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Measuring supply chain efficiency based on a hybrid approach


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ABSTRACT

Supply chain management has a tremendous impact on the success of a company. One of the critical issues for gaining competitive advantages for companies is improving supply chain performance. Most studies about the application of Data Envelopment Analysis (DEA) Supply chain models do not identify the benchmarking units for inefficient supply chains. On the other, measuring the short run and long run of the supply chain efficiency is another challenge for decision makers in supply chain management. Hence, we propose a methodology of DEA for measuring of the supply chain. We integrated two approaches as special cases of the hybrid model and compare the short and long run strategies of supply chain and can be identified benchmarking.

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Introduction

Supply chain management is the practice of coordinating the flow of goods, services, and encompasses the end-to-end flow of information, products, and money. Individually, purchasing, operations, and logistics management does not comprise supply chain management, in other words requires network integration.

Performance evaluation of supply chain is a hot topic today and it is an interesting topic for manager of supply chain to improve their resource allocation strategies and to achieve desired customer satisfaction levels (Yeung et al., 2008; Chen and Gong, 2013; Min and Zhou, 2002). Performance evaluation plays an importance role in supply chain activity. In other words performance evaluation of supply chain has been widely recognized as value maximization, cycle time reduction and improvement efforts across supplier, company and customer operations (Fransoo et al., 2011; Estampe et al., 2013; Gunasekaran et al., 2004). Most supply chain management focus efforts on improving supply chain efficiency by looking at the performance evaluation of supply chain (Estampe et al., 2013; Chen et al., 2013). Supply chain efficiency is one of the most important performance, competitive advantages and can play an important role in the development of the supply chain. Manage and improve the performance of the supply chain is today able to successfully service in the market in the long term if encourages all members of the supply chain to engage in resource sharing and incentive sharing, accelerating time-to-market, forecasting, sharing real-time information, improving products and processes (Akyuz and Erkan, 2010; Stadler and Kilger, 2008). Research from Stephens (2001) show that a tool to improve supply chain efficiency and achieve best practice. This research about supply chain operations reference (SCOR) model is now being successfully applied to improve business operations in the world.

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Supply chain management that performs effectively across the supply chain have enjoyed to know how and to what extent their recourse are being effectively and efficiently utilized, compared to other similar companies in the similar supply chain. Within the context of supply chain efficiency, [Ramanathan and Muyldermans \(2010\)](#) and [Diabat \(2014\)](#) develop a hybrid algorithm for a vendor managed inventory system in a two-echelon supply chain. [Jula and Leachman \(2011\)](#) introduced long and short-Run supply chain optimization models for the allocation and congestion management. This research develops allocation of ports and transportation channels of containerized goods imported from Asia to the USA under mixed integer nonlinear programming.

By means of those important mentioned above, performance evaluation to be a tool that can be used to improve the supply chain efficiency. Data Envelopment Analysis (DEA) is a kind of nonparametric method in operations research and management processes for the proposed use. Several performance evaluation methods in the DEA and the supply chain context have been employed to improve the supply chain efficiency. For a review of these methods, we can refer to performance evaluation with data envelopment analysis and balanced scorecard approach by [Shafiee et al. \(2014\)](#), and Frontier-based performance analysis models for supply chain management: State of the art and research directions, by [Agrell and Hatami-Marbini \(2013\)](#). [Liang et al. \(2006\)](#) proposed DEA models for supply chain efficiency evaluation and also [Yang et al. \(2009\)](#) discussed the problem of production possibility set and performance evaluation model in supply chain using DEA. As well as DEA has been one of the most effective methods to evaluate supply chain efficiency focus on single, two and multiple stages, for example ([Talluri and Baker, 2002](#); [Chen and Yan, 2011](#); [Aoki et al., 2010](#); [Mirhedayatian et al., 2014](#); [Tajbakhsh and Hassini, 2014](#)).

One way to improve the overall supply chain efficiency is to look at benchmarking between supply chains ([Gunasekaran et al., 2004](#)).

Benchmarking is the practice of a supply chain comparing performance evaluation of their operations to other similar supply chains.

The benchmarking process within a supply chain should be constantly reviewed to identify the benefits achieved by the implementation of any improvements. Most studies about the application of DEA supply chain models is not identify the benchmarking units for inefficient supply chains ([Kao and Hwang, 2008](#); [Yang et al., 2009](#)). And also in the analysis of performance evaluation of supply chain, it is important to understand the behavior of the supply chain in short run and long run ([Prior and Filimon, 2002](#); [Coelli et al., 2002](#)).

Despite these advances in supply chain study, there is a main shortcoming, performance evaluation the short time and long run of the supply chain efficiency. Just as important, we propose application of the hybrid model in supply chain management under short run and long run. In this paper, we propose two models for performance evaluation of supply chain by using the hybrid DEA model. This method is very useful to managers of supply chain taking decisions in their short-run and long-run performance evaluation. And this model has been able to successfully describe and provide a benchmarking for supply chain improvement for global projects as well as short-run projects or long-run.

The remainder of the paper is organized as follows. In the next section, provide a review of recent literature on DEA hybrid models. Section 'Methodology' gives the methodology for the proposed modeling approach. In Section 'Example', an application of the models for numerical example is discussed. Finally, some concluding remarks and directions for future research are given in Section 'Conclusions'.

DEA hybrid model

The uses of hybrid DEA model in supply chain, as [Wu \(2009\)](#) addressed, a hybrid model using DEA provides a decision trees (DT) and neural networks (NNs) approach in supplier performance problem. [Kuo et al. \(2010\)](#) proposed integration of artificial neural network and MADA methods for green supplier selection. Within the context of the Hybrid model, the main disadvantage of these researches, these do not methods that could be used in supply chain efficiency evaluations.

The DEA hybrid model cloud offers a number of benefits for performance evaluation of supply chain. It allows supply chain to identify any non-zero slacks with mix inefficiencies and it can also improve each input may be reduced without changing the proportions. This can be a significant benefit for supply chain management. Therefore, this research are focused on improving supply chain efficiency under short-run and long-run and introduce benchmark for inefficiency using hybrid DEA approach.

Methodology

Performance evaluation is a management tool. It is a best way to learn about the frameworks and supply chain operations. Supply chain management systems on one side and hybrid measure of efficiency on the other have emerged significantly. For the reason, measuring of the key activities needed to manage effective and efficient supply chains. Therefore, we believe this section point is exactly improved supply chain management based on data envelopment analysis using hybrid efficient status.

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