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RESEARCH ARTICLE

The Role of Green Supply Chain Management in Enhancing Environmental Sustainability and Competitiveness in Jordanian Industrial Companies

Dr. Gharam Ali Mohammad Abdelaziz*

Aqaba University of Technology–Jordan

ARTICLE INFO	ABSTRACT
  *Corresponding Author: Gharamali@gmail.com	The paper talks about how Jordanian industrial companies can improve their competitiveness and environmental sustainability by implementing green supply chain management. Examining how green supply chain management which includes green design and manufacturing, green distribution, reverse logistics, and green information technology affects Jordanian industrial companies' competitiveness and environmental sustainability, is the goal of this study. The researcher's primary methods for gathering data were induction and the descriptive analytical approach. There are 68 industrial Companies in Jordan that make up the study population. 250 workers in middle and upper management made up the sample. A response rate of 85.4% was obtained from the distribution of 250 questionnaires, of which 241 valid replies were gathered. Questionnaires that were incomplete or invalid were not included. The results of the study showed a direct impact of Green Supply Chain Management (Green Design and Manufacturing, Green Distribution, Reverse Logistics, Green Information Technology) in Enhancing Environmental Sustainability and Competitiveness in Jordanian Industrial Companies.

1.INTRODUCTION

In recent decades, the rise of environmental concerns has made it necessary to embrace a comprehensive strategy that integrates organizational success with environmental principles. According to Zhu et al. (2022), the focus of environmental sustainability initiatives has shifted from greening businesses to greening supply chains. Green supply chain management's main goal is to create a sustainable environment through the use of safe and hygienic techniques.

According to Miemczyk & Macquet)2022), these strategies include reducing the use of dangerous chemicals, encouraging recycling, using renewable energy sources, and improving stakeholder access to information. Attention has increased due to the growing emphasis on the social role of firms and their obligation to reduce environmental problems. One way to successfully integrate environmental concerns into supply chain management is through the concept of Green Supply Chain Management (GSCM) (Carter & Rogers (2021). Carter & Rogers (2021) suggest that companies might be held accountable for both their own environmental and social performance as well as that of their manufacturers.

A growing number of international organizations are adopting the green supply chain management method. For a number of reasons, including cost reduction, improving institutional brand image, encouraging innovation in work processes, and compliance with environmental laws and regulations, many companies are considering adopting it. Unfortunately, a large percentage of small and medium-sized businesses in the industrial sector struggle to adequately handle environmental issues because they lack the necessary human resources and have limited access to pertinent information. It's also important to note that while many contractors agree that using green supply chain management techniques is important, they worry about how difficult it will be to put into

effect. These difficulties include reaction times, cost overruns, communications, technology, and a poor understanding of environmental. Mishra & Kumar (2021), Kuei, C.-H., Madu, C. N., & Lin, C. (2020).

Compared to their counterparts in developing nations, businesses and organizations in developed nations demonstrate a higher level of environmental stewardship. This is explained by the existence of stricter environmental laws and increased environmental consciousness. As a result, many businesses in developed nations have been at the forefront of adopting a variety of green supply chain management techniques that go beyond merely following legal requirements Carter & Rogers (2008).

The study holds significance due to its focus on green supply chain management in Enhancing Environmental Sustainability and Competitiveness in Jordanian Industrial Companies It contributes to existing theoretical knowledge and previous research on this subject, while also exploring the effects of implementing green supply chain management practices in the industrial sector. The primary challenge encountered in this research is to the limited comprehension of the impact of green supply chain management practices on Enhancing Environmental Sustainability and Competitiveness in Jordanian Industrial Companies.

2.LITERATURE REVIEW

Green supply chain management, according to Novitasari et al. (2021), is the incorporation of environmental considerations into various systems, such as product design, supplier selection and material procurement, manufacturing procedures, final product distribution to customers, and product management. In order to conserve energy and stop dangerous materials from leaking into the environment, an eco-friendly supply chain seeks to reduce waste in industrial processes. Supply Chain Management (SCM) is defined by Tan et al. (2019) and Tseng et al. (2021) as a network of suppliers, manufacturing, assembly, distribution, and logistics facilities that collaborate to purchase materials, convert materials into semi-finished goods and finished products, and distribute those products to customers. SCM encompasses everyday administration, operations, logistics, and information processing from suppliers to customers. It also covers scheduling, coordinating, and controlling the production, inventory, and delivery of goods and services to consumers.

Green supply chain management has become a prominent topic that has drawn interest from both the academic and real-world sectors. This phenomenon has piqued the interest of academics more recently. This issue is relevant because adopting eco-friendly methods that reduce energy consumption, eliminate material waste, and safeguard the environment has both economic and environmental benefits Srivastava, S. K. (2007). According to Zhu & Geng (2013), green supply chain management is the process of incorporating environmental concerns into supply chain management practices. This includes applying environmental management principles to every aspect of an organization's operations, starting with design, procurement, manufacturing, assembly, packaging, and distribution. It can also be defined as the process of using environmentally friendly materials and turning them into goods that can be recycled and restored at the end of their life cycle, creating a sustainable production and distribution system. Srivastava (2007). Supply networks were previously viewed negatively by the scientific community. Supply chain management is a key factor in influencing competitiveness and productivity, The idea of a "green supply chain" has emerged as a result, in which the buyer uses their purchasing power to pressure better suppliers in the sourcing chain to enhance their environmental performance. In this situation, the buyer typically a big business takes on the function of enabling providers. Khadke & Sharma (2023).

Zhu & Geng (2020). assert that the significance of green supply chain management at the individual (business) level indicates that it makes an effort to take the environment into account and lower emissions that have an adverse effect. In the long run, the governments of Taiwan, Indonesia, Taiwan, and Canada have plans to buy environmentally friendly products at the national level in order to achieve international competition in their industrial sectors. It also encourages supplier integration by generating markets for green products and increasing demand for them, which in turn causes suppliers to focus more on environmental issues and improves the company's competitive position by lowering costs.

In response to the widening variety of customer-favored styles, manufacturing firms showed an increasing interest in improving production line flexibility, optimizing production and export procedures, and developing new products during the 1980s. Improvements in production capacity during the 1990s led industry managers to acknowledge the significant impact of materials and services from various suppliers on an organization's ability to satisfy consumer needs. But it soon became clear that these advancements by themselves were insufficient for managing a company over the long run. Because it is beneficial to incorporate complete solutions to solve this issue across the whole supply chain, environmental contaminants are of the utmost importance when it comes to industrial development Christopher (2016).

Green Supply Chain Management (GSCM) techniques can improve a company's sustainability performance, according to recent studies. According to Hejazi et al. (2023), GSCM techniques improve Saudi Arabian corporations' performance in terms of sustainability. According to Ward et al. (2019), GSCM techniques improve competitive priority in India's manufacturing sector. According to Huma et al. (2023), GSCPs improve operational competitive capabilities in Pakistan's manufacturing industry. Afzal and Hanif (2022) examine how the performance of companies in Pakistan's manufacturing industry is affected by green supply chain management techniques.

The study emphasizes how many aspects of Green Supply Chain Management (GSCM) have a significant impact on business performance. This highlights the importance of applying these strategies to enhance organizational outcomes and points to directions for future study. The study aims to improve our understanding of sustainable and strategic management paradigms in industrial contexts by utilizing a thorough analytical approach to enhance the discussion of how GSCM practices may interact with and impact the overall competitive priorities landscape. Jabbour et al. (2016) .

Haris et al. (2019) . With an emphasis on green purchasing, communications, customer collaboration, eco-design, internal environmental management, and investment recovery, the study attempts to evaluate how green supply chain management affects corporate brand image. The study employs a logical strategy to tackle the research problem by employing a positivist methodology and gathering quantitative data through surveys. A representative sample of 120 manufacturing enterprises registered on the Pakistan Stock Exchange is included in the population. The results validate how green communications, inventory control, the green supply chain, the internal environment, and customer cooperation all affect a company's reputation. Convenience sampling, the cross-sectional approach, and the study's exclusive emphasis on Pakistan and one industry are among its drawbacks.

Witthaya Mekhum. (2020). Because of their substantial environmental impact, Thai manufacturing enterprises are the focus of this study, which attempts to assess the significance of supply chain management methods in environmental sustainability. Workers in Bangkok's industrial industry were asked to complete a questionnaire. The contribution of several supply chain approaches to sustainability was evaluated using structural equation modeling. According to the findings, sustainability is greatly influenced by facility management, inventory, information, sourcing, pricing, and transportation, with inventory management having the biggest influence. The concept is strengthened by the addition of information technology as a moderator. In order to promote environmental protection, the study advises supply chain and inventory managers to implement lean production, ecologically friendly packaging, and green supply chain management techniques.

Fahmia et al. (2022). The purpose of this study is to examine how Environmental Performance (EP) is affected by Green Innovation (GI), how GI is affected by Green Supply Chain Management (GSCM), and how GI contributes to EP improvement in the digital age. The study used online questionnaires to poll 190 employees of small and medium-sized businesses (SMEs) using a quantitative technique and descriptive statistics. Structural Equation Modeling (SEM) using Partial Least Square (PLS) was used for the analysis. Results indicate that Green Innovation (GI) and Environmental Performance (EP) are positively impacted by GSCM methods, and that GI mediates the relationship between GSCM and EP.

Novitasari & Agustia (2022). With an emphasis on the function of green supply chain management (GSCM) and green innovation as intermediaries between corporate social responsibility (CSR) and company success, this study investigates how businesses affect the environment. The study used a quantitative methodology to examine information from 211 businesses that were listed between

2015 and 2019 on the Indonesia Stock Exchange. Financial statements and annual reports provided the data, which STATA was used to evaluate. The findings indicate that, in contrast to green innovation, GSCM mediates the association between CSR and company performance. Furthermore, the association between GSCM and firm performance is not mediated by green innovation, rather GSCM mediates the impact of CSR on green innovation. Dimensions of Management Chain Supply Green (Hervani et al., 2005): Green Design and Manufacturing, and Green Distribution, Reverse Logistics, Green Information Technology.

3.The study's goals

to investigate how Jordanian industrial firms might improve their environmental sustainability and competitiveness through the use of green design and manufacturing.

to evaluate how Green Distribution Influences Jordanian industrial businesses' competitiveness and environmental sustainability.

Examine how reverse logistics might improve Jordanian industrial businesses' competitiveness and environmental sustainability.

Examine how green information technology might improve Jordanian industrial businesses' competitiveness and environmental sustainability.

4.Research Hypothesis

H1: Green Design and Manufacturing has not significant positive effect on Enhancing Environmental Sustainability and Competitiveness in Jordanian Industrial Companies.

H2: Green Distribution has not significant positive effect on Enhancing Environmental Sustainability and Competitiveness in Jordanian Industrial Companies.

H3: Reverse Logistics has not significant positive effect on Enhancing Environmental Sustainability and Competitiveness in Jordanian Industrial Companies.

H4: Green Information Technology has not significant positive effect on Enhancing Environmental Sustainability and Competitiveness in Jordanian Industrial Companies.

5.RESEARCH METHODOLOGY

The researcher used a descriptive-analytical technique that was appropriate for the goals of the study and was conducted in two stages in order to answer the research problem:

Stage of Descriptive Analysis: In order to comprehend the ideas and practices associated with Green Supply Chain Management (GSCM) and Improving Environmental Sustainability and Competitiveness, this step entails performing a desk study of references, scientific publications, earlier research, reports, and conferences.

Analytical Stage: To comprehend the features of the problem's components and the factors influencing them, the researcher gathers primary data using statistical techniques. This phase entails evaluating the study's hypotheses through the use of data collection methods, survey design, statistical software analysis, and observation of statistical analysis outcomes.

5.1 Data collection

To accomplish the research goals and evaluate the hypotheses, the researcher used two different forms of data collection: primary data from the field study and secondary data from the desk study. Desk Study: This entails compiling and examining existing research and studies that have examined different facets of Green Supply Chain Management (GSCM) and how it might Enhancing Environmental Sustainability and Competitiveness.

Field Study: The field study aims to collect primary data related to the research problem in order to test the hypotheses. Questions concerning the independent variables and the dependent variable were included in the first and second sections of a questionnaire created specifically for this purpose. This study examines how green supply chain management might improve environmental sustainability and competitiveness in Jordanian industrial firms.

5.2 Study Population

The study population consists of all publicly listed industrial companies in the Amman Stock Exchange in the industrial sector, as of the end of 2023, with approximately 68 industrial companies listed (https://www.ase.com). 250 workers in middle and upper management made up the sample. A response rate of 85.4% was obtained from the distribution of 250 questionnaires, of which 241 valid replies were gathered. Questionnaires that were incomplete or invalid were not included. These companies were specifically chosen due to their direct relevance to the research on the role of Green Supply Chain Management (GSCM) in enhancing environmental sustainability and competitiveness.

Given their magnitude of output and resource consumption, industrial businesses are the focus because of their substantial influence on environmental sustainability. They are therefore in a good position to adopt green supply chain procedures and provide favorable environmental effects.

Furthermore, these businesses contribute significantly to the national economy, which emphasizes how crucial it is to research how these practices affect their competitiveness and environmental sustainability. Due to their different characteristics and less direct environmental impact than the industrial sector, other sectors were not included in the study.

5.3 Reliability and Validity (Cronbach's Alpha)

The internal consistency coefficient, also known as Cronbach's Alpha, was computed for both the dependent and independent variables in order to confirm the study tool's dependability. Following the test, the outcomes are displayed in Table (1).

Table (1) makes clear that the Cronbach's Alpha reliability coefficients for the independent variable's components, Green Supply Chain Management, ranged from 0.689 to 0.843. These values are acceptable because they exceed the social studies acceptable threshold of 0.60. The independent variable's items had validity coefficients ranging from 0.902 to 0.781, both of which are high values that guarantee the reliability of the results while performing statistical analysis. It is evident that every measure of the independent variable shows respectable stability and internal reliability.

It is evident from the results that the Cronbach's Alpha reliability coefficient for all items of the dependent variable Enhancing Environmental Sustainability and Competitiveness is 0.839, which is an acceptable value as it is higher than the acceptable threshold of 0.60 in social studies.

Table 1: the independent variables' internal consistency coefficient values for green supply chain management

Variables	Reliability coefficient	validity coefficient
Green Design and Manufacturing	0.843	0.9.2
Green Distribution	0.689	0.885
Reverse Logistics	0.791	0.881
Green Information Technology	0.805	0.781

6.RESULT AND DISCUSSION

Descriptive Statistics

The arithmetic means and standard deviations of the responses from the study sample were computed to evaluate the level of agreement and ascertain the relative significance of each item in the descriptive analysis of the independent variables and the dependent variable that is presented in this section. The following are the outcomes:

Table 2: Green supply chain management dimensions' arithmetic means and standard deviations

variable	A. Mean	S. D	Degree
Green Design and Manufacturing	3.721	1.116	high
Green Distribution	3.661	1.072	high
Reverse Logistics	3.679	1.069	high
Green Information Technology	3.883	1.051	high

The descriptive analysis's findings show that the study sample's agreement on all aspects of Green Supply Chain Management (GSCM) is comparatively high. In particular, the four main dimensions Green Design and Manufacturing, Green Distribution, Reverse Logistics, and Green Information

Technology all have arithmetic means above 3.5, with the highest mean being 3.883 for Green Information Technology. All of the dimensions' standard deviations, which range from 1.051 to 1.116, are comparatively low, indicating that the responses are highly consistent. certain results show that the study sample values certain GSCM activities highly and acknowledges their importance in fostering Enhancing Environmental Sustainability and Competitiveness.

According to the study's findings, the dependent variable had an overall mean of 3.789 and a standard deviation of 1.070. This indicates that respondents generally agreed that improving environmental sustainability and competitiveness is important. Overall, the data shows a solid appreciation of the importance these parameters play in enhancing environmental sustainability and a Company's competitive edge, while the moderate standard deviation suggests some heterogeneity in replies.

6.1 Hypothesis Testing of the Study

Each of the study's hypotheses was tested using a straightforward regression model, as seen below.

Table 3: Simple regression for the study dimensions

Variable	Coefficient	R^2	F statistics	Prob.
Green Design and Manufacturing	0.911	0.702	534.74	0.000
Green Distribution	0.802	0.686	483.172	0.001
Reverse Logistics	0.913	0.669	436.972	0.000
Green Information Technology	0.902	0.585	324.346	0.000
Green Design and Manufacturing	0.787	0.516	243.512	0.000
Dependent Variable: Environmental Sustainability and Competitiveness				

The findings of the regression analysis are shown in Table 3, where all p-values are less than 0.05, indicating statistical significance and significant correlations between the independent and dependent variables. With a coefficient of 0.911 and an R2 value of 0.702, Green Design and Manufacturing demonstrated a significant positive influence on the dependent variable. This implies that improving environmental sustainability and competitiveness is greatly aided by green design and manufacturing techniques. With a coefficient of 0.802 and an R2 value of 0.686, Green Distribution also showed a positive correlation, indicating that it is crucial for promoting sustainability and competitiveness. With a coefficient of 0.913 and an R2 of 0.669, reverse logistics demonstrated a noteworthy impact on enhancing environmental results.

Green IT has a little lesser explanatory power than other dimensions, but it still contributes to the overall aim, as evidenced by its coefficient of 0.902 and R2 value of 0.585. The statistical significance of the models and the effectiveness of the independent variables in explaining the fluctuations in the dependent variable are further supported by the generally high F-statistics for all the variables (varying from 243.512 to 534.74). These results emphasize how crucial it is to use green supply chain management techniques in the quest for increased competitiveness and environmental sustainability.

7. DISCUSSION AND CONCLUSIONS

The findings of this study confirm and corroborate those of a number of earlier investigations. For instance, the study's R2 value of 0.702 and coefficient of 0.911 are in line with Hervani, Helms, and Sakis's (2005) emphasis on the substantial influence of green manufacturing and design on supply chain performance. By showing a substantial positive association between green design and manufacturing and the dependent variable, this study supports their research's emphasis that implementing sustainable design techniques is essential to improving environmental sustainability and competitiveness.

With a coefficient of 0.802 and an R2 of 0.686, the study's positive correlation between sustainability and green distribution also supports Srivastava's (2007) findings that supply chains' overall sustainability is greatly impacted by green distribution practices.

Furthermore, the strong impact of reverse logistics in improving environmental results, as shown by a coefficient of 0.913 and R^2 of 0.669, reinforces findings by Zhu et al. (2022), who discussed how reverse logistics practices contribute to a more sustainable supply chain. Finally, while Green IT demonstrated a slightly lower impact, its contribution is still significant, echoing the conclusions of Jabbour and Jabbour (2016), who recognized the role of green technology in improving operational sustainability, albeit with a more modest explanatory power. These results collectively emphasize the growing importance of green supply chain management in fostering sustainability and competitiveness across industries.

Furthermore, the findings of Zhu et al. (2022), who examined how reverse logistics methods contribute to a more sustainable supply chain, are supported by the high influence of reverse logistics in enhancing environmental results, as demonstrated by a coefficient of 0.913 and R2 of 0.669. Lastly, although though green IT had a somewhat less influence, it still made a considerable contribution. This is consistent with the findings of Jabbour and Jabbour (2016), who acknowledged the relevance of green technology in enhancing operational sustainability, albeit with a less powerful explanatory force. Together, these findings highlight how crucial green supply chain management is becoming to promoting sustainability and industry competitiveness.

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