) Unstable government, 4.) Land acquisition and Negotiation problems, 5.) Lack of quality control and monitoring) which should be consider on a very serious note and if these factors are minimized then we can deal with the up-coming risks factor in a very easy way and to minimized these factors we have to schedule and plan the project before the working and for these we must have standardized team who can put their complete efforts to give the project a smooth road to reach till his destiny. In the research we have consider Quantitative method but it can also be done through Qualitative method.

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