

Chapter 14

Multi-Criteria Decision Making Techniques for Green Supply Chain Management: A Literature Review

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ABSTRACT

Due to increasing importance of environmental issues, green practices became an important part of supply chain management. Today, various multi-criteria decision making techniques (MCDM) have been utilized for incorporation of green efforts in supply chain practices effectively. The purpose of this paper is examining the existing application areas of MCDM techniques in green supply chain management (GSCM) literature. Three questions will be investigated in relation to this issue: 1) Which MCDM techniques were prevalently applied in GSCM literature? 2) Which MCDM techniques have been overlooked in GSCM literature? 3) What are the major application areas of MCDM techniques in GSCM practices? To this aim, literature is reviewed between the period of 2008 and the first half of 2016. In total, ninety eight journal articles were examined. Consequently, this paper represents a detailed picture of application areas of MCDM techniques in GSCM practices and can definitely give a blueprint to researches in solving multiple objective problems effectively in the area of GSCM.

INTRODUCTION

The classical economic system assumes that the limited resources of nature should be used to their maximum potential in order to meet the infinite requests and needs of human. Free market economy prompts companies to be profit oriented regardless of any environmental damage that might be caused (Roarty, 1997). This system, which puts the profit maximization as the unique aim for companies, was support-

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ing the traditional supply chains which based on profit, efficiency and effectiveness until the twentieth century (Güner & Coşkun, 2010). However, this view has led to ignore the natural environment while maximizing the profit and inevitably cause global environmental problems.

Global environmental problems, like holes in the ozone layer and global warming, puts the future of the human race at risk and have shifted people's attention towards these problems and their causes. These problems have weakened the assumption of "*there is one and only one social responsibility of business – to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game*" which was proposed by Friedman (1962) and led to search for new management approaches that brings the environmental concerns into corporate decision making processes.

Today, some developments such as increasing number and activity of governmental and non-governmental environmental organizations, imposing several sanctions by governments in favor of environmental protection and increasing number of international symposiums and congresses on environment, books and other scientific publications that address the environment, environmentalism and environmental problems shows the increasing attention to environmental issues.

Not only external factors such as governmental and non-governmental environmental organizations and academics, but also supply chain members force companies to be more environmental. Environmental crises lead customers to consider environmental effects of what they consume (Güner & Coşkun, 2010). Today, many researches demonstrated that customers are much more sensitive to environmental issues when compared with past years and customers feel personal responsibility for purchasing environmental friendly products (Kotler, 2004; Grant, 2007; Zaltman & Zaltman, 2008). Beside consumers, other companies in supply chains (suppliers, buyers etc.) force companies to be green. Today, environmental requirements are influencing the supplier selection and the supplier evaluation processes (Larsen, 2000). Also, industry leaders support their suppliers to be more environmental friendly (Lee, 2008) and set requirements for all their suppliers to comply with stricter environmental regulations (Ho, Shalishali, Tseng & Ang, 2009).

As a result of these improvements, the traditional approach, which hallows the profit and ignores the environmental issues, gives way to a more proactive green approach in businesses (Azzone & Bertele, 1994). In today's market conditions, economic and financial results alone are not sufficient and they need to be accompanied by ecological achievements (Lee, 2009). This means firms need to leave their traditional way of pure profit and benefit orient and shift to a new understanding that advocates business ethics, social responsibility and green management (Molina-Azorin, Claver-Cortes, Lopez-Gamero & Tari, 2009). Furthermore, many researchers proposed the green management as a competitive weapon for companies (Taylor, 1992; Porter & Van der Linde, 1995).

Briefly, market factors force companies to be more social responsible (Baron, 1995) and these environmental pressures significantly influence the strategic decisions of both large and small enterprises (Sarkis, 1998). Thus, environmental issues merit a more noteworthy investigation in supply chain decision making processes.

On the other side, most researchers suggest that going green may increase the cost burden and reduce the competitiveness of companies (Palmer, Oates & Portney, 1995). There is thus a tradeoff between economy and environmentalism. However, along with the increasing environmental sensitivity of the market, basic principles of environmentalism became an important part of business life and they must be adopted by companies as a part of profit maximization. At this point, operations research provides useful multi-criteria decision making (MCDM) techniques to practitioners for balancing the profit and the environmental concerns.

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