

A Holistic Investigation of Green Supply Chain Management Practices in Small Scale Industries: Applying AHP Methods and Paired Correlation

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Abstract

This research paper deals with the Green Supply Chain Management and its impact on small-scale industries in the region of Jalgaon, Maharashtra, India. It extensively explores the GSCM practices, drivers, pressures, and barriers and their influence on the environmental, economic, and operational performance of SSIs. The methodology integrates survey questionnaires, statistical analyses, Analytic Hierarchy Process (AHP), paired correlational studies, and reliability assessments.

The findings of research reveal a significant correlation between GSCM practices and improved performances. Moreover, GSCM drivers exhibit a strong connection with enhanced performance. However, barriers and pressures in GSCM have been identified as hindrances to performance.

The Analytic Hierarchy Process (AHP) analysis unveils the prioritization of GSCM elements. Among Green Practices, Green Design and Green Supplier emerge as top influencers. For GSCM Drivers, Industrial Drivers and Purchasing Drivers claim the highest ranks. In the realm of GSCM Barriers, Technological Barriers takes the lead. Lastly, GSCM Pressures Regulatory Pressures and Customer Pressures as top priorities. This study contributes to the understanding of GSCM's intricate relationships with proposed GSCM model for sustainable business practices in SSIs.

Key words: Green Supply Chain Management, Small-Scale Industries, Performances, Analytic Hierarchy Process, GSCM Drivers, GSCM Barriers, GSCM Pressures

1 INTRODUCTION

In today's world, the rapid industrialization that has characterized recent times has led to awareness of "green" issues. As a result, business executives are now compelled to consider supply chain strategies through an environmental lens. Industries with high environmental risks, such as chemicals, plastics, automotive, and heavy engineering, have increasingly prioritized improving their environmental performance alongside traditional competitive priorities like cost reduction, manufacturing efficiency, and product quality. In India, a significant proportion of SSIs and MSMEs have not registered with the State Pollution Control Board and Central Pollution Control Board. In this evolving landscape, supply chain managers play a pivotal role in selecting and developing green strategies that enhance environmental, economic, and social performance while gaining

a competitive edge (Green & Morton, 1996; Sarkis, 2014). Historically, addressing industrial pollution has been a pivotal societal concern since the early days of the industrial revolution. Supply chain management gained prominence in management and engineering literature during the 20th century. Over the past few decades, global awareness of environmental issues has surged. Concerns such as global warming, air and water pollution, inadequate waste management, the use of toxic substances, biodiversity loss, and land degradation have become more prevalent. Governments worldwide are encouraging the use of environmentally friendly raw materials, reducing reliance on fossil fuels, and promoting the use of recycled materials for packaging. The concept of Green Supply Chain Management (GSCM) gained traction as an organizational practice during the 1980s and 1990s. Early studies examined the dissemination of

environmentally sound technologies and practices within industries as a consequence of "greening" procurement and supply (Green & Morton, 1996). Later, the focus shifted to more managerial aspects, including logistics (Murphy et al., 1994) and reverse logistics (Farris, 1992), leading to the development of theoretical frameworks for evaluating GSCM (Searing & Muller, 2008). This period laid the foundation for defining GSCM and connecting it with organizational theories. Subsequent reviews and studies, such as those by Sarkis (2014), Zhu (2012), Klassen (2007), Lai and Cheng (2009), and Srivastava (2007), have further expanded the domain, identified research gaps, and highlighted specific areas of interest.

The primary objectives of this study are to identify operational parameters of Green Supply Chain Management (GSCM) practices, assess the prevailing GSCM landscape in the Jalgaon

district, explore challenges encountered by enterprises during GSCM implementation, formulate sector-specific and overarching GSCM models, analyze the financial and environmental dimensions of the proposed GSCM model, employ Multi-Criteria Decision-Making (MCDM) techniques to evaluate the key GSCM factor and their priority and also suggest the GSCM model.

1.1 HYPOTHESIS

After setting research objectives, conducting an extensive literature review, holding brainstorming sessions with entrepreneurs, and engaging in informal conversations with quality experts, the study has developed the following hypotheses to investigate the correlation between the implementation of GSCM key parameters and the performance of small-scale industries (SSIs) in the Jalgaon region. The research framework is depicted in Figure 1.

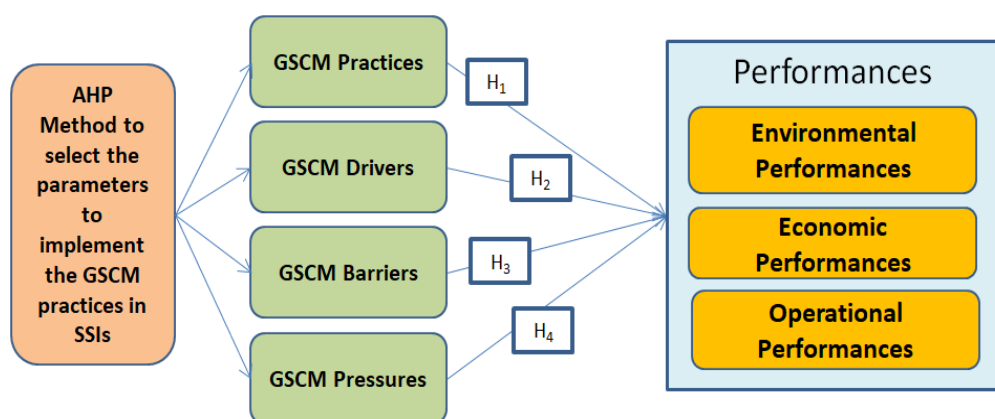


Figure 1 Research framework

H₀- Null Hypothesis
Hypothesis

H₁- Alternative

1. H₁₀: There is no significant correlation between GSCM Practices & Performances.
H₁₁: There is significant correlation between GSCM Practices & Performances.
2. H₂₀: There is no significant correlation between GSCM Drivers & Performances.
H₂₁: There is significant correlation between GSCM Drivers & Performances.
3. H₃₀: There is no significant correlation between GSCM Barriers & Performances.
H₃₁: There is a significant correlation between GSCM Barriers & Performances.

4. H₄₀: There is no significant correlation between GSCM Pressure & Performances.
H₄₁: There is a significant correlation between GSCM Pressure & Performances.

2 LITERATURE REVIEW

2.1 GREEN SUPPLY CHAIN MANAGEMENT

Environmental conservation is a pressing global concern, and Green Supply Chain Management (GSCM) has emerged as a pivotal trend aimed at mitigating environmental risks and enhancing ecological efficiency (Govindan et al., 2014). GSCM is an organizational approach that emphasizes improved environmental

performance and effectiveness. Organizations worldwide are diligently seeking innovative ways to bolster their performance, and GSCM has ignited a green revolution, particularly in large industries, resulting in enhanced performance and competitive advantages. This focus on GSCM has sparked substantial research interest in business practices. GSCM, at its core, involves the amalgamation of green procurement, green manufacturing, green distribution, and reverse logistics, coalescing to form the green supply chain (Govindan et al., 2014). Though it can be defined in various ways, the underlying purpose remains consistent—mitigating environmental issues stemming from industrial waste (Sarkis, 1995). Despite the paramount importance of sustainability in contemporary organizations, there has been limited research into GSCM practices in Indian industries and their environmental performance (Singh, Kaur, & Singh, 2023). In recent years, environmental management has transcended internal processes to encompass boundary-spanning activities, necessitating interactions with supply chain partners, including suppliers and customers (Seuring & Müller, 2008). Beyond internal greening, organizations must integrate green strategies throughout their entire supply chain, giving rise to the concept of Green Supply Chain Management (GSCM). Major corporations, focusing on sustainability, have initiated green supply chain programs to instill environmental management practices across their supply chain networks.

2.2 NECESSITY GREEN SUPPLY CHAIN MANAGEMENT

In the global business landscape, organizations compete fiercely to maximize profits and establish a positive image through GSCM implementation. However, certain parameters hinder GSCM practices in manufacturing industries, including a lack of awareness regarding the financial benefits of green supply chains, limited knowledge and expertise, high environmental application costs, inadequate learning capacity, wasteful waste recycling practices, resistance to rule implementation, and a lack of organizational commitment. Local environmental regulations, societal awareness deficits, improper organizational structures,

transportation costs, and a reluctance to adapt business strategies also pose challenges to GSCM adoption.

GSCM offers numerous advantages, including financial benefits such as cost reduction and increased profits, environmental benefits like waste reduction and pollution control, and social benefits contributing to worker and community safety (Govindan et al., 2014). GSCM is pivotal in addressing environmental degradation and climate change challenges while meeting the burgeoning demand for sustainable products and services (Singh et al., 2023). GSCM embodies a win-win scenario, benefiting businesses through improved financial and environmental performance and advancing the cause of environmental sustainability (Sarkis, 1995; Seuring & Müller, 2008).

2.3 DISCUSSION ON VARIOUS GSCM MODELS

This section discusses various Green Supply Chain Management (GSCM) models, each offering unique insights into the integration of environmental considerations within supply chain practices. Seuring and Muller (2008) emphasize the pivotal role of focal companies in ensuring the environmental and social performance of their suppliers. Their framework encourages empirical research and unique contributions, prioritizing practical insights. On the other hand, Srivastava (2007) introduces a model with three key dimensions: the importance of GSCM, green design, and green operations. It encompasses various green manufacturing activities within the green operations. Zhu, Sarkis, Cordeiro, and Lai (2008) propose a model structuring green practices into five blocks and provide a measurement scale for evaluating GSCM implementation. Their model's validity and reliability were tested in the Chinese industry, offering practical guidance for implementing GSCM effectively. Meanwhile, Testa and Iraldo (2010) categorized external and internal parameters, encompassing normative, coercive, and mimetic pressures as external influences, and reputation, efficiency, and innovation as internal drivers. Tarig Eltayeb and Suhaiza Zailani (2011) present a framework highlighting the significant role of Total Quality Management (TQM) in promoting GSCM

adoption. Furthermore, Hariharan Ganeshan and Dr. P. Suresh (2015) offer a model for GSCM implementation in Small-Scale Industries (SSI), emphasizing the flexibility to prioritize cost versus performance enhancement. Effective management and leadership skills are crucial for its successful implementation, making it particularly effective for SSIs in India. Green Supply Chain Management (GSCM) emerged in the 1990s as an extension of traditional Supply Chain Management (SCM), focusing on environmental sustainability throughout the supply chain (Srivastava, 2007).

Developing countries like India exhibit relatively low awareness of GSCM, necessitating efforts to enhance awareness and knowledge dissemination (Srivastava, 2007). Small Scale Industries (SSIs) in India show limited inclination toward GSCM, emphasizing the need for a focus on GSCM implementation in this sector. Similarly GSCM focus should increase in the SSIs located in rural areas also.

Key components of GSCM encompass various functions within an organization, emphasizing its holistic nature (Srivastava, 2007 & Lam et al., 2015). The essence of Green Supply Chain Management (GSCM) lies in its pivotal components, which include GSCM Practices, Drivers, Barriers, and Pressures. GSCM Practices encompass a spectrum of environmentally conscious activities that organizations adopt to reduce their ecological footprint. These practices enable the integration of sustainability principles within the supply chain, from sourcing eco-friendly materials to responsible waste management (Srivastava, 2007). GSCM Drivers serve as the motivational forces encouraging organizations to embrace green practices. They can be external, such as regulatory compliance or customer demands, or internal, stemming from a company's commitment to environmental responsibility (Khan & Khan, 2014). On the flip side, Barriers represent the challenges and obstacles hindering the effective implementation of GSCM. These may include financial constraints, lack of awareness, or inadequate training, particularly in small-scale industries (SSIs) in district places like Jalgaon, Maharashtra, India (Khan & Khan, 2014). Finally, Pressures come in various forms, encompassing regulatory, market, societal, and

competitive pressures that compel organizations to adopt GSCM practices (Zhu, Q. et al., 2013).

GSCM in SSIs has often overlooked the direct link between GSCM elements and their impact on key performance indicators (KPIs), such as environmental, economic, and operational performance (Govindan et al., 2015). GSCM is a relatively new concept with diverse definitions emphasizing environmental management principles and innovative techniques (Khan & Khan, 2012). Developing countries face low awareness of GSCM, indicating a need for education and training (Al-Akhras & Al-Omari, 2016). Researchers have identified GSCM models, components, performance parameters, and key activities to enhance the understanding and implementation of GSCM (Khan & Khan, 2012, 2013, 2014).

2.4 AHP METHOD FOR ANALYSIS

When it comes to analyzing and prioritizing the diverse aspects of GSCM, the Analytical Hierarchy Process (AHP) is a powerful methodology. AHP offers a structured framework for decision-making and has proven highly effective in evaluating complex multi-criteria problems, precisely the type of challenges that GSCM poses (Saaty, 1980). AHP facilitates the systematic comparison of alternatives and criteria, enabling organizations to make informed decisions regarding the adoption and integration of green practices within their supply chains (Saaty, 2008). By employing AHP, organizations can weigh the importance of GSCM components like Practices, Drivers, Barriers, and Pressures, ensuring that their strategies align with environmental objectives while considering both internal and external parameters. This method's adaptability and precision make it a valuable tool for GSCM analysis, enabling organizations to optimize their environmental, economic, and operational performances within their supply chains (Saaty, 1980).

2.5 RESEARCH GAP

This research aims to explore the challenges that SSIs encounter in implementing GSCM, and concurrently, to provide recommendations to promote sustainable growth within this context.

SSIs facing challenges in embracing GSCM practices, including insufficient awareness, financial constraints, and technological limitations (Govindan, 2011; Narasimhan & Carter, 1998). In the MIDC area of Jalgaon District, SSIs face various challenges while maintaining competitiveness. Despite the growth-oriented approach, these industries grapple with inefficiencies in inventory management, skilled workforce shortage, material underutilization, and safety concerns. This research addresses these challenges by investigating the implementation of GSCM practices to enhance environmental, economic, and operational performances. The study employs the AHP framework to prioritize Green Drivers, Barriers, and Pressures, aiming to enhance the understanding and implementation of GSCM principles in the context of small-scale industries.

3 RESEARCH METHODOLOGY

The methodology employed in this study encompassed the use of a structured questionnaire to assess GSCM in 100 selected small-scale industries (SSIs) within the Jalgaon region. These SSIs were part of a total of 200 in the area, and responses were collected from 300 personnels, including management, managers, engineers, shop floor in-charge and suppliers. The questionnaire was organized into four sections, aiming to gather demographic data on the SSIs, assess the parameters influencing the implementation of green practices, rank key

GSCM parameters, and evaluates the environmental, economic, and operational performances. Before the survey, pilot testing of the questionnaires was conducted through personal interviews with 10 experts.

Categorization of Key GSCM Parameters in this study is to investigate the most influencing Key parameters for GSCM implementation in SSIs to get a maximum identified performance during implementation journey. The team of ten experts was selected to identify the key parameters which affect decision making in GSCM implementation. The are key parameters are illustrated in Figure 2.

In addition to the questionnaire-based survey, this study incorporated various statistical techniques such as t-tests, descriptive statistics, and paired correlational analysis. The t-test was employed to assess the significance of differences between various groups or variables related to GSCM. It allowed for the examination of the impact of different parameters on GSCM practices, drivers, and barriers. Descriptive statistics provided a clear summary of the survey data, offering insights into the central tendency, variability, and distribution of the responses. Paired correlational analysis was conducted to explore the relationships between GSCM practices, drivers, barriers and pressures and the resulting impact on the environmental, economic, and operational performances of the SSIs. This analysis helped identify significant correlations as well supported in testing the hypothesis of study.

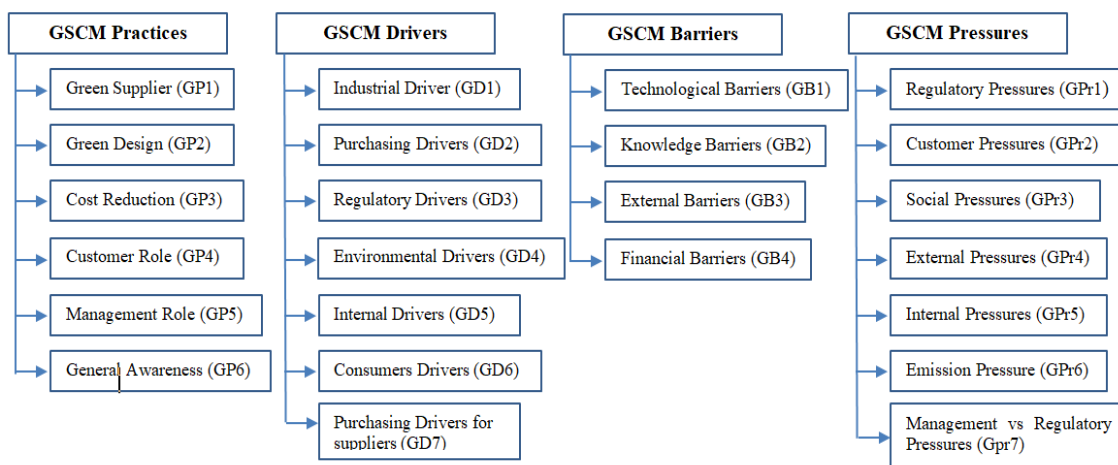


Figure 2. Categorization of Key GSCM Parameters

This study also ensured the robustness of its findings by conducting reliability analysis on the key parameters of Green Supply Chain Management (GSCM), including Practices, Drivers, Barriers, Pressures and Performances. Reliability analysis is a critical statistical method that assesses the consistency and stability of measurement instruments.

Additionally, the study integrated the Analytic Hierarchy Process. In which ten GSCM experts were consulted in the development of questionnaires and reached a consensus through interviews. Pilot testing was conducted with ten SSIs to refine the questionnaires and foster expert discussions. The AHP method was utilized to prioritize GSCM practices ,drivers, barriers and pressures. The experts provided valuable insights using a nine-point scale and pairwise matrices. The AHP method was subsequently employed to assess the levels of GSCM practices, drivers, pressures, and barriers (Govindan, 2013).

4 RESULTS AND DISCUSSIONS

4.1 DESCRIPTIVE STATISTICS:

The descriptive statistics for various GSCM parameters for Shop floor In-charges, managers and suppliers was developed. These statistics include mean and standard deviation values, reflecting the average perceptions and the spread of opinions around the mean for each factor.

For Shop floor In-charges, GP2 and GP3 received higher mean scores of 3.8719 and 4.1494, signifying their perceived importance. Conversely, GB1, GPr7, and GPr6 received lower mean scores of 2.5076, 2.3490, and 2.4976,

indicating less significance. These statistics offer insights into the perspectives of Shop floor In-charges on GSCM, assisting decision-makers in identifying areas for potential improvement in their supply chain practices.

For managers, GP6 to GD6 are perceived as important aspects of GSCM, with mean scores ranging from 3.543 to 3.5952. In contrast, GB4 to GPr4 received lower mean scores of 2.567 to 2.77143. These descriptive statistics provide valuable insights into the perceptions of managers on GSCM, guiding decision-makers in identifying areas of strength and improvement to foster sustainable supply chain practices.

For suppliers, GP1 and GP7 are perceived as significant GSCM parameters, with mean scores of 3.9850 and 3.942. Conversely, GB3 and GPr7 received relatively lower mean scores of 2.7583 and 2.596. These statistics offer insights into the perceptions of suppliers regarding GSCM parameters, aiding decision-makers in understanding their perspectives and devising effective strategies for enhancing sustainability within the supply chain.

4.2 RELIABILITY STATISTICS

Table 1 presents the reliability statistics assessed using Cronbach's Alpha for various constructs within the study. The values of Cronbach's Alpha, all above 0.8, indicate the robust internal consistency of the measurement scales. This strong internal harmony among the reliability of data obtained during the survey ensures the interrelation among the questionnaires framed, bolstering the credibility of the study's measurements and interpretations.

Table 1 Reliability Statistics

	Cronbach's Alpha	Number of Items
GSCM Practices (GP)	0.894	GP1,GP2,GP3,GP,GP5,GP6
GSCM Drivers (GD)	0.846	GD1,GD2,GD3,GD4,GD5,GD6,GD7
GSCM Barriers (GB)	0.816	GB1,GB2,GB3,GB,GB5
GSCM Pressures (GPr)	0.810	GPr1, GPr2, GPr3, GPr4, GPr5, GPr6, GPr7
GSM Performance (GPe)	0.872	GPe1,GPe2,GPe3

4.3 PAIRED SAMPLE T-TEST

The Table 3 illustrates the paired samples t-test ,conducted to assess the significance of

differences between various GSCM elements (GP, GD, GB, GPr) and their corresponding performance indicators GPe1- Environmental

Performance, Gpe2- Economic Performance and GPe3- Operational Performance. In this survey, negative mean differences in performance ratings indicate that respondents perceive a positive impact of specific. This suggests that addressing key factors related to environmental responsibility, economic efficiency, and operational excellence is essential for enhancing overall organizational performance. For the pairs of GP - GPe1, GP - GPe2, and GP - GPe3, the mean differences were approximately 0.8056, indicating an increase in performance from GPe1 to GPe3. For the pairs GD - GPe1, GD - GPe2, and GD - GPe3, where mean differences were around 0.6167. For the pairs of GB - GPe1, GB - GPe2, and GB - GPe3, mean differences

were approximately 1.1829, signifying a increase in performance. Similarly, for the pairs of GPr - GPe1, GPr - GPe2, and GPr - GPe3, mean differences were around 1.728, again indicating an increase in performance. The p-values for all these pairs were less than 0.001, denoting statistical significance.

4.4 HYPOTHESIS TESTING:

Hypothesis testing is a critical statistical approach that informs the decisions about the relationships between variables. In the hypothesis testing using paired sample statistics provides valuable insights into the interrelation between these parameters. The significance level of T- test is presented in table 2.

Table.2 Paired samples t-test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				One-Sided p	Two-Sided p
					Lower	Upper				
Pair 1	GP - GPe1	-.80556	.73016	.073019	-.95043	-.66067	-11.033	99	<.001	<.001
Pair 2	GP - GPe2	-.80532	.74136	.074136	-.95240	-.65819	-10.862	99	<.001	<.001
Pair 3	GP - GPe3	-.75566	.75488	.075488	-.90545	-.60588	-10.010	99	<.001	<.001
Pair 4	GD - GPe1	-.61671	.45989	.045989	-.70799	-.52549	-13.411	99	<.001	<.001
Pair 5	GD - GPe2	-.61646	.48354	.048354	-.71243	-.52054	-12.750	99	<.001	<.001
Pair 6	GD - GPe3	-.56683	.45819	.045819	-.65777	-.47593	-12.371	99	<.001	<.001
Pair 7	GB - GPe1	- 1.18288	.89037	.08903	-1.3595	-1.0062	-13.285	99	<.001	<.001
Pair 8	GB - GPe2	- 1.18263	.90489	.09048	-1.3621	-1.0030	-13.069	99	<.001	<.001
Pair 9	GB - GPe3	-1.1330	.8951	.0895	-1.3106	-.9554	-12.658	99	<.001	<.001
Pair 10	GPr - GPe1	-1.7279	.45406	.04540	-1.8180	-1.63785	-38.055	99	<.001	<.001
Pair 11	GPr - GPe2	-1.7276	.47817	.04781	-1.82257	-1.63281	-36.131	99	<.001	<.001
Pair 12	GPr - GPe3	- 1.67805	.43834	.04383	-1.76503	-1.59108	-38.282	99	<.001	<.001

By comparing the p-values to a predetermined significance level (α), often set at 0.05, it can be decided whether to reject the null hypothesis. If the p-value is less than α , the null hypothesis is rejected in favour of the alternative hypothesis. This implies that the GSCM element and performance indicator under examination are statistically related.

As per the observations of Table 3 the following hypothesis is accepted a mentioned below:

H₁- Alternative Hypothesis

1. H₁₁: There is significant correlation between GSCM Practices & Performances.
2. H₂₁: There is significant correlation between GSCM Drivers & Performances.
3. H₃₁: There is a significant correlation between GSCM Barriers & Performances.
4. H₄₁: There is a significant correlation between GSCM Pressure & Performances.

The strong evidence is present in Table 2. to reject the null hypothesis and accept the alternate hypothesis.

4.5 AHP METHOD

The figure 3 provided in this research offers a detailed breakdown of key parameters in the realm of Green Supply Chain Management (GSCM). It ranks these parameters by priority, providing insight into their respective weight percentages, as well as their reliability metrics, including the Consistency Ratio (CR) and Consistency Index (CI). Each parameter's relative importance is reflected in the percentage of weight assigned to it. This analytical approach yields the following key insights:

Within Green Practices (CR=0.077, CI=0.096), GP2 takes the lead with a weight percentage of 23.77%, followed closely by GP1 at 21.8%. GP3 and GP6 hold the third and fourth positions with weight percentages of 20.81% and 18.92%, respectively. GP4 and GP5 are the fifth and sixth in priority, with weight percentages of 6.15% and 8.56%, respectively.

Among the GSCM Drivers (CR=0.049, CI=0.066), GD1 holds the highest weight percentage at 39.18%, earning it the top rank. GD2 follows closely with a weight percentage of 21.94%. GD5, GD7, GD6, GD4, and GD3 secure ranks three to seven, each with its respective weight percentage, emphasizing their relative significance.

GSCM Barriers (CR=0.077, CI=0.096) are led by GB1, boasting a weight percentage of 62.01%. GB4 and GB2 follow with weight percentages of 15.16% and 14.23%, respectively. GB3, ranking fourth, carries a weight percentage of 8.6%.

In the realm of GSCM Pressures (CR=0.034, CI=0.046), GPr1 stands out as the highest priority with a weight percentage of 30%. It is followed by GPr2 at 20%. GPr7, GPr4, GPr6, GPr3, and GPr5 claim ranks three to seven, each with its corresponding weight percentage.

This detailed evaluation equips organizations with a clear understanding of the relative importance of these parameters within the context of GSCM as illustrated in Figure 3.

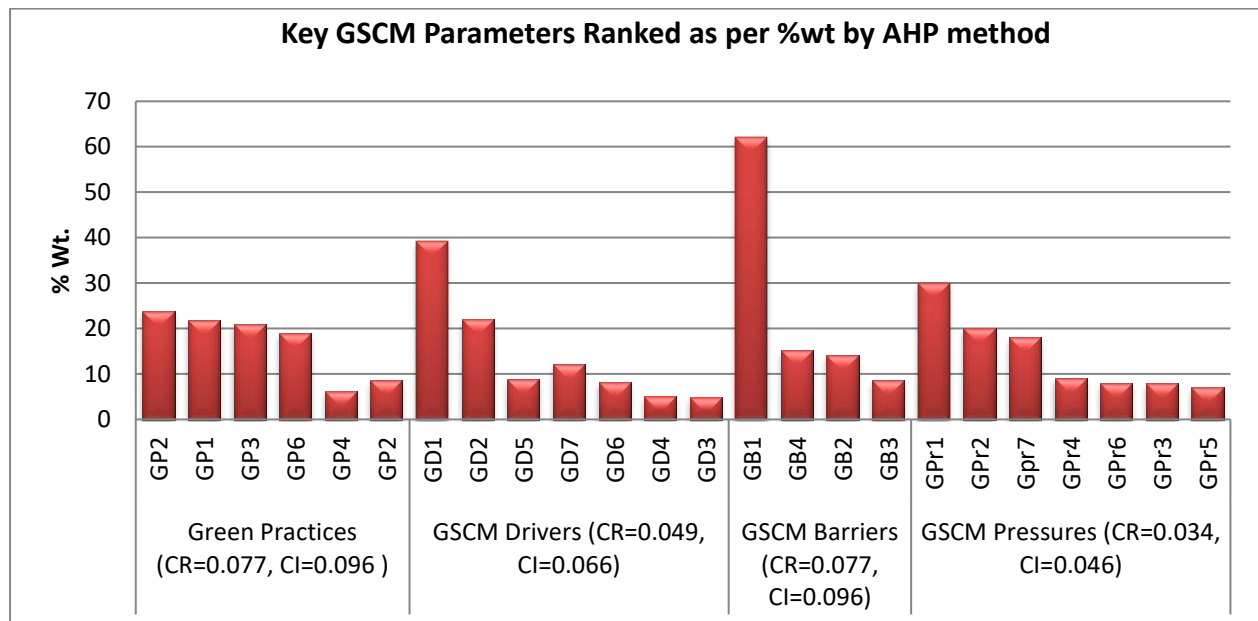


Figure 3 Key GSCM Parameters Ranked as per %wt by AHP method

5 RESEARCH SUMMARY

5.1 KEY FINDINGS

The paired samples t-test revealed that as GSCM practices (GP) increased, the performance of SSIs in environmental (GPe1), economic (GPe2), and operational (GPe3) aspects significantly

improved. This supports H1 (Alternative Hypothesis 1). The analysis showed a significant positive correlation between GSCM drivers (GD) and performance (GPe1, GPe2, and GPe3), confirming H2 (Alternative Hypothesis 2). GSCM barriers (GB) were found to negatively impact

performance (GPe1, GPe2, and GPe3), corroborating H3 (Alternative Hypothesis 3). GSCM pressures (GPr) were identified as negatively impacting performance (GPe1, GPe2, and GPe3), validating H4 (Alternative Hypothesis 4).

The Analytic Hierarchy Process (AHP) analysis emphasized the relative importance of GSCM elements. Within Green Practices (GP), GP2 emerged as the most critical element with a value of 23.77%, closely followed by GP1 with a weight of 21.8%. Among GSCM Drivers (GD), GD1 was ranked as the top influential factor with a weight of 39.18%, and GD2 followed with a weight of 21.94%. In the category of GSCM Barriers (GB), GB1 took the lead with a significant weight of 62.01%, while GB4 and GB2 followed with weights of 15.16% and 14.23%, respectively. GSCM Pressures (GPr) highlighted GPr1 as the highest priority with a weight of 30%, and GPr2 ranked second with a weight of 20%.

The reliability analysis yielded strong Cronbach's Alpha coefficients above 0.8, indicating high internal consistency and reliability for the measurement scales, which enhances the validity of the measurements.

5.2 IMPLICATIONS AND RECOMMENDATIONS

The findings have several important implications for SSIs in the Jalgaon region and beyond. Embracing GSCM practices, drivers, and pressures, as emphasized by the AHP findings, can enhance economic and operational performances. Recognizing the role of GSCM barriers is essential for sustainable green supply chain management.

Based on these results, it is recommended that SSIs in Jalgaon and similar regions should actively adopt and integrate GSCM practices, drivers, and pressures to drive sustainable growth. Address GSCM barriers while mitigating their negative impact on performance.

6 CONCLUSION

In conclusion, this research contributes valuable insights into the dynamics of Green Supply Chain Management in small-scale industries, specifically in the context of Jalgaon,

Maharashtra, India. The study's robust methodology and findings reinforce the significance of GSCM practices, drivers, pressures, and barriers in fostering sustainable supply chains. These findings, including the AHP prioritization, inspire further research and encourage SSIs to embrace GSCM as a key driver of their success while promoting sustainability.

6.1 PROPOSED GSCM MODEL

The provided Green Supply Chain Management (GSCM) model is a comprehensive framework designed to facilitate sustainable management, addressing environmental, economic, and operational impacts with the aim of enhancing organizational profitability. This model encompasses three main components: Inputs, Controllers, and Outputs.

Inputs: Within this category lie green practices, drivers, barriers, and pressures, all of which exert significant influence on the supply chain. Green practices encompass a variety of actions and strategies aimed at achieving environmental sustainability. They are driven by green drivers and pressures while being hindered by green barriers. Green drivers represent the motivating forces compelling companies to adopt green supply chain management practices. On the other hand, green barriers represent the challenges and obstacles faced during the implementation of these practices. Additionally, green pressures include external parameters and expectations that push companies toward adopting green supply chain practices.

Controllers: This segment of the model comprises various stakeholders responsible for implementing and managing the GSCM system. This includes key players such as suppliers, managers, shop floor in-charges, and customers.

Outputs: The outputs pertain to practices related to waste management and disposal, which significantly impact the economic, environmental, and operational performances of the company.

The GSCM model is further enriched by feedback loops that illustrate the intricate interconnections between its various components. Additional insights include aspects like green purchasing, green design, green manufacturing, green marketing, and reverse logistics. These components are all aimed at

reducing the environmental impact of supply chain management. The proposed GSCM model adopts a holistic approach to supply chain management, encompassing all phases from raw material extraction to disposal. This dynamic and adaptable model requires continual adjustments to accommodate changing conditions, such as new regulations and customer preferences. Furthermore, it is highly collaborative, necessitating the involvement of all stakeholders, including suppliers, customers, and employees. This approach represents a

long-term investment with numerous benefits, including reduced environmental impact, improved social performance, and increased profitability. Ultimately, the GSCM model offers a structured and systematic approach for Small-Scale Industries (SSIs) to implement sustainable green supply chain management practices, fostering environmental responsibility, social performance improvement, and financial growth.

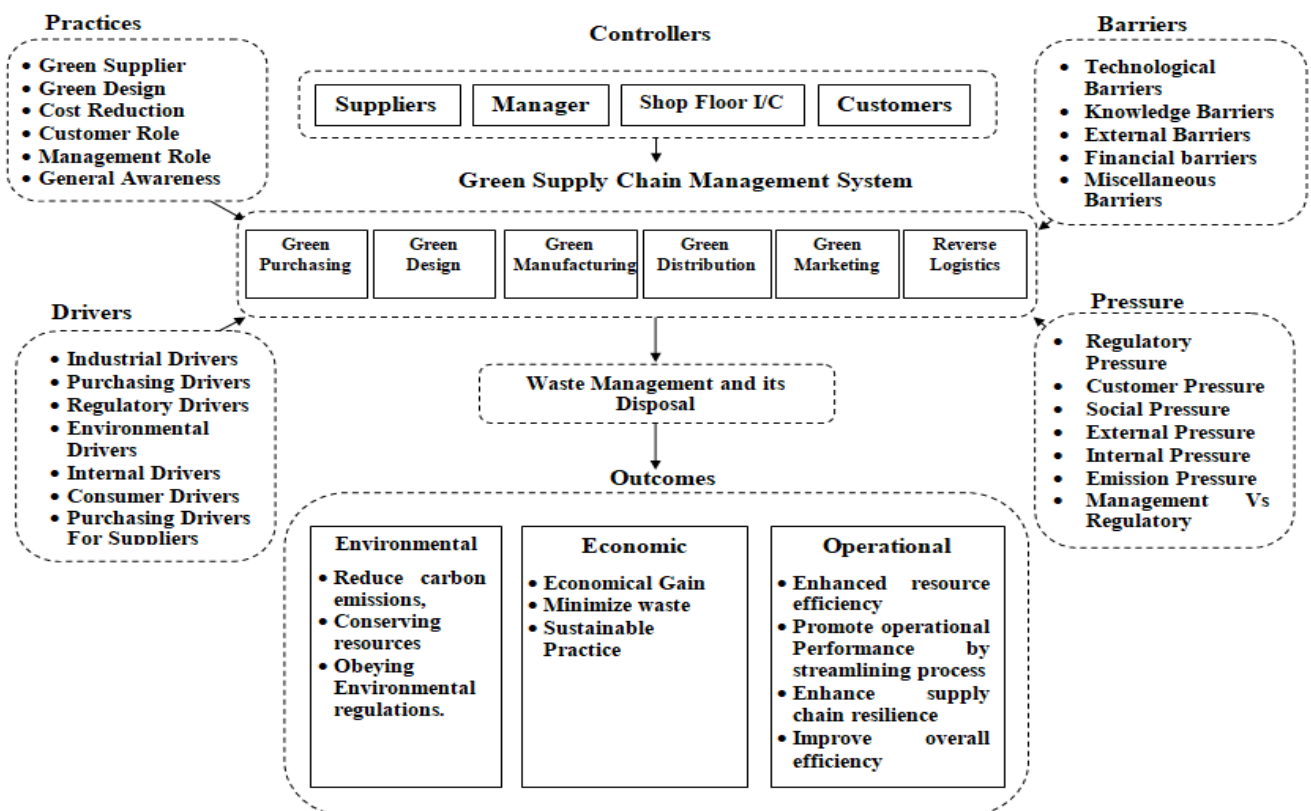


Figure 4 Proposed GSCM model

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