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The Strategic Integration of Environmental Management Accounting and Dynamic Capabilities: A Framework for Circular Economy Transition and Organizational Resilience in The Post-Pandemic Era

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ABSTRACT

The global shift toward sustainable development has necessitated a radical reimagining of corporate accounting and management practices. This research article explores the strategic intersection of Environmental Management Accounting (EMA), dynamic capabilities, and organizational resilience within the context of the circular economy. By synthesizing contemporary research on institutional pressures, green human resource management, and digital convergence, this study provides a comprehensive theoretical elaboration on how firms navigate the complexities of environmental strategy. We analyze the mediating roles of green employee empowerment and ICT regulation in fostering e-participation and sustainable production. The study specifically addresses the unique challenges faced by Small and Medium Enterprises (SMEs) as key drivers of inclusive green growth, particularly in the wake of the COVID-19 pandemic. Using a descriptive analysis of structural equation modeling (SEM) and necessary condition analysis (NCA), the research identifies the critical business factors that enable firms to operate within safe and just planetary boundaries. The findings suggest that EMA acts as a vital strategic tool for internalizing environmental costs, enhancing performance efficiency, and securing long-term financial stability. This article contributes to the "Doughnut Economics" framework by aligning corporate performance with ecological ceilings and social foundations, offering a robust research agenda for business resilience in the face of climate change and shifting global reporting standards.

Keywords: Environmental Management Accounting, Dynamic Capabilities, Circular Economy, Organizational Resilience, Green Innovation, Sustainable Development, Small and Medium Enterprises.

INTRODUCTION

The contemporary business environment is undergoing a profound metamorphosis, driven by the urgent necessity to align industrial activity with the biophysical limits of the Earth. As articulated by Rockström et al. (2009) and further refined in subsequent studies (Rockström et al., 2023), the identification of safe and just Earth system boundaries is no longer a peripheral concern for climatologists but a core strategic imperative for global enterprises. The concept of "Doughnut Economics," as popularized by Raworth (2012, 2017), posits that humanity must operate within a space that satisfies social foundations without overshooting ecological ceilings. For the corporate sector, this means transitioning from a linear "take-make-waste" model to a circular economy, where resource loops are closed and value is preserved across cycles.

At the heart of this transition is Environmental Management Accounting (EMA). Traditionally, accounting systems have been criticized for their "ecological blindness," often failing to account for the externalities of production. However, as Kale (2025) argues, environmental accounting has evolved into a strategic tool for sustainable development, allowing firms to identify, collect, and analyze information about environmental costs and material flows. This shift is supported by the development of dynamic capabilities-the ability of a firm to integrate, build, and reconfigure internal and external competences to address rapidly

changing environments (Scarpellini et al., 2020).

The problem addressed in this research is the persistent "Implementation Gap" between environmental strategy and actual organizational performance. While many firms express a commitment to "green" practices, the effectiveness of these initiatives is often hampered by a lack of top management commitment, environmental uncertainty, and institutional pressures (Latan et al., 2018; Alnaim et al., 2024). Furthermore, the COVID-19 pandemic introduced unprecedented disruptions, forcing businesses to prioritize immediate survival over long-term sustainability (Liguori & Pittz, 2020). This research identifies a literature gap in how digital convergence and ICT access can be leveraged to bridge these gaps, particularly through e-participation and mediated regulation (Adam et al., 2021; Lee & Trimi, 2021).

By examining the nexus of environmental accounting, sustainable production, and financial performance (Ali et al., 2024), this study provides a thorough background on the institutional drivers of green innovation. We explore why "green" matters specifically in sectors with high environmental impact, such as the chemical and construction material industries (Wen et al., 2023; Le et al., 2019). The introduction of green human resource management (GHRM) as a catalyst for employee empowerment further nuances the discussion, suggesting that environmental performance is as much a human factor as it is a technical one (Adu Sarfo et al., 2024).

METHODOLOGY

The methodology of this research is grounded in a systematic and integrative review of diverse analytic frameworks, moving beyond simple narrative summaries to a deep theoretical elaboration of methodological tools. We explore the application of Partial Least Squares Structural Equation Modeling (PLS-SEM), fuzzy-set Qualitative Comparative Analysis (fsQCA), and Necessary Condition Analysis (NCA) as synergistic approaches to understanding environmental performance.

The first component of our methodology focuses on the "Predictive Ability" of management models. Following Liengaard et al. (2021), we elaborate on the cross-validated predictive ability test (CVPAT) within the context of PLS-SEM. This method allows researchers to move beyond in-sample explanatory power (R-squared) to out-of-sample prediction. In the context of EMA, this means testing whether a firm's environmental strategy can truly predict future cost savings and efficiency gains. We describe a process where data is partitioned to ensure that the identified "green drivers" are robust across different market conditions.

The second methodological pillar is the integration of fsQCA and NCA. As demonstrated by Ali et al. (2024), while SEM identifies the average effect of a variable, fsQCA identifies "recipes" for success-combinations of factors like top management commitment, EMA adoption, and green innovation that lead to high financial performance. NCA, on the other hand, identifies "bottlenecks." For instance, it may reveal that while a green strategy is not enough on its own to guarantee performance, it is a "necessary condition"-without it, the firm cannot achieve a high sustainability rating regardless of its other efforts.

Furthermore, we elaborate on the methodology for crafting a systematic literature review in entrepreneurship and sustainability research (Kraus et al., 2020). This involves a rigorous screening process of influential publications (Linnenluecke, 2017) to ensure that the theoretical foundations-ranging from Naess's (1989) "Ecosophy" to Pearce's (1993) measurement of sustainable development-are properly synthesized. We describe a multi-stage process of keyword identification, database searching, and thematic coding to isolate the role of organizational resilience in service innovation and value co-creation (Lopez et al., 2024).

The methodology also accounts for the role of ICT regulation and access. Using the framework from Adam et al. (2021), we discuss the application of structural equation modeling to analyze the mediating effects of digital governance. This involves a descriptive explanation of latent variables, such as "e-participation," and how they are measured through indicators of digital infrastructure and regulatory quality. By explaining these methods purely through descriptive text, we highlight the logical flow from data collection to strategic insight without relying on visual representations.

RESULTS

The findings of this integrated analysis reveal that Environmental Management Accounting (EMA) is the critical "Internal Engine" that powers external sustainability reporting and internal performance efficiency.

First, the results indicate that institutional pressures-coercive, mimetic, and normative-are significant drivers of EMA adoption, but their effectiveness is moderated by the firm's internal environmental strategy (Alnaim et al., 2024). In the Vietnamese construction material industry, for example, EMA was found to directly improve performance efficiency by providing granular data on energy consumption and waste management that traditional accounting ignored (Le et al., 2019). The results show that firms with a "proactive" rather than "reactive" strategy are more likely to successfully implement environmental management system certifications, such as ISO 14001 (Wang et al., 2023).

Second, the descriptive analysis of GHRM reveals that

"Green Employee Empowerment" acts as a vital mediator. The results suggest that simply implementing green policies is insufficient; firms must empower employees to take initiative in environmental problem-solving (Adu Sarfo et al., 2024). This empowerment leads to a significant increase in a firm's environmental performance, as employees become the primary source of green innovation and "bottom-up" circular economy practices. This aligns with the findings that dynamic capabilities are essential for businesses to adapt their accounting practices to the circular economy (Scarpellini et al., 2020).

Third, the research highlights the critical role of SMEs. Koirala (2019) identifies SMEs as the key drivers of green and inclusive growth, yet the results indicate they are the most vulnerable to "Environmental Uncertainty." During the COVID-19 pandemic, SMEs that exhibited high organizational resilience were able to pivot their business models toward service innovation and value co-creation (Liguori & Pittz, 2020; Lopez et al., 2024). The findings show that SMEs that integrated digital tools and ICT access (Adam et al., 2021) were better able to maintain e-participation with stakeholders, thereby preserving their market position despite the crisis.

Regarding the "Triple Bottom Line," the results suggest a shift from "Whither Ecology" (Milne & Gray, 2013) to a more integrated "Nexus" approach. The integrated analysis using PLS-SEM and NCA confirms that environmental accounting, sustainable production, and financial performance are positively correlated (Ali et al., 2024). However, the results also show that the "Financial Performance" boost often follows a time lag, as the initial investments in green innovation and EMA systems are reclaimed through long-term resource efficiency and risk mitigation. In the UAE market, environmental strategy was found to be a prerequisite for the effective use of EMA to enhance organizational performance (Al-Mawali et al., 2018).

DISCUSSION

The deep interpretation of these findings suggests that the global business community is moving beyond the "Blueprint for Measurement" (Pearce, 1993) toward a "Wisdom-Based Ecosophy" (Naess, 1989). This transition requires businesses to recognize that they are embedded within planetary boundaries and that their long-term survival is tethered to the health of the Earth system (Rockström et al., 2023; O'Neill et al., 2018).

A central point of discussion is the "Resilience Framework." Linnenluecke and Griffiths (2010) argue that business resilience in light of climate change involves moving "beyond adaptation" to a proactive stance of structural transformation. Our research elaborates on this by linking resilience to "Dynamic Capabilities." A firm that can reconfigure its accounting systems to track circular material flows (Scarpellini et al., 2020) is inherently more resilient to supply chain shocks and regulatory changes. The discussion posits that EMA provides the "Information Infrastructure" necessary for this resilience.

The role of "Green Supply Chain Management" (GSCM) in the Chinese chemical sector provides a nuanced case study of these theories in action. Wen et al. (2023) find that green practices and green innovation are not just ethical choices but economic imperatives driven by institutional pressures. However, a counter-argument exists: if these pressures are purely "Coercive" (e.g., government fines), firms may engage in "Symbolic Compliance" or greenwashing. The discussion emphasizes that "Environmental Strategy" must be internalized through top management commitment (Latan et al., 2018) to move from symbolic to substantive performance.

We must also consider the "Digital-Sustain Nexus." The convergence of innovation in the digital age (Lee & Trimi, 2021) offers powerful tools for sustainability. However, the "Mediating Role of ICT Regulation" (Adam et al., 2021) suggests that technology alone is not a panacea. Without proper regulatory frameworks that ensure equitable access and use, digital tools could exacerbate the "Distance" between Multinational Enterprises (MNEs) and local sustainability needs, particularly in developing contexts (Reddy & Hamann, 2018). The discussion highlights that MNEs often respond to "State Logics" in ways that prioritize global standards over local ecological realities, a tension that EMA must resolve by providing localized environmental data.

The limitations of this research include the geographic specificity of some studies (e.g., focusing on Vietnam, China, or the UAE) and the difficulty of measuring "Dynamic Capabilities" objectively. Future scope for this research lies in the longitudinal study of "Doughnut Economics" application at the firm level-tracking how companies successfully balance their "Internal Valuation Waterfalls" with the "External Ecological Ceiling."

CONCLUSION

In conclusion, this research article has established that Environmental Management Accounting (EMA) is a fundamental strategic tool for sustainable development in the post-pandemic era (Kale, 2025). By providing the data necessary to bridge the gap between strategy and performance, EMA enables firms to cultivate the dynamic capabilities required for a circular economy. The findings underscore that environmental performance is a multi-dimensional construct, requiring the alignment of institutional pressures, green human resource management, and digital infrastructure.

The transition toward a "Safe and Just Space for Humanity" (Raworth, 2012) requires businesses to move beyond the narrow pursuit of financial performance toward a "Nexus" of ecological and economic goals. As SMEs continue to drive inclusive growth, their survival will depend on their ability to build organizational resilience through innovation and value co-creation. Ultimately, the integration of EMA into corporate strategy is not merely an accounting exercise; it is a profound commitment to "Science to Wisdom" (Naess, 1989), ensuring that the pursuit of prosperity remains within the planetary boundaries that sustain all life.

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