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ECO-INNOVATION DYNAMICS: EXPLORING CAPABILITIES FOR SUSTAINABLE PERFORMANCE ENHANCEMENT

DYNAMIQUES DE L'ECO-INNOVATION : EXPLORATION DES CAPACITES POUR L'AMELIORATION DE LA PERFORMANCE DURABLE

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ABSTRACT

As the importance of eco-innovation and sustainable performance has grown, understanding the connections between these concepts and the capabilities that enable them has become important. This paper includes a thorough literature assessment with a focus on establishing connections between eco-innovation, sustainable performance, and particular abilities. To pinpoint the crucial elements that affect eco-innovation and sustainable performance, 23 pertinent publications were found and meticulously examined. They were carefully chosen based on their rigor and relevance, and they underwent detailed analysis to develop a comprehensive understanding of the intricate relationships between these concepts. The investigation produced a number of significant conclusions, one of which was how important eco-innovation is in promoting sustainable performance outcomes. It also noted particular capabilities s as significant determinants of eco-innovation and sustainable performance.

Keywords : *green innovation, financial performance, environmental performance, environmental capabilities*

RESUME

L'importance de l'éco-innovation et de la performance durable s'étant accrue, il est devenu important de comprendre les liens entre ces concepts et les capacités qui les rendent possibles. Le présent document comprend une évaluation approfondie de la littérature, axée sur l'établissement de liens entre l'éco-

innovation, les performances durables et des capacités particulières. Pour mettre en évidence les éléments cruciaux qui affectent l'éco-innovation et les performances durables, 23 publications pertinentes ont été trouvées et méticuleusement examinées. Elles ont été soigneusement choisies en fonction de leur rigueur et de leur pertinence, et ont fait l'objet d'une analyse détaillée afin de développer une compréhension globale des relations complexes entre ces concepts. L'enquête a permis de tirer un certain nombre de conclusions importantes, dont l'une concerne l'importance de l'éco-innovation dans la promotion des performances durables. Elle a également mis en évidence des capacités particulières comme déterminants significatifs de l'éco-innovation et de la performance durable.
Mots-clés : *innovation verte, performance financière, performance environnementale, capacités environnementales*

1. INTRODUCTION

1.1. CONTEXT AND RESEARCH QUESTIONS

In recent years, the imperative for businesses worldwide to integrate environmental sustainability into their operational frameworks has become increasingly evident. This recognition stems from a collective acknowledgment of the profound impact that businesses have on the environment and the pressing need to mitigate negative consequences. Central to this paradigm shift is the concept of eco-innovation, a multifaceted approach encompassing the development of novel goods, processes, and services designed to generate positive outcomes for both consumers and stakeholders while minimizing adverse environmental effects.

However, the pursuit of eco-innovation is not without its challenges. It demands that businesses cultivate distinctive capabilities and competencies to navigate the intricate intersection of environmental concerns and economic viability successfully. This necessitates a nuanced understanding of how to leverage resources effectively, adapt to evolving environmental conditions, and integrate sustainability principles into every facet of operations.

Despite the burgeoning interest in eco-innovation and sustainable performance, there remains a dearth of comprehensive understanding regarding the mechanisms underpinning these concepts. Specifically, the precise influence of eco-innovation on sustainable performance outcomes and the requisite capabilities for enhancing its impact are areas ripe for exploration.

To address these gaps, this paper embarks on a thorough examination of existing literature on eco-innovation, capacities, and sustainable performance. By synthesizing insights from diverse studies, we aim to elucidate the intricate relationships between these phenomena and provide cogent answers to the following research inquiries:

1. How does eco-innovation shape sustainable performance outcomes?
2. What specific capabilities are essential for fostering eco-innovation and augmenting its impact on sustainable performance?

Through meticulous analysis and synthesis, our findings will not only shed light on the fundamental mechanisms driving eco-innovation and sustainable performance but also offer actionable insights for businesses seeking to bolster their eco-innovation prowess in a rapidly evolving marketplace. By elucidating the core capacities necessary for sustainable innovation and performance, this research endeavors to empower businesses to proactively engage with environmental challenges while concurrently enhancing their competitiveness and resilience.

1.2. RESEARCH METHODOLOGY

A meticulous and focused literature review has been undertaken to explore the intricate interplay between eco-innovation, sustainable performance outcomes, and the specific capabilities crucial for eco-innovation. The primary objective of this study was to unravel the nuanced connections between these domains and identify the pivotal factors shaping eco-innovation and sustainable performance. Utilizing a comprehensive array of scholarly resources, including prominent databases such as Google Scholar, Web of Science, and Scopus, an exhaustive search was conducted to identify relevant literature.

Following a rigorous screening process encompassing the examination of titles and abstracts, a total of 23 articles meeting the predetermined inclusion criteria were selected for in-depth analysis. Subsequently, a thorough examination was conducted on the chosen papers to distill the most salient concepts pertaining to eco-innovation and sustainable performance. Through meticulous scrutiny, the core ideas embedded within the literature were elucidated, with particular attention paid to their interrelationships.

In order to develop a nuanced understanding of the complex dynamics between eco-innovation, sustainable performance outcomes, and the specific capabilities driving eco-innovation, the collected information was subjected to rigorous scrutiny. This involved a comprehensive analysis aimed at discerning patterns, identifying key themes, and elucidating underlying mechanisms. The insights gleaned from this comprehensive review process not only served to refine the research questions but also furnished a robust, evidence-based foundation for understanding the essential tenets of eco-innovation and sustainable performance.

2. EXPLORING THE RELATIONSHIP BETWEEN ECO-INNOVATION AND SUSTAINABLE PERFORMANCE: A TRIPLE BOTTOM LINE APPROACH

Our examination of the 23 articles has unveiled several recurrent themes concerning eco-innovation, sustainable performance, and associated capabilities within the literature (see Figure 1).

Figure 1: The Most Frequently Mentioned Concepts

Source: Developed by the authors using atlas.ti software

To provide a comprehensive overview, we present a summary table highlighting the predominant concepts and compound nouns featured prominently throughout our analysis (see Table 1).

Concepts	Compound nouns
Innovation	eco-innovation, environmental innovation, green innovation, eco-organizational innovation, eco-product innovation, eco-process innovation, eco-marketing innovation
Performance	environmental performance, financial performance, business performance, sustainable business performance, economic performance, firm performance, cost performance, social performance
Eco	eco-innovation, eco-innovation practices, eco-process, eco-product, eco-innovation behavior, eco-innovation types, eco-organizational, eco-capability
Firm	small firms, large firms, firm's environmental performance, firm's ability, firm's financial performance, firm's economic performance, firm's social performance, firm's sustainable business performance, innovative firms
Company	small companies, green technology companies, company performance, larger companies
Technology	new technologies, green technology, environmental technologies, cleaner technologies, waste reduction technologies, innovative technologies
Market	market turbulence, market share, market focus, market-based instrument, market culture, market demand, market orientation, market performance, market requirements, new market, market needs, emerging markets, competitive markets
Process	eco-process, production process, business process innovation, business process, innovation process, manufacturing process, environmental process innovations, new or modified processes, green process innovation, learning processes, product service process

Business	business performance, sustainable business performance, business strategy, business process innovations, business sustainability, business practices, business strategies, key business factors, small businesses
Management	environmental management, green management, environmental management systems, top management, green management practices, top management commitment, green management activities, management systems, pollution management, strategic management, waste management, quality management, resource management
Factor	demand factors, key business factors, environmental factors, internal factors, organizational factors, technological factors
Resource	human resources, resource efficiency actions, resource commitment, resource saving, the resource-based view, natural resources, firm resources, financial resources, human resource capabilities, internal resources, resource productivity, environmental resources, organizational resources, intangible resources, qualified human resources, resource management, resource savings
Impact	environmental impact, positive impact, significant impact, negatif impact, less impact, direct impact
System	environmental management systems, system change, the existing system, system innovation, novel management systems, education system, information systems
Capability	capabilities, technological capabilities, organizational capabilities, dynamic capabilities, environmental organization capabilities, environmental self-regulation capabilities, human resource capabilities, sustainability-oriented capabilities, firm capabilities, human capabilities, marketing capabilities, environmental market sensing capabilities

Table 1: Concepts and Their Compound Nouns

Source: Author's elaboration

These findings serve as the foundation for our subsequent discussions, wherein we delve into the nuanced relationships between eco-innovation, sustainable performance, and associated factors. However, before delving into our detailed analyses, it is imperative to elucidate the definitions of key concepts, a task which we undertake in the following sub-section.

2.1. ECO-INNOVATION AND SUSTAINABLE PERFORMANCE: UNDERSTANDING THE CONCEPTS

In scholarly discourse, terms such as eco-innovation, environmental innovation, sustainable innovation, and green innovation are often used interchangeably due to their shared objective of mitigating environmental impacts (Bossle et al., 2016). This convergence of terminology underscores a collective commitment towards environmental stewardship and sustainable development (Karakaya et al., 2014; Schiederig & Tietze, 2012).

The term "eco-innovation" derives its significance from its ecological connotations, embodying a broader ethos aligned with the Sustainable Development Goals set forth by the United Nations. Furthermore, the prefix "eco" conveys a nuanced perspective rooted in evolutionary economics, acknowledging innovation as a product of both internal strategic decisions and external imperatives (Santos et al., 2019). By amalgamating "eco" and "innovation," the term encapsulates the notion of

environmentally sustainable advancements within contemporary contexts (Gąsior et al., 2022). Various definitions abound within the literature, with eco-innovation broadly characterized as an innovation that enhances environmental performance and yields green dividends in the market (Carrillo-Hermosilla et al., 2009; Andersen, 2008).

Similarly, business sustainability entails the adoption of strategies and practices that meet present needs while safeguarding future resources for the betterment of both enterprises and stakeholders (Labuschagne et al., 2005). Central to this paradigm is the Triple Bottom Line framework, pioneered by Elkington (1997), which evaluates organizational success through the lenses of People, Planet, and Profit. This holistic approach underscores the symbiotic relationship between environmental, social, and economic imperatives, epitomizing the evolution of sustainability discourse.

Throughout our study, we adopt the terminology of "social," "environmental," and "financial" to denote the three dimensions of the Triple Bottom Line, aligning with contemporary sustainability discourse.

2.2. FINANCIAL BENEFITS OF ECO-INNOVATION: EVIDENCE FROM EMPIRICAL STUDIES

From a financial perspective, empirical evidence suggests that eco-innovation often necessitates substantial investments in process reorientation, posing financial challenges for businesses (Arranz et al., 2021). Consequently, enterprises may grapple with resource constraints, compelling them to seek external funding avenues to sustain eco-innovation initiatives (Pinget et al., 2015).

In motivating companies to embrace ecological dimensions in innovation, scholars have scrutinized the nexus between eco-innovation and financial performance. This encompasses a spectrum of metrics, including market share, profitability, energy efficiency, and compliance with environmental regulations (Yurdakul & Kazan, 2020). While some studies report a direct positive impact of eco-innovation on financial performance, others contend that the relationship is nuanced and contingent on contextual factors (Cai & Li, 2018; Putri & Sari, 2019; Fernando et al., 2019; Liao, 2018; Yurdakul & Kazan, 2020).

Moreover, scholars have explored the differential effects of eco-innovation types on financial performance. For instance, studies reveal that eco-organizational innovation exerts a significant positive influence on financial performance in certain industries, while eco-product and eco-process innovations yield varying outcomes (Ch'ng et al., 2021; Al-Hanakta et al., 2023). These findings underscore the nuanced interplay between eco-innovation strategies and financial outcomes, necessitating tailored approaches for different organizational contexts.

2.3. UNLOCKING THE POSITIVE RETURNS OF ENVIRONMENTAL PERFORMANCE THROUGH ECO-INNOVATION BEYOND FINANCIAL METRICS

The symbiotic relationship between eco-innovation and environmental performance is underscored by their shared objective of mitigating environmental harm and fostering sustainability. Empirical studies corroborate the positive impact of eco-innovation on environmental performance across diverse contexts (Cai & Li, 2018; Li, 2014; Yurdakul & Kazan, 2020).

In Malaysia, eco-product and eco-process innovations have been found to significantly enhance environmental performance, whereas eco-organizational innovation exhibits mixed results (Fernando & Wah, 2017). This underscores the importance of aligning eco-innovation strategies with market demands and regulatory frameworks to maximize environmental benefits (Fernando & Wah, 2017).

In conclusion, our examination of empirical studies elucidates the multifaceted relationship between eco-innovation, financial performance, and environmental outcomes, underscoring the need for context-specific approaches to enhance sustainable performance.

3. BUILDING SUSTAINABLE-ORIENTED CAPABILITIES: THE INTERPLAY BETWEEN ECO-INNOVATION AND SUSTAINABLE PERFORMANCE

The evolving landscape of innovation underscores the imperative for companies to cultivate innovation capabilities across various domains, including eco-innovation (K. Lee, 2009). Specifically, companies must hone in on sustainability-oriented capabilities to effectively navigate the complexities of eco-innovation initiatives, as delineated within eco-innovation literature.

In this context, it becomes evident that not all organizational resources and competencies are inherently conducive to addressing the rapidly evolving legislative, technological, and market demands unless they are sustainability-focused (Demirel & Kesidou, 2019). These sustainability-oriented capabilities represent internal organizational competencies crucial for the successful adoption of eco-innovation strategies. They embody a fusion of diverse skills, organizational learning mechanisms, established working routines, and additional firm resources (Doran & Ryan, 2016; Kabongo & Boiral, 2017; S. Lee & Klassen, 2008; Sumrin et al., 2021).

Subsequent sections will delve into a nuanced exploration of these sustainability-oriented capabilities and their pivotal role in fostering a symbiotic relationship between eco-innovation and sustainable performance.

3.1. TECHNOLOGICAL ENVIRONMENTAL CAPABILITY

Philips stands as a testament to the transformative power of innovation harnessed for sustainability. By pioneering an eco-design methodology in 1994, Philips spearheaded efforts to develop energy-efficient solutions and mitigate CO2 emissions. Notably, Philips achieved a remarkable reduction of up to 7% in

CO2 emissions within a single year (Sumrin et al., 2021). Scholars (Cai & Li, 2018; Pereira & Vence, 2012; Sumrin et al., 2021) advocate for the enhancement of firms' technological capabilities to drive eco-innovation initiatives and realize superior outcomes. Specifically, technological capabilities play a pivotal role in facilitating the design and implementation of eco-innovation practices (Sumrin et al., 2021). Moreover, research underscores the primacy of environmental-oriented technological advancements derived from focused research and development (R&D) efforts in catalyzing eco-innovation across both product and process domains (Demirel & Kesidou, 2019).

3.2. ORGANIZATIONAL ENVIRONMENTAL CAPABILITIES

Pacheco et al. (2018) delineate key organizational capabilities essential for fostering eco-innovation within businesses. Central to their framework are pillars of organizational strength, including internal communication, eco-efficiency, adaptability, and organizational learning. The adoption of an environmental management system (EMS) emerges as a linchpin in bolstering organizational environmental capabilities, facilitating the systematic tracking of environmental data for internal and external stakeholders (Cai & Li, 2018). Moreover, the role of human resources in driving eco-innovation cannot be overstated, with employees serving as the bedrock of organizational responsiveness to market demands (Bossle et al., 2016; Ho et al., 2014; K. Lee, 2009; Singh et al., 2020c, 2020a, 2020b). Buhl et al. (2016) underscore the pivotal role of human capital, including tacit knowledge, consumer experiences, and green identity, in fostering a culture of innovation within companies. To this end, organizations must invest in human resource capabilities through targeted knowledge management initiatives and educational training programs centered on sustainability (Arnold & Hockerts, 2011).

3.3. ENVIRONMENTAL MARKET SENSING CAPABILITY

Market sensing capabilities emerge as a critical determinant of firms' ability to anticipate and respond to market shifts, thereby driving the development and uptake of eco-innovations (Demirel & Kesidou, 2019). Leveraging market research tools enables businesses to glean valuable insights into consumer preferences and market dynamics, facilitating the development of eco-innovations tailored to environmental needs (Demirel & Kesidou, 2019; Pereira & Vence, 2012). Furthermore, involving consumers in the eco-innovation process fosters co-creation and ensures alignment with market expectations, thereby maximizing the environmental and economic benefits of eco-innovations (Carrillo-Hermosilla et al., 2010).

3.4. ENVIRONMENTAL SELF-REGULATION CAPABILITY

Environmental self-regulation entails the voluntary adoption of environmentally responsible practices by organizations, either through corporate social responsibility (CSR) initiatives or the implementation of environmental management systems (EMS) (Demirel & Kesidou, 2019). While the literature suggests that CSR may not directly impact investment in eco-innovation, it plays a pivotal role in cultivating

ethical management capabilities, including robust environmental management practices (Demirel & Kesidou, 2019; Hawn & Ioannou, 2016). EMS, in particular, emerges as a potent tool for enhancing environmental management capabilities and performance, streamlining environmental target setting, and facilitating information flows to drive sustainability initiatives (Arimura et al., 2008; Rennings et al., 2006). However, the efficacy of EMS implementation hinges upon its quality and integration within organizational processes, underscoring the importance of implementation fidelity in realizing environmental and economic benefits (Demirel & Kesidou, 2019).

CONCLUSION

The culmination of this study offers profound insights into the intricate interplay among eco-innovation, sustainable performance outcomes, and sustainability-oriented capabilities, including technological environmental capability, organizational environmental capability, environmental market sensing capability, and environmental self-regulation capability. Through a comprehensive review of 23 articles meeting stringent inclusion criteria, this research has provided a nuanced understanding of these critical relationships. Leveraging a strategic combination of keywords and Boolean operators, data were meticulously curated from reputable databases such as Google Scholar, Web of Science, and Scopus, ensuring the relevance and rigor of the analysis.

Central to the study's findings is the paramount importance of sustainability-focused capabilities in driving the attainment of sustainable performance objectives. It is evident that businesses and decision-makers must proactively craft supportive policies that incentivize the adoption and cultivation of sustainability-oriented capabilities to propel sustainability efforts forward. By prioritizing the enhancement and expansion of these capabilities, businesses can catalyze the transition toward a more resilient and sustainable economy, thereby reaping the associated benefits of eco-innovation and sustainable performance.

However, it is imperative to acknowledge certain limitations inherent in this study. While every effort was made to rigorously select and analyze relevant literature, the scope of the review may have inadvertently omitted certain pertinent studies or perspectives. Additionally, the generalizability of the findings may be constrained by the specific contexts and methodologies employed within the selected articles. Furthermore, the dynamic nature of eco-innovation and sustainability necessitates ongoing research efforts to continually refine and deepen our understanding of these complex phenomena.

Looking ahead, future research endeavors should endeavor to build upon the foundations laid by this study by delving into several avenues of inquiry. Firstly, there is a pressing need to assess the efficacy of various sustainability-oriented competencies across diverse organizational settings and industries. Moreover, efforts should be directed toward formulating targeted interventions aimed at fostering the uptake of these capabilities within businesses. Additionally, policymakers have a pivotal role to play in

creating an enabling regulatory environment that incentivizes and supports firms in their pursuit of sustainability-focused practices. By embracing a multi-stakeholder approach and fostering collaboration between academia, industry, and government, we can collectively strive toward a more sustainable future.

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