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A STUDY ON FACTORS ASSOCIATED WITH THE GREEN SUPPLY CHAIN MANAGEMENT IN MANUFACTURING INDUSTRY

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ABSTRACT

One idea that attempts to address the environmental aspect of sustainable development is "green supply chain management." The choice to implement a green strategy is influenced by a variety of circumstances, and it is also a crucial indicator of how widely its practices are being adopted. This descriptive study was conducted to identify the factors associated with green supply chain management in the manufacturing industry. A sample of 110 respondents was selected among the managers, dealers, and distributors for this study. Exploratory Factor Analysis (EFA) was employed to identify the factors associated with green supply chain management. The results of this study revealed that Environmentally-friendly Friendly Design, Eco-Friendly Purchasing, Eco-Friendly Manufacturing, Eco-Friendly Marketing, and Environmentally Friendly Logistics are effectively associated with the green supply chain management practice in manufacturing industries.

Key words: Eco-Friendly design, Environmentally Friendly Design and Green Supply Chain Management.

INTRODUCTION

In the current competitive climate, supply chain performance is crucial for businesses to move goods from producers to final customers in an efficient and effective manner. This performance is typically defined by speed, cost management, and proficient inventory control Handayani et al. (2021). According to Souhli and En-nadi (2023) The idea behind GSCM (Green Supply Chain Management) is to address the environmental aspect of sustainable growth. The choice to implement a green strategy is influenced by a variety of circumstances, and it is also a crucial indicator of how widely its practices are being adopted. Jum'a et al. (2022) posited that the global sustainability movement promotes the adoption and implementation of Green Supply Chain Management (GSCM) methods inside organisations. Furthermore, incorporating sustainable practices into conventional supply chains is a significant challenge in the manufacturing industry. Lin et al. (2020) asserts that the implementation of green technology in company operations yields significant advantages and influences the connections between suppliers and customers inside enterprises. Green supply

chain management (GSCM) strategies, which include transportation optimisation, hazardous material management, recycling and reuse, water and energy efficiency, waste management, and environmental conservation, are considered environmentally sustainable practices.

According to Maqsood et al. (2022), In order to influence CEOs' and top managers' willingness to adopt GSCM practices, organisations should ask the following questions. Green supply chain management (GSCM) strategies are important for businesses because they increase profitability by reducing environmental and health risks, which are major client concerns and make a company more resilient and sustainable. Agrawal et al. (2020) claim that the achievement of sustainable development depends on Green Supply Chain Management (GSCM). A new idea called "sustainability via green supply chain management" was created by combining two pertinent contemporary tactics. They have to do with environmental preservation and economic growth. SGSCM, or sustainable green supply chain management, is a business strategy that aims to increase both ecological efficiency and productivity. Babalola et al. (2024) claim that environmental laws and regulations have a significant impact on how Green Supply Chain Management is implemented. It has been emphasised how important these factors are in forming sustainable supply chain processes. Because SMEs are crucial to the country's economic growth and development, it is imperative that Green Supply Chain Management techniques be used to ensure sustainable supply chain operations in these businesses. Souhli and En-nadi (2023) implies that all businesses can embrace GSCM methods and support environmental sustainability, regardless of their size, age, or line of work. The dedication and participation of top management are essential to the success of GSCMP implementation in businesses. In order to get the intended outcomes, businesses must give senior management's commitment high priority while putting GSCM practices into effect.

REVIEW OF LITERATURE

Agrawal et al. (2020) made an attempt to examine the Key Success Factors (CSFs) for the successful implementation of Sustainable Green Supply Chain Management (SGSCM) techniques in the Indian brass manufacturing sector. Nine critical success factors were identified comprehensive literature review, which was corroborated by an exploratory survey including 189 management professionals. This study's findings indicate that dedication from top management is the paramount success factor, while reverse logistics management is the primary driver of the effective implementation of SGSCM methods.

Amade et al. (2020) investigated the obstacles to implementing Green Supply Chain Management (GSCM) in the Nigerian construction sector with the objective of advancing sustainable environmental practices and green construction methodologies. A questionnaire survey was administered to a sample of construction companies. Obstacles to implementing Green Supply Chain Management (GSCM) were identified through a comprehensive literature review. Data for the study was obtained through questionnaires distributed to pertinent industry practitioners. The results indicated that the primary obstacles to GSCM implementation were insufficient knowledge and expertise, as reported by the respondents. Subsequently, a deficiency in top management support, the expenses associated with adopting GSCM, and an absence of governmental rules and support mechanisms, among other factors, were recognised as impediments to GSCM adoption.

Babalola et al. (2024) conducted a study to investigate the impact of environmental factors on the adoption of Green Supply Chain Management (GSCM) in Nigerian small and medium-sized enterprises (SMEs). Four hundred and twelve questionnaires were collected from the chosen managers and owners of SMEs following the validation and reliability assessment of the instruments via a pilot study. The study's findings revealed that the environmental component serves as a strong predictor of GSCM adoption among SMEs, particularly in relation to customer demand, environmental regulation, environmental unpredictability, and supplier relationships. Moreover, the incorporation of environmental uncertainty as a moderating variable affects the correlation between an environmental issue and the implementation of GSCM procedures concerning environmental regulation and supplier relationships.

Fatima et al. (2024) investigates the factors that influence people's desire to employ Green Supply Chain Management (GSCM) strategies. Technical factors (relative advantage, compatibility, and complexity), organisational factors (corporate social responsibility, organisational readiness, and top management support), and environmental factors (normative pressure, coercive pressure, mimetic pressure, and government support) are all included in the technology-organization-environment framework, which functions as a primary theoretical lens. These elements are further enhanced by self-determination theory factors (intrinsic motivation and extrinsic motivation). The data were collected through an online survey of employees from small and medium-sized manufacturing enterprises (SMEs) in Pakistan, yielding 409 valid responses for hypothesis testing. The findings indicated that all chosen factors are significantly correlated with the intention to implement GSCM techniques.

Handayani et al. (2021) carried out a study to assess how supply chain complexity affected Saudi Arabian manufacturing enterprises' performance. A cross-sectional study approach was used to gather quantitative information from 370 workers in different manufacturing companies. The results showed that supply chain performance is positively and significantly impacted by upstream, operational, downstream, external, and internal supply chain complications. The study also showed that the relationship between supply chain performance and all of its complications is strongly moderated by information technology infrastructure.

Jum’a et al. (2022) Performed a study to evaluate the determinants influencing Green Supply Chain Management GSCM adoption in manufacturing enterprises in Jordan. A well-designed questionnaire was utilised to gather data. A total of 376 responses were obtained from various manufacturing companies in Jordan. Findings indicate that four factors supplier, environmental, customer, and cost factors significantly affect managers' intention to implement Green Supply Chain Management (GSCM). The size of the firm significantly influenced the association between market and financial factors and the adoption of GSCM, as well as the relationship between internal factors and GSCM adoption.

Lin et al. (2020) We out a study to find out what factors influence Malaysian small and medium-sized businesses' (SMEs') adoption of Green Supply Chain Management (GSCM) methods. A questionnaire study aimed at small and medium-sized businesses (SMEs) in Malaysia's Klang Valley was used to gather data. 298 replies in all were analysed. The theoretical relationships between organisational, technological, and environmental factors and

SMEs' intention to implement GSCM approaches were examined using the regression analysis technique. The results of the study show that a number of statistically significant factors influence the adoption of GSCM among Malaysian SMEs, including perceived relative benefit, perceived cost, top management support, complexity, compatibility, company size, customer pressure, regulatory pressure, and human resource quality. Nonetheless, observability and official assistance do not significantly influence the likelihood of implementing GSCM.

Maqsood et al. (2022) assesses the determinants influencing CEOs' and managers' intentions to implement Green Supply Chain Management (GSCM) and Clean Innovation Technology (CIT) practices in small and Medium-Sized Enterprises (SMEs) in Pakistan. This empirical study outlines the primary factors that affect the adoption of GSCM techniques. Employing structural equation modelling (SEM), selected a sample size of 350 distinct manufacturing enterprises in Pakistan. The study's findings indicated that six factors, such as environmental, governmental, organisational, supplier, market, and operational, significantly affect the intention to embrace Green Supply Chain Management (GSCM) and positively influence sustainable production methods. The study's results further indicate that market and operational aspects are critically important in the implementation of GSCM processes. Environmental and organisational elements are equally important in the adoption of GSCM methods.

Muduli et al. (2020) used an empirical dataset of 101 responses from people working in the mining industry to experimentally investigate the behavioural factors influencing green supply chain management (GSCM) performance in a fast-rising economy. links between the six constructs: green innovation, green motivation, workplace culture, resistance to change, teamwork, and top management support. The findings of this study showed that the two most important behavioural factors influencing GCSM are green motivation and top management support.

Naqvi et al. (2023) made an attempt to ascertain the factors affecting the adoption of GSCM among Pakistani SMEs. SPSS software version 23 is used to implement statistical methods on the primary data acquired. The poll was conducted with 600 targeted respondents across all administrative tiers. A total of 210 survey forms were complete and usable. Conducting multiple regression analysis to ascertain the parameters influencing the adoption of green supply chain management in Pakistani SMEs. The results indicate that environmental and organisational factors significantly impact managers' intention to implement GSCM. Conversely, technological considerations exert no substantial influence on managers' plans to implement Green Supply Chain Management (GSCM).

Soufi et al. (2023) carried out a study to evaluate the factors influencing the adoption of green supply chain management in the Iranian construction industry. The experts participated in the study's qualitative and quantitative stages, particularly confirming the motivations found in the literature. The results show that the most important sub-drivers are inventive capability, sustainable product design, and environmental management systems.

Objective of the study

To study the different factors affecting green supply chain management in the manufacturing industry.

RESEARCH METHODOLOGY

The present research study employed a descriptive research strategy. Samples were chosen based on accessibility, with 130 questionnaires delivered to supply chain managers in the manufacturing industry. Samples were selected on the basis of the accessibility of the samples, distributing 130 questionnaires were distributed to supply chain managers of manufacturing industries. Among the non-probability sampling methods, convenient sampling was used for this study because data were conveniently available to the researcher. 118 questionnaires were returned, and 110 were found to be valid responses. 8 responses were considered invalid due to an incomplete record. A sample of 110 respondents was selected among the managers, dealers, and distributors in the manufacturing industry. Research has involved the collection of both primary and secondary data. Primary data was gathered using surveys. A literature review is regarded as secondary data for research purposes. The questionnaire employed a 5-point Likert scale. Exploratory Factor Analysis (EFA) was employed to identify the factors associated with green supply chain management in the manufacturing industry.

RESULTS AND DISCUSSIONS

Factors Influencing the Green Supply Chain Management

This particular section presence the factors reduction of green supply chain management in manufacturing industry. Factors influencing green supply chain was 18 variables based on the averment factors, factor analysis with principal component method through vari-max rotation was applied to reduce the variables into the factors.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.824
Bartlett's Test of Sphericity	Approx. Chi-Square	793.249
	df	209
	Sig.	0.000

The KMO measure of sampling adequacy was obtains as 0.801 and Bartlett’s test of sphericity (Approx. Chi-Square793.249), and it was significant (p<.000), this shows that data taken for the factor analysis is adequate.

Eigen Values of Factors of Green Supply Chain Management Used by Manufacturing Industry

Factors	Eigen value	Percentage of Variance	Cumulative Percentage of Variance
1	4.001	15.642	15.462
2	3.342	13.324	28.966
3	1.732	12.171	41.137

4	1.512	10.243	51.380
5	1.427	8.267	59.647

Here the 18 variables are reduced into 5 distinct factors of green supply chain management by factor analysis it is observed from the Eigen value column that all the Eigen values are more than one. The total cumulative % of variance explored by the 5 factors extracted together account for 59.647%. five factors extracted along with their components and factor loadings are mentioned below.

Components and factor loading

Factor	Components	Factor Loading
Factor 1 Environmentally Friendly Design	Design for recyclability	0.898
	Analysis of the product life cycle in accordance with environmental standards,	0.725
	Involving the replacement of hazardous and polluting elements.	0.693
	Environmental conservation	0.613
	Safer and cleaner alternatives.	0.527
Factor 2 Eco-Friendly Purchasing	Buying eco-friendly products	0.875
	The collaboration with suppliers includes an environmental management system.	0.782
	Environmental assessment of suppliers/vendors	0.697
	Purchasing recyclable and non-toxic material	0.571
Factor 3 Eco Friendly Manufacturing	Decreased energy use	0.818
	Reducing Air Emissions	0.787
	Liquid and Solid Waste	0.673
Factor 4 Eco-Friendly Marketing	Utilisation of eco-friendly packaging for the items	0.719
	Disposition of discarded and second-hand materials	0.631
	Consistent voluntary communication regarding management to clients and organisations	0.576
Factor 5 Environmentally Friendly Logistics	Utilisation of eco-friendly transportation	0.749
	Optimisation of transport flow	0.676
	Reconditioning of returned components or goods	0.575

Environmentally Friendly Design

From the above table, it is inferred that factor 1 is a combination of 5 variables: Design for recyclability, Analysis of the product life cycle in accordance with environmental standards,

Involving the replacement of hazardous and polluting elements, Environmental conservation, and Safer and cleaner alternatives which are named as Environmentally Friendly Design factor.

Eco-Friendly Purchasing

Factor 2 is a combination of 4 variables, namely, buying eco-friendly products, collaborating with suppliers, including an environmental management system, Environmental assessment of suppliers/vendors, and purchasing recyclable and non-toxic material, which is named as Eco-Friendly Purchasing factor**.**

Eco-Friendly Manufacturing

Factor 3 is a combination of 3 variables such as decreased energy use, Reducing Air Emissions, and Liquid and Solid Waste, which is named the Eco-Friendly Manufacturing factor.

Eco-Friendly Marketing

Factor 4 is a combination of 3 variables: The utilisation of eco-friendly packaging for the items, the Disposition of discarded and second-hand materials, and Consistent voluntary communication regarding management to clients and organisations, which is named as Eco-Friendly Marketing factor.

Environmentally Friendly Logistics

Factor 5 is a combination of 3 variables such as the Utilisation of eco-friendly transportation, the Optimisation of transport flow, and the Reconditioning of returned components or goods, which is named as Environmentally Friendly Logistics factor.

CONCLUSION

The conclusion is that the green supply chain management practice in manufacturing industries is effectively associated with a number of factors, including environmentally friendly design, environmentally friendly purchasing, environmentally friendly manufacturing, environmentally friendly marketing, and environmentally friendly logistics. Green supply chain management (GSCM) strategies, which include transportation optimisation, hazardous material management, recycling and reuse, water and energy efficiency, waste management, and environmental conservation, are considered environmentally sustainable practices. The dedication and participation of top management are essential to the success of GSCMP implementation in businesses. In order to get the intended outcomes, businesses must give senior management's commitment high priority while putting GSCM practices into effect.

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