Optimizing Infrastructure Delivery by Public Sector Through Limiting Private Sector Involvement

Chitra Shijagurumayum¹* and Mojahedul Islam Nayyer²

¹Department of Civil Engineering, Manipur Institute of Technology, Imphal – 795001, Manipur, India; chitras10shij@gmail.com
²Department of Civil Engineering, KIIT University, Bhubaneshwar – 751024, Odisha, India; nayyeriitguwahati@gmail.com

Abstract

Objective: An attempt has been made by the author(s) in optimizing the infrastructure delivery by public sector through a rigorous series of questionnaire templates and interviews, in India. **Statistical Analysis**: Likert scale with five (5) points is used to record and tabulate the data. SPSS is used for statistical analysis of the recorded data and Factor analysis is applied to minimize variables. The experimental result is validated using hypothesis test. **Findings:** Public sector has various limitations in executing infrastructure projects, from lack of technological skills to financial constraints. The private sector, on the other hand, has been able to execute projects on timely basis without compromising the technology, but at a much higher cost. Though the private sector procurement methods have better efficiency in technology utilization, public sector procurement has greater impact in socio-economic development of the society. **Improvements:** Further points can be put forwarded such as giving more weightage to citizen's well-being rather than taking GDP as a decision criterion for a country's development.

Keywords: Hypothesis Testing, Infrastructure, Private Sector, Public Sector, Public-Private Partnership, SPSS.

1. Introduction

The public sector has been playing in important role in developing various infrastructures in different regions. In order to have rapid growth of economic development; high quality infrastructure is a necessary criterion which must be fulfilled at any cost. Public private partnership is collaboration between the two sectors that facilitate in achieving common objectives by removing limitations. Due to lack of funds and resources, public sector have lagged in developing the infrastructures efficiently. A case study on the partnership of public-private procurement for creating way value by actively engaging end users as co-creators of values using an intensive single-case methodology was performed on a school property procurement in Finland. The authors have emphasized that even though public service is well recognized by various groups in the society, it lacks user engagement gear for implementation by both producer and supplier. It was found that the most significant end user value is accomplished through interaction in the design phase of the project being procured by public sector. Another study in health sector by public and private partnership was conducted. Even though government has advantages in framing health policies, over the years the heath sector has observed a mismatch of demand and supply. The private sectors on the other hand, have provided ease of access in delivering higher effectiveness, management skills and resources. One such partnership can be seen through the construction of Greenfield Bangalore International Airport, India [1–3].

Though the public and private partnerships have been seen as a successful &potential source[4], it lacks systematic approach in capturing social concerns. A method, public private people partnership (P4) has been suggested as a new strategy in removing the limitations of public private partnership (P3) approach. P4 is seen as a great possible tactic since it moderates the risk of unanticipated oppositions. This method was implemented in infrastructure development in Hong Kong, China[5]. Corruption in public sector undertaking was pointed to be another reason in hindering completion of mega projects, worsening cost and time. The impact of corruption in public sector was used as case study in Italian high speed railways project[6]. Financial difficulties have been the main cause in preferring P3 models over the traditional public sector models. P3 is known to be most active in Turkey in developing infrastructure but a study was conducted to analyze if P3 would authentically provide the necessary service or cause new unseen challenges in public administration from economic point of view. The study concluded that even though P3 models provide the necessary development in infrastructure, they still inflict unjustifiable cost to the society. Another study have pointed out that private participation in public sector projects have adverse consequence through knowledge-transfer effect and cost-increase effect. Hence it demonstrate that the P3 model have caused excessive cost during the development of the projects. It is important to have innovative ideas procured from smart individual or individuals to provide a platform for the ideas to develop into real world projects. Private sectors are willing to pay high price for innovative ideas while public sector has less incentive to the bright individuals. Hence the ideas are generally procured by private sector and transferred through P3 models with huge price tag[7–10].

Social rate of time preferences and social rate for healthcare, education, social services and infrastructure projects were used as a methodology for analyzing public sector projects related to any industry in Russia. The methods were used to estimate social discount rate for cost-benefit analysis [11]. In Malaysia, the government has put up various efforts to ensure that the public money is well managed with integrity. A study was conducted by using data from questionnaires from 104 public officials from federal ministry of Malaysia on twelve (12) elements of integrity through Likert scale. The studies have found that the mean score of each integrity items lay above the midpoint. The authors concluded that the Malaysian public sector is serious in implementing projects and management and the study would offer a platform in enhancing and improving integrity system[12].

The authors in this paper have used five (5) point Likert scale to a set of questionnaires given out and interviews performed in both public and private sector officials in India. Three primary segments were discussed- infrastructure problem identification; private sector involvement analysis & solution solving sections for existing problems. SPSS tool was used for the statistical analysis of the data. To reduce the number of variables in which some variables can be chosen to represent other variables, factor analysis is used. Then, a hypothesis testing was conducted and the research validation is performed.

2. Stages of Infrastructure Activity and its Associated Bottlenecks

In the present scenario of India, there are numerous reasons which hinder the development programs. There are various stages through which constitutes a construction activity. Some of them are listed below-

- Problem Identification by the Government.
- Selection of the infrastructure service to redress the problem.
- Understanding the quantum and type of effort as well as its monetary implication to create such an infrastructure.
- Identifying the means of executing the infrastructure project.
- Request for Information (RFI) stage and Request for Proposal (RFP) stage.
- Efficient and effective allotment of infrastructure project to prospective companies.
- Detailed Project Report (DPR) stage.
- Tracking the effective progress and accountability of the project in its various stages.
- Effective and timely disbursal of funds to support the company involved in the project.
- Effective dispute redressal during the project construction phase.
- Effective coordination with the concerned company post project completion to ensure quality and project bidding time assurances given by the company who has completed the project.

3. Methods and Analysis

3.1 Preparing the Questionnaire Set

After thorough study on the infrastructure delivery services by the public and private sector, the reason for failures and inefficiencies are put forward.A questionnaire template is being prepared which consist of proposed methodology in improving infrastructure delivery and a platform to acquire new ideas. The template consists of the following sections. A sample temple is shown in Figure 1. Due to the simplicity and ease of use, the collected data were analyzed using SPSS tool. The Principal Component Analysis (PCA) is used to determine the factors.

(a) Demographic information of respondents.
(b) Identification of bottlenecks
(c) Effect of public private participation in infrastructure sector
(d) Solutions for improvement in efficient delivery of services.

Figure 1. Sample of the template being used for the study as proposed by the author(s).

3.2 Factor Analysis

Factor analysis is a statistical method which is generally used to portray unpredictability among observed, corrected variables in terms of factors. There are basically three (3) sections which is divided from the questionnaire template- Infrastructure problem identification section; Private sector involvement analysis section and Existing problem solving section.Forty five

(45) samples were considered in this section and the individual means and standard deviations of these factors were calculated using these samples.Correlation level of values greater than ±0.3 is generally considered good and in the analysis performed, we have found a lot of variables with correlation coefficients greater than 0.3.

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy test shows a value of .888 which is greater than 0.5 which shows that the samples are sufficient enough to give a correct representation of the case. The Bartlett's Test of Sphericity also shows a significance level of .000 which is lesser than 0.05 which shows that factor analysis is appropriate for our data. The Scree plot is shown in Figure 2 for the three variables.

Table 1 shows the descriptive statistics for infrastructure problem identification section. From the analysis performed, it was found that "problem identification" by the government agencies was the genesis of all problems faced by the infrastructure sector. The government agencies need to do proper ground studies so as to mitigate the problems faced by the industry.

Descriptive statistics for private sector involvement is shown in Table 2. From the analysis it was observed that private sector misappropriates money intended for infrastructure projects and the efficiency of private sector project implementation is less as was thought otherwise. The descriptive analysis for solution to address infrastructure bottleneck is tabulated in Table 3.

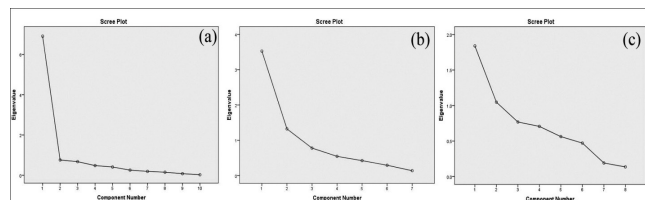**Figure 2.** Scree plot for (a) Infrastructure problem identification section, (b) Private sector involvement analysis section and (c) Existing problem solving section.

Table 1. Descriptive statistics for infrastructure problem identification

	Mean	Std. Deviation	Analysis N
Problem Identification	3.29	1.440	45
Government capability	4.00	1.148	45

Government incapable of proper documentation	3.98	1.097	45
Government project allocation	3.42	.988	45
Private sector make improper DPR	2.78	.927	45
Land Acquisition major issue	4.36	.645	45
Shortage of skilled labor	3.71	.944	45
Timely fund disbursal	3.76	.933	45
Timely statutory clearance	4.11	.682	45
Efficient project tracking	3.69	.925	45

Table 2. Descriptive statistics for private sector involvement

	Mean	Std. Deviation	Analysis N
Private sector money laundering	4.13	.786	45
Private sector project efficiency	2.22	.850	45
Private sector acquires more land	2.91	.949	45
Private sector bribes	3.78	1.064	45
Private sector develops mafias	2.78	1.106	45
Private sector degrades environment	2.96	1.224	45
Public sector project greater social impact	3.98	.965	45

Table 3. Descriptive Statistics for solution to address infrastructure bottleneck section

	Mean	Std. Deviation	Analysis N
Land should be acquired by government	4.22	1.085	45
Single window clearance	4.11	.775	45
Dispute redressal mechanism	3.87	.757	45
Quality of projects more important than L1	3.18	.684	45
SIA mandatory	3.13	1.140	45
Contractor ranking mechanism	3.78	.735	45
Profit limitaion	2.89	.775	45
Citizen's voice	4.24	.679	45

In this analysis, the following correlations were made-

- Land for infrastructure projects should be first acquired by the government and then it should bidding for the project to hasten the project execution.
- Representatives from different departments should form a monitoring committee which will act as a single window clearance body for all issues related to the project.
- Dispute redressal mechanism and arbitration laws must be improved for faster dispute settlement during and post project execution.

3.3 Hypothesis Testing

Seven (7) null hypotheses were considered and the mean of the null hypothesis was calculated to be 3. A sample T-test is conducted to check whether the hypothesis is

Table 4. One sample test

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Private sector money laundering	9.670	44	.000	1.133	.90	1.37
Private sector project efficiency	-6.139	44	.000	-.778	-1.03	-.52
Private sector acquires more land	-.628	44	.533	-.089	-.37	.20
Private sector bribes	4.905	44	.000	.778	.46	1.10
Private sector develops mafias	-1.348	44	.184	-.222	-.55	.11
Private sector degrades environment	-.244	44	.809	-.044	-.41	.32
Public sector project greater social impact	6.797	44	.000	.978	.69	1.27

true or not.If the mean of the 45 samples was greater than 3 and the significance level of the two tailed comparison less than 0.05 then the null hypothesis would be untrue and the proposed hypothesis would be right. Table 4 provides the one sample test for the study.

If the significance level is greater than 0.05, we cannot correctly determine if the null hypotheses is correct or wrong. Thus the null hypotheses is untrue and we can say with 95% confidence level from the questionnaire that-

- Private sector companies mismanage money from the loans availed from the banks for infrastructure projects
- Efficiency of investment is more in private sector than public sector.
- Public sector investments have greater socio-economic impact than those of private sector investments.

4. Conclusions

The conducted studywas able to collect a huge data from public and private sector employees in India. The data was segregated using Factor analysis and grouped to minimize error. SPSS is used as a statistical tool to analyze data. Three important factors are discussed- Infrastructure problem identification section; Private sector involvement analysis section and Existing problem solving section. The questionnaire template and interview is based on the above mentioned factors. From the study, it can be concluded that even though private sector have efficient technology in executing the infrastructure projects, they levy huge charges for the services rendered, which is wastage of public resource. The socio-economic growth can be provided through public sector only and thus the technological gap must be closed down in bringing efficient, timely and cost effective infrastructure development projects.

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