

Evaluation of Performance in PPP/Public Road Projects.

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Abstract- PPP has become the preferred way for execution of Infrastructure projects. Reduced capability of a public sector to deliver socially needed infrastructure projects introduced various types of partnerships with a private sector that can be different in terms of their roles in the agreement. The main reasons for partnerships are the risk sharing and ability of the private sector to convey, finance, maintain, and operate project at lower costs than the public sector. However, some of the public-private partnership (PPP) projects has been performing below the expected level. This situation can lead to the renegotiation process and even earlier termination of the agreement causing additional, unexpected costs. For this reason, number of research papers has been studied the factors that can lead to project's failure or success. The performance management has become more important for efficient and effective public-private partnership (PPP) projects. The study aims at evaluating the overall performance of project by measuring the key performance indices.

Index Terms- Public Private Partnerships (PPPs), Infrastructure, Key Performance Indices, Performance Management, Overall Performance.

1. INTRODUCTION

Now a days Public-Private Partnerships (PPPs) are gaining the popularity. Major challenges in the development of PPPs have raised from the global financial crisis. However, with respect to their monetary value, PPPs are still an desirable option for public sector projects. In the performance management and measurement, the Key Performance Indicators (KPIs) are the most important elements, viewed as efficient methods to help PPPs deliver value for money. The performance of PPP projects could be afflicted by number of factors and their interactions during the whole projects life cycle. These factors can affect the efficiency and effectiveness of the projects and the final outcome from project. KPIs can be useful in identifying the major strengths and weaknesses of PPP projects and are also used as a tool for effective PPP project performance measurement. It is expected that the performance objectives should be fulfilled by the PPP project, from project planning to its execution. The role of performance objectives in performance management is the guideline for performance measurement that is the way of knowing how successful organizations or individuals have been in achieving the objectives.

The key performance indicators are used to evaluate performance of PPP projects related to defined performance objectives. Detailed analysis of performance can be achieved only after the KPIs are evaluated. The key performance indicators are used to evaluate the performance indices, with the help of these different performance indices the overall performance of any project can be calculated. In the PPP/PUBLIC road projects the evaluation of performance become a need, as these project involves high risk from its planning to operation and

maintenance stage and there always been chances of failure of project.

2. OBJECTIVES

- To measure the cost, schedule, billing, profitability, quality, effectiveness of planning, business efficiency, growth performance indices.
- Evaluation of performance for different PPP road project with the help of performance indices.

3. LITERATURE REVIEW

A detailed literature review has been conducted to evaluate the performance of PPP/Public road projects. The literature review focused on identifying KPI's, analyzing the performance indices for construction projects. Different methods for evaluating of performance of projects has been studied in literature review.

Christopher Ngacho and Debadyuti Das (2015) states that the present work attempts to develop a theoretical framework of the performance evaluation of construction projects based on six key performance indicators (KPIs) namely time, cost, quality, safety, minimum site disputes and environmental impact. These KPIs were identified through literature review and discussions with project management professionals. For evaluating the performance on the above KPIs, several characteristic features pertaining to the project, project environment and the stakeholders associated with the project have been identified through an extensive literature review.

Hany Abd Elshakour M. Ali, Ibrahim A. Al-Sulaihi, Khalid S. Al-Gahtani (2012) Slow economic growth,

high competition, and construction industry restructuring have put a strong pressure on construction companies to continually improve their productivity and performance. Many studies on performance measurement have been carried out at the project level. However, recently, the demand for performance evaluation and management at the company level has increased. This paper aims to identify a set of KPIs that can be implemented by construction executives in measuring the performance at the company level in Saudi Arabia. List of 47 potential performance indicators have been identified through the literature review. A survey questionnaire was conducted on a randomly selected sample of large construction firms in Saudi Arabia. The statistical analysis of the collected responses was provided in 10 significant KPIs. Findings indicate that the traditional financial measures can no more be the sole determinant of firm success. Other performance indicators such as external customer satisfaction, safety, business efficiency, and effectiveness of planning are increasingly becoming important. The results of the study is a set of KPIs that are useful as a first step in developing a national benchmarking system for enhancing the performance of construction firms in the Kingdom of Saudi Arabia.

Nassar, Nadim. K. (2009) the objective of construction planning and controls, a basic project management function, is to ensure a well-coordinated and successful project. A basic element of planning is the set-up of objectives. The objectives will guide the many decisions made during the project's life. These decisions involve trade-offs between schedule, cost, quality, and other performance attributes. Effective monitoring of the progress of construction projects requires the integration and quantification of the various aspects of performance. The traditional performance indicators in the construction industry are completion time, cost, and quality. Most current project control systems measure quantitatively cost and schedule status and forget other major aspects of project performance like cash flow, profitability, quality, safety, project team satisfaction, and client satisfaction which are in some cases as important as cost and schedule. Very few project management systems quantify the later project attributes and they do so independently without proper integration to the overall project performance. The perception of failure and success of projects is usually based on personal indices and the experience of the project manager and it is not uncommon that two project managers would assess the performance of the same project using the same data differently (Rad, 2003).

4. METHODOLOGY

Traditionally, for measuring the performance of project the only performance indices like cost and schedule were considered, the reason why evaluation of overall performance of the project is carried out with less structured manner. For project performance

measurement an integrated framework is needed and that will be helpful for the contractors to evaluate performance of construction projects. The overall index can be evaluated by measuring the project objectives namely, cost, and schedule, billing, cash flow, profitability, safety, and quality, effectiveness of planning, business efficiency, and revenue growth. By implementing this set of performance objectives during the project construction phase will provide information that will help project managers to measure all aspects of performance against a quantitative and specific set of targets.

The proposed study aims at obtaining the overall performance of the project by integrating the project performance indicators into one overall index equation by assigning a priority or weight to each indicator index. The Analytical Hierarchy Process (AHP) methodology is proposed to quantify the weights in order to derive the overall project performance index. The proposed study will be able to draw the attention of management to poor performance in every phase construction and will also lead to a more reliable and comprehensive performance benchmarking of projects.

Project Performance Indices

Generally, the project dimensions such as cost, schedule, and quality are considered as the most critical to the successful completion of construction projects. The present study aims at identifying the eight performance indices and presents a methodology to measure the overall performance index. The development of the eight indices to measure the success of projects derived from the literature review. The performance index represent efficiency in terms of cost, time, billing or cash flow, profitability, quality, effectiveness of planning, business efficiency, and revenue growth.

Cost Performance Index (CPI):

The cost performance index (CPI) shows the cost efficiency of the project. The CPI is obtained by dividing the budgeted cost of work performed by the actual costs of work. If the value of $CPI < 1$ shows that costs are overrun (Nassar, Nadim. K., 2009).

$$CPI = BCWP/ACWP$$

Where,

BCWP = Budgeted Cost of Work Performed. It is the budgeted cost for work-completed to-date or the cost allowed (based on budget) to be spent for the actual work done.

ACWP = Actual Cost of Work Performed. It is the cost spend to complete the accomplished work to-date.

Table 1: Cost Performance Index Rating

Condition	Rating	Index Range
A	Outstanding performance	$I > 1.15$
B	Exceeds Target	$1.05 < I \leq 1.15$
C	Within Target	$0.95 < I \leq 1.05$
D	Below Target	$0.85 < I \leq 0.95$
E	Poor Performance	$I \leq 0.85$

Schedule Performance Index (SPI):

The Schedule Performance Index (SPI) measures the schedule efficiency of the project, the SPI is determined by dividing the earned value by the scheduled value. Any value of $SPI < 1$ indicates that we are running behind schedule.

SPI = BCWP/BCWS

Where,

BCWP = Budgeted Cost of Work Performed. It is the budgeted amount of cost for work completed to date.

BCWS = Budgeted Cost of Work Scheduled. It is the budgeted amount of cost for work scheduled to date.

Table 2: Schedule Performance Index Rating

Condition	Rating	Index Range
A	Outstanding performance	$I > 1.15$
B	Exceeds Target	$1.05 < I \leq 1.15$
C	Within Target	$0.95 < I \leq 1.05$
D	Below Target	$0.85 < I \leq 0.95$
E	Poor Performance	$I \leq 0.85$

Billing Performance Index (BPI):

A critical factor for construction organizations to run a profitable business is their ability to perform construction activities with minimum financing costs. Billing Performance Index (BPI) measures the efficiency of invoicing the Client for the earned work. **A BPI value of 1.0 is desired** because it means that the amount billed by the contractor covers all the work earned and the project is therefore efficient in billing the client.

BPI = BRWP/ERWP

Where,

BRWP = Billed Revenue of Work Performed, or the cumulative amount of invoices.

ERWP = Earned Revenue of Work Performed, or the revenue earned for the actual work accomplished to date.

Table 3: Billing Performance Index Rating

Condition	Rating	Index Range	BPI Range
A	Outstanding performance	$I > 1.15$	$BPI > 0.98$
B	Exceeds Target	$1.05 < I \leq 1.15$	$0.95 < BPI \leq 0.98$
C	Within Target	$0.95 < I \leq 1.05$	$0.90 < BPI \leq 0.95$
D	Below Target	$0.85 < I \leq 0.95$	$0.85 < BPI \leq 0.90$
E	Poor Performance	$I \leq 0.85$	$BPI \leq 0.85$

Profitability Performance Index (PPI):

The Profitability Performance Index (PPI) is a measure of how profitable the project is to date.

A PPI value greater than 1.0 is desired because it means that the revenue earned for the amount of work completed to date is greater than the cost incurred for that same work and the project is therefore profitable.

PPI = ERWP/ACWP

Where,

ERWP = Earned Revenue of Work Performed, or the revenue earned for the actual work accomplished.

ACWP = Actual Cost of Work Performed. It is the cost incurred to complete the accomplished work.

Table 4: Profitability performance Index Rating

Condition	Rating	Index Range	PPI Range
A	Outstanding performance	$I > 1.15$	$PPI > 1.3$
B	Exceeds Target	$1.05 < I \leq 1.15$	$1.2 < PPI \leq 1.3$
C	Within Target	$0.95 < I \leq 1.05$	$1.05 < PPI \leq 1.2$
D	Below Target	$0.85 < I \leq 0.95$	$0.90 < PPI \leq 1.05$
E	Poor Performance	$I \leq 0.85$	$PPI \leq 0.90$

Quality Performance Index (QPI):

The Quality Performance Index (QPI) is a measure of consistency in the application of the Project Standards and Procedures as well as acquiesce of the delivered product with the project specifications (Nassar, Nadim. K., 2009).

QPI = CFRI = Construction Field Rework Index

$CFRI = \text{Total direct and indirect cost of rework performed in the field} \div \text{Total field construction phase cost}$

Table 5: Quality performance Index Rating

Condition	Rating	Index Range	PPI Range
A	Outstanding performance	$I > 1.15$	$CFRI \leq 0.5$
B	Exceeds Target	$1.05 < I \leq 1.15$	$0.5 < CFRI \leq 1$
C	Within Target	$0.95 < I \leq 1.05$	$1 < CFRI \leq 2$
D	Below Target	$0.85 < I \leq 0.95$	$2 < CFRI \leq 4$
E	Poor Performance	$I \leq 0.85$	$CFRI > 4$

Effectiveness of planning index:

The effectiveness of planning index is a measure of consistency in planning and managing the project. It also shows how effective is the planning for project.

$$\text{Index} = \frac{\text{Actual cost} - \text{Anticipated cost}}{\text{Anticipated cost}}$$

Table 6: Effectiveness of Planning Performance Index Rating

Condition	Rating	Index Range
A	Outstanding performance	$I > 1.15$
B	Exceeds Target	$1.05 < I \leq 1.15$
C	Within Target	$0.95 < I \leq 1.05$
D	Below Target	$0.85 < I \leq 0.95$
E	Poor Performance	$I \leq 0.85$

Business efficiency index:

Business efficiency index measures the efficiency of business and of any construction project. It shows how efficient project is, and extent to which a project can deliver the profit.

$$\text{Efficiency ratio} = \frac{\text{expenses}}{\text{revenue}}$$

OR

$$\text{Efficiency} = (\text{output} \div \text{input}) \times 100$$

Growth rate index:

The growth rate index gives the revenue growth of the project. It is also a measure of consistency in revenue generation for the particular project (Hany Abd Elshakour M., 2012).

$$\text{Growth rate} = \text{revenue growth}$$

OR

$$\text{Growth rate} = \text{volume of works growth rate}$$

Overall performance index:

It can be also stated as project performance index, which shows the performance of the project as a whole. And is calculated by normalizing the each individual performance index and multiplying each index with their priority weights and addition of all indices.

$$\text{Overall performance index} = W1 \times CPI + W2 \times SPI + W3 \times QPI + W4 \times PPI + W5 \times BPI + W6 \times EPI + W7 \times \text{Business Efficiency} + W8 \times \text{Revenue Growth}$$

5. CONCLUSION

The roads and highways play important role in development of the country. The Indian government has taken various steps to improve the condition of the National Highways. The government of India consented PPP for the development of road networks. The Public Private Partnerships (PPPs) have come out as a very feasible, viable, and growing mode for development of infrastructure for our country. However several problems and challenges have been incorporated in PPP model development. Henceforth the need for more efficient and effective public-private partnership (PPP) projects makes performance evaluation most important.

The major objective of this study was to evaluate the performance of the PPP/Public project by measuring the key performance index.

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