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Measuring and benchmarking managerial efficiency of project execution schedule performance

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Abstract

Though managerial efficiency is considered to be a key driver for successful execution of projects, not much study is reported to measure and benchmark this efficiency. In this study, a basket of 57 projects is selected and configured as Decision Making Units (DMUs) in a Data Envelopment Analysis (DEA) procedure which is then integrated with Principal Component Analysis (PCA). Suitable modifications are made in this DEA-PCA engine to factor in the overall and relative performance of DMUs to measure and rank their managerial efficiency. On the basis of combination of the inputs and managerial efficiency scores, DMUs are then classified using alternative methods of clustering into a five category benchmarking model: “excellent”, “good”, “fair”, “unsatisfactory” and “poor”. Distinguishing features of the model and the findings are discussed in representative DMUs that enable practitioners and policy makers to implement the model and objectively institute a multi-sector managerial performance recognition systems.

Keywords: Project performance; Managerial efficiency; Benchmarking; Data Envelopment Analysis; Principal Component Analysis; Cluster analysis

1. Introduction

India’s state-led, monopolistic model of infrastructure development for about five decades (1950–2000) has been transitioning into a competitive market structure under regulatory oversight. Outcomes of this transition have however been a “mixed bag of performances” (Ministry of Finance, 2011). A twenty year (1993–2013) performance trend of Government of India Central Sector infrastructure development projects is presented in Fig. 1.

In this period (1993–2013), the percentage of delayed infrastructure projects declined from 62.22% in March 1993 to 34.13% in March 2007. Thereafter, the schedule overrun showed an upward trend to reach 53.71% in March 2011 which can mainly be attributed to retention of only the large sized projects with outlay greater than INR 1500 million (approx. USD 25 million) for monitoring purpose. Since 2011 the schedule overrun has remained above 50% signifying that large projects continue to consistently suffer significant delays.

It can be seen from Fig. 1 that the cost over-runs of infrastructure projects declined from 56.8% in March 1993 to 17.24% in March 2013. However, it has persisted between 17% to 20% mark for the last three years with no significant downward movement. An analysis of Government of India’s large projects’ cost overrun data of three years (2011–2013) showed only some attribution to general inflation. Most of this cost overrun was due to project execution delays, which could have been minimized (Ministry of Statistics and Programme Implementation, 2013). This analysis further revealed two dimensions for project delays: (i) delayed clearances (such as land acquisition, forest and environment) and (ii) delayed execution attributed to inefficiencies during planning and construction.

To address the first dimension, Government of India has taken measures to improve administrative efficiencies,

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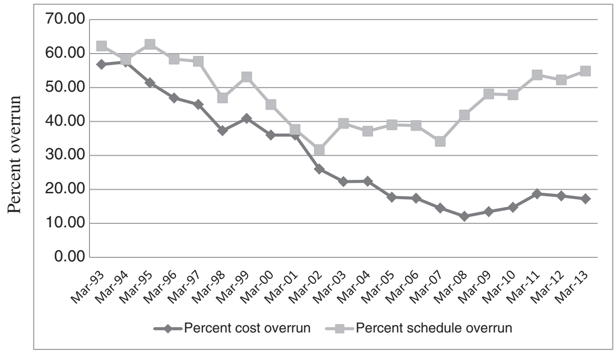

Fig. 1. Twenty year trend of Government of India Central Sector infrastructure development project performance. (Data source: Ministry of Statistics and Programme Implementation (MoSPI)).

streamline policies and implement an inter-disciplinary cum single-window approach for project approval. The second dimension, being unexplored fully, became an obvious choice for the researchers. This research employs a grounded theory approach to study the execution delays in large projects and objectively identify managerial efficiency gaps that often results in poor performance. A methodology has then been developed to measure and benchmark managerial efficiencies of project execution that can eventually set the stage for improvement in schedule performance of projects.

2. Project performance measurement and improvement

2.1. Project performance measurement

Osborne and Gaebler (1992) famously stated "What gets measured gets done". Performance measurement uses objective, relevant information on program or organizational performance to strengthen management, and informed decision making to achieve results, and improve overall performance with increased accountability (Poister, 2003). Such measures can be implemented in any of the four categories, namely performance, motivation, communications, or accountability (Greiner et al., 1996). Of these, "improving performance" can be considered as the most important application of performance measurement (Epstein, 1992; Wholey and Hatry, 1992).

Project performance measurement and identification of project success factors have been active areas of research over the last three decades. Pinto and Slevin (1987) identified ten factors to be critical for successful project implementation and concluded that their relative importance changed as the project progressed. Since then, multiple researchers have contributed to literature in this area that included identifying key performance indicators to measure construction project success and developing industry specific metrics (Astebro, 2004; Bassioni et al., 2004; Cao and Hoffman, 2011; Chan and Chan, 2004; Cooke-Davies, 2002; Hwang et al., 2010; Iyer and Jha, 2006; Shenhar et al., 2002). But till date, literature is divided on universal acceptance of any one framework that can be used to measure the success or failure of these projects. Over the years, simple measures of time, cost, and quality (collectively termed as the 'iron triangle') have gained popularity as measures of construction project performance (Atkinson, 1999) even though researchers have been seeking to enhance this approach (Dainty et al., 2003; Toor and Ogunlana, 2010).

2.2. Benchmarking as a method to improve project performance

The Earned Value and Critical Chain Project Management methods are known to improve project performance, both of which find mention in Project Management Body of Knowledge (PMI, 2013). Besides these, Value Management and Benchmarking have been identified as the two other performance improvement methods in the construction sector (Egan, 1998). While value management attempts to improve the project outputs (products, services or results) and overall performance working within the boundaries of the project, benchmarking is the "search for the best industry practices which will lead to exceptional performance through implementation of these best practices" (Camp, 1989). The Egan report also suggests that construction firms can apply benchmarking as a management tool to understand how their performance measures up to their competitors' and drive improvement up to 'world class' standards. As the present study has also been aimed to suggest a methodology to improve project performance at a national level, the researchers thought benchmarking would be contextually a more appropriate approach than value management.

Benchmarking is grounded in the quality movement of the 1980 and 1990s. The initial set of benchmarking success stories emanated from large US corporations such as Xerox Corporation, Florida Power and Light, AT&T, Alcoa, Motorola, General Electric and reputed UK companies like TNT Express and Shorts. These then became more broad based across countries and industries (Coopers and Lybrand, 1994; Voss et al., 1997). In 2003, Chambre de Commerce et d'Industrie France reported that 50% of their 1000 companies used benchmarking regularly, and 80% of the users regarded it as effective.

Benchmarking models can be classified either according to their *content* (either process, functional, performance or strategic) or their *purpose* (either competitive or collaborative) (Anand and Kodali, 2008). Performance benchmarking is concerned with quantifiable outcome characteristics. For infrastructure projects, schedule performance becomes a relevant outcome for benchmarking and has been considered in this study. For construction firms, the purpose of initiating benchmarking exercises stems from the need to gain competitive advantage and superiority over others. However, from a national or policy perspective, collaborative benchmarking becomes an instrument for developing sector-wide improvement initiatives within an atmosphere of knowledge sharing.

2.3. Benchmarking: construction industry models

According to a global study, there were about 40 different benchmarking systems being used in the construction and infrastructure development sector (Bakens et al., 2005). Some of the early benchmarking models applied in the construction industry are given below.