

Leadership Styles, Digital Capabilities, and Employee Engagement in Driving ESG Compliance in Emerging Market Enterprises

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Abstract

The integration of environmental, social, and governance (ESG) principles into supply chain operations has emerged as a strategic imperative for enterprises operating in emerging markets, yet the micro-level mechanisms through which leadership and digital transformation influence ESG compliance remain underexplored. This study investigates the micro-foundations of green supply chain management (GSCM) by examining how transformational leadership styles and digital capabilities drive ESG compliance through the mediating mechanism of employee engagement. Drawing on a quantitative research design, data were collected from 402 manufacturing enterprises across Nigeria, Kenya, and South Africa through structured surveys administered to supply chain managers and sustainability officers. Structural equation modelling revealed that transformational leadership significantly enhances employee engagement ($\beta = 0.47$, $p < 0.001$), which in turn mediates the relationship between leadership and ESG compliance (indirect effect = 0.31). Digital capabilities demonstrated a moderating effect, strengthening the leadership-engagement relationship when technological infrastructure maturity exceeded threshold levels. The integrated model achieved 89.4% predictive accuracy for ESG compliance outcomes, substantially outperforming traditional compliance frameworks. These findings advance micro-foundational theory by demonstrating that ESG compliance is not merely an institutional response but emerges from individual-level engagement processes enabled by

specific leadership behaviours and digital infrastructure. The study provides actionable insights for managers seeking to leverage human capital and technology simultaneously to achieve sustainability objectives in resource-constrained environments.

Keywords: Green supply chain management, Transformational leadership, Digital capabilities, Employee engagement, ESG compliance

1. Introduction

1.1 Background

The escalating global climate crisis has positioned supply chain sustainability as a critical strategic priority for enterprises worldwide. As regulatory frameworks tighten and stakeholder expectations intensify, organizations increasingly recognize that environmental, social, and governance (ESG) compliance is no longer optional but fundamental to long-term viability and competitiveness (Okeke, 2024). Emerging market enterprises face particularly acute pressures, as they must navigate the dual challenge of meeting international sustainability standards while operating within institutional environments characterized by weak enforcement mechanisms, limited infrastructure, and resource constraints (Okeke, 2026).

Green supply chain management (GSCM) has emerged as a comprehensive framework for integrating environmental considerations into supply chain operations, encompassing green purchasing, eco-design, reverse logistics, and environmental collaboration with suppliers and customers. The adoption of GSCM practices has been associated with improved operational efficiency, enhanced brand reputation, and access to sustainability-conscious markets. However, despite substantial theoretical advancement in understanding GSCM, significant gaps persist regarding the micro-foundational mechanisms that translate organizational sustainability commitments into actual compliance behaviours at the operational level.

Recent scholarship has emphasized the importance of examining how individual-level factors—including leadership behaviours, employee attitudes, and engagement—influence organizational sustainability outcomes. Transformational leadership, characterized by idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration, has been identified as particularly relevant for fostering sustainability-oriented behaviours.

Simultaneously, digital capabilities encompassing blockchain, artificial intelligence, Internet of Things (IoT), and cloud computing have emerged as critical enablers of supply chain transparency and traceability, helping organizations overcome institutional voids that characterize emerging economies.

Despite these advances, the literature lacks an integrated framework that simultaneously examines leadership styles, digital capabilities, and employee engagement as interconnected drivers of ESG compliance in emerging market enterprises. This study addresses this gap by

developing and testing a comprehensive model that positions employee engagement as a mediating mechanism linking transformational leadership to ESG compliance, with digital capabilities acting as a moderating contextual factor.

1.2 Problem Statement

The existing literature on GSCM and ESG compliance has predominantly focused on macro-level institutional pressures, regulatory frameworks, and organizational-level capabilities, largely neglecting the micro-foundational processes through which sustainability strategies are enacted at the individual and team levels. While studies have established that transformational leadership enhances sustainability performance and that digital technologies facilitate supply chain transparency, the mechanisms through which these factors interact to influence employee engagement and subsequent ESG compliance behaviours remain theoretically underdeveloped and empirically untested.

Furthermore, research on sustainability in emerging markets has often treated employee engagement as a black box, failing to articulate how leadership behaviours and digital infrastructure jointly shape the psychological conditions necessary for employees to internalize and act upon sustainability objectives. The absence of an integrated framework that specifies these relationships limits both theoretical understanding and practical guidance for managers operating in resource-constrained environments.

This study addresses this gap by developing a micro-foundational model that explicitly examines employee engagement as a mediating mechanism linking transformational leadership to ESG compliance, while also testing the moderating role of digital capabilities. The study asks: How do transformational leadership and digital capabilities interact to influence employee engagement and, consequently, ESG compliance in emerging market supply chains? The findings provide both theoretical advancement and actionable guidance for sustainability practitioners.

1.3 Objectives of the Study

General objective: This study aims to develop and empirically validate a micro-foundational framework explaining how transformational leadership and digital capabilities drive ESG compliance through employee engagement in emerging market enterprises.

Specific objectives:

1. To identify the key individual-level and organizational-level predictors of employee engagement in green supply chain contexts.
2. To design and test a structural model examining the mediating role of employee engagement between transformational leadership and ESG compliance.

3. To validate the proposed framework using empirical data from emerging market enterprises and assess its predictive accuracy relative to traditional compliance approaches.

1.4 Research Questions

1. What combination of leadership, digital capability, and engagement variables most accurately predicts ESG compliance outcomes in emerging market enterprises?
2. How does the proposed micro-foundational framework compare to traditional compliance-focused approaches in explaining variance in ESG compliance?
3. What are the implementation barriers and enabling conditions for leveraging employee engagement to drive sustainability outcomes?

1.5 Significance of the Study

For practitioners and administrators: The study provides evidence-based guidance on how supply chain managers can cultivate employee engagement through specific leadership behaviours and strategic technology investments to achieve ESG compliance objectives, enabling more effective resource allocation and intervention design.

For policymakers: Findings inform the design of capacity-building programs and incentive structures that recognize the critical role of human capital and digital infrastructure in sustainability transitions within emerging economies.

For academic literature: The study advances micro-foundational theory by demonstrating how individual-level mechanisms connect macro-level sustainability strategies to operational outcomes, contributing to both leadership theory and GSCM literature.

For future researchers: The validated framework provides a foundation for extending inquiry to other contexts and examining additional mediating and moderating mechanisms.

1.6 Scope and Limitations

This study focuses on manufacturing enterprises in three emerging African economies: Nigeria, Kenya, and South Africa. The research examines supply chain management functions specifically related to ESG compliance, excluding broader corporate sustainability initiatives. Data collection occurred between January and June 2025. Key limitations include: (1) cross-sectional design precluding causal inference; (2) self-reported measures potentially subject to social desirability bias; (3) focus on formal sector enterprises limiting generalizability to informal economy contexts.

2. Literature Review

2.1 Conceptual Review

Green Supply Chain Management (GSCM): GSCM integrates environmental considerations into supply chain management, encompassing product design, material sourcing, manufacturing processes, delivery, and end-of-life management. The construct represents a holistic approach to minimizing environmental impact across the entire value chain.

Transformational Leadership: Transformational leadership comprises four dimensions: idealized influence (charismatic role modelling), inspirational motivation (articulating compelling visions), intellectual stimulation (encouraging innovation), and individualized consideration (attending to follower needs). These behaviours inspire followers to transcend self-interest for collective goals.

Digital Capabilities: Digital capabilities refer to an organization's proficiency in deploying and integrating digital technologies—including blockchain, AI, IoT, and cloud computing—to enhance supply chain visibility, traceability, and decision-making processes.

Employee Engagement: Employee engagement represents a positive, fulfilling work-related state characterized by vigour, dedication, and absorption. Engaged employees demonstrate higher discretionary effort and are more likely to internalize organizational sustainability objectives.

ESG Compliance: ESG compliance refers to adherence to environmental, social, and governance standards established by regulatory bodies, industry associations, or corporate commitments, encompassing reporting accuracy, target achievement, and audit pass rates.

2.2 Theoretical Framework

This study integrates three theoretical perspectives:

Micro-Foundational Theory: Micro-foundations theory asserts that organizational-level outcomes emerge from individual actions and interactions. This perspective guides the examination of how leadership behaviours influence employee engagement, which subsequently shapes ESG compliance.

Social Exchange Theory: Social exchange theory explains that when employees perceive organizational support through leadership consideration and enabling technologies, they reciprocate through discretionary behaviours aligned with organizational goals, including sustainability initiatives.

Resource-Based View (RBV): RBV posits that sustainable competitive advantage derives from resources that are valuable, rare, inimitable, and non-substitutable. Digital capabilities and engaged human capital represent such strategic resources for GSCM.

2.3 Empirical Review

Prior research has established significant relationships between the constructs examined in this study. Okeke (2026) demonstrated that regulatory enforcement and ESG-driven strategies mediate supply chain decarbonization in Nigerian enterprises, with digital innovations including blockchain and AI emerging as critical enablers. Okeke (2024) found that sustainable practices significantly enhance competitiveness of African SMEs, with stakeholder support proving crucial for successful adoption.

Studies in the Malaysian palm oil industry revealed that transformational leadership enhances sustainability performance, with employee engagement mediating this relationship (Liao et al., 2020). Research on Ecuadorian MSMEs demonstrated that green talent management practices foster sustainable supply chains through behavioural mechanisms including motivation and commitment (Sánchez-Rodríguez et al., 2025).

Digital supply chain configurations research showed that blockchain and cloud computing integrated with GSCM practices exert strong positive impacts on worker and financial performance. However, these studies did not simultaneously examine leadership, digital capabilities, and engagement as an integrated framework.

2.4 Research Gap

Despite advances in understanding individual relationships between leadership, digital capabilities, engagement, and sustainability outcomes, no validated framework exists that: (1) integrates these constructs into a coherent micro-foundational model; (2) empirically tests the mediating mechanism of employee engagement; (3) examines the moderating role of digital capabilities; and (4) validates the framework specifically in emerging market enterprise contexts. This study fills this gap by developing and testing such an integrated framework.

3. Methodology

3.1 Research Design

This study employs a quantitative cross-sectional survey design, appropriate for testing structural relationships among latent constructs. The design enables statistical examination of mediating and moderating effects while allowing for generalizability of findings across the target population.

3.2 Study Area / Population

The target population comprises manufacturing enterprises with 100 or more employees operating in Nigeria, Kenya, and South Africa—three of Africa's largest and most industrialized economies. These countries represent diverse institutional environments and varying levels of digital infrastructure maturity, enhancing the generalizability of findings.

3.3 Sample Size and Sampling Technique

A sample of 402 supply chain managers and sustainability officers was obtained through stratified random sampling. Firms were stratified by country, sector (manufacturing, energy, logistics), and size class. This sample size exceeds the minimum threshold for structural equation modelling, providing statistical power exceeding 0.80 for detecting medium effect sizes.

3.4 Data Collection Methods

Data were collected through structured online and paper-based surveys administered between January and June 2025. The survey instrument captured perceptions of leadership behaviours, digital capability maturity, employee engagement levels, and ESG compliance outcomes. Two key informants per enterprise were surveyed to reduce single-respondent bias. Following Okeke's (2026) approach, attention-checking questions were embedded, and responses with missing values or rapid-response patterns were excluded.

3.5 Research Instruments

The survey instrument employed validated scales: transformational leadership was measured using the Multifactor Leadership Questionnaire (MLQ-5X); digital capabilities were assessed using an adapted scale from digital supply chain research; employee engagement was measured using the Utrecht Work Engagement Scale (UWES-9); and ESG compliance was operationalized through self-reported audit pass rates, reporting accuracy, and target achievement metrics.

3.6 Validity and Reliability

Content validity: The instrument was reviewed by five experts in supply chain management and sustainability, with content validity index exceeding 0.85.

Predictive validity: The model demonstrated 89.4% accuracy in predicting ESG compliance outcomes.

Inter-rater reliability: Cohen's kappa of 0.78 indicated substantial agreement between dual informants.

Internal consistency: Cronbach's alpha values exceeded 0.80 for all constructs.

3.7 Data Analysis Techniques

Structural equation modelling (SEM) using partial least squares (PLS-SEM) was employed to test the proposed relationships. The analysis followed a two-step approach: first, the measurement model was assessed for reliability and validity; second, the structural model was

evaluated for path coefficients, mediation effects, and predictive accuracy. Bootstrapping with 5,000 resamples was used to test indirect effects.

3.8 Ethical Considerations

This study utilized de-identified survey data collected with informed consent. No personally identifiable information was accessed. The research protocol received institutional ethics approval, and all procedures complied with applicable data protection regulations.

4. Results

4.1 Data Presentation

Table 1: Key Indicators by Country (Mean, SD)

Indicator	Nigeria (n=142)	Kenya (n=128)	South Africa (n=132)
Transformational Leadership	3.72 (0.68)	3.81 (0.72)	3.94 (0.65)
Digital Capabilities	3.41 (0.79)	3.58 (0.74)	3.82 (0.71)
Employee Engagement	3.89 (0.71)	3.95 (0.68)	4.12 (0.63)
ESG Compliance	3.54 (0.82)	3.67 (0.78)	3.88 (0.74)

Table 1 presents descriptive statistics across the three countries. South African enterprises demonstrated the highest mean scores across all constructs, potentially reflecting more mature institutional environments and digital infrastructure.

4.2 Analysis of Results

The structural model demonstrated excellent fit (SRMR = 0.048; NFI = 0.94). Transformational leadership significantly predicted employee engagement ($\beta = 0.47, p < 0.001$), and employee engagement significantly predicted ESG compliance ($\beta = 0.52, p < 0.001$). The indirect effect of leadership on compliance through engagement was significant ($\beta = 0.24, p < 0.001$).

Digital capabilities moderated the leadership-engagement relationship ($\beta = 0.18$, $p < 0.01$), such that the relationship was stronger when digital capability maturity was high. The integrated model explained 67.3% of variance in ESG compliance, with 89.4% classification accuracy.

5. Discussion

5.1 Interpretation

The findings confirm that employee engagement serves as a critical mediating mechanism translating transformational leadership into ESG compliance. This supports micro-foundational theory by demonstrating that organizational sustainability outcomes emerge from individual-level psychological states and behaviours. The moderating role of digital capabilities indicates that technology amplifies leadership effects by enabling transparency, feedback, and accountability mechanisms.

These results align with Okeke's (2024) finding that internal capabilities are key determinants of sustainability success in African SMEs. The study extends this work by specifying engagement as the mechanism through which leadership capabilities translate into compliance outcomes.

5.2 Implications

Academic implications: The study advances micro-foundational theory by providing empirical evidence for individual-level mechanisms linking leadership to sustainability outcomes. It introduces a validated framework that future researchers can apply and extend.

Practical implications: Managers should prioritize transformational leadership development while simultaneously investing in digital infrastructure. Specific metrics to monitor include engagement survey scores, digital adoption rates, and ESG audit outcomes. Expected improvement timelines range from 6-12 months for engagement changes to 12-18 months for compliance improvements.

5.3 Limitations

1. Cross-sectional design limits causal inference.
2. Self-reported measures may be subject to social desirability bias.
3. Focus on formal sector enterprises limits generalizability.

5.4 Future Research Directions

1. Longitudinal studies examining how leadership-engagement relationships evolve over time.

2. Extension to informal sector enterprises and micro-enterprises.
3. Comparative studies across different emerging market regions.
4. Experimental designs testing specific leadership development interventions.

6. Conclusion

This study demonstrates that ESG compliance in emerging market enterprises is fundamentally a human phenomenon, driven by transformational leadership that cultivates employee engagement, amplified by digital capabilities. The validated framework achieves 89.4% predictive accuracy, substantially outperforming traditional compliance-focused approaches. The study's main contribution is a replicable micro-foundational model that practitioners can apply to diagnose and enhance sustainability performance. For administrators, the key takeaway is that investing in leadership development and digital infrastructure simultaneously yields multiplicative returns on sustainability outcomes. As emerging markets continue their sustainability transitions, the enterprises that thrive will be those that recognize engaged employees as the foundation of green supply chain excellence.

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