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# Evaluating factors in implementation of successful green supply chain management using DEMATEL: A case study



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## ABSTRACT

Increasing pressures from stakeholders, government and non-government agencies are forcing the industries to implement Green Supply Chain Management (GSCM) initiatives. A successful implementation of GSCM is important for industries to increase economic-environmental performances and to ensure sustainability in business. The prime objective of this research is to evaluate the important factors associated with the successful implementation of GSCM. This paper proposes a Decision Making Trial and Evaluation Laboratory (DEMATEL) approach to develop a structural model for evaluating the influential factors among recognized factors. The proposed DEMATEL method enables to study the interrelationship between the evaluated factors through a causal diagram. To show the real-life applicability of the proposed DEMATEL based model, an empirical case study of an Indian manufacturing company is conducted. Research findings indicate that Top Management Commitment, Human Technical Expertise, Financial Factors, has obtained the highest influential power for accomplishing the successful GSCM adoption. Conclusions and implications for managers are also discussed.

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## 1. Introduction

Supply Chain Management (SCM) is one of the most promising research fields in the area of Operations Management. SCM includes various activities starting from the collection of raw material from the sources until the final product reaches in the hands of the customer [5]. Curbing the ill-effects caused by the industries by their traditional SCM practices is one of the major objectives of all the nations and environmental regulatory bodies [60]. One of the best and most effective ways to achieve this objective is by integrating the traditional supply chain practices with environmental friendly practices, which results in a novel concept named Green Supply Chain Management (GSCM) [29, 39, 42, 46, 61]. GSCM can be defined as, “incorporating environmental thinking into SCM, including product design, material sourcing and selection, manufacturing practices, delivery of the final products to the consumers, and end-of-life management of the product after its intended life” [54].

Over the past few years, GSCM is playing an important role in the building of sound economic-environmental performances on various levels in business [2, 46, 59, 61]. This fact can be made evident by back-tracking the growth of industries in developed nation which are engaged in successful implementation of GSCM in their organization. On the contrary, the industries in developing nations like China, India, Taiwan, are still struggling to implement GSCM in their respective industries [4]. Moreover, the building pressure from the international environmental bodies on such nation is paving the way for increased research in the GSCM area to find out the means and corresponding factors for the successful implementation of GSCM [36]. In spite of this, industries, are still struggling to integrate green initiative into their traditional approach. It may be due to their lack of knowledge or lack of

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expertise in the subject matter [31, 37]. The other reason behind this could be the cost involved in GSCM adoption initiatives [37]. Therefore, to implement GSCM concepts to the point of view of industries, they must be aware of its long term effects in terms of economic benefits, market share, etc. It should be noted that there are various critical factors either external or internal may be associated with an organizational supply chain and are responsible for to plan and implement GSCM concepts [56]. It may include globalization, export norms and regulations, supplier, economic, competition, etc [28, 32, 56]. These factors and attributes can accelerate its transition from traditional supply chain to green supply chain (GSC). In view of this, it is important for industries to know the factors related to successful implementation of GSCM. However, any inadequacy in understanding of these factors may further increase the difficulty in implementing the process GSCM from an industrial context. To resolve the issue, researchers are playing a very crucial role in addressing the factors crucial to understand and evaluate the addition of green concepts in the supply chain scenario [7, 25]. In addition, some studies have been conducted that analyzes the drivers/critical success factors/variables related to GSCM implementation by taking the case of various industrial sectors, such as, Mining, Automobile, Paper [7, 25, 28, 32]. These studies indicate that the results obtained hold true for the sector under study. It is therefore proposed a great need to carry out the studies on GSCM success factors identification and their evaluation in manufacturing sector as well [28, 32]. This paper addresses the above-mentioned research gap by evaluating of factors relevant to successful implementation of GSCM initiatives in manufacturing industry in Indian Context. For this, we propose to use the DEMATEL method that not only helps to define the causal relationship between each factor, but also assists to define the importance of each factor with respect to one another [54].

The present research work aims to achieve the objective, mentioned as - Understanding and evaluating of green supply chain management agenda from industrial perspectives. The above mentioned objective has been designed on the basis of fact that the industries in India are still very slow to address the issues pertaining to environment [25]. Therefore, it is becoming vital for them to incorporate GSCM initiatives within their work culture. Hence, to resolve the difficulty in implementing green aspect in the business, this research raises two analysis questions, as follows:

- i. What are the factors need to be considered in a successful implementation of GSCM?
- ii. How the causal relations among the identified factors in successful adoption and implementation of GSCM should be determined?

The prime purpose of the present research work is to develop a framework to analyze the factors in GSCM dimension. To achieve the above mentioned objective and to answer the raised questions, this research work is carried out in two parts. In first part of the study, the factors critical for the successful implementation of GSCM in context to the Indian Manufacturing Industries has been searched out by means of literature review and expert inputs. In the second part of this study, these factors are evaluated using DEMATEL technique that helps to recognize the causal relationship of all factors within one another. In addition, it also helps in dividing the factor under evaluation into cause and effect group. According to the findings obtained in this study, the factors Government Regulations and Standards (F1), Top Management Commitment (F2), ISO 14001 Certifications (F3), Globalization (F4), Competitiveness (F5), Customer Requirements (F6), Role of Supplier (F7), Employee Involvement (F10), Role of Stakeholders, NGO and Media (F11), Technical Expertise (F12) and Training of Supplier and Employees (F16) are divided into cause group factors. While the Financial Factors (F8), Brand Image Building (F9), Adoption of New Technology and Processes (F13), Sustainability (F14) and Reverse Logistics (F15) comes under effect group.

The rest of this paper include: Section 2 offers the literature survey on the GSCM along with the factors proposed for successful implementation of GSCM. Section 3 describes the proposed model based on the DEMATEL method. Section 4, presents the real-life application of the proposed model, and discusses the results and managerial implications of the research. The conclusions, limitations of the research, and scope for next work are given in Section 5.

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## 2. Literature Review

### 2.1. Green supply chain management

Increased deterioration of the environment has raised concerns amongst various researchers and academicians. Therefore, many articles have been published in past few years related to GSCM [10, 13, 34, 39, 59]. GSCM is expressed as the addition of environmental contemplation in the business. It has been stated as a useful measure to increase the ecological performance of the enterprise and to reduce the environmental risks [32, 62]. In addition, in a recently conducted study, GSCM has also been linked to human resource management to achieve organizational sustainability and truly sustainable supply chains [25]. GSCM has been recognized as a key part to influence organizational sustainability [48]. In the today's era of globalization, GSCM increases various opportunities for buyers by increasing their focus on improving the environment which not only enhances the process of greening the environment but also increases environmental-economic performances in the supply chain [46].

According to the study of Hervani et al. [15], GSCM comprises of green procurement, green manufacturing or materials management, green distribution or marketing and reverse logistics. It has also been stated that organizations tend to implement GSCM to improvise their competitive advantages and to achieve enhanced profit ratios [29, 51]. Rao and Holt [46], in their work expressed that GSCM is an important organizational attitude, which acts as a significant player in encouraging efficiency and synergy between allies. The implementation of GSCM generates several gains at industrial context, which can be listed as: maximization of environmental performance, minimum waste generation, cost savings resulting in increased profit and market-share objectives etc. The application of green initiatives in the supply chain also helps in improving the ecological proficiency of organizations and their associates. Besides that, an efficient implementation of GSCM in any organization plays a crucial role in acquiring and maintaining competitive gains [62]. Therefore, many researchers had made it evident in their work the GSCM implementation is very vital and result oriented that keep in view the environmental aspects of the organization as well.

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