

Chapter 16

Selection of Green Suppliers Based on GSCM Practices: Using Fuzzy MCDM Approach in an Electronics Company

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ABSTRACT

The environmental pressure from various stakeholders, particularly in the selection of green suppliers in the industrial sector, is alarming. The companies are realizing the significance of incorporating green practices in their daily operations. This chapter proposes a framework on the criteria of GSCM practices using MCDM analysis to select green suppliers for an Indian electronics company. The authors have collected the data from a set of 10 available suppliers. The authors use fuzzy AHP and fuzzy TOPSIS approach to rank the suppliers based on the decision makers' preferences on the selection of green suppliers using GSCM practices. The three dominating criteria concluded by the results are the commitment of senior management towards GSCM; product design that incorporates three R's policy for component, materials, and energy; abundance with environmental laws and auditing programs. This chapter carries out a comparison between Fuzzy Analytical Hierarchy Process (FAHP) and Fuzzy TOPSIS method to enhance the quality of decision making and validate the rankings.

INTRODUCTION

Today, the world is moving towards greater environmental concern and awareness. Lack of attention towards the environmental policies in early periods of industrialization is no longer an option in today's times. The modern thinking is that environmental conservation and industrialization must go hand in

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hand. Hence, the strategy in today's world is sustainable development which is implemented by adopting the practice of Green supply chain management. By inculcating the practice of sustainable development with the neoteric developments in supply chain management and purchasing, the strategy of Green supply chain management is developed. The innovations in industrial purchasing and supply chain management from the perspective of environment is mentioned by GSCM.

In Indian electronic companies, the process for ideal supplier selection process creates a new research avenue known as green supplier selection. This concept facilitates the complex and critical decision making process in ideal supplier selection, by considering the quality of the supplier services and their level of commitment to environmental causes. Many research gaps in this area are yet to be explored. The green supplier selection process is one of the key operational tasks for sustainable supply chain management. Literature review exemplifies why companies should be concerned with environmental and social issues in the supply chain by focussing on the broader concept of sustainable development. It is observed that the pressure from the stockholders in order to enhance the company's reputation to gain competitive advantage is the prime reason for the increasing popularity of GSCM practices. GSCM is not only a concept incorporating sustainable development but also provides added benefits in terms of cost reduction, increased operational efficiency and competitive advantage. The main objective of this chapter is to select green suppliers under a MCDM analysis environment for the electronics companies in India.

BACKGROUND

GSCM develops efficient environmental practices that encourage continuous improvements in the environmental practices of multiple organizations within the supply chain (Vachon and Klassen, 2006). It is the process of amalgamating the environmental concerns into supply chain management by taking into consideration various factors such as material sourcing and selection, product design, manufacturing, delivery of finished products, and the management of product life cycle (Srivastava, 2007) and the environmental issues at every stage of the aforementioned factors (Min and Kim, 2012). The GSCM practices that could be adopted by the suppliers, lack in environmental evaluation. Environmental performance is enhanced in the whole supply chain by suppliers who implement these practices. There are many companies who are struggling with eco-friendly supplier selection. Advancements in the GSCM strategies can help these companies. (Handfield et al., 2002).

In this research work, we have implemented multi-criteria decision making analysis (MCDM) analysis to evaluate best suppliers out of many who follows green practices. Some of those techniques include Analytical Hierarchy Process (AHP) (Noci, 1997; Handfield et al., 2002; Lu et al., 2007; Chiou et al., 2008; Lee et al., 2009; Grisi et al., 2010); Analytic Network Process (ANP) (Hsu & Hu 2009, Büyüközkan & Çifçi, 2010, 2011); the rough set methodology (Bai & Sarkis, 2010a, b); Data Envelopment Analysis (DEA) (Kumar & Jain, 2010); and fuzzy TOPSIS methodology (Awasthi et al., 2010).

Govidan et al., (2013) proposed fuzzy axiomatic design approach to carry out green supplier selection practices with 26 traditional criteria and 72 environmental criteria under 13 main criteria. Ajukumar and Gandhi (2013), Khalili and Duecker (2013), Sarkis (2003) and Sarkis et al. (2012) discussed environmental and economic tradeoffs for the organizational decision making based on supplier selection. Govindan et al., (2015) reviewed the green supplier evaluation and their selection with multi-criteria decision making analysis model.

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