ISSN 2409-2665
Journal of Logistics, Informatics and Service Science
Vol. 12 (2025) No. 7, pp. 87-102
DOI:10.33168/JLISS.2025.0706

Digital Marketing Capability and Green Innovation Effects on SME Performance: Market Orientation Mediation and Environmental Dynamism Moderation

Lambok Manurung [1], Etty Harya Ningsi [1], Chairul Imam [2]

[1] Universitas Battuta, Indonesia

[2] Universitas Pembinaan Masyarakat Indonesia, Indonesia

manurunglambok66@gmail.com

Abstract. This study investigates relationships between digital marketing capability, green innovation, and small and medium enterprise (SME) performance, examining market orientation as mediating mechanism and environmental dynamism as moderating factor. Using stratified random sampling, data were collected from 150 SME owner-managers across manufacturing and service sectors in Deli Serdang, North Sumatera, Indonesia. Cross-sectional quantitative design tested through PLS-SEM using SmartPLS 4.0, incorporating mediation and moderation analyses. Findings: Digital marketing capability ($\beta = 0.335$, $t = 3.970$, $p = 0.001$) and green innovation ($\beta = 0.270$, $t = 3.004$, $p = 0.003$) significantly enhance SME performance. Market orientation partially mediates these relationships (indirect effects: 0.175 and 0.170 respectively, both $p = 0.045$ and $p = 0.048$). Environmental dynamism moderates green innovation-performance relationship ($\beta = 0.122$, $t = 2.573$, $p = 0.010$) but not digital marketing capability-performance link. The model explains 85.9% of performance variance. SMEs should simultaneously develop digital marketing and green innovation capabilities while fostering market orientation. In dynamic environments, green innovation benefits amplify, suggesting context-dependent strategic priorities. Research extends dynamic capabilities theory demonstrating how digital and environmental capabilities create value through market-sensing mechanisms. Reveals market orientation's mediating role and environmental dynamism's boundary conditions in emerging market SMEs.

Keywords: Digital marketing capability, Green innovation, Market orientation, Environmental dynamism, SME performance, Indonesia.

1. Introduction

Contemporary small and medium enterprises (SMEs) operate in increasingly complex environments where digital transformation and sustainability imperatives intersect (Verhoef et al., 2021; Abbas & Sağsan, 2019). This convergence creates new strategic challenges and opportunities, particularly for SMEs navigating resource constraints while building capabilities enabling competitive advantage (Eller et al., 2020; Ratten & Jones, 2021).

Two critical capability domains emerged as particularly important for SME success: digital marketing capability and green innovation. Digital marketing capability enables firms to leverage technological platforms for customer engagement and market expansion (Kannan, 2017; Zhang & Zhu, 2021), while green innovation represents firms' ability to develop environmentally sustainable products, processes, and business models (Schrank & Kijkasiwat, 2024; Xie et al., 2022).

This study addresses three critical literature gaps. First, while previous research examined digital capabilities and green innovation separately (Escoz Barragan & Becker, 2025; Xie et al., 2022), few studies investigated their parallel effects on SME performance. Second, mechanisms through which these capabilities influence performance remain underexplored, particularly market orientation's mediating role (Kohli & Jaworski, 1990; Narver & Slater, 1990). Third, boundary conditions under which these relationships operate received limited attention, especially environmental dynamism as contextual moderator (Dess & Beard, 1984; Miller & Friesen, 1983).

Drawing on dynamic capability framework (Teece et al., 1997; Teece, 2007), this study develops and tests comprehensive model examining: (1) direct effects of digital marketing capability and green innovation on SME performance; (2) market orientation's mediating role; and (3) environmental dynamism's moderating influence on capability-performance linkages.

The research makes several theoretical contributions by extending dynamic capabilities theory, advancing understanding of capability complementarity, and contributing to contingency theory through revealing environmental dynamism's differential effects on capability strategies.

2. Literature Review and Hypothesis Development

2.1 Theoretical Foundation: Dynamic Capabilities Framework

Dynamic capabilities framework provides theoretical foundation for understanding how SMEs develop and deploy capabilities achieving superior performance (Teece et al., 1997; Eisenhardt & Martin, 2017). Dynamic capabilities represent firms' abilities to integrate, build, and reconfigure internal and external competencies addressing rapidly changing environments (Teece, 2007; Helfat et al., 2009).

Digital marketing capability and green innovation represent distinct dynamic capabilities that enable SMEs to sense market opportunities, seize competitive positions, and reconfigure resources for sustained advantage through separate but complementary pathways (Kindström et al., 2013; Weerawardena & Mavondo, 2011). Rather than requiring integration, these capabilities operate as parallel mechanisms for value creation, each contributing unique advantages while potentially reinforcing overall organizational performance. These capabilities are particularly crucial for SMEs operating in emerging markets, where institutional support may be limited and competitive dynamics rapidly evolving (Zahra et al., 2006).

This study examines how these two distinct dynamic capabilities create value through separate pathways while both being mediated by market orientation as a common value-creation mechanism.

2.2 Digital Marketing Capability and SME Performance

Digital marketing capability encompasses firms' abilities to effectively utilize digital technologies, platforms, and tools creating, communicating, and delivering customer value (Day, 2011; Trainor et al., 2014). For SMEs, this capability particularly valuable as it enables overcoming traditional scale and resource disadvantages through cost-effective market access and customer engagement (Quinton &

Wilson, 2016; Taiminen & Karjaluoto, 2015).

Recent empirical evidence supports digital marketing capability's performance benefits. Escoz Barragan and Becker (2025) found digital orientation significantly improves SME performance through enhanced market-sensing capabilities. Zhang and Zhu (2021) demonstrated social media strategic capabilities enhance SME innovation and disruptive capabilities through organizational learning mechanisms. Wu et al. (2024) confirmed digital marketing strategy enhances firm performance through improved customer engagement and operational efficiency. Additionally, Deku et al. (2024) revealed that digital marketing significantly improves business performance for SMEs in emerging markets, while Lu and Shaharudin (2024) emphasized the role of digital transformation in achieving sustainable competitive advantage.

Dynamic capabilities logic suggests digital marketing capability creates value by enabling SMEs to continuously sense customer needs, seize market opportunities, and reconfigure marketing resources responding to changing market conditions (Teece, 2007; Morgan, 2012).

H1: Digital marketing capability positively influences SME performance.

2.3 Green Innovation and SME Performance

Green innovation refers to firms' capabilities developing new or improved products, processes, and business models reducing environmental impact while creating economic value (Xie et al., 2022; Ahmad et al., 2023). This capability encompasses both technological innovations (cleaner production processes, eco-friendly products) and non-technological innovations (environmental management systems, sustainable business models).

For SMEs, green innovation capability offers multiple performance advantages through differentiation in environmentally conscious markets (Porter & Linde, 1995; Hart, 1995), access to green market segments with premium pricing potential, and operational efficiencies through resource optimization and waste reduction.

Empirical studies provide evidence for green innovation's performance benefits. Schrank and Kijkasiwat (2024) found green innovation significantly enhances SME financial performance, particularly when supported by sustainability readiness. Maziriri and Maramura (2022) demonstrated both green product and process innovation positively influence sustainable competitive advantage and business performance. Yin et al. (2022) further confirmed that green entrepreneurship positively impacts SME performance, with firm age serving as a moderating factor.

H2: Green innovation positively influences SME performance.

2.4 Market Orientation as Mediator

Market orientation represents firm's organization-wide generation, dissemination, and responsiveness to market intelligence (Kohli & Jaworski, 1990; Narver & Slater, 1990). This strategic orientation encompasses customer orientation, competitor orientation, and inter-functional coordination, creating market-sensing and customer-linking capability (Day, 1995; Slater & Narver, 1994).

Market orientation may serve as crucial mediating mechanism linking digital marketing capability and green innovation to performance outcomes. Digital marketing capability enhances firms' abilities to gather customer intelligence, monitor competitor activities, and coordinate marketing efforts across functions (Kumar et al., 2016; Zhang & Zhu, 2021). Similarly, green innovation requires deep understanding of evolving customer preferences, regulatory changes, and competitive responses to environmental challenges.

Recent studies have confirmed market orientation's mediating role in SME contexts. Amin et al. (2016) found market orientation mediates the relationship between entrepreneurial orientation and SME performance. Bamfo and Kraa (2019) demonstrated that market orientation mediates the relationship

between innovation and SME performance in Ghana. Bodlaj and Čater (2022) revealed that marketing capabilities mediate the relationship between market orientation and export venture performance.

Market orientation enhances performance by enabling firms to develop superior customer value propositions, respond effectively to competitive threats, and coordinate internal resources toward market opportunities (Kirca et al., 2005; Ellis, 2006). This creates value-creation chain where capabilities enhance market orientation, subsequently driving performance outcomes.

H3a: Market orientation mediates the relationship between digital marketing capability and SME performance.
H3b: Market orientation mediates the relationship between green innovation and SME performance.

2.5 Environmental Dynamism as Moderator

Environmental dynamism refers to rate and unpredictability of change in industry's competitive, technological, and regulatory environment (Dess & Beard, 1984; Miller & Friesen, 1983). High dynamism characterized by rapid changes in customer preferences, technology evolution, competitive intensity, and regulatory requirements (Jansen et al., 2006; Wang & Ahmed, 2007).

Environmental dynamism may moderate capability-performance relationships by influencing value and effectiveness of different strategic approaches. In highly dynamic environments, ability to continuously adapt and innovate becomes more critical for success (Eisenhardt & Martin, 2017; Zhang & Zhu, 2021).

Green innovation may be particularly valuable in dynamic environments due to increasing regulatory pressures, evolving consumer environmental consciousness, and rapid technological changes in clean technologies (Hart, 1995; Sharma & Vredenburg, 1998). Conversely, digital marketing capability may provide stable benefits regardless of environmental dynamism, as digital tools offer fundamental advantages in customer reach, engagement, and market intelligence gathering across various environmental conditions (Day, 2011; Borah et al., 2022).

H4a: Environmental dynamism moderates the relationship between digital marketing capability and SME performance, such that the relationship is stronger under high dynamism.
H4b: Environmental dynamism moderates the relationship between green innovation and SME performance, such that the relationship is stronger under high dynamism.

3. Research Methodology

3.1 Research Design and Philosophical Foundation

This investigation adopts positivist research paradigm, grounded in belief that objective reality exists independently and can be measured through systematic empirical inquiry (Creswell & Creswell, 2017). Given our objective to establish causal relationships between specific constructs and test theoretically-derived hypotheses, this philosophical stance provides most appropriate foundation.

Research employs quantitative, cross-sectional survey design capturing comprehensive snapshot of SME capabilities and performance at specific point in time. While this approach inherently limits ability to make definitive causal claims, it offers several advantages for theory testing in Indonesian context. The deductive research strategy moves systematically from established theoretical propositions toward empirical testing through advanced statistical modeling.

Unit of analysis centers on individual SMEs, with data collection focused on owner-managers possessing comprehensive knowledge of their firms' strategic capabilities and operational performance. These individuals serve as optimal key informants due to direct involvement in strategic decision-making processes and intimate familiarity with day-to-day operations across all functional areas.

3.2 Research Context and Sampling

Investigation unfolds in Deli Serdang Regency, North Sumatera, Indonesia—setting chosen for

remarkable diversity of SME operations and progressive government initiatives supporting both digital transformation and environmental sustainability. Constructing sampling frame required careful integration of multiple data sources ensuring comprehensive SME population coverage. We began with official database maintained by Deli Serdang Cooperative and Small-Medium Enterprise Office, housing records of 1,247 registered enterprises. We supplemented this primary source with membership lists from local Chamber of Commerce (589 additional SMEs) and various industry association registries (342 enterprises). After systematically removing duplicates and inactive businesses through verification calls, final sampling frame encompassed 1,178 unique, operational SMEs.

Following Indonesian government criteria, we focused exclusively on enterprises with annual revenues between IDR 300 million and IDR 50 billion, employing 5-99 workers, and maintaining operations for at least three years. Calculating appropriate sample size involved balancing statistical requirements with practical constraints. Hair et al. (2020) recommend "10 times rule" for PLS-SEM, requiring minimum 30 observations based on our model's maximum three paths directed toward any single construct. However, achieving adequate statistical power (0.80) to detect medium effect sizes ($f^2 = 0.15$) at $\alpha = 0.05$ demanded more substantial sample. G*Power analysis indicated 119 observations as minimum threshold, leading us to target 150 SMEs accommodating potential non-response and incomplete surveys. We employed stratified random sampling across three critical dimensions ensuring representative coverage of SME diversity: business sector (manufacturing versus services), firm size (small versus medium enterprises), and owner gender (male versus female leadership).

3.3 Data Collection

Field data collection unfolded over intensive eight-week period from March through April 2025, timeframe carefully chosen to avoid major Indonesian holidays and business disruptions. Data gathering process centered on face-to-face interviews using structured questionnaire, approach proving essential for building trust with SME owner-managers and ensuring complete, thoughtful responses. Prior to entering field, we invested considerable effort in instrument refinement through pilot testing with 15 SME managers representing diverse sectors and business sizes. We recruited and trained four experienced enumerators possessing both strong interpersonal skills and deep familiarity with Deli Serdang's business community. All interviews conducted exclusively in Bahasa Indonesia ensuring participant comfort and response accuracy. From comprehensive database, we randomly selected 180 enterprises (representing 20% oversample accommodating anticipated non-response) for interview invitations. Our field team achieved remarkable success, ultimately securing 150 complete and usable responses—impressive 83.3% response rate reflecting both quality of our enumerator training and genuine interest of SME owners in sharing experiences.

3.4 Sample Characteristics

Final sample demonstrated good representativeness across key SME dimensions. Table 1 presents detailed respondent characteristics.

Table 1. Sample Characteristics (N = 150)

Characteristic	Category	Frequency	Percentage
Business Sector	Manufacturing	87	58.00
	Services	63	42.00
Firm Size	Small (5-19 employees)	98	65.33
	Medium (20-99 employees)	52	34.67
Annual Revenue	IDR 300M - 2.5B	73	48.67
	IDR 2.5B - 15B	51	34.00
	IDR 15B - 50B	26	17.33
Firm Age	3-5 years	34	22.67

	6-10 years	58	38.67
	11-20 years	45	30.00
	>20 years	13	8.67
Owner/Manager Gender	Male	93	62.00
	Female	57	38.00
Education Level	High School	42	28.00
	Diploma/Bachelor	89	59.33
	Graduate	19	12.67
Previous Digital Training	Yes	67	44.67
	No	83	55.33
Environmental Certification	Yes	28	18.67
	No	122	81.33

Note: Sample achieved excellent geographic representation across Deli Serdang's economic landscape, spanning 12 sub-districts.

3.5 Measurement Instruments

Developing measurement approach required careful adaptation of established scales ensuring cultural relevance and conceptual accuracy within Indonesian SME context. We began with instruments validated in Western contexts, then employed rigorous back-translation procedures creating linguistically equivalent Bahasa Indonesia versions. Digital marketing capability assessment drew from Trainor et al. (2014) and Day's (2011) foundational capability frameworks, resulting in eight-item scale ($\alpha = 0.907$) encompassing firms' abilities to effectively utilize digital technologies and platforms for marketing purposes. Green innovation measurement built upon recent advances by Schrank and Kijkasiwat (2024) and Xie et al. (2022), producing seven-item scale ($\alpha = 0.909$) capturing firms' capabilities to develop environmentally sustainable products, processes, and business models. Market orientation measurement built on seminal contributions of Narver and Slater (1990) and subsequent refinements by Kohli et al. (1993), developing nine-item scale ($\alpha = 0.916$) capturing organization-wide generation, dissemination, and responsiveness to market intelligence. Environmental dynamism scale drew inspiration from Miller and Friesen (1983) and Jansen et al.'s (2006) contemporary refinements, creating six-item scale ($\alpha = 0.876$) measuring rate and unpredictability of change in competitive, technological, and regulatory environments.

Performance measurement presented unique challenges in SME context, where traditional financial metrics may be less reliable or available. We developed comprehensive eight-item scale ($\alpha = 0.922$) extending Venkatraman and Ramanujam's (1986) multidimensional approach through Wiklund and Shepherd's (2005) SME-specific refinements, capturing both financial dimensions and non-financial outcomes relative to main competitors over past three years. All measurement employed seven-point Likert scales anchored by "strongly disagree" and "strongly agree" maximizing response variance while maintaining respondent comprehension.

3.6 Data Analysis

Our analytical approach leveraged the capabilities of SmartPLS 4.0, selected for its robustness in handling complex SEMs and its particular strength in exploratory contexts. Consistent with Hair et al. (2020), we implemented a multi-stage plan that moved systematically from measurement validation to tests of structural relationships. The process opened with a thorough evaluation of the measurement model—assessing construct reliability and establishing convergent and discriminant validity for the theoretical building blocks. We then turned to the structural model, which formed the core of our inquiry, focusing on the size and significance of path coefficients and on the model's overall explanatory power. Following Hair et al. (2020) recommendations for PLS-SEM, the structural relationships were specified as follows:

$$\text{SME Performance} = \beta_1(\text{DMC}) + \beta_2(\text{GI}) + \beta_3(\text{MO}) + \beta_4(\text{DMC} \times \text{ED}) + \beta_5(\text{GI} \times \text{ED}) + \varepsilon_1$$
$$\text{Market Orientation} = \beta_6(\text{DMC}) + \beta_7(\text{GI}) + \varepsilon_2$$

Where DMC = Digital Marketing Capability, GI = Green Innovation, MO = Market Orientation, ED = Environmental Dynamism, β = path coefficients, and ε = error terms.

We complemented these tests with analyses targeting the model's underlying mechanisms. Mediation was examined using rigorous, bias-corrected bootstrapping to estimate indirect effects, illuminating how capabilities translate into performance via market orientation. Moderation was evaluated through interaction terms and simple-slopes probes to specify the conditions under which environmental dynamism strengthens or weakens capability–performance relationships. Throughout, statistical choices prioritized reliability: we employed 5,000 bootstrap subsamples and reported 95% confidence intervals for all parameters to ensure stable estimates and clear uncertainty bounds.

4. Results

4.1 Common Method Bias Assessment

Following Kock's (2015) recommendation, we conducted comprehensive full collinearity test assessing common method bias. All Variance Inflation Factor (VIF) values remained well below critical threshold of 3.3, ranging from 1.048 to 2.246, indicating no common method bias concerns.

Harman's single-factor test further validated absence of common method variance. Unrotated principal component analysis revealed first factor explained only 37.498% of total variance, substantially below problematic 50% threshold, confirming minimal common method variance effects.

4.2 Measurement Model Assessment

Measurement model achieved exemplary psychometric properties across all reliability and validity dimensions. We assessed convergent validity through factor loadings, with all indicators demonstrating satisfactory loadings above 0.70 threshold. Factor loadings ranged from 0.704 to 0.966, with majority exceeding 0.75, indicating strong item-to-construct relationships.

Table 2. Factor Loadings and Reliability Assessment

Construct	**Items**	**Cronbach's α**	**CR**	**AVE**	**VIF**
Digital Marketing Capability	8	0.907	0.925	0.608	2.347
Green Innovation	7	0.909	0.928	0.648	2.186
Market Orientation	9	0.916	0.931	0.600	3.124
Environmental Dynamism	6	0.876	0.906	0.617	1.897
SME Performance	8	0.922	0.938	0.656	N/A
Note: CR = Composite Reliability; AVE = Average Variance Extracted; VIF = Variance Inflation Factor					

Internal consistency proved robust, with Cronbach's alpha coefficients ranging from 0.876 to 0.922, while composite reliability values consistently exceeded 0.90, confirming exceptional scale reliability (see. Figure.1). Convergent validity received strong support through average variance extracted values spanning 0.608 to 0.656, all surpassing critical 0.50 benchmark.

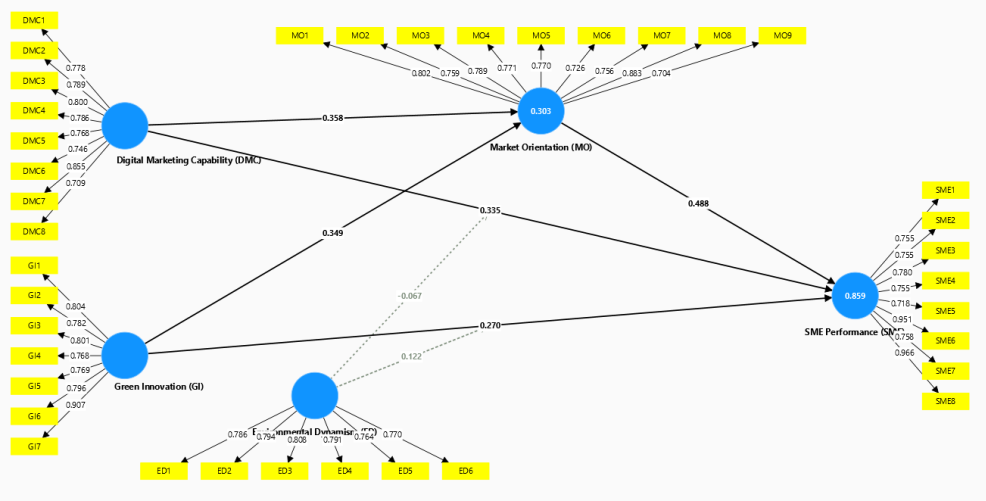

Fig.1: Outer Model (Measurement Model)

Table 3. Discriminant Validity Assessment (HTMT Criterion)

Construct	DMC	ED	GI	MO
Environmental Dynamism (ED)	0.181			
Green Innovation (GI)	0.233	0.568		
Market Orientation (MO)	0.469	0.363	0.458	
SME Performance (SME)	0.666	0.489	0.659	0.886
Note: DMC = Digital Marketing Capability; ED = Environmental Dynamism; GI = Green Innovation; MO = Market Orientation; All HTMT values below 0.900 threshold				

Discriminant validity assessment confirmed adequate construct distinctiveness through multiple rigorous criteria. HTMT ratios remained comfortably below conservative 0.900 threshold, with highest value being 0.886 for MO-SME relationship, establishing that constructs capture distinct phenomena rather than overlapping conceptual domains.

4.3 Structural Model Results

Structural model demonstrated compelling performance across multiple quality indicators. Model fit achieved good standards with SRMR reaching 0.100, meeting threshold for acceptable fit. More importantly, model exhibited substantial explanatory power, accounting for 85.9% of variance in SME performance and 30.3% in market orientation. Both R^2 values substantially exceed Cohen's (1988) benchmarks for large effects (> 0.260). Hypothesis testing revealed strong empirical support for core theoretical propositions. Digital marketing capability emerged as significant predictor of SME performance ($\beta = 0.335$, SE = 0.084, t = 3.970, p = 0.001), providing robust support for H1. Green innovation demonstrated strong effects ($\beta = 0.270$, SE = 0.090, t = 3.004, p = 0.003), confirming H2 with substantial statistical confidence.

Table 4. Direct Effects Results

Hypothesis	Path	β	SE	t-value	p-value	95% CI	Decision
H1	DMC → Performance	0.335	0.084	3.970	0.001	[0.160, 0.482]	Supported
H2	GI → Performance	0.270	0.090	3.004	0.003	[0.122, 0.467]	Supported
Note: DMC = Digital Marketing Capability; GI = Green Innovation; MO = Market Orientation; SE = Standard Error							

Figure 2 presents structural equation model results showing path coefficients and significance levels for all hypothesized relationships.

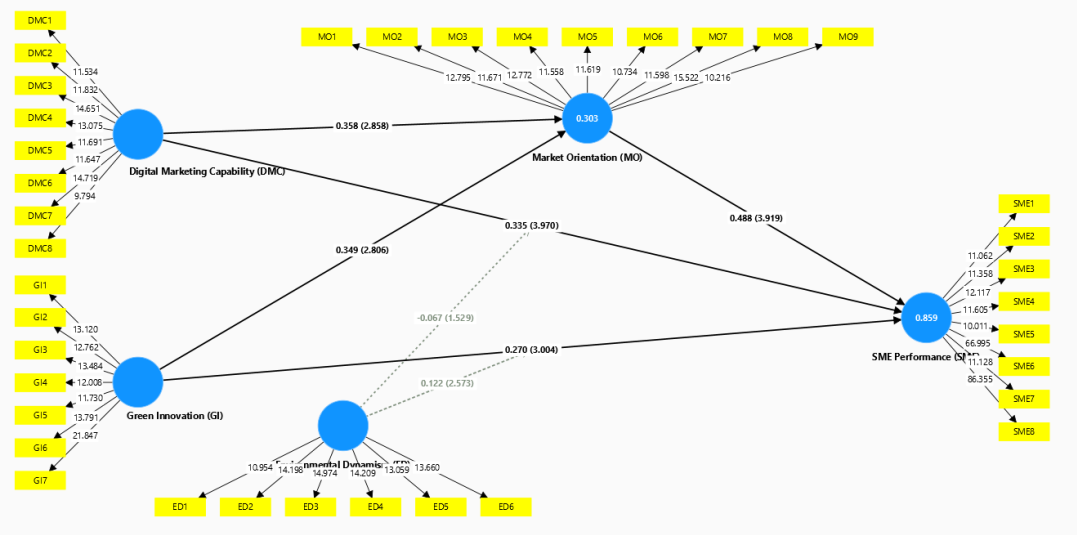

Fig.2: Inner Model (Structural Model)

4.4 Mediation Analysis

Bootstrapping procedures with 5,000 subsamples unveiled significant indirect pathways connecting capabilities to performance through market orientation mechanisms. Digital marketing capability influenced performance indirectly through market orientation (indirect effect = 0.175, SE = 0.087, t = 2.005, p = 0.045, 95% CI [0.040, 0.360]), supporting H3a. Green innovation similarly operated through market orientation pathways (indirect effect = 0.170, SE = 0.086, t = 1.983, p = 0.048, 95% CI [0.034, 0.350]), confirming H3b.

Table 5. Mediation Analysis Results

Mediation Path	**Indirect Effect**	**SE**	**t-value**	**p-value**	**95% CI**	**VAF**	**Type**
H3a: DMC → MO → Performance	0.175	0.087	2.005	0.045	[0.040, 0.360]	34.26	Partial Mediation
H3b: GI → MO → Performance	0.170	0.086	1.983	0.048	[0.034, 0.350]	38.66	Partial Mediation
Note: VAF = Variance Accounted For (indirect effect / total effect); SE = Standard Error; DMC = Digital Marketing Capability; GI = Green Innovation; MO = Market Orientation							

Variance accounted for (VAF) calculations revealed market orientation explains substantial portions of capability-performance relationships. For digital marketing capability, indirect pathway accounts for 34.26% of total effect, while green innovation shows 38.66% mediation. These patterns indicate partial rather than complete mediation.

4.5 Moderation Analysis

Environmental dynamism emerged as significant boundary condition shaping effectiveness of green innovation strategies but not digital marketing capabilities. Interaction between green innovation and environmental dynamism yielded significant results (β = 0.122, SE = 0.047, t = 2.573, p = 0.010), providing strong support for H4b. However, environmental dynamism failed to moderate digital marketing capability-performance relationship (β = -0.067, SE = 0.044, t = 1.529, p = 0.127), leading to rejection of H4a.

Table 6. Moderation Analysis Results

Hypothesis	Interaction Path	β	SE	t-value	p-value	Decision
H4a	DMC × Env. Dynamism → Performance	-0.067	0.044	1.529	0.127	Not Supported
H4b	GI × Env. Dynamism → Performance	0.122	0.047	2.573	0.010	Supported
Note: SE = Standard Error; DMC = Digital Marketing Capability; GI = Green Innovation						

4.6 Model Performance and Predictive Relevance

The integrated model explains 85.9% of SME performance variance, representing exceptional explanatory power that substantially exceeds typical SME studies (usually 35-45%) and even many large-firm studies. This high level of variance explanation demonstrates the robustness and comprehensiveness of the theoretical framework integrating digital marketing capability, green innovation, and market orientation.

Stone-Geisser Q^2 values demonstrated strong predictive validity across key constructs. Market orientation achieved $Q^2 = 0.174$, indicating medium predictive relevance, while SME performance showed $Q^2 = 0.552$, representing large predictive relevance according to established thresholds. Both Q^2 values substantially exceed the 0.020 threshold for meaningful predictive relevance, with SME performance showing particularly strong out-of-sample predictive capability. These results confirm that the model not only explains existing relationships well but also has strong capacity to predict outcomes in new samples, enhancing confidence in the theoretical framework's generalizability and practical utility.

5. Discussion

This study addresses three critical literature gaps identified in the introduction and provides empirical evidence from Indonesian SMEs that advances our understanding of SME capabilities in emerging markets. While previous research examined digital capabilities and green innovation separately, this study reveals their parallel effects on SME performance within the specific context of Indonesian SMEs. Digital marketing capability ($\beta = 0.335$, $p = 0.001$) and green innovation ($\beta = 0.270$, $p = 0.003$) both significantly enhance performance, with total effects of 0.510 and 0.440 respectively. These findings extend recent work by Escoz Barragan and Becker (2025) who found digital orientation improves SME performance, and Schrank and Kijkasiwat (2024) who demonstrated green innovation's performance benefits, by showing these capabilities work as complementary but distinct pathways rather than requiring direct integration.

Our results advance recent findings on mediating mechanisms. Ahmad et al. (2023) showed the role of management practices in green innovation effects on performance, while our study reveals market orientation partially mediates both digital marketing capability-performance (indirect effect = 0.175, VAF = 34.26%) and green innovation-performance relationships (indirect effect = 0.170, VAF = 38.66%). This extends contemporary understanding within emerging market contexts by demonstrating market orientation as an important value creation mechanism through which multiple dynamic capabilities operate in parallel.

Recent research has given limited attention to boundary conditions under which capability-performance relationships operate. Our results reveal differential moderation effects: environmental dynamism significantly moderates green innovation-performance relationship ($\beta = 0.122$, $p = 0.010$) but not digital marketing capability-performance link ($\beta = -0.067$, $p = 0.127$). This finding contrasts with Zhang and Zhu (2021) who found environmental dynamism moderates social media capabilities, suggesting different capability types respond differently to environmental conditions in our Indonesian SME context.

The substantial explanatory power (85.9%) surpasses recent SME studies, including Prihandono et al. (2024) who achieved 45% variance explanation for Indonesian SME digital transformation, and

Latifi et al. (2023) who explained significant variance in business model innovation performance. While this high explanatory power is noteworthy, it may reflect the specific characteristics of our sample and context, and should be interpreted cautiously regarding broader generalizability. Our results demonstrate that examining digital and green capabilities through market orientation in this specific context provides comprehensive understanding of these particular SME success factors.

Recent studies by Sony et al. (2024) and Kumar et al. (2020) have highlighted the importance of digital transformation for SME sustainability, particularly in the post-COVID-19 era. Our findings complement these studies by demonstrating how digital and green capabilities can be developed in parallel for superior performance outcomes.

5.1 Implications

Based on our findings from Indonesian SMEs, results offer insights for SME managers and policymakers in similar emerging market contexts. Given the substantial effects observed in our sample, SMEs may benefit from prioritizing development of both digital marketing and green innovation capabilities as parallel strategic initiatives rather than choosing one over the other. Digital marketing capabilities appear to provide robust and consistent impact across varying environmental conditions, potentially complemented by green innovation capabilities that amplify under environmental dynamism. Our results suggest SMEs should recognize market orientation as an important value creation mechanism that mediates substantial portions of capability effects on performance. The high explanatory power in our model indicates that investing across these capability domains may yield performance improvements for SMEs operating in contexts similar to our study setting.

Environmental context emerges as important for strategic decision-making in our Indonesian sample. In stable environments, our findings suggest SMEs should emphasize digital marketing capabilities, while in dynamic environments characterized by rapid regulatory changes and shifting market conditions, green innovation capabilities may become increasingly valuable.

For policymakers in emerging markets, results suggest effective SME support programs could benefit from adopting approaches that address multiple capability domains. Training programs combining digital skills development with environmental innovation support and market intelligence capabilities may yield superior outcomes compared to fragmented approaches, though this should be tested in different contexts.

These implications should be considered within the limitations of our cross-sectional study in a single Indonesian province, and future research should validate these patterns across different emerging market contexts.

5.2 Limitations and Future Research Directions

Several limitations should be noted. First, the study focuses on a single province in Indonesia, which may constrain generalizability. That said, Deli Serdang's economic diversity offers a reasonable snapshot of varied SME conditions. Second, the cross-sectional design restricts causal inference. We mitigated this risk with a strong theoretical foundation and rigorous analysis, but longitudinal designs would provide more definitive evidence.

Future research can extend this work in several ways. Longitudinal studies should track firms over time to identify causal pathways more clearly. Cross-cultural comparisons across multiple emerging markets could test whether the patterns observed here reflect broader trends beyond Indonesia. It would also be valuable to probe interaction effects—particularly between digital marketing capability and green innovation—and to examine industry-specific heterogeneity in these relationships. In addition, institutional contingencies (e.g., regulatory quality, financing access, digital infrastructure and environmental enforcement) may moderate capability effectiveness and deserve explicit modeling.

Although our findings center on Indonesian SMEs, the insights travel to many emerging-market settings where limited digital infrastructure can create first-mover advantages, environmental awareness is accelerating, and evolving regulatory frameworks open windows for capability development with

outsized returns relative to mature economies. Looking ahead, researchers should explore how digital technologies can strengthen sustainable entrepreneurship models in post-pandemic business environments, with attention to knowledge management practices, data-driven decision making, and the organizational routines that enable rapid capability scaling.

6. Conclusion

This study provides empirical evidence from Indonesian SMEs that both digital marketing capability and green innovation significantly enhance SME performance through direct effects and indirect effects mediated by market orientation. Our model demonstrates these capabilities represent important drivers of SME success in our specific emerging market context. Our findings suggest market orientation serves as an important value-creation mechanism translating capabilities into performance outcomes, highlighting the potential importance of market-sensing competencies in SME strategy within similar contexts. Differential moderation effects suggest green innovation strategies may become particularly valuable in dynamic contexts, while digital marketing capabilities appear to provide stable benefits across environmental conditions.

Within the scope of our study, research contributes to theory by providing evidence for how digital and environmental competencies create value through market-sensing mechanisms in parallel pathways. It advances understanding of capability complementarity and reveals potential boundary conditions for capability-performance relationships in SME contexts that warrant further investigation. For practitioners operating in contexts similar to our study, the research demonstrates SME success in contemporary markets may require developing multiple, complementary capabilities while maintaining strong market orientation. The substantial variance explained in our model suggests focusing on these key capability domains could meaningfully improve SME performance outcomes, though this should be validated in different settings. As markets continue digitalizing and environmental consciousness grows, capabilities examined in this study may become increasingly important for SME competitiveness and sustainability. The parallel pathways approach demonstrated here provides one potential roadmap for SMEs navigating complex contemporary business environments while building sustainable competitive advantages, though generalizability beyond our Indonesian sample requires further research. Future studies should examine these relationships across different cultural, economic, and institutional contexts to establish broader theoretical and practical validity of our findings.

Acknowledgments

The authors gratefully acknowledge financial support from Ministry of Education, Culture, Research, and Technology of Republic of Indonesia through Directorate General of Higher Education, Research, and Technology under research grant agreements No. 122/C3/DT.05.00/PL/2025 (Main Contract) and 34/SPK/LL1/AL.04.03/PL/2025, 011/04/LPPM/VI/2025 (Derivative Contract).

Appreciation extended to LLDIKTI Wilayah I Sumatera Utara and Universitas Battuta for institutional support throughout research process. Special thanks to local communities and collaborators involved in study, and research assistants who contributed to data collection and field coordination in North Sumatera.

References

Abbas, J., & Sağsan, M. (2019). Impact of knowledge management practices on green innovation and corporate sustainable development: A structural analysis. Journal of Cleaner Production, 229, 611-620.

Ahmad, N., Mahmood, A., Han, H., Ariza-Montes, A., Vega-Muñoz, A., Alam, M., & Scholz, M. (2023). The role of green innovation on environmental and organizational performance: Moderation of human resource practices and management commitment. Heliyon, 9(1), e12679.

Amin, M., Thurasamy, R., Aldakhil, A.M. and Kaswuri, A.H.B. (2016). The effect of market orientation as a mediating variable in the relationship between entrepreneurial orientation and SMEs performance. Nankai Business Review International, 7(1), 39-59.

Bamfo, B. A., & Kraa, J. J. (2019). Market orientation and performance of small and medium enterprises in Ghana: The mediating role of innovation. Cogent Business & Management, 6(1), 1605703.

Bodlaj, M., & Čater, B. (2022). Responsive and proactive market orientation in relation to SMEs' export venture performance: The mediating role of marketing capabilities. Journal of Business Research, 138, 256-265.

Borah, P. S., Iqbal, S., & Akhtar, S. (2022). Linking social media usage and SME's sustainable performance: The role of digital leadership and innovation capabilities. Technology in Society, 68, 101900.

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences, 2nd ed. Lawrence Erlbaum Associates, Hillsdale, NJ.

Creswell, J.W. and Creswell, J.D. (2017). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th ed. Sage Publications, Thousand Oaks, CA.

Day, G. S. (1995). The capabilities of market-driven organizations. The Journal of Product Innovation Management, 3(12), 257-258.

Day, G.S. (2011). Closing the marketing capabilities gap. Journal of Marketing, 75(4), 183-195.

Deku, W. A., Wang, J., & Preko, A. K. (2024). Digital marketing and small and medium-sized enterprises' business performance in emerging markets. Asia Pacific Journal of Innovation and Entrepreneurship, 18(3), 251-269.

Dess, G.G. and Beard, D.W. (1984). Dimensions of organizational task environments. Administrative Science Quarterly, 29(1), 52-73.

Eisenhardt, K. M., & Martin, J. A. (2017). Dynamic capabilities: what are they?. The SMS Blackwell handbook of organizational capabilities, 341-363.

Eller, R., Alford, P., Kallmünzer, A., & Peters, M. (2020). Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization. Journal of Business Research, 112, 119-127.

Ellis, P.D. (2006). Market orientation and performance: a meta-analysis and cross-national comparisons. Journal of Management Studies, 43(5), 1089-1107.

Escoz Barragan, K., & Becker, F. S. R. (2025). Keeping pace with the digital transformation—exploring the digital orientation of SMEs. Small Business Economics, 64(3), 1361-1385.

Hair, J.F., Howard, M.C. and Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. Journal of Business Research, 109, 101-110.

Hart, S.L. (1995). A natural-resource-based view of the firm. Academy of Management Review, 20(4), 986-1014.

Helfat, C.E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D. and Winter, S.G. (2009). Dynamic Capabilities: Understanding Strategic Change in Organizations. John Wiley & Sons, Hoboken, NJ.

Jansen, J.J., Van Den Bosch, F.A. and Volberda, H.W. (2006). Exploratory innovation, exploitative innovation, and performance: effects of organizational antecedents and environmental moderators. Management Science, 52(11), 1661-1674.

Kannan, P. K. (2017). Digital marketing: A framework, review and research agenda. International Journal of Research in Marketing, 34(1), 22-45.

Kindström, D., Kowalkowski, C. and Sandberg, E. (2013). Enabling service innovation: a dynamic capabilities approach. Journal of Business Research, 66(8), 1063-1073.

Kirca, A.H., Jayachandran, S. and Bearden, W.O. (2005). Market orientation: a meta-analytic review and assessment of its antecedents and impact on performance. Journal of Marketing, 69(2), 24-41.

Kock, N. (2015). Common method bias in PLS-SEM: a full collinearity assessment approach. International Journal of e-Collaboration, 11(4), 1-10.

Kohli, A.K. and Jaworski, B.J. (1990). Market orientation: the construct, research propositions, and managerial implications. Journal of Marketing, 54(2), 1-18.

Kohli, A.K., Jaworski, B.J. and Kumar, A. (1993). MARKOR: a measure of market orientation. Journal of Marketing Research, 30(4), 467-477.

Kumar, A., Bezawada, R., Rishika, R., Janakiraman, R. and Kannan, P.K. (2016). From social to sale: the effects of firm-generated content in social media on customer behavior. Journal of Marketing, 80(1), 7-25.

Kumar, S., Singh, B., Mehta, K., & Dhir, S. (2020). Digital transformation and knowledge management in SMEs: A systematic review and future research directions. Journal of Enterprise Information Management, 34(4), 1143-1176.

Lamberton, C. and Stephen, A.T. (2016). A thematic exploration of digital, social media, and mobile marketing: research evolution from 2000 to 2015 and an agenda for future inquiry. Journal of Marketing, 80(6), 146-172.

Latifi, M. A., Nikou, S., & Bouwman, H. (2023). Managerial ties, business model innovation & SME performance: Moderating role of environmental turbulence. Journal of Innovation & Knowledge, 8(1), 100252.

Lu, H., & Shaharudin, M. S. (2024). Role of digital transformation for sustainable competitive advantage of SMEs: a systematic literature review. Cogent Business & Management, 11(1), 2419489.

Maziriri, E. T., & Maramura, T. C. (2022). Green innovation in SMEs: The impact of green product and process innovation on achieving sustainable competitive advantage and improved business performance. Academy of Entrepreneurship Journal, 28(1), 1-14.

Miller, D., & Friesen, P. H. (1983). Strategy-making and environment: the third link. Strategic Management Journal, 4(3), 221-235.

Morgan, N. A. (2012). Marketing and business performance. Journal of the Academy of Marketing Science, 40(1), 102-119.

Narver, J. C., & Slater, S. F. (1990). The effect of a market orientation on business profitability. Journal of Marketing, 54(4), 20-35.

Porter, M. E., & Linde, C. V. D. (1995). Toward a new conception of the environment-competitiveness relationship. Journal of Economic Perspectives, 9(4), 97-118.

Prihandono, D., Wijaya, A. P., Wiratama, B., Prananta, W., & Widia, S. (2024). Digital transformation to enhance Indonesian SME performance: Exploring the impact of market competition and digital strategy. Problems and Perspectives in Management, 22(2), 103.

Quinton, S., & Wilson, D. (2016). Tensions and ties in social media networks: Towards a model of understanding business relationship development and business performance enhancement through the use of LinkedIn. Industrial Marketing Management, 54, 15-24.

Ratten, V., & Jones, P. (2021). Covid-19 and entrepreneurship education: Implications for advancing research and practice. The International Journal of Management Education, 19(1), 100432.

Schrank, J., & Kijkasiwat, P. (2024). Impacts of green innovation on small and medium enterprises' performance: The role of sustainability readiness and firm size. Business Strategy & Development, 7(3), e407.

Sharma, S., & Vredenburg, H. (1998). Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. Strategic Management Journal, 19(8), 729-753.

Slater, S.F. and Narver, J.C. (1994). Does competitive environment moderate the market orientation-performance relationship? Journal of Marketing, 58(1), 46-55.

Sony, M., Antony, J., & McDermott, O. (2024). Knowledge management and SMEs' digital transformation: A systematic literature review and future research agenda. Journal of Innovation & Knowledge, 9(2), 100733.

Taiminen, H. M., & Karjaluoto, H. (2015). The usage of digital marketing channels in SMEs. Journal of Small Business and Enterprise Development, 22(4), 633-651.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319-1350.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18(7), 509-533.

Trainor, K. J., Andzulis, J. M., Rapp, A., & Agnihotri, R. (2014). Social media technology usage and customer relationship performance: A capabilities-based examination of social CRM. Journal of Business Research, 67(6), 1201-1208.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. Academy of Management Review, 11(4), 801-814.

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research, 122, 889-901.

Wang, C. L., & Ahmed, P. K. (2007). Dynamic capabilities: A review and research agenda. International Journal of Management Reviews, 9(1), 31-51.

Weerawardena, J., & Mavondo, F. T. (2011). Capabilities, innovation and competitive advantage. Industrial Marketing Management, 40(8), 1220-1223.

Wiklund, J., & Shepherd, D. (2005). Entrepreneurial orientation and small business performance: a configurational approach. Journal of Business Venturing, 20(1), 71-91.

Wu, C. W., Botella-Carrubi, D., & Blanco-González-Tejero, C. (2024). The empirical study of digital marketing strategy and performance in small and medium-sized enterprises (SMEs). Technological Forecasting and Social Change, 200, 123149.

Xie, X., Hoang, T. T., & Zhu, Q. (2022). Green process innovation and financial performance: The role of green social capital and customers' tacit green needs. Journal of Innovation & Knowledge, 7(1), 100165.

Yin, C., Salmador, M. P., Li, D., & Lloria, M. B. (2022). Green entrepreneurship and SME performance: The moderating effect of firm age. International Entrepreneurship and Management Journal, 18(1), 255-275.

Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and dynamic capabilities: A review, model and research agenda. Journal of Management Studies, 43(4), 917-955.

Zhang, F., & Zhu, L. (2021). Social media strategic capability, organizational unlearning, and disruptive innovation of SMEs: The moderating roles of TMT heterogeneity and environmental dynamism. Journal of Business Research, 133, 183-193.