

Selection of Performance Objectives and Key Performance Indicators in PPP Projects: A Review

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ABSTRACT

Public-Private Partnerships (PPP), now applied widely in the global construction market, are more complex than conventional public procurements in economic, social, political, legal, and administrative aspects. Therefore, in order to ensure good performance and subsequent success of project, PPPs require a well-formulated performance management system that takes into consideration the perspectives of all stakeholders involved. A general agreement on how to measure success is necessary, which may be achieved by the definition of Performance Objectives (POs) of the project. Further statistical evidence, often labelled Key Performance Indicators (KPIs), may be employed to ensure that the actual progress is at par with the targeted. Determination of appropriate POs and KPIs is important for successful performance management. Numerous studies have been conducted worldwide to identify a desirable set of POs and KPIs in PPPs. This paper compiles the information gathered from such studies, to arrive at a collective understanding of the considerations while selecting POs and KPIs. Studies imply that the conventional notion of sticking to the “iron triangle” criteria, which considers time, cost, scope and thereby quality to be the basic criteria for project success, has shifted to a broader perspective. It now includes several other factors such as user satisfaction, benefits to stakeholders, innovation and development, relationship among stakeholders, environmental impact etc. It was also noted that although all stakeholders approved of the importance of most indicators, there were significant differences in the perception of different stakeholders regarding safety, contract management and concession period.

Keywords: Public Private Partnership (PPP), Performance Objectives (POs), Key Performance Indicators (KPIs), iron triangle

1 Introduction

Public Private Partnerships (PPPs) are a delivery method that promises greater efficiency and value for money, if carried out with proper planning. It is a cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks, responsibilities, and rewards (CCPPP 2001). In other words, PPP is simply a contractual agreement formed between a government agency and a private sector entity that allows for greater private sector participation in the delivery of public infrastructure projects (Deloitte 2005). Governments adopt PPP as a preferred procurement method to provide better essential public services, including transport, water and power supply, health and education (Liu et al. 2014).



PPP projects differ from conventional construction projects in terms of project development, implementation, and management. PPP projects focus on delivering specified services at defined quantity and levels, rather than on delivering a particular class/type of assets. The key-determining factor in deciding whether to develop a specific project as a PPP is Value for Money (VfM). PPPs try to gain efficiency from improved project delivery, operation and management, and access to advanced technology that can offset the additional costs such as higher administrative costs, transaction costs and cost of borrowing money, thus ensuring VfM as important as the choice of mode of contract is its execution and analysis. Frequent analysis along the course of the project is inevitable in maximizing financial and operational performance and minimizing risk, which contributes to the success of the project.

PPPs are complex regarding economic, social, political, legal, and administrative aspects. This complexity in structure is due to its long-term contract period and partnership relationship between public and private sectors. (Wang et al. 2020). This necessitates the proper monitoring of the process, from the stage of its inception to its termination, with frequent evaluations conducted in order to ensure that the actual progress is at par with the targeted. Here comes the significance of performance evaluation in PPPs.

In order to assess the performance of PPP projects, the "iron triangle" criteria, which focus on the efficiency, scope, resources and timeline of the project and are commonly used to calculate conventional construction projects, have been applied. Research shows, however, that these requirements are too simplistic to represent the anticipated results of stakeholders in the execution of PPP projects (Liang et al. 2018). This is because unlike in traditional procurement approach, the radical PPP approach aims at procuring services and/or facilities rather than assets. Also, the goals and aspirations of most stakeholders, including end users, should be met by a good PPP project., which requires various other factors also to be taken into consideration.

1.1 Need for Performance Objectives and Indicators

According to goal-setting theory (Locke 1968, Locke and Latham 1990), goal setting is essentially linked to task performance. Specific and challenging goals along with appropriate feedback contribute to higher and better task performance. In simple words, goals indicate and give direction to an employee about what needs to be done and how much efforts are required to be put in. This points to the necessity of setting objectives prior to execution. Further, identification of objectives of the project before performance planning is important in the implementation of a complete and effective performance management system. This will help make a comparison of the actual economy, efficiency and effectiveness (i.e., the 3 e's) of the PPP project, with the planned outputs and outcomes.

Besides the perception of stakeholders, the objectives and measures to be selected for a project would largely depend on the type of infrastructure to be constructed. Therefore, it is not realistic to generalize a set of performance metrics for all forms of partnerships, since every project has certain specific characteristics and limitations, even if performed under the same procurement system. Still there is a need for identifying a set of common objectives and indicators to be used in measuring performance of PPPs.

1.1.1 Performance Objectives

Performance Objectives (POs) are the basis for performance assessment in assessing how effective organisations or individuals have been in achieving these goals. (Solomon and Young 2007). They should be set at the planning stage and used as an efficient motivating mechanism focused on the goal-setting principle to handle projects. The performance standards that the stakeholders expect the PPP project to achieve are

demonstrated by a performance objective. Therefore, specification of the requirements from each stakeholder's perspective should be considered while setting the objectives for the project.

1.1.2 Key Performance Indicators

Statistical evidence, both quantitative and qualitative, should be used to determine the progress of each measure in contributing to agency goals. This evidence is often labelled a "performance indicator". Thus, Key Performance Indicators (KPIs) are data compilations used to measure and determine the performance of a PPP operation (Kagioglou et al. 2001). These measures compare actual and expected performance in terms of productivity, effectiveness and quality. Determination of the appropriate KPIs is prerequisite to measuring the effects of any given change on the process of PPP projects. Only after the KPIs are determined and monitored can accurate analysis of performance be achieved.

2 Studies on General Construction Projects

Due to the increasing uncertainties in technology, budgets, and development processes, the construction industry is considered to be dynamic in nature. While the ultimate goal of any project remains to be project success, what success means to different projects varies according to its nature, as well as the perception of its stakeholders. The "iron triangle" criteria were the sole basis for performance measurement for a long time. But considering the dynamic nature of construction projects and the complexities involved, over time researchers have come up with more criteria such as user satisfaction, transfer of technology, environment, health and safety etc. to measure project success.

Shenhar et al. (1997) proposed that project success is divided into four time-dependent dimensions. The first dimension, project efficiency, is the period during project execution and soon after project completion. The second dimension, impact on customer, can be assessed shortly afterwards, when the project has been delivered to the customer. The third dimension, business success, can be assessed after a significant level of sales has been achieved. Finally, the fourth dimension, preparing for the future, can only be assessed 3-5 years after project completion.

Based on prevailing literature on performance measurement, Chan and Chan (2017) developed a set of KPIs, dividing them into objective indicators and subjective ones (see Table 1), to measure the performance of a construction project. Values of objective indicators can be calculated using mathematical formulae, while the other group uses subjective opinions and personal judgement of the stakeholders.

Table 1. KPIs for Project Success

Objective measures	Subjective measures
Construction time	Quality
Speed of construction	Functionality
Time variation	End-user's satisfaction
Unit cost	Client's satisfaction
Percentage net variation over final cost	Design team's satisfaction
Net present value	Construction team's satisfaction
Accident rate	
Environmental Impact Assessment (EIA) scores	

(Source: Chan and Chan, 2017)

Toor and Ogunlana (2010) investigated the significance of key performance indicators from the perspective of various construction stakeholders (client, consultants, and contractors) in the context of a large construction project in Thailand. Findings indicated that the traditional measures of the iron triangle were no more applicable to measuring performance on large public sector development projects. Other performance indicators such as effectiveness, efficient use of resources, safety, satisfaction of stakeholders, and reduced conflicts and disputes were increasingly becoming important. This study pointed to the departure of performance measurement from the traditional quantitative methods to a mix of both quantitative and qualitative performance measurement in the construction arena.

3 Studies on PPPs in Construction

The expansion of performance measurement beyond the iron triangle criteria in construction projects is especially applicable to PPPs, where the complexities regarding economic, social, political, legal, and administrative aspects are comparatively larger. Numerous studies have been conducted worldwide to identify the desirable set of performance objectives and indicators in PPPs. These studies have focussed on various domains of infrastructure, like buildings, roads, railways, ports and so on. Despite all differences, there are still a set of objectives and indicators that are identified to be common in all PPP projects. Despite variations in the perception of stakeholders regarding performance objectives, the ultimate objective of PPPs is achieving best value for public service and product (Zhang 2006). Best value emphasizes efficiency, quality, performance standards and VfM. (Akintoye et al., 2003).

Based on literature review and goal-setting theory, Yuan et al. (2009) selected 15 performance objectives for PPPs. These were ranked by seeking the opinions of stakeholders belonging to four groups (academia, public sector, private sector and general public):

1. Acceptable quality of project
2. Quality public service
3. Budget compliance in construction and operation
4. Compliance to schedule in project completion
5. Satisfy the need for public facilities
6. Timelier and more convenient service for society
7. Solution to the problem of public sector budget restraint
8. Life cycle cost reduction
9. Introduction of business and profit-generating skills to the public sector
10. Transfer risk to private sector
11. Make profit from public service
12. Promote local economic development
13. Improve technology level, gain technology transfer
14. Public sector can acquire additional facilities/ services from private sector
15. Private sector can earn government sponsorship, guarantees and tax reductions

Acceptable quality of project was found to be the most important objective from the perspective of all groups of stakeholders. While common opinions were observed in all groups on the quality, cost, time and service objectives of the PPPs, there were evident differences in the objectives of public sector budget constraints, risks, revenue and guarantees due to the different preferences of the stakeholders.

On the basis of a questionnaire survey conducted, Yuan et al. (2008) established a conceptual performance indicator model consisting of 48 KPIs belonging to three major packages.

- (1) physical characteristics of projects
- (2) the requirements of stakeholders, and
- (3) project process.

The most highly ranked indicators are shown in Table 2. It can be noted that cooperation and support among different stakeholders and reasonable management capability, along with knowledge of PPPs within both the public and private sectors were found to be of high importance. Traditional project goals (schedule, quality, and cost) also found place among the 10 top rated indicators.

Table 2. Top KPIs Identified by Different Researchers

Yuan et al. (2008)	Aje et al. (2012)	Ogunsanmi (2013)
Commitment between public and private sector	Cost	Return on investments
Appropriate risk allocation, sharing, and transfer	Innovation, development, and learning	Satisfaction of project teams
Good governance	Sustainability	Quality control
General public satisfaction	Time	Concession period
High quality control	Quality	Satisfaction of financiers
Cost management	Socio economic issues	Equity/debt ratio
Concessionaire's knowledge	Environmental	Tariff/toll
Government's knowledge	Communication and relationship	Satisfaction of clients
Financial innovation	Scope for rework	Unit price of projects
Time management	Financials and marketing	Relationship between concessionaire and subcontractors

In a similar study conducted by Aje et al. (2012), possible indicators were extracted from literature survey, interviews conducted and questionnaires circulated among four groups of respondents- Consultants, Contractors, Government, and Concessionaires, on the basis of which a set of Performance Indicators (PIs) was developed for infrastructure public-private partnerships in Lagos state, Nigeria.

A total of 15 PIs were identified and ranked, top 10 of which are shown in Table 2. All the classes of respondents that participated in the study thought that most of the measures were at least moderately relevant. Innovation, learning and development; and sustainability, in particular, alongside time, cost and project efficiency, made the list of first five indicators.

Another study conducted by Ogunsanmi (2013), focused on PPP projects in Lagos, Nigeria, compared the perceptions of stakeholders on KPIs and investigated whether there was a substantial difference between the perceptions of stakeholders on most KPIs. Architects, architects, quantity surveyors, project owners and banking officials who have been involved in PPP projects were respondents to the questionnaire survey. A total of 39 KPIs were identified, which fit into the conceptual model of 5 KPI sets proposed by Yuan et al. (2008). The top 10 indicators have been shown in Table 2.

It was found that the perceptions of all stakeholders on most of the indicators were similar, but significant differences in perception were observed for concession period, safety and contract management. These

indicators were viewed by consultants as contributing more to the results of PPP projects, than customers and contractors.

3.1 Case studies in transportation, housing and health sectors

Based on case studies conducted by Miguel (2013) in the road and health sectors in USA, Canada, Australia and Portugal, a framework of indicators that enable the public entities to monitor the performance of PPPs effectively was developed. The varied set of indicators were grouped into 5 major groups (See Table 3).

The author implies that although the indicators presented were primarily developed only for the road sector and for the health sector, the indicators groups shall be adopted for all PPPs, regardless of the sector in which it operates.

Operational KPIs are the ones designed to monitor the performance of activities of operation and maintenance, and would largely vary depending on the type of infrastructure project. These are further classified as infrastructure KPIs (e.g. pavements, road markings etc.) and service KPIs (e.g. traffic lane availability, response to accidents/incidents etc.). Largely common to all sectors of infrastructure, Financial KPIs include costs, incomes, value for money, net present value etc. Relational KPIs are intended to reflect fulfilment of reporting obligations, meetings and communication plan (e.g. fulfilment of the periodicity of reporting obligations, content quality of reporting etc.). Environmental KPIs are intended to monitor the effects of the PPP project in the environment, biodiversity and habitat. Some indicators may be environmental impact, energy consumption, habitat retention, impact on biodiversity etc. Social KPIs are proposed with the aim to realize the effects that a given PPP project has in the society. Community’s satisfaction with the infrastructure or service, users’ satisfaction with the infrastructure or service etc. come under this category of indicators.

Table 3. Classification of KPIs for monitoring of PPPs

Miguel 2013	Molenaar et al. (2013)
Operational KPIs	Operations and maintenance
Financial KPIs	Design and construction
Relational KPIs	Handback requirements
Environmental KPIs	
Social KPIs	

Molenaar et al. (2013) examined case studies from around the world to analyse the possibilities of use of performance measures and KPIs in PPPs for highway design, construction, maintenance, and operations, and consolidated a list of KPIs into 3 broad groups as shown in Table 3. First 2 categories of KPIs include those related to the organizational structure, remedies and dispute resolution procedures for poor performance etc. in the fields of operations & maintenance, and design & construction respectively. Handback requirements are those that hold the concessionaire accountable for the operations and maintenance performance measures included in the contract during the concession period.

A study conducted by Liang and Jia (2018) on transportation projects, public housing and hospital projects in Hong Kong attempted to identify and develop success indicators for PPP projects. The study was based on a questionnaire survey, in which the respondents were experienced practitioners from the public, private, and other sectors. The success indicators explored and verified in this study dealt with meeting design goals, benefits to end user, private partner and public partner, and finally, preparing for the future.

Analytical studies showed that success indicators in PPP projects were relatively complicated compared with those in other projects. The traditional measurements of the "iron triangle" represent only one dimension of

the progress of the PPP project. Further research in this regard will provide a benchmark for practitioners to evaluate the success of PPP projects and provide a solid basis for scholars to perform further studies.

4 Conclusion

PPP is a contractual agreement formed between a government agency and a private sector entity. It allows for greater private sector participation in the delivery of public infrastructure projects. It differs from conventional construction projects in terms of project development, implementation, and management. Considering the complexities involved in PPPs regarding economic, social, political, legal, and administrative aspects, in order to ensure good performance and subsequent success of project, one must know what the definition of success is in order to make correct measures to achieve this goal. This is because success might appeal as different for different categories of stakeholders. Therefore, a general agreement on how to measure success is necessary. This may be achieved by the definition of POs of the project, taking into consideration the perspective of all stakeholders. Further, frequent evaluations should be conducted in order to ensure that the actual progress is at par with the targeted, for which KPIs may be employed.

Determination of appropriate POs and KPIs is inevitable to measure performance or calculate the effects of any given change on the process of PPP projects. Numerous studies have been conducted worldwide to identify the desirable set of performance objectives and indicators in PPPs. The results of such studies imply that the conventional notion of sticking to the “iron triangle” criteria, which considers time, cost, scope and quality to be the basic criteria for project success, has shifted to a broader perspective, considering several other factors such as user satisfaction, environmental impact, benefits to stakeholders etc. to measure project success. Several researchers have come up with sets of objectives and indicators to measure the performance of PPPs. Apart from the popular ‘iron triangle’ criteria, a number of indicators like user satisfaction, innovation and development, relationship among stakeholders, environmental impact etc., are found suitable for measuring the performance of PPP projects. It was also noted that although all stakeholders approved of the importance of most indicators, there were significant differences in the perception of different stakeholders regarding few indicators, like safety, contract management and concession period.

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