

PPP Framework For Financing Infrastructure in Smart Cities

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Abstract- A public-private partnership (PPP) is a cooperative arrangement between two or more public and private sectors, typically of a long-term nature. Public-private partnerships between a government agency and private-sector company can be used to finance, build and operate projects, such as public transportation networks, parks and convention centers. This research analyzes the literature, development, challenges and issues in public-private partnership (PPPs) in case of the Transportation sector in Mumbai, India.

This research will try to find out the ways to incorporate private sector along with the public party in financing the infrastructure and it will also study about the critical factors affecting on the applicability of PPP and try to find out the solution of the problems they are facing in this case.

Keywords- PPP, infrastructure, Highways, critical factors, PPP BOT (Toll), BOT (Annuity), etc.

I. INTRODUCTION

1.1 Background

Physical infrastructure such as roads, water, sanitation networks and transportation system involve large investments that can put a strain on the public purse. This strain is especially great for countries such as India, whose economies are undergoing rapid development and urbanization and have a great need for expanded infrastructure. Hence PPPs are effective at producing new infrastructure without a large upfront capital investment on the part of a government agency.

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public-private partnership can allow a project to be completed sooner or make it a possibility in the first place.

After being metropolitan city, Mumbai needs to invest huge amount of budget in infrastructure and development programs. These sources are not enough for the municipality. This can be compensated by involving private sector in development activities and mobilizing their financial, human and technical resources. The city has a well-developed transportation system, which includes the suburban railway, metro rail, buses, and taxis. However, the city has been facing a number of challenges related to transportation infrastructure, including traffic congestion, inadequate road network, poor quality of roads, and lack of last-mile connectivity. The city's roadways infrastructure is in dire need of upgrading and modernization.

1.1 PPP Models in Road Development

National and state highways in India are primarily developed through following three PPP modes: Engineer Procure Construct (EPC), PPP (annuity) and PPP (BOT).

PPP models have been widely applied across a wide range of infrastructure projects in several countries and the experience of them is also widely varying. The experience / success of PPP projects depends upon a variety of factors related to the host government (political/ governance systems) to economic conditions to legal and financial framework to the occurrence of natural disaster events.

Further, private sector response/ responsiveness to projects also matters. The major PPP models that have been taken up for road/highway development in India are given below. Much of the private sector participation in road development has been coming forth in India under the BOT model with the variants of:

- i. Hybrid Annuity Mode (HAM)
- ii. Built Operate Transfer (Toll Basis)
- iii. Built Operate Transfer (Annuity Basis)
- iv. Engineering, Procurement, Construction (EPC)

II. OBJECTIVES OF THE STUDY

1. To find out how PPP can be used as an effective model for urban infrastructure development in Mumbai Metropolitan City.
2. To analyse the framework for smart infrastructure projects PPP mechanism in Mumbai Metropolitan City.
3. To find the most critical factors affecting the applicability of PPP.
4. To review the existing PPP policies regarding PPP in India and study about the problems and issues in their implementation.

III. PROPOSED METHODOLOGY

3.1 Research Methodology

The methodology used to ensure that this study conforms to the objectives that have been outlined. The topics covered in this chapter are project design, descriptions of project and data collection procedures and the techniques employed for analysis in this study.

In a general sense, the analysis methodology is the steps or the sequence of work involved from the beginning of the study till the completion of the ultimate report. From the information obtained through the literature review, the questionnaire is then developed and distributed to the targeted participants. The targeted participants of the survey comprised primarily of people who are concerned about constructions projects in their daily lives.

Afterward, the data obtained from the questionnaires is analyzed and their inferences are given. This will be followed by the discussions and suggestions and eventually, conclusions are drawn to conclude the study.

For the aim of this study, the analysis methodology is shortly divided into four stages, namely:

1. Literature review
2. Data collection
3. Data Analysis, Findings and Discussion
4. Conclusion

3.2 Research Design

The project design is defined as how the study is designed to achieve its objectives. Project design starts with a topic selection and is then followed by data collection methods, measurement procedures, and questionnaire design and data analysis. This study adopted questionnaire, the most

common qualitative data collection method, for learning the present situation regarding PPP framework for financing infrastructure in smart cities development as well as largest and populated densely PPP framework for financing infrastructure in smart cities development and offering metro community. The respondents herein exactly imply the conclusion users, companies, workers are supposed to be to unorganized sphere as well as reps of PPP management triggers. Descriptive and analytical kind of Research analysis is done with the subject "A research of PPP framework for financing infrastructure in smart cities development with unique guide to Mumbai Metro Region".

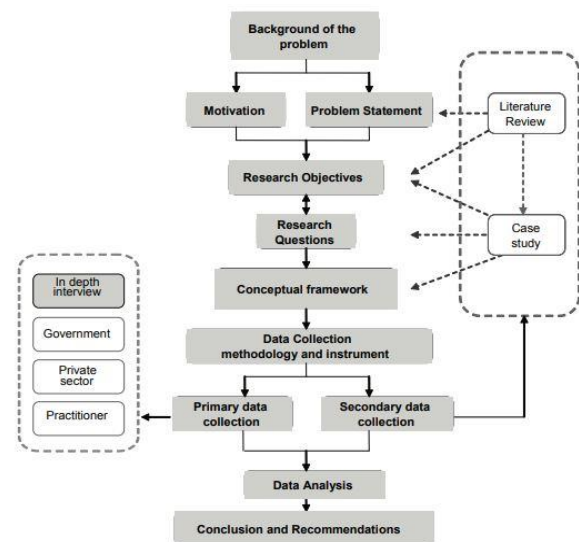


Figure 3.1. Research Design

IV. RESULT AND DISCUSSION

The main aim of this chapter is to discuss and analyse the results obtained from the questionnaire survey conducted to study the PPP framework for financing the highway or roadway infrastructure and to investigate issues and challenges in their implementation.

4.1 Identification of critical factors affecting the applicability of ppp:

The applicability of PPP can be influenced by several critical factors. Here are some key factors that can affect the viability and success of PPP in development of mthl in Mumbai city:

1. Legal and Regulatory Framework
2. Political Stability and Policy Consistency
3. Financial Viability and Risk Allocation
4. Project Size and Scale
5. Transparency and Accountability

6. Project Complexity and Technical Feasibility
7. Stakeholder Engagement and Public Support
8. Economic Viability and Market Conditions
9. Availability of Financing
10. Local Capacity and Expertise

These factors can vary depending on the country, sector, and specific project context. A thorough assessment of these critical factors is necessary to determine the suitability and applicability of PPP in a given situation.

4.2 Relative important index (RII):

The Relative Importance Index (RII) is a statistical tool used to determine the importance of different factors in a given context. In the case of Public-Private Partnerships (PPP), the RII can be applied to assess the critical factors affecting the applicability or success of PPP projects.

To determine the RII for critical factors affecting PPP applicability, you would typically follow these steps:

1. Identify the factors
2. Design a survey
3. Rate the factors
4. Analyze the data
5. Calculate the RII
6. Rank the factors

The formula for calculating the RII is as follows:

$$RII = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{A * N}$$

- n₅= Number of respondents for Strongly Agree
- n₄= Number of respondents for Agree
- n₃= Number of respondents for Neutral
- n₂= Number of respondents for Disagree
- n₁= Number of respondents for Strongly Disagree
- A = Highest weight (i.e. 5 in the study)
- N = Total number of respondents

The table 4.1 is used to arrange the factors in order of their importance based on the rank obtained.

Table 4.1 : Governing factors affecting on applicability of PPP in order of importance

IF	Critical Factors affecting on applicability of PPP	Relative Important Index (RII) in %	Rank
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F9	Availability of financing	97	1
F1	Legal and regulatory framework	94	2
F4	Project size and scale	93	3
F10	Local capacity and expertise	90	4
F3	Financial viability and risk allocation	78	5
F6	Project complexity and technical feasibility	75	6
F2	Political stability and policy consistency	73	7
F8	Economic viability and market condition	72	8
F7	Stakeholder engagement and public support	68	9
F5	Local capacity and expertise	67	10

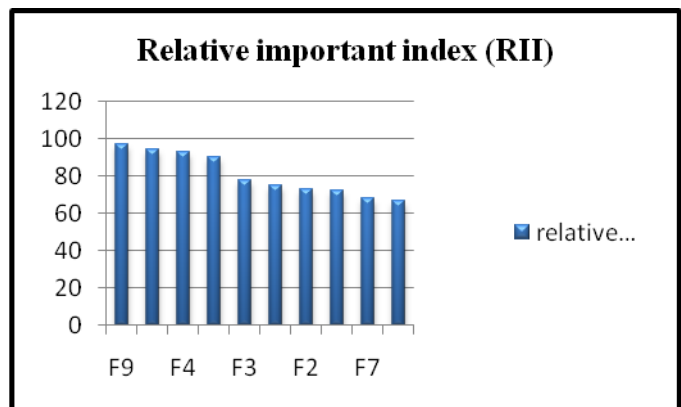


Fig 4.1: Bar chart of 10 governing critical factors affeting on applicability of PPP

Discussion On The Result:

The findings revealed ten most critical factors affecting on the applicability of PPP. The first one being Availability of financing having RII of 97%. This factor causes real hindrance to the development of projects and long term operations. Second is the legal and regulatory framework, Financial viability and risk allocation, etc.

These factors can vary depending on the country, sector, and specific project context. A thorough assessment of these critical factors is necessary to determine the suitability and applicability of PPP in a given situation.

V. CONCLUSION

Mumbai Municipality has recently been upgraded from a Sub-Metropolitan to a Metropolitan City due to the addition of peri-urban areas. However, the municipality lacks the financial, technical, and managerial capacity to meet the growing demands for infrastructure and services. External support is needed, and Public-Private Partnerships (PPPs) can be a viable option.

So for successful implementation of PPP projects of transportation, municipality should establish a dedicated PPP Unit and develop guidelines tailored to its context.

VI. APPENDIX

There are various types of PPPs , depending upon the arrangements between the government and the private sector.

- BOT(BuildOperateTransfer)
- BOO(BuildOwnOperate)
- BOOT (BuildOwnOperateTransfer)
- DBFO (DesignBuildFinanceOperate)

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