# An Overview on Factors Affecting Risk Management in PPP Based Infrastructure Projects

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***Abstract*— The infrastructure industry has complexity in its nature because it contains a large number of parties as Public, Private,Government and others. Infrastructure projects suffer from many problems and complex issues in performance, such as Land acquisition, Time overrun, Quality assurance & Control, Termination of agreement by law, Operation cost overrun, Design alteration risk, Design alteration risk, Design deficiency/bad workmanship/law quality during construction, Deficiency of design, Inadequate experience in PPP. The aim of this thesis is to identify and evaluate the main factors affecting the risk management in PPP based Infrastructure projects A questionnaire survey was conducted and 60 factors were identified, categorized into 8 groups, was evaluated and ranked from Private, Government and researcher perspectives. Ranking method mean was used. Statistical Package for Social Sciences (SPSS) Software was used as analytical method for analysis of factors also generate correlation between respondents. The validation of the results have been done through survey of the experienced experts. A recommendation were suggested to improve project efficiency and suggest solution model. For factors affecting risk management in PPP based infrastructure projects.**

***Index Terms*— Risk Management, PPP, Infrastructure Projects.**

## I. INTRODUCTION

No venture is sans hazard. In any case, the quantum of work and capital required in the foundation ventures prompts higher hazard. Likewise the instabilities and flow of each progression in general society private association infrastructur ventures interest for thorough hazard administration at different stages, from pre-offered assessment to contract conclusion. An a reality chance can't be disregarded yet It can be overseen, limited, shared, exchanged or acknowledged. The development tasks are broadly unpredictable and have regularly with huge spending plans, and this necessiates limiting the dangers related ought to be a need for each venture supervisor. The proposed work incorporates an utilization of hazard administration amid the whole life cycle of framework activities, particularly the metro rail extend.

The development business works in an exceptionally unverifiable condition where conditions can be dynamic because of the many-sided quality of each venture, delay because of asset deficiency, lack of common sense and absence of supervision, specialized foundation, and nature of the partners required in PPP mode the venture. Aside from man, material and cash PPP extend relies on upon government approaches and open premium. Which makes hazard administration essential for effective venture. It ought to be underlined that hazard administration is not an instrument, which guarantees achievement yet rather an apparatus, which builds the likelihood of making progress. Hazard administration is accordingly a proactive instead of a receptive idea. With the development in Indian economy, the Governments at the focal, state and neighborhood body levels have embraced real foundation advancement activities. These undertakings are defenseless against endorsement delays in light of the fact that they require different statutory and non-statutory vulnerabilities and clearances amid the advancement stage and venture particular endorsements amid the usage stage. The recognized dangers will profit the engineers and venture chiefs of the framework ventures. The arranging, planning, sorting out, controlling of such infrastructural activities will be more proficient and powerful alongside known dangers. Framework ventures considering effect of these dangers and how to alleviate the same.

K. Jayasudha et al. (2014) portrayed hazard appraisal and administration in development ventures. K. RajKumar et al. (2013) explored variables affecting the foundation improvement extends under PPP. Chris Harty et al. (2014) considered hazard administration and instability in foundation ventures. Mihnea Craciun (2011) expressed new kind of hazard in foundation ventures. As per past reviews. One might say that the execution estimation is a procedure incorporate elements which are time, cost, condition and security keeping in mind the end goal to empower estimation of current venture execution and to accomplish critical execution enhancements of future undertakings.

## II. SURVEY WORK, DATA COLLECTION AND DATA ANALYSIS

The survey work shall be carried out within the scope of the study and among the selected respondents of the sample. The questionnaires will be distributed to respondents and data will be collected through these filled questionnaires. By these questionnaires the perceptions of respondents with regarding to factors affecting PPP based infrastructure projects.

## III. SAMPLE SIZE CALCULATION

Simple random sampling selects by methods that allow each possible sample to have an equal probability of being picked and each item in the entire population to have an equal chance of being included in the sample.We heve used this only to help us think about samling from infinite population. Here the metrorail concept is new and also it has infinite population so we take random sampling for collection of data. An infinite population is population in which it is theretically impossible to observe all the elements. Although many population appear to be xceedingly large, no truly infinite population of physical objects actually exists. After all, given unlimited resources and time, we could enumerate any finite population. As a practical matter then we use the term infinite population when we are talking about a population that could of infinite population as an approximation of a large finite population, just as we earlier used the theoretical concept of continuous random variable as an approximation of a discrete random variable that could take on many closely spaced values.

## IV. QUESTIONNAIRE DISTRIBUTION AND COLLECTION

The questionnaire was distributed to various stakeholders by informing them regarding the purpose of the research and asking them about their willingness to participate in the research. Once the respondents showed the initial willingness, a questionnaire was given to them. Total 120 questionnaires were distributed to different respondents in Ahmedabad District. Total 100 respondents provided their response for this research work.

| **Resondents** | **No. Of Response Received** | **(No. /Total No.)*100= %** |
|---|---|---|
| PRIVATE | 60 | 60 |
| GOVERNMENT | 20 | 20 |
| RESEARCHER | 20 | 20 |

TABLE-1TOTAL PERCENTAGE RESPONSES RECEIVED

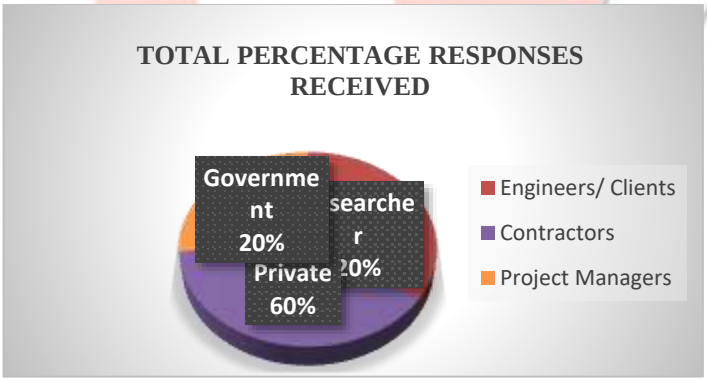


FIG.-1-TOTAL PERCENTAGE RESPONSES RECEIVED

## V. RANKING

The Mean is computed for each factor to identify the most significant factor. It is helps to identify the most important factor affecting Risk management in PPP based infrastructure project.

| **Sr. No.** | **Factors Affecting risk Management** | **Mean** | **Rank** |
|---|---|---|---|
| 1 | Land acquisition | 4.360 | 1 |
| 2 | Time overrun | 3.980 | 2 |
| 3 | Quality assurance & Control | 3.880 | 3 |
| 4 | Termination of agreement by law | 3.760 | 4 |
| 5 | Operation cost overrun | 3.700 | 5 |
| 6 | Design alteration risk | 3.662 | 6 |
| 7 | Planning risk | 3.660 | 7 |
| 8 | Design deficiency/bad workmanship/law quality during construction | 3.620 | 8 |
| 9 | Deficiency of design | 3.600 | 9 |

| | | | |
|---|---|---|---|
| 10 | Inadequate experience in PPP | 3.560 | 10 |
| 11 | Connection of public utilities to boundaries of site | 3.542 | 11 |
| 12 | Change of work | 3.540 | 12 |
| 13 | Financial closure risk | 3.520 | 13 |
| 14 | Poor financial management | 3.502 | 14 |
| 15 | Delay in project approvals | 3.500 | 15 |
| 16 | Government intervention | 3.460 | 16 |
| 17 | Insolvency of promoter or controller | 3.442 | 17 |
| 18 | supervision, organization and control for inspection of construction works | 3.440 | 18 |
| 19 | Access and delivery of site | 3.430 | 19 |
| 20 | Support from local/state government | 3.424 | 20 |
| 21 | Project/operation changes | 3.422 | 21 |
| 22 | Supply and demand | 3.420 | 22 |
| 23 | Political/Public opposition | 3.400 | 23 |
| 24 | Political decision making system | 3.382 | 24 |
| 25 | Staff crises | 3.380 | 25 |
| 26 | Change in regulation & law | 3.368 | 26 |
| 27 | Social impact assessment | 3.366 | 27 |
| 28 | Government corruption | 3.364 | 28 |
| 29 | Physical obstacles that cannot be avoided | 3.362 | 29 |
| 30 | Material shortage | 3.360 | 30 |
| 31 | Private monopoly risk | 3.342 | 31 |
| 32 | Inadequate law and supervision system | 3.340 | 32 |
| 33 | Failure of partner to perform provide requisite quality | 3.320 | 33 |
| 34 | legislation changes | 3.302 | 34 |
| 35 | Coordination risk | 3.300 | 35 |
| 36 | Market competition | 3.280 | 36 |
| 37 | Poor public decision making process | 3.260 | 37 |
| 38 | Imposition of new taxes/increase in taxes | 3.244 | 38 |
| 39 | Imperfect contract documents | 3.240 | 39 |
| 40 | Environment clearance/pollution | 3.220 | 40 |
| 41 | Inflation | 3.200 | 41 |
| 42 | Change in standard (Construction, Operating, Technical) | 3.180 | 42 |
| 43 | Contract formulation | 3.162 | 43 |
| 44 | Change in general project condition | 3.160 | 44 |
| 45 | Third party delay/Violation | 3.120 | 45 |
| 46 | Interest rate fluctuation | 3.062 | 46 |
| 47 | Subjective project evaluation Method | 3.060 | 47 |
| 48 | Traffic/incident management | 2.962 | 48 |
| 49 | Unforeseen geotechnical condition | 2.960 | 49 |
| 50 | Dispute resolution | 2.882 | 50 |
| 51 | Nationalization/expropriation | 2.880 | 51 |
| 52 | Permit risk | 2.840 | 52 |
| 53 | Attitude of government towards foreign investors | 2.820 | 53 |
| 54 | Antiquities risk | 2.800 | 54 |
| 55 | Social unrest problem | 2.780 | 55 |
| 56 | Rebellion/Terrorism | 2.740 | 56 |
| 57 | Import/export restrictions | 2.622 | 57 |
| 58 | Unforeseen weather condition | 2.620 | 58 |
| 59 | Sustainability risk | 2.560 | 59 |
| 60 | Foreign exchange fluctuation | 2.500 | 60 |

TABLE-2-OVERALL RANKING OF ALL RESPONDENTS

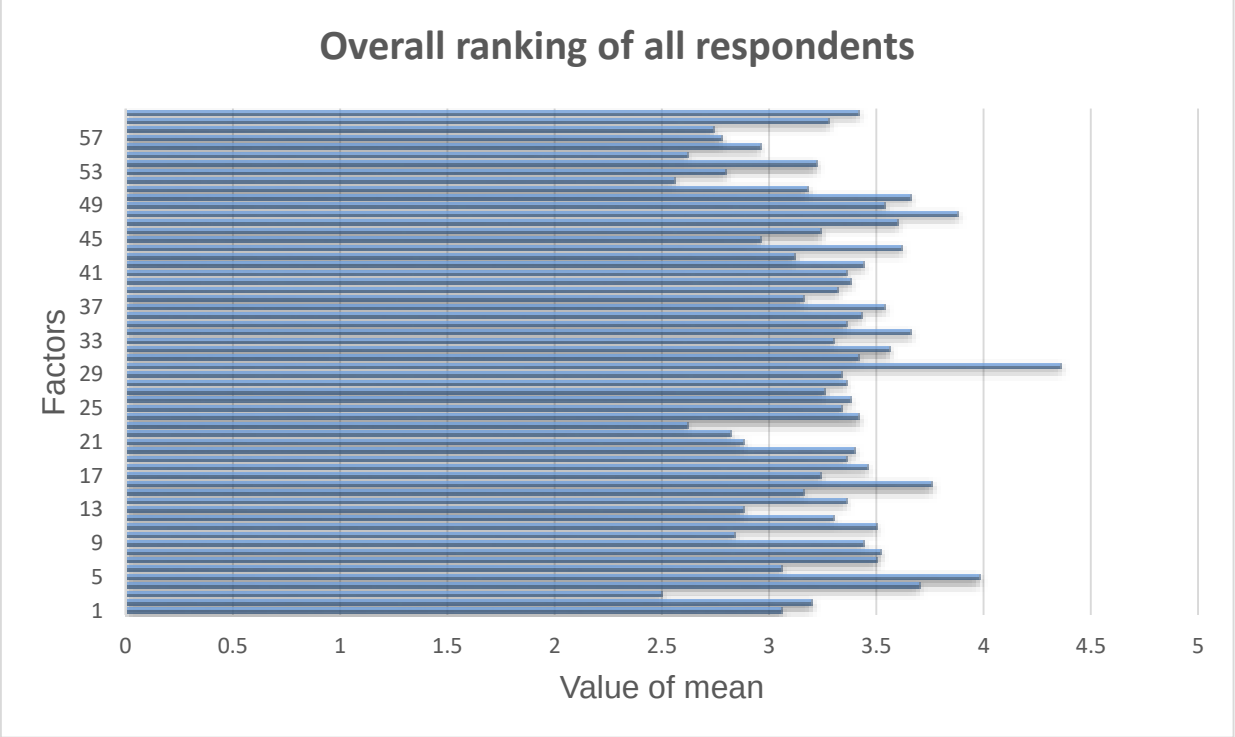


FIG-2-OVERALL RANKING OF ALL RESPONDENTS

VI. **Analysis of Variance (ANOVA)**

Ho: There is no difference of the opinions between private, government, and researcher in the factors related to the contract and project characteristics and affecting bidder's participation in the construction tenders at significance level = 0.05

To test the hypothesis, it uses the one way ANOVA for the difference between the means of the opinions between private, government, and researcher in the factors affecting PPP based infrastructure project.

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Interest rate fluctuation | Between Groups | 2.907 | 2 | 1.453 | 1.625 | .202 |
| | Within Groups | 86.733 | 97 | .894 | | |
| | Total | 89.640 | 99 | | | |

TABLE-2-ONE-WAY ANOVA FOR THE DIFFERENCE OF THE OPINIONS

Where:

(F) is a statistical test called Fish test.

(df) is the degree of freedom which equal ( Number of variables-1) or (Number of dependents -1) X (number of independents -1).

The results shown in Table 4.2, illustrates that the calculated F value is less than the critical value for this field, that describes the factors within and between the whole groups, also the value of the calculated P-value is greater than 0.05 which lead to accept the null hypothesis and to say there is no difference of the opinions between the Private,Government and Reserchер in the factors affecting risk management in PPP mode infrastructure projects at significance level □ = 0.05.

**VII. ACKNOWLEDGEMENT**

I express sincere and heartfelt thanks to Dr. I.N. Patel, I/C Principal, Birla Vishvakarma Mahavidyalaya Engineering College, Vallabh Vidhyanagar, Dr. L. B. ZALA, Professor & Head of Department, Civil Engineering Department, Birla Vishvakarma Mahavidyalaya Engineering College, Vallabh Vidhyanagar and Prof. J. J. BHAVSAR, Associate Professor and PG Coordinator of Construction Engineering and Management, Civil Engineering Department, Birla Vishvakarma Mahavidyalaya Engineering College, Vallabh Vidhyanagar. I express a deep sense of gratitude to Prof. A.N. Bhavsar, Assistant Professor, Civil Engineering Department, Birla Vishvakarma Mahavidyalaya Engineering College, Vallabh Vidhyanagar for his extraordinary cooperation, invaluable guidance and supervision. This work is the result of his painstaking and generous attitude. I would also extend my special thanks to Dr. Shakil Malek, for his regular response to my needs promptly. I am extremely thankful to my family for their continuous moral support allowing me to realize my potentials. Their support and love always encouraged me significantly and this is the greatest gift anyone can ever give. All my gratitude to my friends, thank you for your love, support and encouraging me in my work.

## VIII. CONCLUSION

In India, about 75% of the infrastructure projects were not succeeded due to lack of the appropriate performance of construction. It is truly recommended to the companies, associated with construction and planning must create or rearranged the framework for systematic risk management process. The construction industry varies from any other industry. There are many such unique factors making construction industries standing different in the crowd of many other industries. These factors are government policies, surrounding circumstances, health etc. It is firmly recommended that factors like Land acquisition, Time overrun, Quality assurance & Control, Termination of agreement by law, Operation cost overrun, Design alteration risk, Design alteration risk, Design deficiency/bad workmanship/law quality during construction, Deficiency of design, Inadequate experience in PPP are the most important factor which affects the risk management in infrastructure projects. For keeping infrastructure sector more motivating, comparative and committed; there should be a collaborative culture developed between the government and project parties. This will be helpful for the success and enhancement of the infrastructure projects.

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