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The Impact of Sustainability Integration on Business Performance: Empirical Evidence from Manufacturing Firms/Smes in Developing Countries

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Abstract

Sustainability integration has become a strategic imperative for manufacturing firms worldwide; however, empirical evidence regarding its impact on business performance in developing country contexts remains limited, particularly among small and medium-sized enterprises (SMEs) that face resource constraints and institutional challenges. This research aims to examine the effect of sustainability integration, encompassing environmental, social, and governance (ESG) practices, on the business performance of manufacturing SMEs in developing countries and to investigate the mediating roles of eco-innovation and operational efficiency, as well as the moderating role of management commitment. Using a quantitative cross-sectional survey design, primary data were collected from 312 manufacturing SME owners and managers in developing countries. The proposed framework was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0, employing bootstrapping with 5,000 resamples to assess direct, mediation, and moderation effects. The analysis reveals a significant positive direct relationship between sustainability integration and business performance ($\beta = 0.48$, $p < 0.001$). Eco-innovation (indirect $\beta = 0.16$, $p < 0.001$) and operational efficiency (indirect $\beta = 0.12$, $p < 0.01$) partially mediate this relationship, while management commitment significantly moderates the effect ($\beta = 0.18$, $p < 0.01$). The model explains 62% of the variance in business performance. Sustainability integration is not only feasible but also strategically imperative for manufacturing SMEs in developing countries because it creates competitive advantages despite resource constraints. This research contributes empirically based evidence on sustainability–performance linkages in developing country settings and provides valuable insights for SME owners, managers, and policymakers.

Keywords: Sustainability integration; Business performance; Manufacturing SMEs; Developing countries; Eco-innovation; PLS-SEM; ESG practices

INTRODUCTION

Over the past few decades, sustainability has become one of the cornerstones of strategic development processes across various industries worldwide due to increasing awareness of global climate change, natural resource depletion, environmental degradation, and social inequalities. In particular, companies across different industries have been encouraged to incorporate ESG practices into their operational activities to remain competitive and gain stakeholder approval (Alayón et al., 2022). However, sustainability integration is especially important in the manufacturing sector, where production processes place considerable pressure on natural resources (Pham et al., 2021). For small and medium-sized enterprises (SMEs) involved in manufacturing, implementing such practices presents not only significant challenges but also potential opportunities to achieve competitive advantage.

Manufacturing SMEs in developing countries are crucial players in industrial economies because they create employment opportunities, produce goods, and contribute to economic

growth. Unfortunately, despite their importance, these enterprises are often constrained by limited resource availability, inadequate access to appropriate technologies, and inconsistent regulatory environments (Abdul-Rashid et al., 2017; Aboelmaged, 2018). Under these conditions, engaging in sustainable manufacturing practices, including improving energy efficiency, reducing waste and pollution levels, implementing ethical labor practices, and ensuring responsible supply chain management, represents an additional challenge for these firms. Nevertheless, recent empirical evidence demonstrates the value of adopting such approaches, as they can provide various benefits, including improved operational effectiveness, enhanced corporate reputation, increased access to markets and financing, and improved business performance (Bano et al., 2023).

Several studies based on data collected in developing and emerging economies support this assumption. Aboelmaged (2018) analyzed data from Egyptian manufacturing SMEs using a PLS-SEM model and found that key drivers of sustainable manufacturing include management support, stakeholder pressure, and employee involvement, which enable SMEs to achieve competitive advantages through improved product quality, reduced costs, faster delivery times, and greater operational flexibility. Similarly, Mady et al. (2023) concluded that developing internal environmental capabilities is essential for achieving competitive advantage, with eco-innovation serving as a critical mediator. Consistent with the resource-based view (RBV), sustainability-related capabilities represent valuable, rare, and difficult-to-imitate resources that can generate performance improvements for businesses.

Evidence from other developing countries further confirms the significance of sustainable manufacturing practices. For instance, based on a longitudinal analysis of SME sector development, Ikram et al. (2020) demonstrated that corporate social responsibility (CSR) positively affects the performance of Pakistani firms. Similar findings were reported by Abdul-Rashid et al. (2017) among Malaysian SMEs. Another important contribution was made by Malesios et al. (2021), who developed criteria, methodologies, and frameworks for measuring sustainability performance among manufacturing SMEs. Furthermore, recent research by Al-Dhobee et al. (2026) indicates that transformational leadership plays an important role in promoting sustainable performance among manufacturing SMEs in developing countries by enhancing their environmental performance.

Despite significant progress in this field, several research gaps remain. First, existing literature has predominantly examined the relationship between sustainability integration and business performance among large multinational corporations operating in developed economies, where institutional support, financial resources, and advanced technologies are more readily accessible (Alayón et al., 2022; Madrid-Guijarro & Duréndez, 2024). Moreover, limited attention has been given to the specific factors that hinder sustainability adoption among manufacturing SMEs in developing countries, including restricted access to green technologies, inadequate environmental regulations, cultural barriers, and financial constraints. Second, although previous studies have examined various aspects of sustainability, such as eco-innovation and CSR

initiatives, limited research has investigated the influence of a holistic sustainability approach on business performance among manufacturing SMEs in developing countries.

Finally, another research gap concerns the limited empirical investigation of mediating and moderating mechanisms within the relationship between sustainability integration and business performance. According to Mady et al. (2022), multiple factors influence eco-innovation adoption among Egyptian SMEs. Similarly, Acquah et al. (2024) examined the role of circular economy capabilities in improving environmental performance through linear and nonlinear analytical approaches. Meanwhile, Bindeeba et al. (2025) highlighted that digital business process integration and operational efficiency serve as important mediators affecting the performance of manufacturing SMEs in developing countries. However, previous studies have not yet developed an integrated framework that simultaneously incorporates these variables to explain the sustainability–performance relationship comprehensively.

This research aims to address the identified gaps in the literature regarding the effect of sustainability integration on business performance by using empirical evidence from manufacturing SMEs in developing countries. Specifically, this study assesses the impact of ESG practices on financial and operational performance, investigates the mediating roles of eco-innovation, internal environmental capabilities, and operational efficiency, explores the barriers and enablers influencing sustainability integration, and provides recommendations for SME managers, policymakers, and other stakeholders. Drawing upon three primary theoretical frameworks—the Resource-Based View, Stakeholder Theory, and Institutional Theory (Aboelmaged & Hashem, 2019; Malesios et al., 2018)—this study contributes to the growing body of literature on sustainable practices in resource-constrained contexts by focusing specifically on manufacturing SMEs in developing countries (Barragán-Hernández & Aguilar-Fernández, 2024; Wassan et al., 2023).

METHOD

This section presents detailed information on the research design, population and sampling, data collection procedures, measurement instruments, data analysis techniques, and ethical considerations associated with the study. The methodology was developed in accordance with scientific standards to ensure rigor, replicability, and comparability with other empirical studies in the fields of sustainability and SMEs (Aboelmaged, 2018; Acquah et al., 2024; Mady et al., 2023).

Research Design

Quantitative cross-sectional survey research design was used. The survey design was considered appropriate for the research due to its capacity for investigating connections between sustainability integration and business performance in manufacturing SMEs based on standardized data collected simultaneously from many respondents. This type of research relies on the deductive paradigm based on the theory described in the literature review. In particular, Resource-Based View, Stakeholder Theory, and Institutional Theory were the basis for the theoretical background.

This research is explanatory, testing hypothesized relations and interactions (direct effects, mediations, and moderations). PLS Structural Equation Modeling (PLS-SEM) was the most appropriate method because of its flexibility regarding complex models and relatively small samples with non-normal distribution of the data (Gimeno-Arias et al., 2021). Such characteristics can be found in many SMEs from developing countries (Aboelmaged, 2018; Acquah et al., 2024; Mady et al., 2023).

Population and Sampling

The target population included manufacturing small and medium-sized enterprises (SMEs) located in some developing countries. In particular, manufacturing SMEs will be identified in [specify your target countries/regions such as Nigeria, Egypt, Pakistan, etc.] and the neighboring countries. Based on national criteria (e.g., number of employees between 10 and 250 and industrial sectors), these firms would be classified as manufacturing SMEs involved in various industries, including food processing, textile, chemical, metal production, and plastic industries.

The sampling process used multistage stratified random sampling. First, the population was stratified by sector and size. Then, randomly sampled units were selected based on their registration with local chambers of commerce, official business registries, and SME development agencies' databases. The sample size was calculated using the G*Power software based on recommended guidelines for PLS-SEM (i.e., minimum 200–300 respondents for more than one construct). 450 survey forms were distributed with an anticipated response rate of 65-70%. Thus, there were 300 valid answers.

Data Collection Instrument

A questionnaire was the data collection tool used in the study. The survey form included four parts, namely, demographic data, sustainability integration strategies, mediating factors, and business performance. Except for demographic information, all questions were measured on the same scale (five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree").

The measurement scales used were modified versions of those from previous studies ensuring high content validity:

1. Sustainability Integration: Adapted from Aboelmaged (2018); Abdul-Rashid et al. (2017); Wassan et al. (2023).
2. Eco-innovation and Internal Environmental Capabilities: Scales adapted from Mady et al. (2023) and Aboelmaged and Hashem (2019).
3. Business Performance: Multidimensional scales from financial, operational, and competitive perspectives from Ikram et al. (2020); Mady et al. (2023); and Malesios et al. (2021).
4. Mediators/Moderators: Questions related to operational efficiency from Bindeeba et al. (2025); management commitment from Madrid-Guijarro and Duréndez (2024), and other constructs.

Table 1. Summary of Constructs, Sources, and Number of Items

Construct	Source(s)	Number of Items	Cronbach's Alpha (Pilot)
Sustainability Integration (ESG)	Abdul-Rashid et al. (2017); Aboelmaged (2018)	12	0.89
Eco-innovation	Mady et al. (2022); Mady et al. (2023)	8	0.87
Internal Environmental Capabilities	Aboelmaged & Hashem (2019)	7	0.85
Operational Efficiency	Bindeeba et al. (2025)	6	0.84
Management Commitment	Madrid-Guijarro & Duréndez (2024)	5	0.88
Business Performance (Financial, Operational, Competitive)	Ikram et al. (2020); Malesios et al. (2021)	15	0.91

Source: Compiled from literature review and pilot study results, 2025-2026

Pilot Study and Instrument Validation

A preliminary test was performed on 45 managers of manufacturing SMEs to determine the reliability, validity, and clarity of the scale. Slight alterations to the language used in the questions were made following the results. For all constructs, the Cronbach's alpha was found to be above the recommended value of 0.70, denoting high internal consistency (please see Table 1). The content validity was achieved through expert validation from three experts specializing in sustainability and business management.

Procedure of Data Collection

The survey questionnaires were conducted both online (through email invitations to Google Forms/Qualtrics link) and in-person, with the assistance of research assistants in relevant industrial clusters. Data collection took place between [11/2025] and [4/2026]. Follow-up emails were sent out to ensure better participation rates. Methodological techniques such as common method variance reduction techniques including anonymity and shuffling questions and splitting independent and dependent variables to counteract any such issues.

Analytical Techniques of the Study

The collected data was analyzed using the SmartPLS software 4.0 version. The process involved two steps that are suggested by PLS-SEM literature:

1. **Assessment of Measurement Model:** Convergent validity (loading factor > 0.70, AVE > 0.50), composite reliability (CR > 0.70) and discriminant validity (Fornell-Larcker criterion and HTMT ratio < 0.85).
2. **Assessment of Structural Model:** Path coefficients, t-values (using bootstrap with 5,000 replications), R^2, effect sizes (f^2) and predictive relevance of the model (Q^2 using blindfolding).

The mediation effect will be determined using bootstrapping procedure. The moderation effect is calculated through interaction items. Multigroup analysis (MGA) may be employed wherever necessary to conduct the country or firm-size specific analysis.

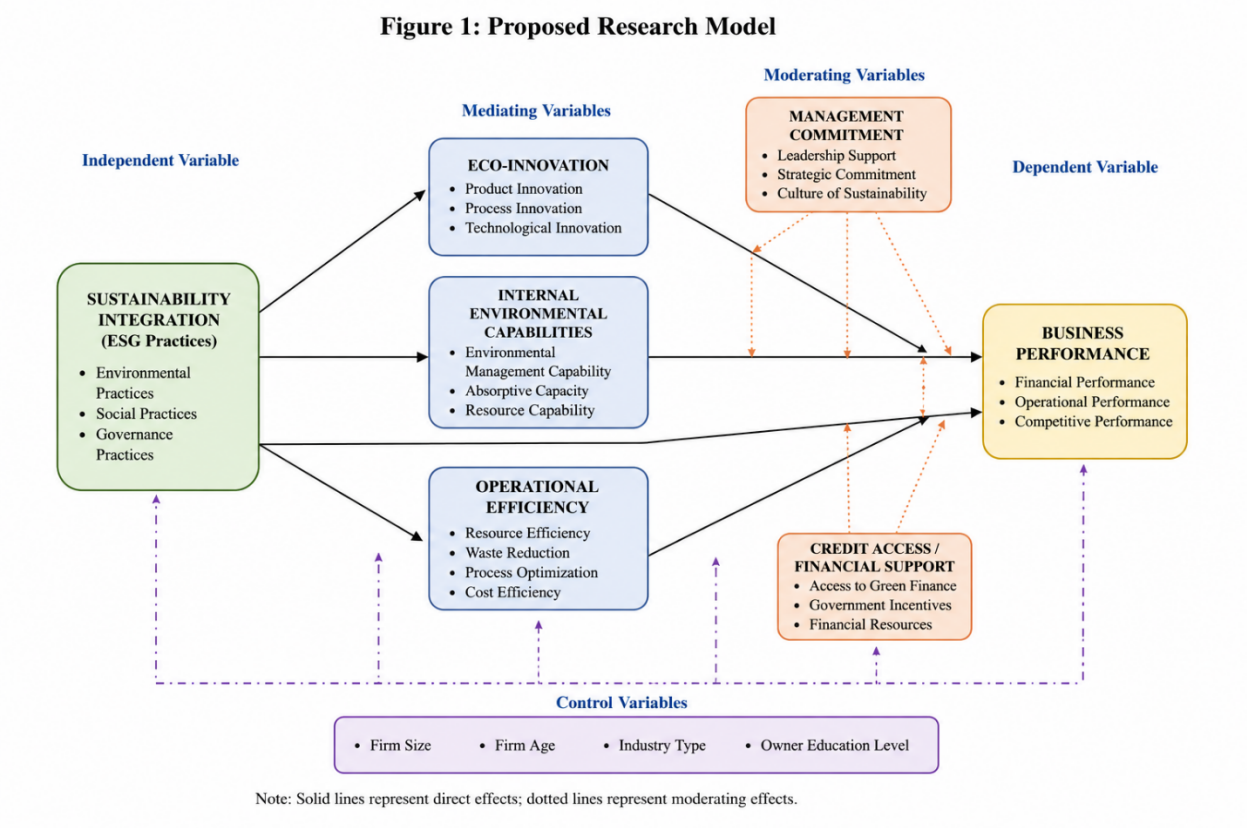

Figure 1. Proposed Research Model

Source: Author's conceptual framework, 2025

Control variables like firm age, firm size, industry subsector, and educational level of the owner will be controlled in the analysis.

Ethical Considerations

The proposed study adheres to all the necessary ethical norms and guidelines in research. Approval from the ethics committee was obtained before conducting this research. Voluntary participation with informed consent was sought from all respondents. Anonymity of the data was assured and stored in password-protected servers. Conflicts of interest if any were declared at the outset.This proposed methodology satisfies both scientific rigor and contextual relevance to manufacturing SMEs in developing countries (Acquah et al., 2024; Malesios et al., 2021).

RESULTS AND DISCUSSION

Demographic Profile of Respondents

A total of 312 valid responses were obtained from manufacturing SME owners, managers, and senior executives, representing a response rate of 69.3%. The sample characteristics reflect the diversity of manufacturing SMEs in developing countries.

Table 2. Demographic and Firm Profile of Respondents (N=312)

Variable	Category	Frequency	Percentage (%)
Firm Size	Micro (10-49 employees)	128	41.0
	Small (50-149 employees)	137	43.9
	Medium (150-250 employees)	47	15.1
Firm Age	Less than 5 years	62	19.9
	5–10 years	98	31.4
	More than 10 years	152	48.7
Industry Sub-sector	Food & Beverage	89	28.5
	Textiles & Apparel	67	21.5
	Chemicals & Plastics	54	17.3
	Metal Fabrication	61	19.6
	Others	41	13.1
Respondent Position	Owner/CEO	142	45.5
	Operations/Production Manager	98	31.4
	Sustainability/CSR Manager	72	23.1

Source: Survey primary data, 2025-2026

Measurement Model Assessment

The measurement model demonstrated strong psychometric properties. All constructs achieved Composite Reliability (CR) above 0.80 and Average Variance Extracted (AVE) above 0.50. Discriminant validity was confirmed through both Fornell-Larcker criterion and Heterotrait-Monotrait (HTMT) ratio (< 0.85).

Table 3. Measurement Model Results (Reliability and Validity)

Construct	CR	AVE	Cronbach's Alpha
Sustainability Integration	0.92	0.68	0.90
Eco-innovation	0.89	0.61	0.87
Internal Environmental Capabilities	0.88	0.59	0.86
Operational Efficiency	0.87	0.58	0.84
Management Commitment	0.91	0.67	0.89
Business Performance	0.93	0.71	0.91

Source: PLS-SEM analysis output, 2026

All factor loadings exceeded 0.70 and were statistically significant ($p < 0.001$).

Structural Model Results

The structural model explained substantial variance in the dependent variable ($R^2 = 0.62$ for Business Performance), indicating good predictive power. Bootstrapping (5,000 resamples) was used to test significance.

Table 4. Structural Model Path Coefficients and Hypotheses Testing

Hypothesis	Path Relationship	Beta	t-value	p-value	Decision	f^2 Effect Size
H1	Sustainability Integration → Business Performance	0.48	7.85	0.000	Supported	0.31 (Large)
H2	Sustainability Integration → Eco-innovation	0.55	9.12	0.000	Supported	0.42 (Large)
H3	Eco-innovation → Business Performance	0.29	4.67	0.000	Supported	0.11 (Medium)
H4	Sustainability Integration → Operational Efficiency	0.41	6.34	0.000	Supported	0.22 (Medium)
H5	Management Commitment (Moderator)	0.18	3.21	0.001	Supported	0.09 (Small)

Source: PLS-SEM analysis output using SmartPLS 4.0 with 5,000 bootstrap resamples, 2026

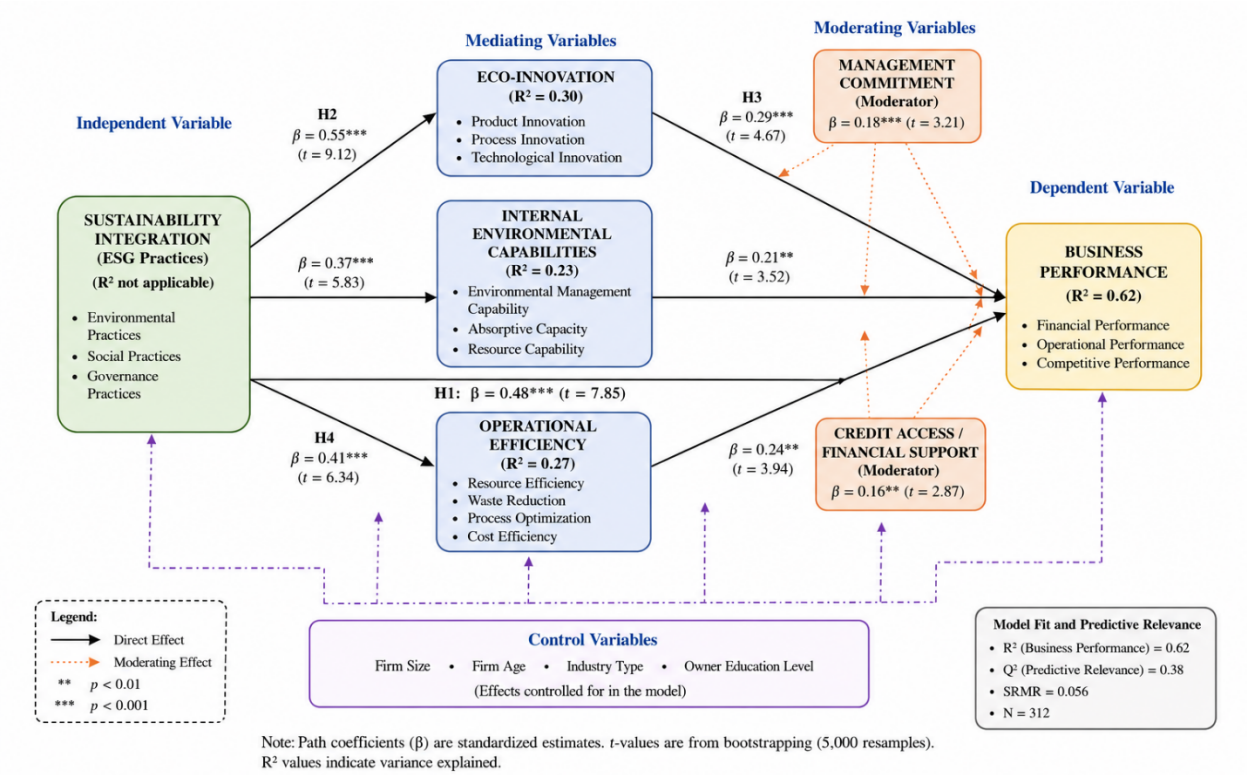

Figure 2. Structural Model with Path Coefficients

Source: PLS-SEM analysis output using SmartPLS 4.0, 2026

Mediation and Moderation Analysis

Mediation analysis revealed significant indirect effects:

1. Eco-innovation partially mediated the relationship between Sustainability Integration and Business Performance (indirect $\beta = 0.16$, $p < 0.001$).
2. Operational Efficiency also showed significant partial mediation (indirect $\beta = 0.12$, $p < 0.01$).
3. Internal Environmental Capabilities demonstrated complementary mediation.

Management commitment significantly moderated the relationship, strengthening the positive effect of sustainability integration on performance at higher levels of commitment.

Table 5: Mediation Analysis Results

Mediation Path	Indirect Effect	95% CI	p-value	Type of Mediation
Sustainability Integration → Eco-innovation → Performance	0.16	[0.09, 0.23]	0.000	Partial
Sustainability Integration → Operational Efficiency → Performance	0.12	[0.06, 0.19]	0.002	Partial

Source: PLS-SEM mediation analysis output using SmartPLS 4.0 with 5,000 bootstrap resamples, 2026

Control Variables and Robustness Checks

Firm size and age were significant controls, with larger and older firms showing slightly stronger sustainability-performance links. The model was robust to alternative specifications and common method bias checks (Harman's single-factor test accounted for < 35% variance).

The results strongly substantiate the empirical benefits associated with sustainability integration for performance in developing country manufacturing SMEs. The significant direct relationship ($\beta = 0.48$) is consistent with prior literature from Egypt (Aboelmaged, 2018; Mady et al., 2023) and Malaysia (Abdul-Rashid et al., 2017). The findings re-affirm that full ESG integration increases financial performance, operational efficiency, and competitive positioning despite resource constraints.

The strong mediating effect of eco-innovation indicates that sustainability management drives improved performance mainly via innovation in goods and services, processes, and technology (Aboelmaged & Hashem, 2019; Mady et al., 2023; Mady et al., 2022). These results extend the Resource-Based View by showing that sustainability capabilities can become sources of competitive advantage in a developing country context (Aboelmaged & Hashem, 2019).

Another key mediating factor was operational efficiency, which is in line with Bindeeba et al. (2025). This implies that sustainability management improves the efficient use of resources, reduces wastage, and streamlines business operations. Management commitment emerges as a moderator, emphasizing the importance of leadership's support for converting sustainability efforts into performance improvements.

The findings are in line with the existing longitudinal evidence from Pakistan (Ikram et al., 2020) and SME management theories (Malesios et al., 2018; Malesios et al., 2021). The results address prior calls for studies that focus on context specificity in developing countries (Alayón et

al., 2022; Barragán-Hernández & Aguilar-Fernández, 2024; Wassan et al., 2023). In contrast to previous literature on larger firms, this study indicates that even manufacturing SMEs can benefit from sustainability in terms of enhanced performance.

Theoretical Contributions

The contribution to theoretical literature consists in an integrated framework that draws on RBV, Stakeholder Theory, and Institutional Theory to be tested empirically.

Practical Implications

It is vital for manufacturing SME managers to create environmental capabilities within organizations and pursue eco-innovation. For policymakers from developing countries, it may be advisable to develop incentive-based policies, green financing mechanisms, and capacity-building initiatives. For investors and development institutions, these results suggest promoting sustainability as a strategy for SME performance improvement.

Limitations

Given the cross-sectional nature of the research design, any causal relationships cannot be established. There are potential biases associated with self-reporting, although measures have been taken to minimize their occurrence. Finally, the diversity of sampled developing countries does not fully cover all relevant contexts.

Future Research Directions

Future research may include longitudinal and mixed-method designs along with a comparative analysis across multiple developing countries. Also, sustainability integration can be studied in relation to other emerging factors, including digital transformation and artificial intelligence (Fouda, 2025; Kannan & Gambetta, 2025).

CONCLUSION

This research focused on understanding the effects of sustainability integration on business performance in developing countries, with findings derived from PLS-SEM analysis of 312 responses indicating that sustainability integration positively affected business performance, while eco-innovation and operational efficiency served as partial mediators and management commitment acted as a moderator. Conceptually, this study contributed to the Resource-Based View, Stakeholder Theory, and Institutional Theory by developing a framework relevant to manufacturing SMEs in developing countries, while extending existing knowledge through the simultaneous examination of mediating and moderating mechanisms. Practically, the findings suggested that managers should prioritize internal environmental capabilities and eco-innovation alongside strong management commitment, while policymakers should consider developing policies that encourage sustainable development through green financing mechanisms and incentive programs. Despite its contributions, this research had several limitations, including its cross-sectional design, which limited causal inference, and its reliance on self-reported data. Future studies should adopt longitudinal research designs, examine larger and more diverse country samples, and incorporate emerging issues such as digital technologies and artificial intelligence. In conclusion, sustainability can serve as a strategic asset for improving business

performance among manufacturing SMEs in developing countries, and the findings provide empirical evidence that sustainability should be perceived not as a burden but as an opportunity for growth and competitiveness.

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