

# Identification of Success & Failure Factors in Roads/Highways Infrastructure Development Project Involving PPP in India

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## Abstract

India has prioritized road and highway infrastructure expansion with Public-Private Partnership (PPP) projects and has established a great bar for venture capital incursions. However, it is generally assumed that roads or highways infrastructure work has not continued to evolve at a requisite stride and that PPP road or highway infrastructure projects have been plagued by multiple footraces and project delays, thereby jeopardizing project success or failure. This paper examines the crucial success aspects & failure factors of roads or highways infrastructure projects that are part of a public-private partnership in India. Using different approaches, a survey questionnaire was done between samples of stakeholders in road or highways infrastructure projects to recognize the CSF (critical success factor) and CFF (critical failure factor) at altogether four foremost project phases. The critical factors were first identified by rating them according to their average or mean score. To consider the critical success/failure variables, the predictable RII score was scrapped long ago. Lastly, the crucial success & failure factors were acknowledged grounded on stakeholder ranking and their relationship. The calculations revealed a stronger link between the various methods and a higher level of agreement amid project stakeholders on the acute success factors and failure aspects of road or highways involving PPP infrastructure projects.

**Key-Words:** Project delays, Roads/Highways infrastructure, Public-Private Partnership (PPP), CSF/CFF, RII and Stakeholders.

## Introduction

With a total length of 5.8 million km (including National Highways, Expressways, State Highways, Major District Roads, other District Roads, and Village Roads), India has the world's second largest road network. About 64.5 % of all goods in the country are transported by road, and 90% of all passenger traffic is transported by road. The government has been working quickly to monetize prevailing road projects in order to meet surplus capital necessities for new projects, but has been incapable to entice the requisite investor interest. Presently, the NHAI's only option is to sell expanses of road less than the Toll-Operate-

Transfer model, which is receiving a half-hearted response due to concessionaires' concerns about the TOT model, and bids acknowledged do not meet the Net Asset Value. The auction of TOT-4 for Rs. 2,166 crore and TOT-5 for Rs. 2,800 crore was scheduled for February 2020, but it has been postponed due to the outbreak of the COVID-19 pandemic. Because of the anticipated drop in traffic as a result of state border sealing, a good TOT rollout now appears to be difficult. The NHAI had also intended to launch an InvIT to help monetise road properties, but that, too, appears to be on hold at the moment, considering low market sentiment and the impossibility of seeing passable traffic levels in the near future. Furthermore, the enforcement of the Force Majeure provision for reimbursing developers for toll deferral periods caused by the Covid19 outburst is less successful, since it only allows for an extension of the concession duration rather than the anticipated compensation for O&M and interest payments. Projects that draw high-density traffic are typically monetized faster because they pique investor interest. Flyvbjerg, B. (2007) specified large infrastructure projects problems, their causes & cures, paper identifies cost overrun reasons & benefit shortfalls, some policy implications, inaccuracy in forecasting of cost & better practises & initiatives implemented to overcome the cost-overrun problem. As a result, a project's success or failure is determined by whether or not these predetermined restrictions are met. At a high pace, project delays involving cost increases require immediate attention, while projects including cost increases (but certainly not deferrals) owing to different factors often require attention. Also projects that have been deferred but would not charge additional money need commitment to ensure that the deferrals are reduced and that the land receives the production commencing these projects as soon as possible. All of this suggests that road PPP projects are more dangerous and complicated than previously assumed. It is moreover noted that the size of infrastructure expansion projects commenced in India has increased, and major infrastructure development projects are implemented in many portions of the world, resulting in increased risks in project and complications in the Indian scenario.

Finishing the infrastructure construction for the stakeholders, the completion of PPP projects on schedule and within budget is a measure of success, but the construction procedure is matter of numerous variables and unpredictable factors resulting from a variety of sources. There are many factors that influence whether road infrastructure projects development succeed or fail in the country, and they must be assumed. Certain significance of things upsetting achievement & disappointment of the PPP ventures initiatives, this paper takes out the consequences from examine of the essential success elements & failure elements of infrastructure involving PPP ventures in India, in order that it results in a higher PPP operational outline for avenue infrastructure expansion. Second, we will go over the related collected works study on project success factors and failure factors, followed by a discussion of the current study's evaluation framework. The methods and findings of the analysis are then discussed. We show a review of the outcomes and their implications for refining roads and highways infrastructure growth in India in PPP projects in the concluding section.

## Review of Literature

Several critical factors of Road projects research are carried out by researcher where they have set out certain uncertain success factors & failure factors in road or highway based infrastructure projects in India & across nation. Based on this literature review is done to showcase the various projects delays & its sub-factors, its relatable causes, cures & the series of studies conducted by a researcher.

Mišić, S., & Radujković, M. (2015) conducted a study on megaprojects & its associated reasons for success & failure of project. They identified success factors depend on four aspects which are legal, risk, political & project manager aspect whereas the failure factors depend mainly on strategy, ineffective risk allocation & closed communication.

Edison, J., & Singla, H. K. (2020) underlined the initial factors which causes a delay in infrastructure projects in India, total 73 critical factors were identified by them which are owner related, contractor related, consultant related, project related, design related, material related & labour

related. & identified the key success & failure factors that affect the overall cost performance of infrastructure projects & on-cost analysis, financial initiatives & schemes & good governance takes the positive side whereas over-cost analysis takes the negative side in study. Herrera, R. F., Sánchez, O., Castañeda, K., & Porras, H. (2020) they identified causative factors which determine cost-overrun in infrastructure projects & their mitigation solutions & also analysed five profound principles of cost-overrun stages with their frequency.

Boeing Singh, L., & Kalidindi, S. N. (2006) identified various events of default in BOT projects, where concessionaire & granting authority are the key factors in causing default in PPP road projects in India based on this Annuity model study is conducted & several risk allocation measures were summarized.

Chou, J. S., & Pramudawardhani, D. (2015) they elaborated various key drivers of success factors & risk allocation technique for PPP projects in cross country differentiation. Several PPP success factors & PPP risk factors are grouped respectively.

Flyvbjerg, B. (2007) specified large infrastructure projects problems, their causes & cures, paper identifies cost overrun reasons & benefit shortfalls, some policy implications, inaccuracy in forecasting of cost & better practises & initiatives implemented to overcome the cost-overrun problem.

Gupta, A., Chandra Gupta, M., & Agrawal, R. (2013) depicts certain success factors of BOT projects in India & for analysis ranking method is applied which is based on six success aspects predominant environment, financial feasibility, Concessionaire association, financial platform, risk provision and technical resolution which is level 1 & then grouping of similar success related factors were done in level 2 & then their relative importance are calculated.

Gupta, P. K., & Verma, H. (2020) paper analysed three phase's viz. project development phase, project construction phase & project operation phase. In each phase there are several risk factors associated with PPP infrastructure project financing & ranking method is applied on various phases to judge the overall risk perception in projects.

Rajgor, M., Chauhan, P., Panchal, C. H. I. R. A. G., & Bhavsar, D. (2016) this paper identifies the ten critical factors of causes of delay in construction projects & it is analysed with the help of RII & IMPI method & several solutions were laid down to minimize or avoid the critical causes of delay in construction project. Iyer, K. C., & Jha, K. N. (2006) this paper identifies the various attributes for success & failure factors & grouped into six success factors & seven failure factors. The studies of responses of the questionnaire concluded that two critical success factors and one critical failure factor: obligation of project contributors; owner's capability; and battle between projects contributors underwrite pointedly in improvement of present performance measure of the project.

Reddy, N. S., & Sharma, P. (2017) this paper highlights the various risk factors in PPP projects via pre-operative work risk, construction & operation phase risk & various other risk factors. Matrix is created for Engineering Procurement Construction (EPC) & Design, build, finance, operate & transfer (DBFOT) & merits of various PPP models are evaluated.

Zhang, X. (2005) this paper identifies the critical success factors & sub-factors for PPP projects lie complimentary investment environment, economic feasibility, Consistent concessionaire association with solid technical power, Thorough financial package, Suitable risk allocation via consistent contractual provisions then the significance index & ranking is done on each success sub-factors in PPP project & finally it is analysed with the help of agreement analysis.

Prasad, K., Vasugi, V., Venkatesan, R., & Bhat, N. S. (2018) Paper identifies the various critical delay factors in cost overrun in infrastructure projects & their mitigation strategies. For analysis part questionnaire is prepared & data is collected from clients or owners, contractors & consultants for determining the critical reasons for delay in construction projects & then the importance index method is applied to study data.

Subramanyan, H., Sawant, P. H., & Bhatt, V. (2012) this paper highlights the critical risk factors which are project specific, owner specific, contractor specific, consultant

specific, project manager specific, resource specific, external-environment specific, finance specific, contract clause specific. For data analysis fuzzy analytical hierarchy process is used. Tawalare, A. (2019) this paper identifies the risk factors of Indian Highway construction & created the factor profile of critical risk factors like construction risk, engineering risk, resource procurement risk, public sector management risk & social risk. Factor analysis was done to excerpt the critical risk factors.

Durdyev, S., & Hosseini, M. R. (2019) Paper highlights the comprehensive list of causes of delay in construction project. An overall of 149 causes were identified in a systematic appraisal of 97 particular studies. Climatic conditions, deprived communication, non-existence of coordination and fights among stakeholders, ineffectual or inappropriate planning, material scarcities, financial difficulties, payment deferments, and tools/plant deficiency, absence of competence between project stakeholders, labour scarcities and meagre site management were recognized as the ten furthestmost collective CPDs.

El-Kholy, A. M. (2019) this paper laid down the various factors those groundsdeferment& cost-overrun in highway ventures. Principal component study& modular neural linkage is used to analyse the data & predicting the percentage delay in construction project. Muneeswaran, G., Manoharan, P., Awoyera, P. O., & Adesina, A. (2018) this paper explores the schedule delays & risk in construction project using the relative importance index & fuzzy ranking of factors like execution risk, design risk, construction risk, financial, political & safety risk & prioritization of risk factors & mitigation measures for critical delay factors.

Parikh, D., Joshi, G. J., & Patel, D. A. (2019) under this research paper a hierarchical structure of claim causes were developed for highway construction project, cost overrun causes, degree of occurrence of claim clauses in cost-overruns & disputes & their ways to minimize or avoid the critical delays & claims.

Yun, S., Jung, W., Heon Han, S., & Park, H. (2015) This paper highlights the five critical success factors viz Project

execution capability, inter-organizational synchronization, government leadership & assistance, risk allocation & mitigation approaches & government economic support hence the questionnaire were filled by contractors, SPCs & financial investors & assessment of success of PPP project is done using seven-point Likert scale. Mainly analysis is done using multiple regression analysis.

Ullah, F., Thaheem, M. J., Sepasgozar, S. M. E., & Forcada, N. (2018) This paper explores risk involved concession estimation by finding out 59 critical success factors & outlines the complexities involved in PPP project by using system dynamic approach.

Bansal, R., Ali, N., & Sharma, A. (2019) this paper outlines the critical factors that affect the performance of infrastructure project in India. Five factors were identified which were Cost Performance factors, Time performance factor, human related factors, quality& safety performance factor & environmental factors which were assessed using likert scale & concluded that cost & time performance factors affect most in infrastructure project as compared to other factors.

Iyer, K., & Sagheer, M. (2011) this paper explores the mitigation strategy to avoid critical risk involved in traffic demand in BOT PPP model in highway projects in India. A traffic band actuality quite similar to financial options, the paper recommends to practice a 'put' option thought by the concessionaire to define the traffic floor, whereas a 'call' option thought by the government supports the traffic ceiling. Garg, S. (2020) This paper identifies unequal circumstances and methods for PPP realization and disappointment. Additionally, conducted by thorough appropriate information, the learning circumstances initiated in diverse disciplines, and make a work to assimilate the varied writings. A projects appropriate accomplishment / deteriorating in appropriate completion is establish to be unevenly initiated by project research, resource accessibility, and prescribed maturity; manufacture contribution of private sector; and importance on social associations.

## Road/Highways Infrastructure PPP Projects -Success/Failure Factors

Road/Highways infrastructure projects, like most projects, go through a project life cycle in which they experience delays, escalation, and unsuccessful/successful completion, all of which can be due to a variety of factors at the project level. As a result, various factors have been taken into account at various stages of PPP projects in India's road sector for a more thorough review of the project's success or failure. In our analysis, we looked at the following phases of the project life cycle:

### • Project Planning phase

This Planning stage of a public-private partnership project for road/highways infrastructure involves studies such as the project's need, feasibility studies, and risk assessments. This is a formative stage in which a strategy for implementing the PPP project is created.

### • Project Procurement phase

The bidding process and related activities are the most important activities in this stage. The attractiveness of a

project is largely determined by the contract terms and the fairness of the bidding process.

### • Project Development phase

The project is grounded in development stage subsequently the viability studies and the reward of the road projects.

### • Project Construction & operational phase

This stage encompasses events that take place before and after building. This is the stage that takes the most time and energy.

After consulting with senior infrastructure project management practitioners, we nominated the factors that influence road or highway PPP project success & failure over the project life phase given in Table I, whereas the collected works survey facilitated us to recognize numerous factors linked with venture success and failure. While most traditional studies focus on mean scores ranking, the recent research identifies stakeholders using both stakeholders' assessments and the traditional RII score. The following parts clarify the study's structure and methodology.

**Table I Factors affecting Success/ Failure of Road Infrastructure Project**

Project Planning phase	Project Procurement phase	Project Development phase	Project Construction & operational phase
Traffic valuation	Tender criteria	Property accomplishment	Accessibility of outworker's incomes
Market Investigation	Tender procedure	Sanction and permissions	Difference of opinion
Fluctuations/ adjustments in policies & toll rules	Monetary attraction of venture to investors	Demarcated project choice	Time deferral in construction
Community dispute and disapproval	Effect of upper ruling classes and governmental belongings	Investment into the venture	Cost overruns in construction
	Insufficiency of concession/agreement	Association and harmonization between shareholders	Cost overruns in maintenance
		Finding of raw-material, labour and capital & machines.	Tariffs Levels
		Force majeure	Payment delays to outworkers
		Hike in Interest rates and price increase	Technical and monetary closure

## Research Methodology

We used the questionnaire survey as the 'Primary data collection method' to recognize the serious success & failure factors of road or highway development projects involving PPP. For the questionnaire survey, we drew

unplanned respondents sample. The respondents were divided into the subsequent "stakeholder" groups, which were taken into account for the analysis: Govt. Firms, project Consultants, EPC Contractors, financing houses or institutions & off-takers or users.

### A. Survey Questionnaire

Two sections are covered for surveying questionnaire which comprised the following characteristics.

Section 1: Questions were mainly based upon the respondents profile, respondent's name, company in which they are employed & their designation & through these questions we can identify the different types stakeholders the respondents goes to.

Section 2: It covered the numerous factors that influence a public-private partnership (PPP) project for road infrastructure. The various factors characterized in four distinct phases are project planning phase, project

procurement phase, project development phase and construction & operational phase.

### B Questionnaire Survey

We devised a questionnaire survey and performed the survey by directing it to targeted respondents via e-mail. On a Likert Scale, respondents were asked to rate the crucial success and failure factors. We went with a six-point scale that incorporates the three-point scales for performance and failure factors. The definition, scale taken & metrics used in the questionnaire provided to respondents are shown in Table II.

**Table II Particulars of Questionnaire & Likert scale**

Metrics Used in analysis					
-3	-2	-1	1	2	3
Severely Opposing	Significantly Opposing	Minimally Opposing	Minimally Favourable	Significantly Favourable	Highly Favourable

### C. Questionnaire Survey Respondents description

According to research, around 1200,000 construction & operation experts employed in different portions of India. If we split the nation into four areas, around 300,000 occupations in every area were seen and our study is restricted to experts in East Area. If we assume a net of 5%, then for this size of the population, we need to pull a sample of 584 respondents & assumed a greater edge of fault (10%) and reached next to the sample mass of nearby 400, supposing not as much of 50% response rate. Though, we were convinced nearby upper replies, we had established a primary aim of at minimum 200 replies from the several respondents of road or highway infrastructure development projects. The overall number of replies acknowledged was 60, out of which 40 were effective replies that were possibly taken in the study. Additionally, all the respondents were considered into three stages via low-ranking, middle-ranking and senior-ranking level, grounded on the span of project task skill & related work experience.

### Data Analysis and Results

We determined the mean scores of the answers or replies to several factors posed to them based on the responses obtained in the questionnaire survey. To determine the crucial success factor & failure factors of highway or road infrastructure projects involving PPP, for ranking of factors we used mean scores. The sub-sections that follow analyse the responses to the survey questionnaire and evaluate the essential factors in each of the project phases. Data analysis is carried out using three methods:

- i. Factors Ranking based on Mean Scores.
  - ii. Relative Importance Index based ranking (RII).
  - iii. Factors Ranking based on Stakeholder Preferences.
- i. Factor ranking based on mean scores Affecting Success & Failure in Different Project phases**

In all project stages, we achieved the mean scores of responses taken for each factor. The outcomes are presented in table III.

**Table III - Ranking of factors in Project Planning phase, Project Procurement phase, Project Development phase, Project Construction & operational phase**

<b>Project Planning phase</b>			
<b>Factors</b>	<b>Mean-Score</b>	<b>Rank</b>	<b>SD</b>
Traffic valuation	1.9	1	1.558
Market investigation	1.821	2	1.165
Fluctuations/ adjustments in policies & toll rules and strategies	1.816	3	1.303
Community dispute and disapproval	-0.764	4	1.614
<b>Project Procurement phase</b>			
<b>Factors</b>	<b>Mean-Score</b>	<b>Rank</b>	<b>SD</b>
Tender criteria	1.7	1	1.601
Tender procedure	0.659	2	1.748
Monetary attraction of venture to investors	1.7	1	1.518
Effect of upper ruling classes and governmental belongings	-0.381	4	1.667
Insufficiency of concession/agreement	-0.21	3	1.612
<b>Project Development phase</b>			
<b>Factors</b>	<b>Mean -Score</b>	<b>Rank</b>	<b>SD</b>
Property accomplishment	0.643	4	3.123
Sanction and permissions	0.471	5	1.842
Demarcated project choice	0.357	6	1.655
Investment into the venture	1.443	1	1.313
Association and harmonization between shareholders	1.154	2	1.605
Finding of raw-material, labour and capital & machines.	0.714	3	1.876
Force majeure	-0.776	8	1.667
Hike in interest rates and price increase	-0.3	7	1.766
<b>Project Construction &amp; operational phase</b>			
<b>Factors</b>	<b>Mean -Score</b>	<b>Rank</b>	<b>SD</b>
Accessibility of outworker's incomes	1.133	1	1.634
Difference of opinion	0.529	2	1.842
Time deferral in construction	-0.434	6	1.785
Cost overruns in construction	-0.357	5	1.739
Cost overruns in maintenance	-0.669	8	1.672
Tariffs Levels	-0.067	4	2.024
Payment delays to outworkers	-0.439	7	1.603
Technical and monetary closure	0.471	3	1.829

We can deduce that 'traffic valuation' is the most important success factor in the road projects involving PPP in the Project planning phase, while 'community conflict and disapproval' is the most important factor in the failure factor in the road projects involving PPP. The utmost important factor for the success of a PPP road project during the

project procurement phase is 'Tender criteria' / 'Monetary attraction of venture to investors,' and the utmost important factor for the failure of PPP projects is 'Effect of higher authorities and political belongings,' 'Investment into the venture' is the utmost important factor for the success of road PPP projects in the project development phase, and

'Force majeure' is the utmost important factor for the failure of road PPP projects. 'Accessibility of outworker's incomes' is the most important factor in the performance of PPP road projects during the Project construction & operational phase. We may also infer that "cost overruns in maintenance" are the most significant contributor to the failure of PPP road projects.

## ii. Relative Importance Index (RII) based ranking

Various researchers, such as Bansal, R., Ali, N., & Sharma, A. (2019) use an importance index-based ranking to classify essential factors. Such an index can be generated for each factor by taking into account all responses obtained by all Likert ranking, i.e., it further taken the responses acknowledged as a weightage. The Relative Index (RII) for all factor in different project phases with the subsequent formula to assess the ranking of factors are calculated as:

$$\text{Relative Importance Index (RII)} = \frac{\sum A_i \times N_i}{(P \times N)}$$

Where  $A_i$  represents the Likert scale scores (which range from -3 to +3),  $n_i$  represents the number of comebacks or responses to the score on Likert scale,  $P$  represents the uppermost score (here +3), and  $N$  represents the entire number of respondents (40 were taken). In essence, the RII applies the weighting of responses to each score and stabilizes it via highest possible score that all respondents will give. At various stages of road PPP projects, RII can be calculated for every factor with the help of equation mentioned, which is presented in the sub-sections further down along with an exploration.

The RII based scores are calculated for altogether factors in the project planning phase, project Procurement phase, project development phase, project construction & operational phase which are presented in table IV. We could determine that the previous statement we achieved via computing mean-scores of the acute factors of road or highway projects embraces right as they are held by factors ranking by RII relative importance values.

**TABLE IV- Ranking of Factors based on RII in Project Planning phase, Project Procurement phase, Project Development phase, Project Construction & operational phase**

Project Planning phase								
Factors	-3	-2	-1	1	2	3	RII	Rank
Traffic valuation	0	4	0	6	10	15	0.62	1
Market investigation	0	1	2	6	18	8	0.49	2
Fluctuations/ adjustments in policies & toll rules	1	2	2	13	14	3	0.29	3
Community dispute and disapproval	8	5	13	5	3	1	-0.213	4
Project Procurement phase								
Factors	-3	-2	-1	1	2	3	RII	Rank
Tender criteria	2	1	2	7	10	13	0.432	1
Tender procedure	4	2	4	11	11	3	0.31	2
Monetary attraction of venture to investors	1	2	0	9	15	8	0.432	1
Effect of upper ruling classes and governmental belongings	1	8	16	2	4	4	-0.134	4
Insufficiency of concession/agreement	1	9	10	8	5	2	-0.057	3
Project Development phase								
Factors	-3	-2	-1	1	2	3	RII	Rank
Property accomplishment	3	5	7	3	9	8	0.161	4
Sanction and permissions	2	5	9	5	9	5	0.134	5
Demarcated project choice	0	8	8	8	8	3	0.086	6
Investment into the venture	0	2	4	9	14	6	0.458	1



Association and harmonization between shareholders	0	3	6	7	13	6	0.321	2
Finding of raw-material, labour and capital & machines.	3	3	4	7	10	8	0.201	3
Force majeure	7	10	9	3	2	4	-0.255	8
Hike in interest rates and price increase	2	12	8	4	7	2	-0.123	7

Project Construction & operational phase								
Factors	-3	-2	-1	1	2	3	RII	Rank
Accessibility of outworker's incomes	2	3	2	7	16	5	0.341	1
Difference of opinion	2	6	4	7	11	5	0.22	2
Time delay in construction	2	9	12	5	4	3	-0.143	6
Cost overruns in construction	1	6	16	4	3	4	-0.086	5
Cost overruns in maintenance	2	13	8	7	4	1	-0.22	8
Tariffs Levels	5	7	4	10	6	3	-0.018	4
Payment delays to contractors	3	6	14	6	4	2	-0.133	7
Technical and financial termination	1	7	5	9	6	7	0.17	3

### iii. Factors Ranking based on Stakeholder Preferences of Success factors & Failure Factors in Different Project Phases

As previously stated, the surveys done on respondents stood divided into various stakeholders for this study (Segment IV). This gives us insight into how each one of the stakeholders viewed the questionnaire survey. Edison, J.,

& Singla, H. K. (2020). The results of the study and how they were interpreted at different points are discussed below.

#### Project planning phase

The mean response score for the project planning phase was calculated, and a ranking analysis was performed, as shown in table V.

**Table V Stakeholders' Ranking in Project Planning Phase**

Factors	Government Firms	Concessionaire	Consultant	Contractor	Financial Institution	Users
Traffic valuation	2	1	2	1	1	1
Market investigation	1	2	1	3	3	3
Fluctuations/ adjustments in policies & toll rules	2	3	3	2	2	2
Community dispute and disapproval	3	4	4	4	4	4

**According to the outcome grounded on mean scores for every stakeholder, we determine the subsequent:**

- Deliberating to the Govt. houses /firms & Consultants, the utmost accountable factor for success is 'Market investigation' and the utmost accountable factor for failure for Govt. firms, concessionaires, consultants, contractor, financial institution & users are 'Community dispute and disapproval'.

- Deliberating to the Concessionaires, Contractors, financial houses/institutions & users the utmost accountable factor for success in project is 'Traffic valuation',

#### Project Procurement phase

In the project procurement phase, mean scores were obtained for each stakeholder, and rankings were made based on them, as shown in table VI.

**Table Vi: Stakeholders' Ranking in Project Procurement Phase**

Factors	Government Firms	Concessionaire	Consultant	Contractor	Financial Institution	Users
Tender criteria	1	2	1	1	1	3
Tender procedure	4	4	3	3	3	2
Monetary attraction of venture to investors	2	1	2	2	2	1
Effect of upper ruling classes and governmental belongings	2	1	4	5	4	5
Insufficiency of concession/agreement	3	3	5	4	3	4

According to the outcome grounded on mean scores for every stakeholder, we determine the subsequent:

- Deliberating to the Govt. firms, consultant, contractor & financial institution the utmost accountable factor for success in project is 'Tender criteria ' and the utmost accountable factor for failure in project for Govt. firms & Concessionaire is 'Tender procedure'.
- Deliberating to the Concessionaires, the utmost accountable factor for success in project is 'Monetary attraction of venture to investors / 'Effect of upper ruling classes and governmental belongings.
- Deliberating to the Consultant, the factor which is accountable for the failure of the project is Insufficiency of concession/agreement.

- Deliberating to the Contractors, financial institutions & users the utmost accountable factor for failure in project is 'Effect of upper ruling classes and governmental belongings.
- Deliberating to the Users, the utmost accountable factor for success in project is 'Monetary attraction of the venture to investor'.

#### **Project Development phase**

The mean scores for every stakeholder in the project development phase were obtained, & ranking was concluded on them, as shown in table VII.

**Table VII- Stakeholders' Ranking in Project Development Phase**

Factors	Government Firms	Concessionaire	Consultant	Contractor	Financial Institution	Users
Property accomplishment	2	1	2	5	2	3
Sanction and permissions	2	1	3	7	2	4
Demarcated project choice	2	5	4	4	3	5
Investment into the venture	1	4	1	1	3	1
Association and harmonization between shareholders	3	2	2	2	1	2
Finding of raw-material, labour and capital & machines.	4	3	4	3	2	2
Force majeure	6	6	5	8	4	6
Hike in interest rates and price increase	5	5	5	6	5	7

According to the outcome grounded on mean scores for every stakeholder, we determine the subsequent:

- Deliberating to the Govt. firms, consultant, contractor & users the utmost accountable factor for success in project is 'Investment into the venture'.
- Deliberating to the Concessionaires, the utmost accountable factor for the success in project is 'Property accomplishment' / 'sanction & permissions'.
- According to the Govt. firms, Concessionaires & contractor the utmost accountable factor for failure in project is 'Force Majeure'.
- Deliberating to consultants, the utmost accountable factor for failure in project is 'Force Majeure' / 'Hike in interest rates and price increase'.

- Deliberating to the various financial houses, the utmost accountable factor for success in project is 'Association and harmonization between shareholders', and the utmost accountable factor for failure is 'Hike in interest rates and price increase'.
- Deliberating to users, the utmost accountable factor for failure is 'Hike in interest rates and price increase'.

### Project construction & operational phase

The mean scores used for each stakeholder in the project construction & operational phase were obtained, and a ranking was performed based on them, as presented in table VIII.

**Table VIII -Stakeholders' Ranking in Project Construction & Operational Phase**

Factors	Government Firms	Concessionaire	Consultant	Contractor	Financial Institution	Users
Accessibility of outworker's incomes	1	2	1	1	2	2
Difference of opinion	2	3	2	2	1	4
Time deferral in construction	3	4	3	4	3	6
Cost overruns in construction	3	3	4	6	4	5
Cost overruns in maintenance	4	4	6	8	5	7
Tariffs Levels	3	2	4	5	3	3
Payment deferrals to contractors	5	5	5	7	4	5
Technical and monetary closure	1	1	2	3	1	1

According to the outcome based on mean scores for every stakeholder, we determine the subsequent:

- Deliberating to the Govt. firms, the utmost accountable factor for success in project is 'Availability of Outworker's income' / 'Technical and monetary closure', and the utmost accountable factor for failure for govt. firms & Concessionaires are 'Payment deferrals to contractors'.
- Deliberating to the Concessionaires & Users, the utmost accountable factor for success in project is 'Technical and monetary closure'.
- Deliberating to the Consultants & Contractors, the utmost accountable factor for success in project is

Accessibility of outworker's incomes, & the utmost accountable factor for project failure for consultants, contractors, financial institution & users are 'Cost overruns in maintenance'.

- Deliberating to the Financial houses or institutions, the utmost accountable factor for success is 'Difference of opinion' / 'Technical and monetary closure'.

### Conclusions and Recommendations

#### A. Conclusion from various analyses

Each phase of a road or highway involving Public Private Partnership project has its own set of requirements that must be met in order for the project to be successful. The

fiasco of one or more phases in the project progression will cause the PPP project to fail. We discovered crucial success factors & failure factors at various project phases that will aid project managers in gaining a better understanding of the main project threats elaborated in roads / highways PPP based projects and, as a result, take effective measures to address them at various project stages. The results of the ranking review conducted earlier in this section are now summarized.

**Table IX- Responsible Success Factors Of Road Infrastructure Projects**

STUDY/ANALYSIS			Stakeholders' view Ranking
PROJECT PHASE	Mean Ranking	RII Ranking	
Project Planning phase	Traffic valuation	Traffic valuation	Traffic valuation
Project Procurement phase	Tender criteria	Tender criteria	Tender criteria
Project Development phase	Investment into the venture	Investment into the venture	Investment into the venture
Project construction & operational phase	Accessibility of outworker's incomes	Accessibility of contractor's incomes	Accessibility of contractor's incomes

According to the analysis conducted based on mean ranking, RII ranking & stakeholders viewpoint ranking in different project stages of Road/Highways construction in relation to PPP, the critical success factors which is common in all three analysis, so in first stage i.e. project planning stage it is Traffic valuation, procurement stage it is Tender criteria, Development Stage it is Investment into the venture & construction & operational phase it is Accessibility of outworker's incomes.

### CSF's (Critical Success Factors) based on different Ranking Study/Analysis

Table IX showcases the critical success elements of different phases on the basis of three diverse measures: Mean Score Ranking, RII (relative importance index) Ranking Score and viewpoint of Stakeholders' ranking.

### CFF's (Critical Failure Factors) based on different Ranking Study/Analysis

Table X showcases the critical failure elements of different phases on the basis of three diverse measures: Mean Score Ranking, RII (relative importance index) Ranking Score and viewpoint of Stakeholders' ranking.

**Table X: Responsible Failure Factors of Road Infrastructure Projects**

STUDY/ANALYSIS	Mean Ranking	RII Ranking	Stakeholders' view Ranking
PROJECT PHASE			
Project Planning phase	Community dispute and disapproval	Community dispute and disapproval	Community dispute and disapproval
Project Procurement phase	Effect of upper the ruling classes and governmental belongings	Effect of upper the ruling classes and governmental belongings	Effect of upper the ruling classes and governmental belongings
Project Development phase	Force Majeure	Force Majeure	Force Majeure
Project construction & operational phase	Cost-Overruns in Maintenance	Cost-Overruns in Maintenance	Cost-Overruns in Maintenance

According to the analysis conducted based on mean ranking, RII ranking & stakeholders viewpoint ranking in different project stages of Road/Highways construction in relation to PPP, the critical failure factors which is common in all three analysis, so in first stage i.e. project planning stage it is Community dispute and disapproval, procurement stage it is Effect of upper the ruling classes and governmental belongings, Development Stage it is Force Majeure & project construction & operational phase it is Cost Overruns in Maintenance.

### B. Recommendations

This research used rating analysis to look at the crucial success & failure factors of road or highways PPP infrastructure projects, expending different methods such

as mean score, RII, and stakeholder viewpoint. If a larger sample size is used, the findings will become more reliable. We got a smaller sample than the aim owing to interval period and reserverestrictions, as well as lesserreplies. In addition, our sample survey was limited to respondents who were involved in projects in India's Western region. Although the Western region of India has a huge amount of PPP infrastructure projects, the effects are subject to area concentrations of projects, so the results which differ if the survey is expanded to former parts of the country.

We similarly give some recommendations for addressing every critical factor in order to improve the performance of road PPP projects. The critical factors are listed in Table XI, along with the recommendations that go with them.

**Table XI: Critical Factors And Recommendations**

CRITICAL FACTORS	RECOMMENDATIONS
Traffic valuation	A thorough traffic analysis is needed. The potential for a different path must be thoroughly investigated.
Tender criteria	The requirements must be practical on the ground and must foster greater competition, i.e., additional contractors must be qualified to bid.
Investment into the venture	In addition to capital inflow incentives, the government must include incentives such as success bonuses for projects completed early to attract investors.
Accessibility of contractor's incomes	Contractors with strong resource capabilities should be granted higher scores during the bidding phase, or it should be included in the pre-qualification requirements.
Community dispute and disapproval	The architecture for PPP production should be socially and environmentally conscious.
Effect of upper the ruling classes and governmental belongings	The bidding process must be open, and bidding requirements must be followed.
Force majeure	In the event of a force majeure scenario, the developers must be supported by the government.
Cost Overruns in Maintenance	To minimize maintenance costs, innovative technologies such as an automated tolling system should be used.

### Limitation of our research:

This research provides various success factors & failure factors in PPP infrastructure projects to upcoming researchers but more techniques & risk assessment models to be taken up by banks to eliminate the cause of delay factors in project development.

### Acknowledgement

I would like to take this to express my gratitude & thanks to Co-workers, my family members, and editorial board in supporting suitable settings for my research work.

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