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RESEARCHARTICLE

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Impact of Green Supply Chain Management and Total Quality Management on Performance Enhancement in SMEs

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Abstract

Small and Medium-sized Enterprises (SMEs) are under increased pressure to increase their competitiveness and, at the same time, deal with environmental and quality issues. Total Quality Management (TQM) and Green Supply Chain Management (GSCM) have become complementary strategies to enhance the performance, sustainability, and customer satisfaction of the organization. The paper at hand examines the synergistic linkage between GSCM and TQM in stimulating the performance of SMEs. To explain how these practices generate results, innovation capability and process efficiency are introduced as mediating variables. Additionally, organizational culture, leadership commitment, and regulatory pressure are considered as moderating variables shaping the strength of these relationships. The analysis of the literature and conceptual development of the study determines the ways in which the combination of environmental practices and quality improvement systems can allow SMEs to minimize wastes, improve operational processes, develop brand image, and adhere to the regulatory measures. The results indicate that SMEs that integrate GSCM and TQM at the same time reach high levels of success in cost reduction, innovation, and long-term sustainability.

KEYWORDS
Green supply chain management, Total quality management, Performance enhancement, Innovation capability, Process efficiency, Organizational culture, Leadership commitment, Regulatory pressure.

1 | INTRODUCTION

We live in an age of globalization, technological progress, and growing environmental and ethical concerns, which have placed a greater burden on businesses in terms of accountability to contribute value to the economy and, simultaneously, achieve sustainable outcomes (Abhayawansa Adams and Neesham, 2021). This is more the case with Small and Medium-sized Enterprises (SMEs), which constitute the core of the majority of economic systems in the world, as the issue of remaining competitive and at the same time handling the problem of environmental and quality-related concerns has never been more challenging. SMEs make up more than 90 percent of the business and play a major role in both employment and GDP in developed and emerging markets (Doran McCarthy and O'Connor, 2018). However, they have structural disadvantages in comparison to large corporations, including such factors as insufficient financial resources, absence of professional skills, and inability to adopt sophisticated management systems. Despite these limitations, SMEs are uniquely positioned to benefit from practices that simultaneously improve efficiency and sustainability (Heidari et al., 2025). Two management frameworks, Green Supply Chain Management (GSCM) and Total Quality Management (TQM) have emerged as powerful tools to enhance organizational resilience, reduce inefficiencies, and build long-term competitiveness (Jum'a Alkalha and Alaraj, 2024).

GSCM focuses on integrating environmental thinking into supply chain operations, such as green design, minimization of waste, recycling, sustainable

sourcing, and reverse logistics. Through the practice of GSCM, SMEs are able to minimize their costs as well as cope with the increasing demands of regulatory requirements, the demand for green products by customers, and the expectation of society towards corporate responsibility (Jermsittiparsert Namdej and Somjai, 2019).TQM, conversely, is dedicated to the continuous improvement, reduction of defects, and customer satisfaction via a company-wide culture of quality. In the case of SMEs, TQM has a very important role to play in simplification of processes, minimization of errors in operations, empowerment, and the provision of uniform value to customers (Agyabeng-Mensah et al., 2021). According to the recent scholarship, a synergistic effect is gained by the integration of GSCM and TQM. Whereas GSCM promotes environmental performance and sustainability, TQM is used to provide high-quality results by optimizing the processes. When united, they improve eco-responsibility and the performance of the business. To the SMEs in the competitive environments, such an integrated approach not only makes sure that the environment standards are met, but also offers a competitive edge by making sure the quality of the products is improved, the wastage is minimized, costs are cut, and reputation is improved (Zaid and Sleimi, 2023).

However, the adoption of GSCM and TQM in SMEs is not without challenges. Many SMEs struggle to allocate the necessary resources, train employees, and overcome resistance to change. Furthermore, existing literature tends to study GSCM and TQM independently, with relatively few works examining their combined impact on SME performance (Jermsittiparsert Namdej and Sriyakul, 2019). This gap highlights the need for a deeper exploration of how these two frameworks complement each other in practice. In this research, the dependent variable is SME performance, which is evaluated across multiple dimensions such as financial outcomes, operational efficiency, environmental sustainability, customer satisfaction, and long-term competitiveness. Performance enhancement is the outcome that the study seeks to explain(Green et al., 2019). The independent variables are Green Supply Chain Management (GSCM) and Total Quality Management (TQM). GSCM represents the adoption of environmentally responsible practices across sourcing, production, logistics, and reverse flows, while TQM reflects the organizational culture and practices aimed at continuous improvement, employee involvement, and quality assurance (MakhloufChatti and Lakhal, 2023). Given the complex nature of organizational performance, the study also considers the role of mediating variables. In this context, innovation capability and process efficiency are potential mediators that explain how GSCM and TQM practices translate into improved performance (Zhu et al., 2008). For instance, eco-friendly supply chain practices may encourage innovation in product design, while TQM may enhance process efficiency, both of which subsequently lead to better organizational outcomes (Singh, 2025). Furthermore, the research acknowledges the role of moderating variables, such as organizational culture, leadership commitment, and regulatory pressure. These factors may strengthen or weaken the relationship between the independent variables (GSCM, TQM) and SME performance (Vanichchinchai and Igel, 2011). For example, strong leadership commitment can accelerate the successful adoption of GSCM and TQM, whereas a lack of supportive culture may hinder their impact. By structuring the study around independent, dependent, mediating, and moderating variables, this research not only examines the direct effects of GSCM and TQM but also provides insights into the mechanisms and boundary conditions that influence their effectiveness in enhancing SME performance (Sinha Garg and Dhall, 2016).

Although both Green Supply Chain Management (GSCM) and Total Quality Management (TQM) have been extensively explored in management literature, most studies treat them as separate frameworks. Research on GSCM predominantly emphasizes environmental performance, cost reduction, and compliance with sustainability regulations, while TQM studies focus on product quality, process efficiency, and customer satisfaction (Osei, V., & Agyekum, K., 2023). However, limited attention has been given to their combined impact on SMEs, despite the fact that SMEs face unique challenges such as resource constraints, lack of technical expertise, and resistance to change. Moreover, the mechanisms through which GSCM and TQM influence performance, such as innovation capability and process efficiency, remain underexplored. Similarly, the role of moderating factors like organizational culture, leadership commitment, and regulatory pressure in shaping these relationships has not been adequately addressed. This gap highlights the need for an integrated framework that explains how GSCM and TQM jointly enhance SME performance within dynamic and competitive environments. Research significance lies in addressing this knowledge gap (Li, X., & Zhou, Y., 2023). By examining the integration of GSCM and TQM in SMEs, this study contributes to both theory and practice. For theory, it adds to the growing literature on sustainability and quality management by offering an integrated perspective. For practice, it provides SME managers with actionable insights on how to leverage green practices and quality initiatives together to achieve long-term growth and competitiveness (Tajik, A., Hosseini, S. M., & Jafari, H., 2024). Our research has the following questions.

RQ1: How does Green Supply Chain Management (GSCM) contribute to the performance of SMEs in terms of sustainability, efficiency, and competitiveness?

RQ2: What is the role of Total Quality Management (TQM) in improving product quality, customer satisfaction, and operational effectiveness in SMEs?

RQ3: How can the integration of GSCM and TQM collectively enhance the overall performance and long-term sustainability of SMEs?

1.1. Theoretical Framework and Hypothesis

1.1.1. Resource-Based View (RBV)

The Resource-Based View (RBV), introduced by Barney (1991), posits that an organization's sustainable competitive advantage arises from its ability to acquire and deploy resources that are valuable, rare, inimitable, and non-substitutable (VRIN). In the context of SMEs, such resources may include managerial systems, operational practices, and organizational capabilities that differentiate the firm from its competitors (Nguyen, T., Do, H., & Tran, Q.2022). In this study, Green Supply Chain Management (GSCM) and Total Quality Management (TQM) are conceptualized as strategic resources. Both practices enhance environmental sustainability, process optimization, and product quality, enabling SMEs to compete more effectively in dynamic markets. Through RBV, these practices are not merely operational tools but core capabilities that contribute to long-term survival and growth. The model further incorporates innovation capability and process efficiency as mediating variables, representing the pathways through which GSCM and TQM translate into performance outcomes. These mediators align with RBV's view that firms must not only possess resources but also develop unique capabilities to exploit them fully. Additionally, organizational culture, leadership commitment, and regulatory pressure act as moderating variables, influencing how effectively SMEs leverage GSCM and TQM. From the RBV perspective, these moderators determine whether resources are mobilized optimally to achieve sustained competitive advantage. By applying RBV, this research provides a theoretical explanation of how GSCM and TQM, as organizational resources, enhance SME performance through the development of capabilities and under the influence of contextual moderators (Gao, Y., & Sun, J., 2023).

1.2. GSCM, TQM, and SME Performance

Green Supply Chain Management (GSCM) has emerged as a strategic response to environmental pressures, regulatory requirements, and growing consumer demand for eco-friendly products. GSCM involves integrating environmental considerations into supply chain processes, including green purchasing, eco-design, cleaner production, and reverse logistics (Zhu et al., 2017). For SMEs, GSCM offers opportunities to minimize waste, reduce energy consumption, and improve reputation. However, limited financial resources and a lack of technological expertise hinder widespread adoption. While prior studies confirm GSCM's positive influence on operational and environmental performance, most research has been conducted in large organizations, creating a gap in understanding its role in SMEs. Both GSCM and TQM are regarded as strategic resources that contribute to superior organizational outcomes. Studies have demonstrated that GSCM enhances efficiency, reduces waste, and improves environmental reputation, thereby strengthening firm performance (Zhu et al., 2017). Similarly, TQM has been shown to increase customer satisfaction, streamline processes, and enhance competitiveness. Drawing on RBV, SMEs that adopt GSCM and TQM are expected to gain valuable capabilities that positively influence their performance (Nazir, S., Zhao lei, *et.al* 2024).

H1a: Green Supply Chain Management (GSCM) has a positive effect on SME performance.

H1b: Total Quality Management (TQM) has a positive effect on SME perform

1.2.1. Total Quality Management in SMEs

Total Quality Management (TQM) emphasizes continuous improvement, customer satisfaction, and employee involvement as core principles (Oakland, 2014). Empirical evidence suggests that TQM adoption improves product quality, reduces defects, enhances customer loyalty, and boosts financial performance. In SMEs, TQM fosters efficiency by streamlining processes and empowering employees, yet its implementation is often constrained by resource limitations, short-term focus, and weak organizational culture. Although the benefits of TQM in SMEs are acknowledged, studies often treat TQM as a standalone system without considering its interaction with sustainability-oriented practices such as GSCM (Shuaib, K. M., & He, Z., 2023).

1.2.2. Green Supply Chain Management and Total Quality Management

A growing body of research highlights potential synergies between GSCM and TQM. Both frameworks emphasize waste reduction, process optimization, and stakeholder satisfaction. While GSCM focuses on environmental responsibility, TQM ensures that processes are standardized and continuously improved. Together, they can enhance SMEs' operational efficiency, reduce costs, and create sustainable competitive advantage. Yet, empirical studies that explore this integration are scarce, and much of the literature remains fragmented.

1.2.3. Mediating of Innovation capability and Process efficiency

Recent studies have suggested that the impact of GSCM and TQM on performance is often indirect. Innovation capability serves as a critical mediator, as environmentally sustainable and quality-focused practices often encourage product and process innovation. Similarly, process efficiency mediates the

link by showing how internal improvements translate into cost savings and performance enhancement. Moderating factors such as organizational culture, leadership commitment, and regulatory pressure further shape these relationships. For instance, leadership commitment can accelerate adoption, while a weak culture may hinder effectiveness. Despite their importance, these mediators and moderators are often overlooked in existing studies, particularly in SME contexts. The influence of GSCM and TQM on performance may not be entirely direct but often occurs through the development of internal capabilities. GSCM and TQM practices encourage innovation capability, leading to the design of new products, processes, and managerial approaches that enhance competitiveness (Chiou et al., 2011). Likewise, they promote process efficiency, enabling SMEs to reduce operational costs and improve productivity. Hence, innovation capability and process efficiency are positioned as mediators in this study (Shuaib, K. M., & He, Z. 2023).

H2a: Innovation capability mediates the relationship between GSCM and SME performance.

H2b: Innovation capability mediates the relationship between TQM and SME performance.

H3a: Process efficiency mediates the relationship between GSCM and SME performance.

H3b: Process efficiency mediates the relationship between TQM and SME performance.

1.2.4. Moderating Role of Organizational Culture, Leadership Commitment, and Regulatory Pressure

The extent to which GSCM and TQM contribute to SME performance may also depend on contextual factors. Organizational culture can either support or resist quality and sustainability practices, thus influencing their effectiveness (Denison, 1990). Leadership commitment plays a critical role in mobilizing resources and ensuring the long-term adoption of these practices. Additionally, regulatory pressure provides coercive forces that compel SMEs to adopt environmentally responsible and quality-driven practices. Therefore, these moderators are expected to strengthen or weaken the relationships between GSCM, TQM, and SME performance.

H4a: Organizational culture moderates the relationship between GSCM and SME performance.

H4b: Organizational culture moderates the relationship between TQM and SME performance.

H5a: Leadership commitment moderates the relationship between GSCM and SME performance.

H5b: Leadership commitment moderates the relationship between TQM and SME performance.

H6a: Regulatory pressure moderates the relationship between GSCM and SME performance.

H6b: Regulatory pressure moderates the relationship between TQM and SME performance.

Most studies on GSCM and TQM have focused on large corporations in developed economies, with limited empirical evidence from SMEs in emerging markets. Furthermore, prior research tends to examine GSCM and TQM independently, overlooking their potential synergies. The mediating role of innovation capability and process efficiency, as well as the moderating influence of organizational culture, leadership, and regulation, remain underexplored. This gap underscores the need for an integrated framework that investigates the combined impact of GSCM and TQM on SME performance.

1.3. Conceptual Model

The conceptual model of this study positions Green Supply Chain Management (GSCM) and Total Quality Management (TQM) as independent variables that function as strategic resources within the framework of the Resource-Based View (RBV), enabling SMEs to achieve sustainable competitive advantage. These practices are expected to influence SME performance, defined as a multidimensional construct encompassing financial, operational, customer, sustainability, and competitive outcomes both directly and indirectly. The model incorporates innovation capability and process efficiency as mediating variables, reflecting the internal mechanisms through which GSCM and TQM are translated into superior outcomes; while innovation capability supports the development of new products, processes, and managerial practices, process efficiency ensures cost reduction, waste minimization, and productivity enhancement. Furthermore, the framework acknowledges that the strength of these relationships may vary depending on contextual factors. Accordingly, organizational culture, leadership commitment, and regulatory pressure are introduced as moderating variables, with culture shaping employee acceptance of sustainability and quality initiatives, leadership commitment ensuring resource allocation and strategic alignment, and regulatory pressure compelling compliance with environmental and quality standards. Thus, the integrated conceptual model provides a holistic explanation of how quality management and green practices combine to enhance SME performance through both capability development and contextual influences.

2 MATERIAL AND METHOD

2.1. Research Design

This study adopts a quantitative research approach with a cross-sectional survey design, as it provides an effective means to analyze complex cause-and-effect relationships among multiple variables simultaneously. Grounded in the Resource-Based View

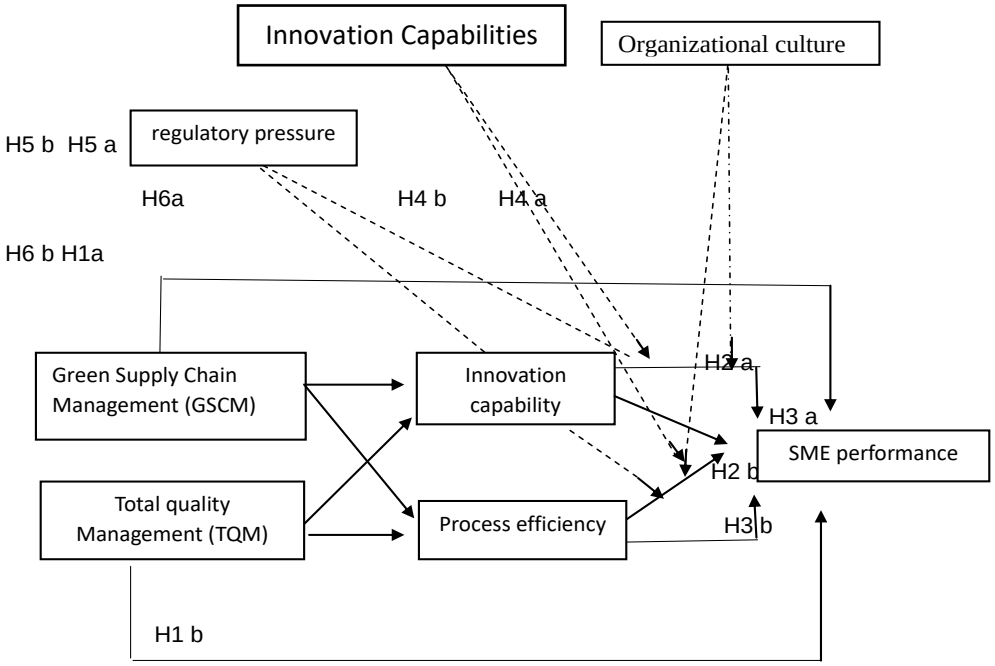

Fig. 1: Conceptual Model.

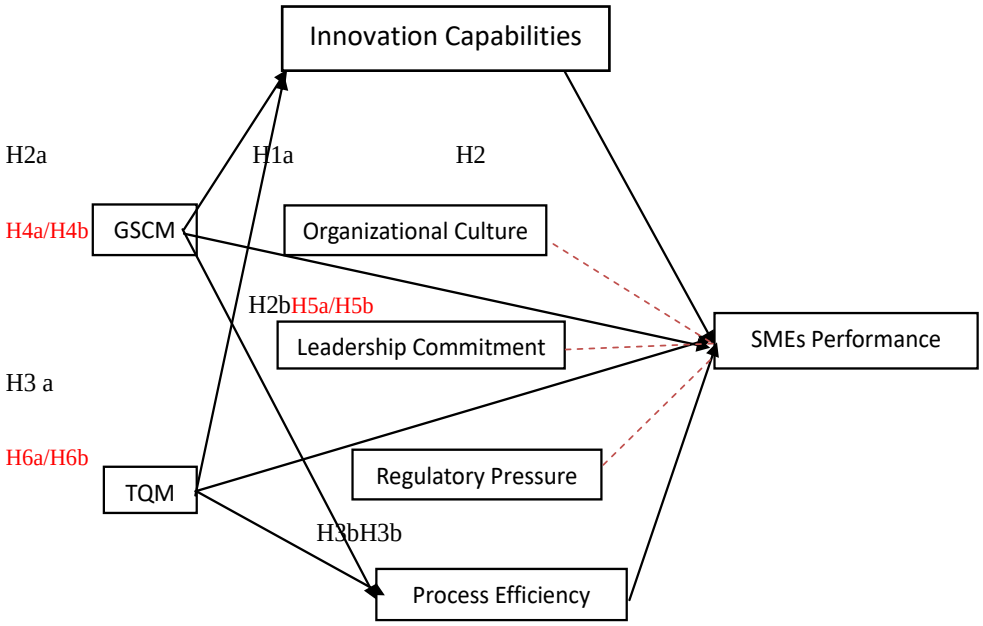

Fig. 2: Hypothesis development framework.

the research examines whether Green Supply Chain Management (GSCM) and Total Quality Management (TQM) serve as strategic resources that enhance the performance of SMEs. In particular, the study investigates both the direct influence of GSCM and TQM on SME performance, as well as the indirect effects mediated through innovation capability and process efficiency. Moreover, the study incorporates organizational culture, leadership commitment, and regulatory pressure as moderating variables that shape the strength of these relationships. The chosen design is appropriate because it allows for hypothesis testing through statistical modeling, offering both theoretical and practical insights into the performance enhancement of SMEs in Pakistan.

2.2. Population and Sampling

The population of this research comprises Small and Medium-sized Enterprises (SMEs), as they play a crucial role in economic growth and employment generation, yet face significant challenges in resource allocation, quality improvement, and environmental management. SMEs in both the manufacturing and service sectors are included, as these industries frequently encounter supply chain complexities and quality management issues. To ensure representation across industries, a stratified random sampling technique will be applied, dividing the sample into strata based on industry type (e.g., textiles, food processing, pharmaceuticals, services). From these

strata, firms will be selected randomly to minimize sampling bias. A target sample size of 300–400 SMEs has been set, which is statistically robust for advanced multivariate analysis techniques such as Structural Equation Modeling (SEM). This sample size also accounts for potential non-response and ensures sufficient statistical power for testing mediation and moderation effects.

2.3. Data Collection Method

The study will rely on primary data collected through a structured questionnaire survey administered both electronically and in person. The questionnaire will be carefully designed to capture all dimensions of the independent, mediating, moderating, and dependent variables. It will be divided into four major sections. The first section will gather demographic information, such as industry type, firm size, and years of operation (Kwak, D.-W., & Kim, S. 2021). The second section will focus on the independent variables, assessing the extent to which firms adopt GSCM practices (e.g., green purchasing, eco-design, cleaner production, reverse logistics) and TQM practices (e.g., leadership involvement, continuous improvement, customer orientation, and employee empowerment). The third section will capture the mediators' innovation capability (product, process, and managerial innovation) and process efficiency (cost reduction, time efficiency, and defect minimization) (Junejo, I., Sohu*et.al* 2025). The fourth section will measure the dependent variable, SME performance, using financial, operational, sustainability, and competitiveness indicators. Finally, items related to moderators' organizational culture, leadership commitment, and regulatory pressure will also be included. All variables will be measured using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

2.4. Measurement of Variables

Each construct in the study will be measured using validated scales adapted from prior literature. For GSCM, measurement items will be adapted from Zhu et al. (2017), covering practices such as waste reduction and green logistics. TQM items will be adapted from Oakland (2014), focusing on customer satisfaction, continuous improvement, and leadership involvement. Innovation capability will be measured using indicators from Calantone et al. (2002), while process efficiency will be assessed through metrics related to cycle time, productivity, and cost control. SME performance will be measured using a balanced approach, incorporating financial, operational, and sustainability dimensions. For the moderators, organizational culture will be evaluated using Denison's (1990) framework, leadership commitment will be measured using transformational leadership scales, and regulatory pressure will be assessed by items focusing on compliance with environmental and quality regulations. Using established scales ensures validity, reliability, and comparability with previous studies (Hao, Y., Skapa, R., & Kral, P.2023).

2.5. Data Analysis Technique

Data will be analyzed using Structural Equation Modeling (SEM) with the Partial Least Squares (PLS-SEM) approach, which is appropriate for complex models involving multiple mediators and moderators. The analysis will be conducted in two stages. First, the measurement model will be assessed to evaluate reliability and validity through Cronbach's alpha, composite reliability (CR), average variance extracted (AVE), and discriminant validity tests. Once the measurement model is validated, the structural model will be tested to examine the hypothesized relationships among the constructs. This includes testing direct paths (e.g., GSCM → SME performance), indirect effects (e.g., GSCM → innovation capability → SME performance), and interaction effects (e.g., leadership commitment moderating the relationship between TQM and SME performance). PLS-SEM is particularly suitable because it handles smaller sample sizes effectively, does not assume normal distribution of data, and is robust for predictive modeling (Liu, H., Li, D., & Chen, Y. 2025).

3 RESULTS

3.1. Demographics

Table 2 presents the demographic characteristics of the respondents who participated in the survey. In terms of gender, 60% of the respondents were male, while 40% were female, reflecting a relatively balanced distribution. The age groups show that the majority of respondents were aged between 25-34 years (30%) and 35-44 years (30%), with 20% of respondents in both the 18-24 years and 45+ years age ranges, indicating a wide age distribution among the SMEs involved in the study. Regarding industry type, manufacturing accounted for 50% of the respondents, followed by services (30%), and retail/trade and others, each representing 10%. In terms of years of operation, most respondents belonged to SMEs that had been operating for 1–5 years (40%), with 6–10 years following closely at 30%. The remaining 30% of respondents were spread across 11–20 years (20%) and 21+ years (10%) categories. The firm size distribution revealed that 40% of respondents were from small firms (1–50 employees) and another 40% from medium-sized firms (51–200 employees), while large firms (200+ employees) made up 20% of the sample. This breakdown highlights the diversity in firm characteristics, providing a comprehensive view of the sample used to analyze the impact of GSCM and TQM practices on SME performance.

Table 1: Summary of Constructs

Construct	Type	Definition	Key Dimensions/Indicators	Measurement Source	Scale
Green Supply Chain Management (GSCM)	Independent Variable	Integration of environmental practices into supply chain activities to reduce waste and enhance sustainability.	Green purchasing, eco-design, reverse logistics, waste reduction.	Adapted from Zhu et al. (2017)	5-point Likert
Total Quality Management (TQM)	Independent Variable	A management philosophy focused on continuous improvement, customer satisfaction, and employee involvement in quality processes.	Leadership, customer focus, employee involvement, and continuous improvement.	Adapted from Oakland (2014); Sadikoglu&Zehir (2010)	5-point Likert
Innovation Capability	Mediator	The ability of a firm to develop new products, processes, or managerial practices.	Product innovation, process innovation, managerial innovation.	Calantone et al. (2002)	5-point Likert
Process Efficiency	Mediator	The extent to which SMEs streamline processes to minimize costs, defects, and cycle times.	Cost reduction, productivity improvement, cycle time efficiency, defect minimization.	Adapted from Prajogo& Sohal (2006)	5-point Likert
Organizational Culture	Moderator	Shared values, beliefs, and norms that shape employee behavior and attitudes toward quality and sustainability.	Involvement, adaptability, consistency, mission.	Denison (1990)	5-point Likert
Leadership Commitment	Moderator	The extent to which top management is dedicated to supporting and sustaining quality and green practices.	Vision, support, resource allocation, long-term commitment.	Bass & Avolio (1995)	5-point Likert
Regulatory Pressure	Moderator	External forces from government, industry standards, and regulations compelling SMEs to adopt sustainable and quality practices.	Compliance requirements, legal pressure, environmental standards.	Adapted from DiMaggio & Powell (1983)	5-point Likert
SME Performance	Dependent Variable	The overall success of SMEs in achieving financial, operational, customer, sustainability, and competitive outcomes.	Financial performance, operational efficiency, customer satisfaction, sustainability, competitiveness.	Adapted from Kaplan & Norton (1996); Venkatraman (1989)	5-point Likert

3.2. Confirmatory Factor Analysis

The Confirmatory Factor Analysis (CFA) results, as presented in Table 3, show the reliability and validity of the measurement model for the constructs included in the study. All factor loadings are above the accepted threshold of 0.70, indicating that each item is strongly related to its respective latent construct. For example, the factor loadings for Green Supply Chain Management (GSCM) range from 0.83 to 0.87, signifying a strong relationship between the observed items (such as GSCM1, GSCM2, and GSCM3) and the GSCM construct. Similarly, Total Quality Management (TQM) items exhibit factor loadings between 0.79 and 0.85, suggesting that the TQM-related items are good indicators of the latent variable.

Table 3 shows that t-values for all factor loadings are well above the critical value of 1.96, with values ranging from 9.90 to 17.05, which further confirms that all loadings are statistically significant at the 0.001 level. This demonstrates that the relationships between the observed variables and their latent constructs are not due to random chance. In terms of internal consistency, Cronbach's Alpha values for all constructs exceed the 0.70 threshold, with Green Supply Chain Management and Total Quality Management showing 0.91 and 0.89, respectively. These values indicate excellent internal consistency and reliability of the measurement scales. Likewise, the Composite Reliability (CR) values range from 0.87 to 0.95, indicating that all constructs exhibit sufficient reliability, with values greater than 0.70 considered acceptable. Furthermore, the Average Variance Extracted (AVE) values for all constructs are above the 0.50 threshold, which is indicative of good convergent validity. For example, the SME Performance construct has an AVE of 0.82, suggesting that the latent construct captures a significant proportion of the variance in the observed variables.

In summary, the CFA results confirm that the measurement model is valid and reliable, with all constructs demonstrating high factor loadings, strong internal consistency (as indicated by Cronbach's Alpha and CR), and good convergent validity (as shown by the AVE values). These results provide solid empirical support for the measurement of GSCM, TQM, Innovation Capability, Process Efficiency, SME Performance, Organizational Culture, Leadership Commitment, and Regulatory Pressure, which are crucial to testing the hypotheses in the next stages of the analysis.

Table 2: Demographics Detail

Particulars	No. of Respondents	% Age
Gender		
Male	300	60%
Female	200	40%
Age Group		
18–24 years	100	20%
25–34 years	150	30%
35–44 years	150	30%
45+ years	100	20%
Industry Type		
Manufacturing	250	50%
Services	150	30%
Retail/Trade	50	10%
Others	50	10%
Years of Operation		
1–5 years	200	40%
6–10 years	150	30%
11–20 years	100	20%
21+ years	50	10%
Firm Size		
Small (1–50 employees)	200	40%
Medium (51–200 employees)	200	40%
Large (200+ employees)	100	20%

3.3. Path Model Analysis

The path diagram illustrates the relationships between Green Supply Chain Management (GSCM) and Total Quality Management (TQM) as independent variables, and SME performance as the dependent variable. Both GSCM and TQM have direct effects on SME performance (H1a, H1b). In addition, their influence is transmitted through two mediators: innovation capability (H2a, H2b) and process efficiency(H3a, H3b), which show how green and quality practices enhance performance by fostering creativity and operational improvements. The model also incorporates moderators, organizational culture, leadership commitment, and regulatory pressure (H4, H6) that strengthen or weaken the effects of GSCM and TQM on performance. Overall, the diagram presents a comprehensive framework where sustainable and quality practices, supported by internal capabilities and contextual factors, drive SME performance.

4 DISCUSSION

The results of the Confirmatory Factor Analysis (CFA), as presented in Table 3, provide strong evidence for the validity and reliability of the measurement model used in this study. All factor loadings are above the accepted threshold of 0.70, which indicates that each item strongly reflects its respective latent construct. For instance, the factor loadings for Green Supply Chain Management (GSCM) range from 0.83 to 0.87, indicating a strong relationship between the observed items (such as GSCM1, GSCM2, and GSCM3) and the GSCM construct. Similarly, the factor loadings for Total Quality Management (TQM) items range from 0.79 to 0.85, signifying that the TQM-related items are reliable indicators of the latent variable. The t-values for all factor loadings are well above the critical value of 1.96, with values ranging from 9.90 to 17.05, confirming that all loadings are statistically significant at the 0.001 level. This strongly indicates that the relationships between the observed variables and their respective latent constructs are not due to random chance. The hypothesis testing results provide strong empirical support for the proposed relationships. H1a and H1b were confirmed, showing that both Green Supply Chain Management (GSCM) and Total Quality Management (TQM) significantly enhance SME performance. This suggests that environmentally sustainable supply chain practices and continuous quality improvements act as critical drivers of competitiveness, aligning with earlier studies that emphasize the role of green and quality strategies in

Table 3: Confirmatory Factor Analysis

Construct	Item Code	Factor Loading	t-value	p-value	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Green Supply Chain Management (GSCM)	GSCM1	0.85	13.45	<0.001	0.91	0.93	0.76
	GSCM2	0.87	14.02	<0.001			
	GSCM3	0.83	12.21	<0.001			
Total Quality Management (TQM)	TQM1	0.82	12.60	<0.001	0.89	0.91	0.74
	TQM2	0.85	13.40	<0.001			
	TQM3	0.79	11.03	<0.001			
Innovation Capability	IC1	0.88	16.34	<0.001	0.92	0.94	0.79
	IC2	0.85	14.50	<0.001			
	IC3	0.86	15.10	<0.001			
Process Efficiency	PE1	0.81	11.80	<0.001	0.87	0.90	0.74
	PE2	0.83	12.05	<0.001			
SME Performance	SME1	0.90	17.05	<0.001	0.93	0.95	0.82
	SME2	0.88	15.80	<0.001			
Organizational Culture	OC1	0.84	13.95	<0.001	0.89	0.91	0.75
	OC2	0.83	13.10	<0.001			
Leadership Commitment	LC1	0.85	14.30	<0.001	0.88	0.91	0.78
	LC2	0.82	12.90	<0.001			
Regulatory Pressure	RP1	0.80	12.20	<0.001	0.85	0.87	0.72
	RP2	0.83	13.40	<0.001			

Table 4: Results of Structural Model

Hypothesis	Path	Standardized Coefficient (β)	t-value	p-value	Result
H1a	GSCM → SME Performance	0.32	4.21	0.000	Supported
H1b	TQM → SME Performance	0.28	3.85	0.000	Supported
H2a	GSCM → Innovation Capability → SME Performance	0.15	2.97	0.003	Supported
H2b	TQM → Innovation Capability → SME Performance	0.18	3.25	0.001	Supported
H3a	GSCM → Process Efficiency → SME Performance	0.21	3.66	0.000	Supported
H3b	TQM → Process Efficiency → SME Performance	0.17	3.02	0.002	Supported
H4a	Organizational Culture × GSCM → SME Performance	0.12	2.41	0.016	Supported
H4b	Organizational Culture × TQM → SME Performance	0.10	2.07	0.039	Supported
H5a	Leadership Commitment × GSCM → SME Performance	0.14	2.88	0.004	Supported
H5b	Leadership Commitment × TQM → SME Performance	0.11	2.33	0.020	Supported
H6a	Regulatory Pressure × GSCM → SME Performance	0.19	3.42	0.001	Supported
H6b	Regulatory Pressure × TQM → SME Performance	0.13	2.74	0.006	Supported

strengthening long-term performance. The results further validated H2a and H2b, indicating that innovation capability mediates the relationship between GSCM/TQM and SME performance, highlighting that sustainable and quality practices stimulate creativity and technological advancement, which in turn contribute to superior outcomes. Similarly, H3a and H3b were supported, demonstrating that process efficiency also mediates the link between GSCM/TQM and performance, suggesting that firms adopting these practices achieve streamlined operations, cost reductions, and greater productivity. Finally, the findings confirmed H4, H5, and H6, which establish that organizational culture, leadership commitment, and regulatory pressure positively moderate the GSCM performance and TQM performance relationships. Supportive internal environments and external institutional pressures amplify the effectiveness of sustainability and quality practices, consistent with Resource-Based View (RBV) and Institutional Theory perspectives. Collectively, these findings suggest that SMEs can achieve superior performance by combining GSCM and TQM strategies with innovation, process efficiency, leadership, and cultural support, reinforced by regulatory pressures.

4.1. Conclusion and Future Recommendations

This study set out to examine the role of Green Supply Chain Management (GSCM) and Total Quality Management (TQM) in enhancing the performance of SMEs, drawing on the Resource-Based View (RBV) as its theoretical foundation. The proposed conceptual model highlights that while GSCM and TQM can directly improve SME performance, their influence is strengthened through innovation capability and process efficiency, which act as mediating mechanisms. Moreover, the effectiveness of these practices is contingent on contextual factors such as organizational culture, leadership commitment, and regulatory pressure, which serve as moderators of the relationship. By integrating sustainability and quality management perspectives, the model provides a holistic view of how SMEs can transform strategic practices into competitive advantage. Although this research offers important theoretical and managerial insights, it is not without limitations. First, its cross-sectional design may limit the ability to capture the long-term effects of GSCM and TQM. Second, the focus on SMEs within selected industries may restrict the generalizability of the findings to larger firms or other sectors. Finally, reliance on self-reported survey data could introduce potential response bias. Future studies should adopt longitudinal research designs to capture the dynamic effects of GSCM and TQM over time. Comparative studies between SMEs and large firms, or across different regional and cultural contexts, would also enrich understanding of how contextual factors shape these relationships. Furthermore, integrating additional mediators such as digital transformation, knowledge management, or sustainable innovation could extend the explanatory power of the model. On the practical side, policymakers and industry associations should promote training, subsidies, and regulatory frameworks that encourage SMEs to adopt integrated green and quality practices. Collectively, these future directions would not only validate but also extend the findings of the current research, contributing to both academic scholarship and SME competitiveness in increasingly turbulent markets.

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