Jurnal Akuntansi, Ekonomi dan Manajemen Bisnis
Vol. 14 No. 1, June 2026, 107-115
E-ISSN: 2548-9836

Article History
Received May, 2026
Accepted June, 2026

THE MEDIATING ROLE OF GREEN INNOVATION IN THE RELATIONSHIP BETWEEN GREEN MARKETING STRATEGY, GREEN SUPPLY CHAIN MANAGEMENT, AND BUSINESS PERFORMANCE: EVIDENCE FROM BATAM MSMEs

Ainun Azizah[1], Ninda Wahyuni Binti Kasmin[2], Yohana Agustina Simamora[3], Winda Gokma Fransiska[4], Rania Okta Aryanti[5], Nadia Fathurrahmi Lawita[6]

[1,2,3,4,5,6] Batam State Polytechnic
Applied Business Administration Study Program
Parkway Street, Batam Centre, Batam 29461, Indonesia
[2] E-mail: nindawahyuni019@gmail.com

Abstract

This research explores the function of Green Innovation (GI) as a mediator linking Green Marketing Strategy (GMS) and Green Supply Chain Management (GSCM) to Business Performance (BP) within MSMEs in Batam City. To resolve inconsistent empirical findings across various sectors, a quantitative approach was employed, surveying 45 purposively chosen operators from the food and beverage, handicraft, and agribusiness industries. Data evaluated through SEM-PLS using SmartPLS 4.0 indicate that both GMS and GSCM exert a positive influence on GI and BP. Furthermore, GI directly drives BP and functions as a partial mediator in the relationships between the two green strategies and firm performance. Theoretically, this study enriches the Natural Resource-Based View (NRBV) framework by illustrating GI's capacity to bridge environmental initiatives with measurable outcomes. Practically, it equips policymakers and MSME owners with actionable strategies to build sustainable competitive advantages through formalized green innovation.

Keywords: Green Innovation, Green Marketing Strategy, Green Supply Chain Management, Business Performance, MSMEs.

1. Introduction

Global economic development and rapid industrialization have triggered severe environmental challenges. The accumulation of greenhouse gas emissions from industrial and economic activities has led to rising global temperatures (Intergovernmental Panel on Climate Change, 2022). One sector that is often overlooked in this environmental discourse is Micro, Small, and Medium Enterprises (MSMEs). Although MSMEs operate on a relatively smaller scale compared to large corporations, their aggregate carbon footprint is substantial, primarily due to fossil fuel dependency, inadequate waste management, and a heavy reliance on non-environmentally friendly raw materials (Wildnerova et al., 2024).

In Indonesia, MSMEs occupy a strategically vital position in the national economy. Data from the Kementerian Koordinator Bidang Perekonomian Republik Indonesia (2025) indicate that MSMEs contribute over 60% of Gross Domestic Product (GDP) and provide employment for nearly 97% of the workforce across more than 64 million business units. Despite this economic significance, the integration of green-oriented practices among MSMEs remains markedly limited. Barriers such as restricted access to eco-friendly technology, insufficient knowledge regarding waste management, and low managerial capacity in embedding sustainability into business strategies have resulted in suboptimal environmental governance (Ilyas et al., 2025). This indicates that sustainability-based Business Performance (BP) has not been fully integrated into MSMEs marketing or supply chain management practices.

In response to heightened consumer demands and stringent environmental regulations, Green Marketing Strategies (GMS) have emerged as pivotal frameworks that embed eco-friendly principles across the marketing mix: product, pricing, place, and promotion

(Hasnah Devina et al., 2022; Rahmatullah et al., 2024). Complementarily, Green Supply Chain Management (GSCM) integrates environmental sustainability across all supply chain activities, from product design and raw material procurement to post-consumption waste management (Lutfian & Isfianadewi, 2023; Rahmatullah et al., 2024). The simultaneous adoption of these strategies can stimulate Green Innovation (GI), which encompasses product and process innovations that prioritize resource efficiency, waste reduction, and minimized ecological impact (Chhetri et al., 2025; Tjahjadi et al., 2020). Ultimately, the holistic implementation of GMS, GSCM, and GI is theorized to improve BP, assessed not only through financial indicators such as profitability but also through non-financial metrics like customer satisfaction, corporate reputation, and long-term sustainability (Lutfian & Isfianadewi, 2023; Novitasari & Agustia, 2021).

However, a critical review of previous research reveals important empirical inconsistencies that warrant further investigation. Previous research indicates that GSCM significantly contributes to operational cost efficiency in SMEs (Siregar & Pinagara, 2022). Furthermore, while Chhetri et al. (2025) found that green marketing orientation directly and strongly improves BP, Rahmatullah et al. (2024) discovered that GI mediates the GSCM BP link but fails to mediate the GMS BP relationship. These divergent results underscore a notable gap in the existing literature: the mediating mechanism of GI appears to be highly context-dependent, necessitating deeper investigation in unique and underexplored operational settings.

Given these inconsistencies and the scarcity of studies focusing on MSMEs in special economic zones such as Batam, this study further examines the interrelationship among GMS, GSCM, and BP by positioning GI as a mediating variable in MSMEs within the Food and Beverage (F&B), craft, and agribusiness sectors in Batam City. The selection of these sectors is based on their significant contribution to waste generation and the characteristics of the waste produced.

Batam City offers a particularly relevant and compelling context to address this gap. As a strategic special economic zone in the Riau Islands, Batam hosts a diverse MSME ecosystem operating within sectors that generate high environmental impacts. Specifically, the Food and Beverage (F&B) sector contributes 46.15% of organic waste and 21.03% of plastic waste (Kementerian Lingkungan Hidup/Badan Pengendalian Lingkungan Hidup, 2025); the craft sector relies heavily on natural raw materials, requiring urgent innovation in sustainable alternatives (Syamsuddin & Nurhadi, 2025); and the agribusiness sector possesses significant waste generation potential (Dinas Lingkungan Hidup Kota Batam, 2024). Furthermore, environmental data reveals that only 17% of waste in Batam was managed through 3R-based approaches in 2023 (Dinas Komunikasi dan Informatika Kota Batam, 2026). In a confined island ecosystem like Batam, these ecological pressures make it exceptionally urgent for local MSMEs to adopt green innovations to sustain business operations without causing irreversible environmental degradation. Yet, no prior study has systematically investigated the interplay of GMS, GSCM, GI, and BP within this multi-sector context.

Accordingly, this study aims to fill the aforementioned gap through a comprehensive analysis of the mediating role of GI in the relationships between green strategies (GMS and GSCM) and business performance among Batam MSMEs. This study's novelty stems from its integration of three interconnected paradigms into a single, cohesive structural model, applied specifically to cross-sector MSMEs in a special economic zone, a context previously neglected in the literature. Theoretically, this study contributes to the Natural Resource Based View (NRBV) by positioning Green Innovation as a dynamic capability that translates strategic environmental initiatives into superior firm performance. In practical terms, this study contributes a systematic diagnostic framework through which MSME practitioners and local policymakers can pursue sustainable business growth.

2. Literature Review

2.1 Green Marketing Strategy (GMS) and Business Performance

Green Marketing Strategy (GMS) is defined as a managerial approach that proactively integrates environmental sustainability into corporate responsibility and marketing activities (Hasnah Devina et al., 2022; Suherman & Puspaningrum, 2023). Unlike conventional marketing, GMS aligns business practices with ecological sustainability to satisfy eco-conscious consumers and comply with environmental regulations (Rahmatullah et al., 2024; Tjahjadi et al., 2020). From an agribusiness perspective, this strategy can enhance competitiveness through raw material efficiency, ISO 14001 training, and eco-friendly promotion (Dzulkarnain et al., 2019). While early literature predominantly treated GMS as a descriptive construct, recent empirical studies have begun evaluating its strategic impact critically. Chhetri et al. (2025) and Tjahjadi et al. (2020) assert that GMS exerts a direct, positive effect on business performance. Conversely, other scholars argue that GMS is merely a front-end strategy that may not independently drive performance without being coupled with backend operational adjustments or innovativeness, pointing to the need for a mediating variable (Novitasari & Agustia, 2021). Therefore, it is hypothesized that:

H1: GMS positively affects Business Performance.

2.2 Green Supply Chain Management (GSCM) and Business Performance

Green Supply Chain Management (GSCM) extends environmental considerations into the operational and logistical domains of an organization. It involves integrating eco-friendly practices throughout the supply chain lifecycle, from raw material procurement to product end-of-life management (Lutfian & Isfianadewi, 2023; Rahmatullah et al., 2024). GSCM includes internal dimensions (e.g., green manufacturing design) and external dimensions (e.g., green purchasing and customer collaboration) (Tjahjadi et al., 2023). Previous studies in the agricultural sector highlight that GSCM fosters economic and ecological sustainability (Putro & Suharjito, 2025). However, a critical limitation in the existing literature is the assumption that GSCM automatically yields superior financial performance. In the resource-constrained context of MSMEs, implementing GSCM often incurs high initial costs, meaning its direct effect on performance can be ambiguous unless it triggers efficiency-enhancing innovations. Thus, this study hypothesizes:

H2: GSCM positively affects Business Performance.

2.3 Green Innovation (GI) as a Mediating Mechanism

Green Innovation (GI) encompasses the development of products, processes, and practices explicitly designed to reduce environmental harm while optimizing resource utilization (Baquero, 2024; Chhetri et al., 2025). Rooted in the Natural Resource Based View (NRBV) theory proposed by Hart (1995), GI constitutes a distinctive organizational capability. GMS and GSCM function as external and internal pressures that create the necessary organizational conditions for GI to emerge. Once mobilized, GI, through energy efficiency, waste recycling, and eco-friendly product design, translates these strategic conditions into tangible Business Performance (BP) outcomes such as cost reduction, enhanced reputation, and product differentiation (Novitasari & Agustia, 2021).

This study argues that the relationships between GMS, GSCM, and BP are not purely direct; rather, they are complex mechanisms that require GI to span the boundary between strategic intent and performance realization. This critical synthesis leads to the following hypotheses:

H3: GMS positively affects Green Innovation.

H4: GSCM positively affects Green Innovation.

H5: Green Innovation positively affects Business Performance.

H6: Green Innovation mediates the relationship between GMS and Business Performance.

H7: Green Innovation mediates the relationship between GSCM and Business Performance:

3. Research Method

This study adopts an explanatory quantitative survey design to examine the causal relationships between GMS, GSCM, GI, and BP. The target population consists of MSME operators within the Food and Beverage (F&B), handicraft, and agribusiness sectors in Batam City who have begun integrating sustainable business practices.

To guarantee data validity and relevance, this research applied a purposive sampling approach, a non-probability method ideal for targeting participants who meet distinct operational requirements (Sugiyono, 2023). A random sampling technique was deliberately avoided, as it could involve businesses lacking green practices and consequently render the structural model untestable. Therefore, the chosen MSMEs had to fulfill six rigid criteria: (1) operating physically within Batam City; (2) functioning continuously for a minimum of three months; (3) utilizing at least one environmentally friendly raw material; (4) actively practicing waste reduction; (5) deploying eco-friendly or reduced-plastic packaging; and (6) prioritizing local suppliers. Based on Roscoe's guideline, which recommends a minimum sample size of ten times the number of latent variables, a baseline of 40 respondents was established. Ultimately, 45 valid questionnaires were gathered.

Information was gathered using a structured online survey administered via Google Forms. The questionnaire utilized established measurement scales modified from earlier notable studies (Lutfian & Isfianadewi, 2023; Rahmatullah et al., 2024; Tjahjadi et al., 2020). Participants rated their responses on a four-point Likert scale, ranging from 1 (Strongly Disagree) to 4 (Strongly Agree). This even-numbered scale was deliberately selected to remove the neutral option, thereby requiring respondents to take a clear stance. This approach significantly enhances the accuracy of measuring behaviors and perceptions related to environmental practices.

For data evaluation, Partial Least Squares Structural Equation Modeling (PLS-SEM) was executed using the SmartPLS 4.0 software. This variance-oriented technique is particularly suitable for this investigation because it handles small sample sizes effectively, does not require data normality, and supports exploratory frameworks. The analytical process involved testing the outer measurement model (focusing on reliability, alongside convergent and discriminant validity) and the inner structural model (assessing R-squared, f-squared effect sizes, and path significance). To

determine the significance of paths and mediating effects, a bootstrapping method with 5,000 resamples was applied to extract t-statistics, p-values, and confidence intervals.

4. Result and Discussion

4.1 Respondent Characteristics

Based on business location, all 45 respondents (100%) were verified to operate physically within Batam City, satisfying the geographic prerequisite (Table 1).

TABLE I

MSMES LOCATED IN BATAM

Batam MSMEs	Frequency	Percentage (%)
Yes	45	100%
No	0	0%
Total	**45**	**100%**

Source: Data compiled by the researcher, 2026

To ensure proportional analytical weight across the targeted sectors, the respondents were equally distributed: 15 respondents each from the F&B, handicraft, and agribusiness sectors (33.3% respectively) (Figure 1).

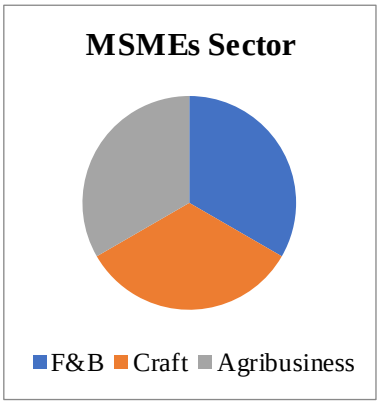

Figure 1: MSMEs Sector

Source: Data compiled by the researcher, 2026

Additionally, all businesses met the minimum maturity criterion, having operated for a minimum of three months (Table 2).

TABLE 2

BUSINESS DURATION

Business in Operation	Frequency	Percentage (%)
≥ 3 months	45	100%
≤ 3 months	0	0%
Total	**45**	**100%**

Source: Data compiled by the researcher, 2026

4.2 External Model Testing (Outer Model)

Convergent Validity

The loading factor values for each variable indicate that most indicators have values > 0.70. However, there is one indicator with a loading factor < 0.70, meaning it does not meet the validity criteria. Therefore, this indicator has been removed from the research model. The loading factor values for the indicators that meet the criteria are presented in the table below.

TABLE 3

OUTER LOADING VALUE

Variable	Indicator	Outer Loading	Validity
Green Marketing Strategy (X1)	GMS1	0.763	Valid
	GMS2	0.889	Valid
	GMS3	0.796	Valid
	GMS4	0.724	Valid
	GMS5	0.813	Valid
	GMS6	0.776	Valid
	GMS7	0.796	Valid
	GMS8	0.735	Valid
	GMS9	0.826	Valid
Green Supply Chain Management (X2)	GSCM1	0.733	Valid
	GSCM10	0.794	Valid
	GSCM2	0.821	Valid
	GSCM3	0.727	Valid
	GSCM4	0.815	Valid
	GSCM5	0.703	Valid
	GSCM6	0.753	Valid
	GSCM7	0.715	Valid
	GSCM8	0.759	Valid
	GSCM9	0.761	Valid
Green Innovation (Z)	GI1	0.843	Valid
	GI2	0.862	Valid
	GI3	0.767	Valid
	GI4	0.854	Valid
	GI5	0.784	Valid
	GI6	0.832	Valid
	GI7	0.827	Valid
Business Performance (Y)	BP1	0.818	Valid
	BP3	0.791	Valid
	BP4	0.824	Valid
	BP5	0.774	Valid
	BP6	0.81	Valid
	BP7	0.823	Valid
	BP8	0.783	Valid
	BP9	0.853	Valid

Source: Smart-PLS Primary Data, 2026

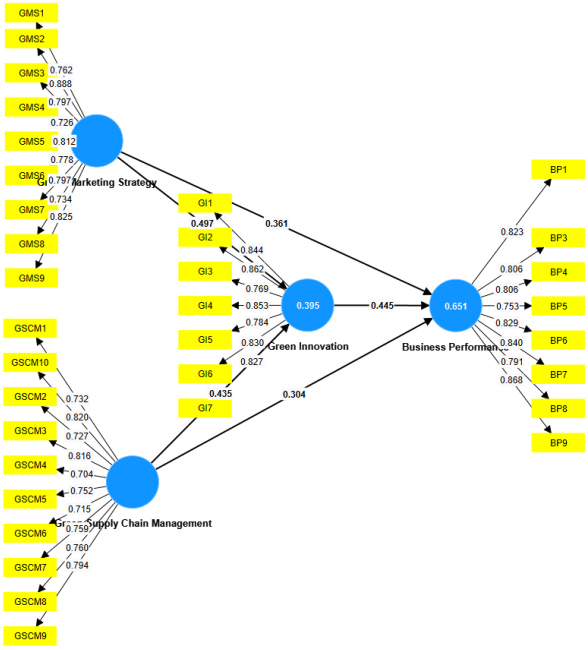

Figure 2: Graph of Factor Loadings

Source: Smart-PLS Primary Data, 2026

Composite Reliability

Construct reliability was examined using Composite Reliability and Cronbach's Alpha. As presented in Table 4, all constructs exceeded the recommended threshold of 0.70, demonstrating strong internal consistency.

TABLE 4

COMPOSITE RELIABILITY

Latent Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Green Marketing Strategy	0,926	0,933	0,938	0,627
Green Supply Chain Management	0,919	0,932	0,931	0,576
Green Innovation	0,921	0,927	0,937	0,680
Business Performance	0,923	0,930	0,936	0,623

Source: Smart-PLS Primary Data, 2026

Discriminant Validity

Applying the Fornell-Larcker criterion (Table 5), the square root of the AVE for each construct (diagonal values) is higher than its correlation with any other construct, thereby fulfilling the discriminant validity criteria.

TABLE 5

FORNELL & LACKER'S STATISTICAL VALUE

Variable	Green Marketing Strategy (X1)	Green Supply Chain Management (X2)	Green Innovation (Z)	Business Performance (Y)
Green Marketing Strategy	0,792		0,454	0,542
Green Supply Chain Management	-0,095	0,759	0,387	0,450
Green Innovation			0,825	0,719
Business Performance				0,789

Source: Smart-PLS Primary Data, 2026

4.3 Structural Model Testing (Inner Model)

R-Square Test

The explanatory power of the model was assessed through the R-squared values (Table 6). Green Innovation yielded an adjusted R^2 of 0.364 (moderate), suggesting that 36.4% of its variance is explained by GMS and GSCM. Business Performance exhibited a strong adjusted R^2 of 0.630, indicating that 63% of performance variations in Batam MSMEs are driven by the integrated green model.

TABLE 6

R-SQUARE VALUE

Variable	R-Square adjusted	Category
Green Innovation (Z)	0.364	Moderate
Business Performance (Y)	0.630	Strong

Source: Smart-PLS Primary Data, 2026

F-Square Test

The effect sizes (F-square) were interpreted based on Cohen's criteria (0.02 = small, 0.15 = moderate, 0.35 = high). Table 7 reveals that GMS exerts a high structural effect on GI (0.401) and a moderate effect on BP (0.300). GSCM and GI maintain robust, moderate effect sizes on their respective endogenous variables.

TABLE 7

F-SQUARE VALUE

Variable	Green Innovation	Business Performance
Green Innovation		0,311
Green Marketing Strategy	0,401	0,300
Green Supply Chain Management	0,309	0,231

Source: Smart-PLS Primary Data, 2026

Hypothesis Testing (Direct Effect)

Statistical significance was established using a bootstrapping procedure (5,000 resamples), evaluating the path coefficients against the t-statistic (> 1.96) and p-value (< 0.05). To ensure the robustness of the estimates, the 95% bias-corrected confidence intervals (CI) were also analyzed. A direct effect is considered significant if the confidence interval does not contain zero. Table 8 presents the direct effect results.

TABLE 8

PATH COEFFICIENT, T-STATISTIC, P-VALUE

Hypothesis	Relationship	Original Sample (O)	T-Statistic	P-Value	95% Bias-Corrected CI [2.5% , 97.5%]	Decision
H1	GMS -> Business Performance	0.361	3.957	0	[0.174 , 0.530]	Accepted
H2	GSCM -> Business Performance	0.304	2.68	0.007	[0.034 , 0.494]	Accepted
H3	GMS -> Green Innovation	0.497	4.802	0	[0.265 , 0.674]	Accepted
H4	GSCM -> Green Innovation	0.435	3.294	0.001	[0.120 , 0.639]	Accepted
H5	Green Innovation -> Business Performance	0.445	4.016	0	[0.231 , 0.670]	Accepted

Source: Smart-PLS Primary Data, 2026

The results can be explained as follows:

- H1: GMS positively affects BP (t-statistic of 3.957; p-value = 0.000); therefore, H1 is accepted.
- H2: GSCM positively affects BP (t-statistic of 2.680; p-value = 0.007); accordingly, H2 is

accepted.

- H3: GMS positively affects GI, (t-statistic of 4.802; p-value = 0.000); hence, H3 is accepted.
- H4: GSCM positively affects GI, (t-statistic of 3.294; p-value = 0.001); as a result, H4 is accepted.
- H5: GI positively affects BP (t-statistic of 4.016; p-value = 0.000); for this reason, H5 is accepted.

The results confirm that all direct hypotheses are accepted. GMS and GSCM significantly improve Business Performance (H1 & H2), as evidenced by their positive path coefficients and CI values that remain entirely above zero. Similarly, both GMS and GSCM strongly drive the adoption of Green Innovation (H3 & H4). Furthermore, Green Innovation itself is proven to be a highly significant predictor of Business Performance (H5), laying the foundation for testing the mediation mechanisms.

Mediation Analysis (Indirect Effect)

To rigorously assess the mediation mechanisms requested in the research objectives, this study examined the specific indirect effects generated by the bootstrapping procedure. A mediation is established when the indirect paths yield t-values > 1.96, p-values < 0.05, and most importantly, when the 95% bias-corrected confidence intervals do not straddle zero. The results of the mediation analysis are presented in Table 9.

TABLE 9

PATH COEFFICIENT, T-STATISTIC, P-VALUE

Hypothesis	Relationship	Original Sample (O)	T-Statistic	P-Value	95% Bias-Corrected CI [2.5% , 97.5%]	Decision
H6	GMS -> GI -> Business Performance	0.221	2.951	0.003	[0.099 , 0.395]	Accepted
H7	GSCM -> GI -> Business Performance	0.194	2.485	0.013	[0.074 , 0.387]	Accepted

Source: Smart-PLS Primary Data, 2026

- H6: The indirect effect of GMS on BP through GI is significant (t-statistic = 2.951; p-value = 0.003); therefore, H6 is accepted. So it can be concluded that GI bridges the correlation between GMS and BP.
- H7: The indirect effect of GSCM on BP through GI is significant (t-statistic = 2.485; p-value of 0.013); therefore, H7 is accepted. These findings indicate that positive GSCM will enhance GI, which in turn encourages SMEs to improve their BP.

The indirect effect analysis confirms that Green Innovation (GI) successfully bridges the relationships between the two green strategies and Business Performance.

For H6, the indirect path from GMS to Business Performance through GI is statistically significant (O = 0.221; t-statistic = 2.951; p-value = 0.003). The bias-corrected confidence interval [0.099, 0.395] does not include zero, confirming the mediation effect. Because the direct effect of GMS on BP (H1) also remains significant, GI acts as a partial mediator. This implies that while green marketing alone can enhance performance, its impact is substantially amplified when it stimulates tangible green innovations.

Similarly, for H7, the indirect path from GSCM to Business Performance via GI is significant (O = 0.194; t-statistic = 2.485; p-value = 0.013), with a confidence interval of [0.074, 0.387]. Given that the direct effect of GSCM on BP (H2) is also significant, GI again functions as a partial mediator. This demonstrates that optimizing the supply chain with environmental considerations directly benefits the firm, but channeling those supply chain capabilities into concrete innovative processes (GI) creates a secondary, highly effective pathway to superior business performance.

4.4 Goodness-of-Fit (GoF) Test

GoF is used to evaluate the general adequacy fit of the model. The GoF value is calculated by multiplying the average AVE and the average R-squared, then taking the square root of the result. GoF criteria: 0.1 = low, 0.25 = moderate, 0.36 = high.

TABLE 10

RESULTS OF THE GOF CALCULATION

Latent Construct	AVE	Adjusted R-square
Green Marketing Strategy	0.627	
Green Supply Chain Management	0.576	
Green Innovation	0.680	0.364
Business Performance	0.623	0.630
Total	**0.627**	**0.497**
GoF	**0.562**	

Source: Data processed by the researcher, 2026

The Goodness of Fit (GoF) index was employed to evaluate the overall model fit. With an average AVE of 0.627 and average R-squared of 0.497. the computed GoF is 0.562. Since this value is higher than the recommended benchmark of 0.36. the model demonstrates satisfactory overall explanatory power and model fit.

4.5 Discussion

The statistical acceptance of all direct hypotheses (H1 to H5) indicates that GMS and GSCM act as powerful drivers for improving MSME performance and stimulating eco-centric innovation. The positive effect of GMS on Business Performance (H1) confirms that marketing strategies focused on sustainability effectively respond to consumer pressures. aligning with the findings of Chhetri et al. (2025). Similarly. the validation of H2 indicates that GSCM practices reduce operational inefficiencies and resource waste. leading to better financial and non-financial metrics.

Crucially. the mediation analysis uncovers the complex

mechanism driving these outcomes. Supported by the robust confidence intervals from the bootstrapping procedure. the findings indicate that Green Innovation significantly mediates the relationship between GMS and BP (H6) as well as between GSCM and BP (H7). Because the direct effects (H1 and H2) also remain significant alongside these indirect paths. The data explicitly demonstrates a partial mediation mechanism. This indicates that while green marketing and green supply chain protocols can improve performance directly on their own. their effectiveness is significantly maximized when they are utilized to trigger technological or process-based Green Innovations within the firm.

These findings contrast with Rahmatullah et al. (2024), who found no mediating effect of GI on the GMS-BP link, but align closely with Lutfian & Isfianadewi (2023). The contextual nuances of Batam City explain this specific outcome. As a special economic zone characterized by geographical constraints and severe waste management issues (e.g., only 17% of waste managed via 3R in 2023). Batam MSMEs are disproportionately pressured to adopt tangible innovations (like alternative raw materials in crafts or eco-packaging in F&B) rather than just employing superficial green marketing. Hence. GI becomes an indispensable bridging capability. proving the Natural Resource-Based View framework in a localized MSME context.

5. Conclusion

The empirical findings of this study confirm that Green Innovation (GI) functions as a crucial partial mediator linking both Green Marketing Strategy (GMS) and Green Supply Chain Management (GSCM) to Business Performance (BP) among multi-sector MSMEs in Batam City. Based on the PLS-SEM evaluation. It is evident that although GMS and GSCM exert direct positive effects on firm performance. leveraging these environmental strategies to stimulate tangible product and process green innovations substantially amplifies overall business success.

Theoretical Contributions: This research enriches the Natural Resource-Based View (NRBV) framework by highlighting that environmental strategies must be coupled with the dynamic boundary-spanning capacity of Green Innovation to effectively translate into a sustainable competitive edge. Furthermore. the study addresses previous empirical contradictions by delivering robust evidence of this partial mediation mechanism operating within the unique multi-sector ecosystem of a special economic zone.

Practical Implications: For MSME practitioners. The study emphasizes that merely marketing a product as "green" is insufficient. Business owners must structurally embed innovation—such as sourcing alternative local materials and utilizing zero-waste production methods—to survive and scale in competitive zones like Batam. For local policymakers. these findings serve as a clarion call to provide technical and financial subsidies directed specifically toward green technological innovation. Moving beyond basic administrative MSME training.

Limitations and Recommendations for Future Research: While the current methodology successfully applied PLS-SEM on a focused group of 45 enterprises. this narrow scope inherently limits how well the conclusions apply to the entire country. To overcome these boundaries. upcoming research endeavors must scale up the participant count. Additionally. adopting a time-series approach rather than cross-sectional observations will help capture the enduring consequences of adopting sustainable practices. Scholars should also integrate contextual modifiers into their frameworks—specifically. the degree of institutional backing and the technological capabilities of the owners—to paint a complete picture of what drives sustainability in smaller commercial sectors.

References

Baquero. A. (2024). Examining the role of ambidextrous green innovation and green competitive advantage in stimulating sustainable performance: The moderating role of green absorptive capacity. *SAGE Open*. *14*(4). 1–22. https://doi.org/10.1177/21582440241294160

Chhetri. J.. Uniyal. A. K.. Khan. N.. Shareef. M. N.. & Johri. A. (2025). The Influence of Green Market Orientation on Business Performance: Exploring the Mediating Role of Green Innovation. *International Journal of Sustainable Development and Planning*. *20*(5). 1917–1923. https://doi.org/10.18280/ijsdp.200509

Dinas Komunikasi dan Informatika Kota Batam. (2026). *Data Infografis Sistem Informasi Lingkungan Hidup Kota Batam*. https://silh.batam.go.id/web/

Dinas Lingkungan Hidup Kota Batam. (2024). *Ringkasan Eksekutif Dokumen Informasi Kinerja Pengelolaan Lingkungan Hidup Daerah Kota Batam Tahun 2024*. https://share.google/365acSDH1JrlONQWN

Dzulkarnain. Santoso. I.. Ariqoh. T.. & Maulida. N.

(2019). Green marketing strategy for local specialty agro-industry development to support creative agro-industry. *IOP Conference Series: Earth and Environmental Science*. *230*(1). 012052. https://doi.org/10.1088/1755-1315/230/1/012052

Hart. S. L. (1995). A Natural-Resource-Based View of the Firm. *Academy of Management Review*. *20*(4). 986–1014. https://doi.org/10.5465/amr.1995.9512280033

Hasnah Devina. Y.. Kastaman. R.. & Mardawati. E. (2022). Green marketing strategy increases the effect of green knowledge on green purchase intention. *Advances in Food Science. Sustainable Agriculture and Agroindustrial Engineering*. *5*(2). 182–192. https://doi.org/10.21776/ub.afssaae.2022.005.02.7

Ilyas. H.. Rufaida. E. R.. Sasliana. S.. & Mus. S. F. (2025). Green UMKM : Transformasi Bisnis dalam Upaya Menjaga Kelestarian Lingkungan. *Owner*. *9*(1). 200–212. https://doi.org/10.33395/owner.v9i1.2517

Intergovernmental Panel on Climate Change. (2022). *Climate Change 2022: Mitigation of Climate Change*. https://www.ipcc.ch/report/ar6/wg3/

Kementerian Koordinator Bidang Perekonomian Republik Indonesia. (2025). *Pemerintah Dorong UMKM Naik Kelas. Tingkatkan Kontribusi terhadap Ekspor Indonesia*. https://www.ekon.go.id/publikasi/detail/6152/pemerintah-dorong-umkm-naik-kelas-tingkatkan-kontribusi-terhadap-ekspor-indonesia

Kementerian Lingkungan Hidup/Badan Pengendalian Lingkungan Hidup. (2025). *Sistem Informasi Kinerja Pengelolaan Sampah Nasional (SIPSN): Statistik Pengelolaan Sampah*. https://sampahnasional.kemenlh.go.id/

Lutfian. Z. E.. & Isfianadewi. D. (2023). Pengaruh Green Innovation Dalam Memediasi Hubungan Green Supply Chain Management Dan Sustainable Firm Performance (Studi Kasus UMKM Batik di Kota Klaten). *Jurnal Doktor Manajemen (JDM)*. *6*(1). 79–86. https://doi.org/10.22441/jdm.v6i1.19210

Novitasari. M.. & Agustia. D. (2021). Green supply chain management and firm performance: The mediating effect of green innovation. *Journal of Industrial Engineering and Management*. *14*(2). 391. https://doi.org/10.3926/jiem.3384

Putro. D. A.. & Suharjito. (2025). Green Supply Chain Management Innovation in Promoting Sustainability in Indonesia's Palm Oil Industry. *Jurnal Penelitian Pendidikan IPA*. *11*(5). 925–934. https://doi.org/10.29303/jppipa.v11i5.10951

Rahmatullah. A.. Sutiono. H.. & Kusmantini. T. (2024). Green Marketing Strategy, Green Supply Chain Management, on Business Performance: Green Innovation as Mediation. *Jurnal Riset Bisnis Dan Manajemen*. *17*(2). 49–56. https://doi.org/10.23969/jrbm.v17i2.16775

Siregar. D. H.. & Pinagara. F. A. (2022). Analysis of The Relationship between Practices and Performance of Green Supply Chain Management in Indonesian Micro. Small. and Medium Enterprises (MSMEs). *The South East Asian Journal of Management*. *16*(2). 118–138. https://doi.org/10.21002/seam.v16i2.1169

Sugiyono. P. D. (2023). *Metode Penelitian Kuantitatif. Kualitatif. dan R&D* (M. Dr. Ir. Sutopo. S.Pd (ed.); Kedua). ALFABETA.

Suherman. A. A.. & Puspaningrum. A. (2023). Pengaruh Green Marketing. Green Brand Image. dan Green Trust Terhadap Purchase Decision. *Jurnal Manajemen Pemasaran Dan Perilaku Konsumen*. *2*(4). 1002–1012. https://doi.org/10.21776/jmppk.2023.02.4.15

Syamsuddin. N.. & Nurhadi. A. (2025). Penerapan

Inovasi Bahan Baku Alternatif untuk Efisiensi Biaya dan Keberlanjutan Produk Kerajinan. *Jurnal Serambi Engineering*. *X*(3). 13766–13777.

Tjahjadi. B.. Agastya. I. B. G. A.. Soewarno. N.. & Adyantari. A. (2023). Green human capital readiness and business performance: do green market orientation and green supply chain management matter? *Benchmarking: An International Journal*. *30*(10). 3884–3905. https://doi.org/10.1108/BIJ-10-2021-0622

Tjahjadi. B.. Soewarno. N.. Hariyati. H.. Nafidah. L. N.. Kustiningsih. N.. & Nadyaningrum. V. (2020). The Role of Green Innovation between Green Market Orientation and Business Performance: Its Implication for Open Innovation. *Journal of Open Innovation: Technology. Market. and Complexity*. *6*(4). 173. https://doi.org/10.3390/joitmc6040173

Wildnerova. L.. Menon. C.. Dehghan. R.. Kinne. J.. & Lenz. D. (2024). Which SMEs are greening? In *OECD SME & Entrepreneurship Papers* (OECD SME and Entrepreneurship Papers. Vol. 60. Issue 60). https://doi.org/10.1787/ddd00999-en