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The impact of green leadership and green commitment on green performance the mediating role of green it empowerment in SMEs

Abstract

This study examines the influence of Green Transformational Leadership (GTL) and Green Commitment (GC) on Green Performance (GP), with Green IT Empowerment (GITE) as a mediating mechanism, within small and medium-sized enterprises (SMEs) in Indonesia. Grounded in sustainability and leadership theories, the research explores how environmentally oriented leadership and organizational commitment enhance technological empowerment to improve sustainability performance in SMEs operating in a developing-country context. A quantitative explanatory design was employed, with data collected through structured questionnaires from 100 respondents across ten SMEs in Gresik, East Java, selected based on their engagement in sustainability initiatives and technology-based processes. Data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with SmartPLS to evaluate both measurement and structural models. The results indicate that GTL and GC have significant positive effects on both GITE and GP, while GITE significantly mediates the relationships between leadership, commitment, and green performance outcomes. The model explains 60.8% of the variance in GITE and 64.9% of the variance in GP, demonstrating substantial explanatory power and underscoring the pivotal role of green leadership and commitment in driving environmental performance. These findings contribute to the literature on sustainable management in SMEs within emerging economies and offer strategic implications for SME leaders and policymakers to strengthen green leadership capabilities and technology-driven empowerment initiatives to enhance long-term sustainability performance.

Keywords: Green Transformational Leadership; Green Commitment; Green IT Empowerment; Green Performance; SMEs; Indonesia

Abstrak

Penelitian ini bertujuan untuk mengkaji pengaruh Green Transformational Leadership (GTL) dan Green Commitment (GC) terhadap Green Performance (GP) dengan Green IT Empowerment (GITE) sebagai mekanisme mediasi pada usaha kecil dan menengah (UKM) di Indonesia. Berlandaskan teori keberlanjutan dan kepemimpinan, penelitian ini mengeksplorasi bagaimana kepemimpinan yang berorientasi lingkungan dan komitmen organisasi mampu memperkuat pemberdayaan teknologi guna meningkatkan kinerja keberlanjutan pada UKM di negara berkembang. Penelitian ini menggunakan desain kuantitatif eksplanatori dengan pengumpulan data melalui kuesioner terstruktur terhadap 100 responden dari sepuluh UKM di Gresik, Jawa Timur, yang dipilih berdasarkan keterlibatan dalam inisiatif keberlanjutan dan penggunaan proses berbasis teknologi. Analisis data dilakukan menggunakan Partial Least Squares–Structural Equation Modeling (PLS-SEM) melalui perangkat lunak SmartPLS untuk mengevaluasi model pengukuran dan struktural. Hasil penelitian menunjukkan bahwa GTL dan GC berpengaruh positif dan signifikan terhadap GITE dan GP, serta GITE terbukti memediasi secara signifikan hubungan antara kepemimpinan, komitmen, dan kinerja lingkungan. Model penelitian mampu menjelaskan 60,8% variasi pada GITE dan 64,9% variasi pada GP, yang menunjukkan daya jelas model yang kuat serta menegaskan peran strategis

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kepemimpinan hijau dan komitmen organisasi dalam mendorong kinerja keberlanjutan. Temuan ini berkontribusi pada literatur manajemen berkelanjutan pada UKM di negara berkembang serta memberikan implikasi strategis bagi pimpinan UKM dan pembuat kebijakan untuk memperkuat kapasitas kepemimpinan hijau dan pemberdayaan teknologi dalam meningkatkan kinerja keberlanjutan jangka panjang.

Kata Kunci: Green Transformational Leadership; Green Commitment; Green IT Empowerment; Green Performance, UKM; Indonesia

1. Introduction

In recent decades, environmental degradation, climate change, pollution, and the depletion of natural resources have emerged as critical global challenges that require organizations to reconsider their roles beyond purely economic objectives. Businesses are increasingly expected to integrate sustainability into strategic decision-making in line with the triple bottom line framework—people, planet, and profit (Molina & Rajagopal, 2023). Within this context, small and medium-sized enterprises (SMEs) play a paradoxical role: although they dominate economic activity and employment, they also contribute to environmental pressure due to limited resources, technological constraints, and managerial capability gaps (Castro & Moreira, 2024).

In Indonesia, SMEs constitute the vast majority of business entities and contribute significantly to national economic output (Algan, 2019). Nevertheless, only a small proportion of SMEs have adopted renewable energy practices, sustainable procurement systems, or environmental management certification, indicating a persistent gap between policy ambition and operational implementation. This condition highlights the importance of identifying internal organizational drivers capable of accelerating sustainability transformation within resource-constrained SME environments.

From a theoretical perspective, sustainability capability in SMEs can be understood through the integration of the Resource-Based View (RBV) and Dynamic Capabilities Theory (Eikelenboom & de Jong, 2019). RBV explains how unique organizational resources—such as leadership orientation, organizational commitment, and technological capability—can create sustainable competitive advantage (Hossain et al., 2022; El Nemar et al., 2025). Meanwhile, dynamic capabilities emphasize the firm's ability to reconfigure and deploy these resources in response to environmental change. In this regard, green leadership and digital environmental capabilitybecome central mechanisms enabling SMEs to adapt to sustainability demands.

One strategic organizational resource is Green Transformational Leadership (GTL) (Cui et al., 2023), which embeds environmental values into vision, culture, and decision-making while motivating employees toward pro-environmental innovation and behavior. Complementing leadership, Green Commitment (GC) reflects the organization's long-term dedication to sustainability through policy alignment, resource allocation, and institutional support (Nguyen et al., 2026). Although both constructs are recognized as key determinants of environmental performance, empirical evidence explaining how GTL and GC translate into measurable sustainability outcomes within SMEs—particularly in developing countries—remains limited.

Technological capability provides the operational bridge between intention and outcome (Salisu & Abu Bakar, 2020). Green IT Empowerment (GITE) enables organizations to optimize energy consumption, monitor environmental impact, and

implement data-driven sustainability decisions (Bibri, 2020; Elnour et al., 2024). From a dynamic capability perspective, GITE functions as a transformational mechanism that converts intangible leadership and commitment into tangible environmental performance. However, its mediating role in SME sustainability, especially within emerging-economy contexts, is still insufficiently explored.

Accordingly, this study develops and empirically tests an integrated theoretical framework linking Green Transformational Leadership, Green Commitment, Green IT Empowerment, and Green Performance within Indonesian SMEs. By positioning Green IT Empowerment as a mediating dynamic capability, this research contributes to sustainability management literature while offering context-sensitive insight into how SMEs in developing economies can achieve environmental performance despite structural limitations. The findings are expected to provide both theoretical enrichment and practical guidance for SME leaders and policymakers in advancing sustainable business transformation.

2. Literature riview

Sustainability performance in small and medium-sized enterprises (SMEs) can be theoretically grounded in the integration of the Resource-Based View (RBV) and Dynamic Capabilities Theory (De Moura & Saroli, 2021). The RBV posits that sustainable competitive advantage derives from firm-specific resources that are valuable, rare, inimitable, and non-substitutable (VRIN) (Purba et al., 2023). Within the sustainability context, intangible organizational resources such as leadership orientation, environmental commitment, and technological knowledge constitute strategic assets that shape long-term environmental outcomes (Alqatan et al., 2025). However, RBV alone is insufficient to explain how these resources are mobilized under conditions of rapid environmental and technological change. Dynamic Capabilities Theory complements RBV by emphasizing the firm's capacity to sense opportunities, seize them, and reconfigure internal competencies to respond to environmental pressures (Sun et al., 2024). In SMEs—particularly those operating in developing economies characterized by institutional constraints and limited resource slack—the interaction between strategic resources and adaptive capabilities becomes critical for achieving sustainability objectives. Thus, green leadership and green commitment may be conceptualized as strategic intangible resources, while Green IT Empowerment represents a dynamic capability that operationalizes sustainability strategy into measurable environmental performance.

Green Transformational Leadership (GTL) extends traditional transformational leadership theory by embedding pro-environmental vision, ethical responsibility, ecological values, and innovation stimulation into organizational processes (Qasim et al., 2024; Udin et al., 2025). GTL encourages employees to internalize environmental goals, fosters green creativity, and strengthens pro-environmental behavioral norms (Alkandi, 2025). Empirical studies demonstrate that GTL enhances green psychological climate, environmental knowledge sharing, green innovation, and sustainable performance outcomes (Chen et al., 2025; Muzakki et al., 2026). Nevertheless, existing research predominantly focuses on large corporations in developed economies, leaving limited empirical evidence regarding GTL effectiveness in SMEs. This gap is particularly significant in Indonesia, where collectivist cultural values and relatively high power-distance orientation may amplify leadership influence on employee behavior and

technology adoption. In such contexts, leaders function not merely as strategic decision-makers but as normative role models whose environmental commitment shapes organizational culture and operational practices.

Green Commitment (GC) reflects the institutionalization of sustainability values within organizational strategy, policies, managerial priorities, and resource allocation decisions (Haldorai et al., 2025). It signals long-term dedication to environmental responsibility and strengthens organizational legitimacy among stakeholders. Prior research confirms that GC positively affects environmental performance, eco-efficiency, and pro-environmental employee behavior (Nasir et al., 2023). However, commitment may remain symbolic or declarative if not supported by operational capabilities (Arellano et al., 2021). In SMEs, where formal sustainability systems are often underdeveloped, translating commitment into measurable outcomes requires mechanisms that enable implementation and monitoring.

Green IT Empowerment (GITE) represents such a mechanism. It refers to the organization's capability to leverage digital technologies, energy-efficient systems, environmental monitoring tools, and data-driven decision processes to reduce ecological impact while improving operational efficiency. From a dynamic capability perspective, GITE enables SMEs to integrate sustainability objectives with technological processes, thereby transforming intangible leadership vision and organizational commitment into tangible environmental improvements (Ahmad et al., 2026). Empirical evidence suggests that green IT adoption contributes to energy conservation, waste minimization, regulatory compliance, and enhanced environmental competitiveness (Sikder et al., 2023). However, the mediating role of GITE linking leadership and commitment to Green Performance remains underexplored, particularly within SMEs in emerging economies.

Green Performance (GP) reflects the effectiveness of organizational efforts in achieving environmental outcomes, including waste reduction, energy efficiency, emission control, regulatory compliance, and environmental reputation (Angela et al., 2025). In SMEs, GP depends not solely on strategic intention but on the alignment between intangible resources and dynamic technological capabilities. Sustainability performance thus emerges from a systemic integration of leadership, commitment, and capability deployment.

Despite growing interest in green leadership, green commitment, and green IT adoption, prior studies largely examine these constructs independently. Few studies integrate them within a unified RBV–Dynamic Capability sustainability framework, and empirical validation in developing-country SME contexts remains scarce (Coldwell et al., 2022). Furthermore, contextual explanations rooted in Indonesia's cultural and institutional environment are still limited. Addressing these gaps, the present study proposes an integrated sustainability model in which Green Transformational Leadership and Green Commitment operate as strategic organizational resources, Green IT Empowerment functions as a mediating dynamic capability, and Green Performance represents the resulting sustainability outcome. By empirically testing this framework within Indonesian SMEs, the study advances theoretical refinement of sustainability management in resource-constrained settings while providing contextually grounded insights into green transformation in emerging economies.

3. Method

3.1 Research design

This study adopted a quantitative explanatory research design to examine the causal relationships among Green Transformational Leadership (GTL), Green Commitment (GC), Green IT Empowerment (GITE), and Green Performance (GP) within SMEs in Gresik, East Java, Indonesia. An explanatory design enables theory-driven hypothesis testing and the assessment of complex direct and mediating relationships among latent variables (Hair et al., 2022). Given the objective of validating a theoretically integrated RBV–Dynamic Capabilities framework, structural equation modeling was considered the most appropriate analytical strategy (Sarstedt et al., 2022).

3.2 Population, sample, and sampling technique

The target population consisted of SME employees involved in sustainability and technology-related activities. A purposive sampling technique was employed to ensure theoretical relevance and construct validity (Sekaran & Bougie, 2016). Respondents were required to: (1) work in SMEs operating for at least three years to ensure organizational maturity, (2) be actively involved in environmental sustainability initiatives, and (3) participate in technology-based operational processes. The final sample comprised 100 employees from ten SMEs in Gresik. The sample size satisfies the minimum requirement for PLS-SEM based on the ten-times rule and statistical power considerations (Hair et al., 2022).

3.3 Measurement instrument

Data were collected using a structured questionnaire adapted from previously validated and widely cited scales in green leadership, sustainability management, and green innovation literature to ensure construct validity and theoretical alignment. Green Transformational Leadership (GTL) items were adapted from Robertson and Barling (2013) and Chen and Chang (2013), which have been extensively used in environmental leadership research. Green Commitment (GC) indicators were derived from sustainability commitment and organizational environmental orientation literature (Chen, 2011; Latan et al., 2018). Green IT Empowerment (GITE) was adapted from studies on green IT capability and environmental information systems (Molla et al., 2011; Deng & Ji, 2015). Green Performance (GP) items were adapted from prior environmental performance measurement research (Zhu, Sarkis, & Lai, 2012; Chen & Chang, 2013).

All constructs were operationalized as reflective latent variables and measured using multiple indicators on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Reflective specification is appropriate because indicators represent manifestations of the underlying latent construct (Hair et al., 2022). To ensure instrument rigor, a pilot test involving 15 SME employees was conducted to assess clarity, wording precision, and preliminary reliability. The pilot yielded Cronbach's Alpha = 0.84, exceeding the recommended threshold of 0.70 (Nunnally & Bernstein, 1994). Content validity was established through adaptation from peer-reviewed Q1/Q2 journal sources and evaluation by two academic experts in sustainability management. During the full analysis stage, construct reliability and validity were further assessed using Composite Reliability (CR),

Average Variance Extracted (AVE), Fornell–Larcker criterion, and HTMT ratio (Henseler et al., 2015; Hair et al., 2022).

Table 1. Operational definitions and measurement indicators

Variable	Operational Definition	Measurement Indicators	Key References
Green Transformational Leadership (GTL)	A leadership style that articulates an environmental vision, motivates pro-environmental behavior, and stimulates green innovation through role modeling and ethical influence.	1. Leaders communicate a clear environmental vision 2. Leaders inspire environmental responsibility 3. Leaders act as green role models 4. Leaders encourage green innovation 5. Leaders integrate environmental values into decisions	Robertson & Barling (2013); Chen & Chang (2013)
Green Commitment (GC)	The degree to which the organization demonstrates long-term dedication to sustainability through policies, resource allocation, and integration of environmental values.	1. Strong organizational environmental commitment 2. Existence of formal environmental policies 3. Allocation of resources for green initiatives 4. Environmental incentives and rewards 5. Integration of sustainability into business processes	Chen (2011); Latan et al. (2018)
Green IT Empowerment (GITE)	The organizational capability to leverage digital technologies and IT systems to enhance environmental efficiency and reduce ecological impact.	1. Digital automation reduces waste 2. IT monitors energy consumption and emissions 3. IT supports sustainability targets 4. Use of energy-efficient software systems 5. Environmentally friendly IT infrastructure	Molla et al. (2011); Deng & Ji (2015)
Green Performance (GP)	The extent to which the firm achieves measurable environmental outcomes through eco-friendly operational practices.	1. Reduction in waste generation 2. Improvement in energy efficiency 3. Compliance with environmental regulations 4. Positive environmental reputation 1. 5. Achievement of sustainability objectives	Zhu et al. (2012); Chen & Chang (2013)

Source: Authors' own work (2025)

3.4 Data analysis technique

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.1.1. PLS-SEM was selected because it is suitable for prediction-oriented research, complex mediation models, and relatively small sample sizes (Hair et al., 2022; Sarstedt et al., 2022). Additionally, PLS-SEM does not require multivariate normality, which makes it appropriate for SME survey data (Hair et al., 2022). The analysis followed a two-stage approach:

1. Measurement Model Evaluation (Outer Model)

Reliability was assessed using Cronbach's Alpha and Composite Reliability (CR), with thresholds above 0.70 considered acceptable (Hair et al., 2022). Convergent validity was evaluated using Average Variance Extracted (AVE > 0.50) and indicator loadings (> 0.70). Discriminant validity was assessed using the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT) (Henseler et al., 2015).

2. Structural Model Evaluation (Inner Model)

Hypotheses were tested using path coefficients, t-values, and p-values obtained via bootstrapping with 5,000 resamples (Hair et al., 2022). The model's explanatory power was assessed using R^2 values, while predictive relevance was examined using Q^2 statistics (Shmueli et al., 2019). Effect sizes (f^2) were also calculated to determine the magnitude of structural relationships.

The significance level was set at $p < .05$. Green IT Empowerment was specified as a mediating variable between GTL and GP, as well as between GC and GP, to examine its role as a dynamic capability transforming strategic environmental resources into measurable sustainability performance.

4. Results

4.1 Measurement model evaluation

The measurement model was assessed to ensure internal consistency reliability, convergent validity, and overall construct adequacy prior to structural model evaluation. As shown in Table 1, Cronbach's Alpha values range from 0.915 to 0.940, exceeding the recommended threshold of 0.70, indicating strong internal consistency. Composite Reliability (CR) values range between 0.932 and 0.951, further confirming construct reliability and suggesting that the indicators consistently represent their respective latent variables. Convergent validity was evaluated using Average Variance Extracted (AVE). All AVE values exceed the recommended minimum threshold of 0.50, ranging from 0.632 to 0.706, indicating that more than 50% of the variance in each construct is explained by its indicators. The highest AVE is observed for Green Transformational Leadership (0.706), reflecting strong indicator convergence (see Table 1). Overall, the measurement model demonstrates satisfactory psychometric properties, supporting the adequacy of the constructs for subsequent structural analysis.

4.2 Structural model evaluation

The explanatory power of the structural model was assessed using R^2 values. As presented in Table 2, Green IT Empowerment (GITE) demonstrates $R^2 = 0.608$, indicating that

60.8% of its variance is explained by Green Transformational Leadership (GTL) and Green Commitment (GC). According to commonly accepted benchmarks (0.25 = weak, 0.50 = moderate, 0.75 = substantial), this value reflects moderate-to-substantial explanatory power. Green Performance (GP) exhibits $R^2 = 0.652$, suggesting that 65.2% of the variance in environmental performance is jointly explained by GTL, GC, and GITE. This indicates strong model explanatory capability in the SME sustainability context.

Table 1. Reliability and convergent validity

Construct	Cronbach's Alpha	Composite Reliability	AVE
Green Commitment	0.922	0.936	0.649
Green IT Empowerment	0.915	0.932	0.632
Green Performance	0.934	0.945	0.683
Green Transformational Leadership	0.940	0.951	0.706

Source: Authors' own work (2025)

Table 2. Coefficient of Determination

Variable	R^2	Adjusted R^2
Green IT Empowerment	0.608	0.600
Green Performance	0.652	0.618

Source: Authors' own work (2025)

4.3 Predictive Relevance (Q^2)

Predictive relevance was examined using Stone–Geisser's Q^2 obtained via blindfolding procedures. As shown in Table 3, both endogenous constructs exhibit Q^2 values greater than zero (GITE = 0.590; GP = 0.484), confirming that the model possesses predictive relevance. The higher Q^2 value for GITE indicates stronger predictive accuracy for technological sustainability capability compared to final performance outcomes. This pattern is theoretically consistent, as organizational performance is typically influenced by additional external and contextual factors beyond internal leadership and capability variables.

Table 3. Predictive Relevance

Variable	Q^2
Green IT Empowerment	0.590
Green Performance	0.484

Source: Authors' own work (2025)

4.5 Hypothesis Testing

Hypotheses were tested using bootstrapping with 5,000 resamples. All structural paths are positive and statistically significant at $p < 0.05$, providing empirical support for the proposed framework (see Table 4).

The strongest direct effect is observed in the relationship between GITE and GP ($\beta = 0.487$), indicating that technological sustainability capability plays a dominant operational role in enhancing environmental performance. Although GTL ($\beta = 0.216$) and GC ($\beta = 0.179$) also exert significant direct effects on GP, their magnitudes are smaller compared to GITE, suggesting that leadership and commitment primarily influence sustainability outcomes through capability development rather than through immediate

performance impact. The significant indirect effects (H6 and H7) confirm partial mediation. Green IT Empowerment serves as a critical transmission mechanism through which strategic environmental resources—leadership orientation and organizational commitment—are translated into measurable sustainability performance. These findings empirically support the integrated RBV–Dynamic Capabilities framework, demonstrating that intangible strategic resources (GTL and GC) enhance sustainability performance most effectively when converted into operational technological capabilities (GITE). For SMEs, particularly those facing resource constraints, digital environmental capability emerges as a pivotal lever for sustainability transformation.

Table 4. Hypothesis testing results

Hypothesis	Path	β	t	p	Decision
H1	GTL → GITE	0.441	5.002	0.000	Supported
H2	GC → GITE	0.358	3.828	0.000	Supported
H3	GITE → GP	0.487	5.377	0.000	Supported
H4	GTL → GP	0.216	2.612	0.009	Supported
H5	GC → GP	0.179	2.051	0.041	Supported
H6	GTL → GITE → GP	0.218	3.587	0.001	Supported
H7	GC → GITE → GP	0.185	2.996	0.003	Supported

Source: Authors' own work (2025)

5. Discussion

The results of this study demonstrate that Green Transformational Leadership (GTL) and Green Commitment (GC) significantly shape Green IT Empowerment (GITE), providing empirical evidence that strategic intangible resources serve as foundational drivers of sustainability capability in SMEs. Aligned with the Resource-Based View (Barney, 1991), this finding confirms that organizational values and leadership vision are critical in cultivating internal resources that are valuable, rare, and difficult to imitate, especially in sustainability contexts (Hitt et al., 2020). Recent research further supports this mechanism, suggesting that sustainability leadership not only influences environmental orientation but also facilitates organizational learning and innovation adoption (Song et al., 2021; Martínez-Conesa et al., 2020). In particular, the Indonesian SME context—characterized by hierarchical structures, collectivist cultural values, and strong respect for authority—amplifies the effects of transformational leadership on employee engagement in green initiatives and technology adoption (Minkov, 2023). Thus, GTL functions as more than motivational influence; it aligns organizational beliefs, norms, and practices toward sustainability objectives. Similarly, GC reinforces organizational cohesiveness toward environmental goals and provides a normative foundation that legitimizes investments in sustainability capabilities (Jabbour et al., 2021). Together, GTL and GC create a robust cultural and strategic platform from which digital capabilities are developed and deployed effectively.

Despite significant direct effects of GTL and GC on Green Performance (GP), our findings indicate that Green IT Empowerment exerts the strongest direct influence on sustainability outcomes, underscoring the centrality of technological capability in actual performance realization. This result corroborates the logic of Dynamic Capabilities Theory, which posits that merely possessing valuable resources is insufficient unless an organization can integrate and reconfigure these resources in response to complex

environmental challenges (Teece, 2007; Helfat & Martin, 2015). This study's evidence aligns with recent sustainability research demonstrating that digital transformation and environmentally oriented IT capabilities are key determinants of green performance across sectors (Dawkins & Ngunjiri, 2021; Zhang et al., 2023). Specifically, digital capabilities enable real-time monitoring, data-driven decision-making, and automation that materially affect energy efficiency, waste reduction, and compliance with environmental regulations (Molla & Abareshi, 2024). In resource-constrained settings such as SMEs, where financial and human capital are limited, the ability to deploy digital sustainability tools may outweigh the singular effects of leadership vision or commitment. The stronger effect of GITE also extends prior findings that technological empowerment functions as a boundary-spanning capability linking internal strategy with external performance outcomes (Bai et al., 2022). Therefore, GITE can be conceptualized as a critical operational lever that actualizes abstract sustainability intentions into actionable, measurable, and scalable environmental outcomes.

Additionally, the mediator role of Green IT Empowerment reinforces that organizational strategy and commitment manifest their full impact through capability enactment. The relatively smaller direct impacts of GTL and GC on GP suggest that leadership and commitment are necessary but not sufficient conditions for performance; their effects are most potent when channeled through enabling mechanisms that facilitate execution (Raut et al., 2020). This insight holds particular relevance for SMEs, where operationalization of strategy often encounters barriers such as limited technological infrastructure, financial constraints, and skill shortages (Mittal et al., 2020). In this regard, SMEs benefit significantly from targeted investments in green technologies and IT systems that embed sustainability into core operations and performance evaluation frameworks. The contextual setting of Indonesian SMEs—characterized by regulatory uncertainty and uneven access to digital resources—amplifies the importance of internal digital empowerment as a performance driver (Siregar et al., 2023). Additionally, the unexplained variance in GP suggests that external institutional factors such as government policies, stakeholder pressures, and competitive environment may further influence sustainability performance, aligning with studies that call for multi-level models integrating organizational and environmental antecedents (Del Río et al., 2021; Bocken et al., 2021). Collectively, these findings contribute to sustainability management literature by demonstrating that effective sustainability transformation in SMEs is both resource-driven and capability-activated, and that digital empowerment represents the pivotal bridge that converts managerial intention into measurable environmental performance.

6. Conclusion

This study investigated the structural relationships among Green Transformational Leadership (GTL), Green Commitment (GC), Green IT Empowerment (GITE), and Green Performance (GP) within small and medium-sized enterprises (SMEs) in Gresik, Indonesia. The empirical findings confirm that both GTL and GC significantly enhance Green IT Empowerment, and that GITE exerts the strongest direct effect on Green Performance. Furthermore, the mediation analysis demonstrates that GITE functions as a critical transmission mechanism through which leadership orientation and organizational commitment translate into measurable environmental outcomes. These results indicate that sustainability performance in SMEs is not merely a function of visionary leadership

or normative commitment, but rather emerges from the integration of strategic intent and operational technological capability. In this integrated process, Green IT Empowerment becomes the pivotal bridge that converts sustainability aspirations into concrete improvements in energy efficiency, waste reduction, regulatory compliance, and environmental reputation. Thus, sustainability transformation in SMEs can be understood as a capability-driven process in which digital empowerment operationalizes environmental strategy.

7. Theoretical and practical contribution

Theoretically, this research advances sustainability management literature by reinforcing and extending the Resource-Based View (RBV) and Dynamic Capabilities perspectives within the SME context. First, it substantiates the argument that green leadership and green commitment represent strategic intangible resources that shape environmental orientation and internal sustainability culture. Second, it empirically demonstrates that Green IT Empowerment operates as a dynamic capability that reconfigures and deploys these resources to generate performance outcomes, thereby strengthening the resource–capability integration logic. Third, by focusing on Indonesian SMEs—an underrepresented context in global sustainability research—the study enriches empirical evidence from developing economies where institutional support, digital maturity, and financial resources may differ substantially from developed-country settings. Collectively, these contributions highlight that sustainability advantage in SMEs arises not solely from resource possession but from the effective orchestration of leadership, commitment, and technological capability within constrained organizational environments.

From a practical standpoint, the findings suggest that SME sustainability transformation should follow a structured and sequential strategic pathway. Organizations should begin by cultivating green transformational leadership to articulate environmental vision and motivate pro-environmental behavior. This should be followed by institutionalizing green commitment through formal policies, incentive systems, and dedicated resource allocation to ensure organizational alignment. Finally, SMEs must invest in Green IT Empowerment as the operational engine that embeds sustainability into daily processes and performance measurement systems. For policymakers, the results underscore the importance of strengthening digital sustainability infrastructure, providing regulatory incentives, and facilitating access to green technology support programs to accelerate SME transformation. Nevertheless, several limitations warrant consideration. The study's focus on a single regional context and a relatively modest sample size may constrain generalizability, and the exclusion of external institutional and market pressures suggests opportunities for broader modeling approaches. Future research should therefore expand cross-regional samples, incorporate regulatory and stakeholder variables, adopt longitudinal designs to capture capability evolution over time, and explore additional innovation-based mediators. Such efforts will further deepen understanding of how SMEs in emerging economies achieve sustainable performance through integrated strategic and technological capability development.

8. Limitations and future research directions

Despite its theoretical and practical contributions, this study is subject to several limitations that provide avenues for future research. First, the empirical setting was confined to SMEs in Gresik, East Java, which may limit the generalizability of the findings to other regions in Indonesia or to different developing and developed country contexts with varying institutional environments and levels of digital maturity. Second, the cross-sectional design restricts the ability to capture the dynamic evolution of green capabilities over time, whereas sustainability transformation is inherently longitudinal and path-dependent. Third, the sample size, although adequate for PLS-SEM analysis, may not fully reflect the heterogeneity of SME sectors and sustainability practices. Additionally, the model primarily focuses on internal organizational factors, without incorporating external drivers such as regulatory pressure, stakeholder expectations, market competition, or financial constraints that may significantly influence Green Performance. Future research is therefore encouraged to employ longitudinal designs, expand cross-country comparisons, integrate institutional and policy variables, and examine additional mediating or moderating mechanisms—such as green innovation capability, digital readiness, or environmental culture—to provide a more comprehensive and multi-level understanding of sustainability transformation in SMEs.

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