Benchmarking Performance Indicators of Indian Rail Freight by DEA Approach

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INTRODUCTION

To accomplish the organization's logistics/distribution activities, measurement systems have been designed to capture information regarding five types of performance. These five categories are: asset management, cost, customer service, productivity and logistics quality (Li, 2005).

Li (2005) discussed several evaluation methods for logistics performance. Qualitative and quantitative data can be dealt by AHP method but the weight of different factors is objective. The result is influenced by the subjectivity greatly. Mathematic statistics method mainly conducts the quantitative data, and the evaluation process is objective. However strong qualitative analysis ability has been shown by Fuzzy comprehensive evaluation and Rough sets method. The above methods are not systematized as a whole. The objects, contents and methods are too much complicated to be integrated. But DEA (Data Envelopment Analysis) especially suitable for multi-input and multi-output complicated systems take the weights of input and output of DMU (Decision Making Units) for variables, evaluates in terms of DMU. In a word, DEA is more suitable evaluation method for the logistics activities as it has very strong objectivity.

Data Envelopment Analysis (DEA)

DEA measurement can be defined as the ratio of total weighted output to total weighted input. It is a linear programming-based technique that converts multiple input and output measures into a single comprehensive measure of productivity efficiency (Epstein, & Henderson, 1989). DEA provides a measure by which one firm or department can compare its performance, in relative terms, with other homogeneous firms or departments. In measuring the relative efficiencies of organizations with DEA each organization can utilize different weights for the set of performance measures. Weights are selected that will maximize the composite efficiency score for each functional unit. Taking into account differences in goals, responsibilities, and type of procurement, this variable weighting allows for the evaluation of performance. The range of possible weights is controlled by requiring all weights to be positive, and specifying that if another unit used the same weight, their total efficiency score could not exceed the value of one. The technique also gives information as to the specific effect each input or output has on overall efficiency as yet, which has demonstrated its use as a potential evaluation tool for logistics performance. In summation, DEA can be used to reduce some of the existing problems with performance evaluation system (Charnes, Cooper, & Rhodes, 1978).

An examination of the literature reveals the application of DEA for performance benchmarking in a variety of settings such as telecommunications (Lupi, Manenti, Scialà, & Varin, 2011), educational institutes (Portela, Camanho, & Borges, 2011), productive efficiency (Farrell, 1957; Chandraprakaikul, & Suebpongsakorn, 2012; Holden, Xu, Greening, Piecyk, & Dadhich,

2016), Irrigation sector (Phadnis, & Kulshrestha, 2012), safety performance (Beriha, Patnaik, & Mahapatra, 2011), etc.

Indian Railway Container Scenario

By taking over network of seven Inland Container Depots (ICDs) of Indian Railways (IR) located at Delhi, Ludhiana, Bangalore, Coimbatore, Guwahati, Guntur and Anaparti, Container Corporation of India (CONCOR) was incorporated in March 1988 as a Public Sector Enterprise under the Ministry of Railways. The company was formed with objective to have a separate organization for promoting and managing the growth of containerization in India as well as developing multimodal (surface, rail, water and air) transport logistics and infrastructure to support India's growing inland as well as international trade. Under the supervision of Managing Director, the day-to-day affairs of the business of CONCOR are managed by various divisional heads (CARE, 2009). Although, IR is a public sector monopoly, there is a growing demand on it to realize the full scope of its assets through proper use of systems and technology and also to address the lack of its customer orientation. Therefore, there is a strong need to devise a performance benchmarking system of its supply chain operations (George, & Rangaraj, 2008). To introduce competition in the container operations segment, the Ministry of Railways allowed the entry of private and public sector operators to obtain licenses for running container trains on the Indian Railways (IR) network in January 2006. Until then, the Container Corporation of India, a subsidiary of IR, was the monopoly operator of container trains in India.

This book chapter is an extension of previous study conducted on evaluating the performance of CONCOR over a period of time using super-efficiency analysis by employing CCR and BCC models of DEA considering different parameters for additional years to outline the key issues for needful improvement by validating the results of CCR and BCC models. The subsequent sections narrate thorough study of background of

performance evaluation perspective of logistics operations within and outside country. Further, DEA models, which are used in this study and the application of these models for benchmarking of Indian Railway Container Business within CONCOR, have been explained. The last section presents appropriate discussion on the results obtained and conclusions of the study.

BACKGROUND

Freight Container Business continued to be monopoly in the hands of government owned Container Corporation of India. In this section, history of performance evaluation has been discussed within and outside country in competitive scenario over the years in order to cite the various cases of performance oriented studies related to logistics.

Background Within Country

Napa (2006) discussed strategic moves and logistic operations, CONCOR took to establish it and face the challenges posed by the entry of new players. The task ahead in the company had been discussed in addition to questions, which can be taken as possible new problems for work. This framework further provides scope for readers to analyse various strengths and weaknesses of the CONCOR in the light of the future competition.

George, & Rangaraj (2008) analysed the performance benchmarking study of the zones of Indian Railways (IR) to develop an alternate approach for measurement of aggregate operational performance. The efficiency trends within the set of inputs and outputs considered with efficiency scores ranging between 58.26% to 100% by CCR and 58.26% to 254.92% by RCCR analysis identified the best performing railway zones over the years. The conclusion showed some weaknesses of the conventional DEA due to cross-efficiencies along with self-efficiencies and operating ratios.

Gangwar, & Raghuram (2010) examined the current policy environment from the point of view of business viability for 15 new Container Train

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