

Strategizing Sustainability: The Mediating Role of Green Open Innovation and Ambidexterity in Hotels

Abstract

Tourism's rapid growth has intensified global greenhouse gas emissions, positioning the hospitality industry as a critical site for environmental transformation. Hotels, in particular, contribute substantially to tourism-related emissions but also possess the strategic potential to lead sustainability transitions. Despite growing awareness, existing research has largely emphasized operational initiatives, overlooking the strategic mechanisms that enable hotels to convert environmental capabilities into measurable outcomes. Grounded in Dynamic Capabilities Theory, Open Innovation Theory, and Organizational Ambidexterity Theory, this study develops and empirically tests a model explaining how Green Dynamic Capabilities (GDC) enhance Hotel Green Performance (HGP) through the sequential mediating effects of Green Open Innovation (GOI) and Green Ambidexterity (GA). Using survey data from 264 hotel managers in Pakistan and employing PROCESS Macro (Model 6), the results reveal that GDC positively influence both GOI and GA, which jointly strengthen HGP. However, GOI alone does not yield direct performance gains without ambidextrous execution. The findings advance theoretical understanding by integrating capability, innovation, and ambidexterity perspectives to explain strategic sustainability in hospitality, while offering actionable insights for hotel managers seeking to align environmental commitment with long-term competitiveness.

Keywords: hotel green performance; green dynamic capabilities; green open innovation; green ambidexterity

Introduction

Tourism today stands at the crossroads of economic vitality and environmental responsibility. While it remains one of the fastest-growing sectors globally, it is also among the most carbon-intensive. Recent estimates indicate that the tourism industry produces around five billion metric tons of carbon dioxide equivalent each year, contributing nearly nine percent of total global greenhouse gas emissions (Tiseo, 2025). Alarming, these emissions are projected to rise by 25 percent by 2030 compared to 2016 levels, with a 40 percent increase observed between 2009 and 2019 - a growth rate more than double that of global emissions. This trajectory reflects a persistent sustainability paradox, wherein tourism's economic expansion continues to outpace global decarbonization efforts. Despite the sector's commitment to halving emissions by 2030 and achieving net-zero by 2050, the gap between ambition and progress remains wide (UNWTO, 2023). The sources of these emissions are multifaceted, encompassing transportation, accommodation, food services, and cruise operations, with air travel and cruise tourism being the

largest contributors (Menegaki, 2025). Yet, accommodation particularly hotels accounts for a significant share of the sector's environmental burden, estimated at nearly one-quarter of total tourism-related emissions. Hotels are inherently resource-intensive, consuming substantial energy for heating, cooling, and lighting, as well as water and materials for daily operations. Their influence, however, extends beyond internal activities: they shape upstream supply chains (e.g., sourcing and procurement) and downstream consumption behaviors (e.g., guest practices and preferences). Consequently, improving hotel green performance (HGP) is not merely an operational enhancement but a strategic necessity for mitigating tourism's overall ecological footprint (Casais & Ferreira, 2023; Merli et al., 2019).

From a managerial standpoint, hotel sustainability efforts often remain fragmented and reactive focused on visible initiatives such as energy-saving devices or waste reduction campaigns without embedding sustainability into the strategic core of organizational capabilities (Muisyo et al., 2022). As a result, many hotels demonstrate environmental commitment symbolically but lack the mechanisms to sustain long-term transformation. Addressing this issue requires moving beyond isolated operational practices toward a strategic reconfiguration of capabilities, fostering innovation and learning that translate environmental intent into measurable performance outcomes. From an academic perspective, this shift necessitates theoretical integration. Existing hospitality studies frequently overlook how hotels transform green-oriented capabilities into strategic assets that yield sustainable performance advantages (Takalo et al., 2021). This study therefore draws upon Dynamic Capabilities Theory (Teece et al., 1997) to explain how firms sense and reconfigure resources for sustainability, Open Innovation Theory (Chesbrough, 2003) to capture the role of inbound and outbound green knowledge exchange, and Organizational Ambidexterity Theory (Tushman & O'Reilly, 1996) to elucidate how hotels balance exploration and exploitation in their environmental strategies. By integrating these frameworks, the study proposes a cohesive model where Green Dynamic Capabilities (GDC) enhance Hotel Green Performance (HGP) through the mediating roles of Green Open Innovation (GOI) and Green Ambidexterity (GA), see Table 1 for key differences between GDC, GOI, and GA.

In doing so, the paper contributes to both theory and practice by advancing a strategic understanding of sustainability in hospitality. It conceptualizes hotels not merely as consumers of environmental resources but as strategic enablers of decarbonization within the broader tourism value chain. This integrative approach responds to the urgent need for empirical research that

bridges managerial practice and strategic theory in driving environmental transformation within service industries.

Table 1: Differentiating Dynamic Capabilities, Open Innovation, and Ambidexterity in Green Context

| Dimension | Green Dynamic Capabilities (GDC) | Green Open Innovation (GOI) | Green Ambidexterity (GA) |
|---------------------------------|--|--|---|
| Core Definition | The firm's ability to sense, seize, and reconfigure resources to respond to environmental changes. | The firm's practice of integrating external green knowledge (outside-in) and sharing internal green knowledge (inside-out) to accelerate innovation. | The firm's ability to simultaneously explore new green opportunities and exploit existing green practices efficiently. |
| Primary Focus | Capability → Adaptation → Transformation. | Collaboration → Knowledge Flow → Innovation. | Balance → Dual Innovation → Performance Sustainability. |
| Strategic Role | Builds the internal foundation for sustainability by aligning competencies with green objectives. | Expands the knowledge boundary through stakeholder engagement and partnerships. | Converts acquired and internalized knowledge into dual green innovations for long-term advantage. |
| Key Processes | Sensing green trends and technologies. Seizing green opportunities. Reconfiguring operations for sustainability. | Outside-in: acquiring eco-knowledge from partners, suppliers, customers. Inside-out: sharing internal eco-solutions externally. | Green exploration: developing new eco-products or processes. Green exploitation: refining existing sustainable practices. |
| Knowledge Orientation | Internal learning and absorptive capacity. | Boundary-spanning and knowledge sharing. | Integration of internal and external knowledge into balanced innovation. |
| Theoretical Base | Dynamic Capabilities Theory (Teece, 1997). | Open Innovation Theory (Chesbrough, 2003). | Organizational Ambidexterity Theory (Tushman & O'Reilly, 1996). |
| Typical Green Example in Hotels | Installing smart energy systems after scanning eco-technology trends and reorganizing resources accordingly. | Partnering with cleantech firms to adopt renewable systems and licensing unused green solutions to others. | Developing new green services while simultaneously improving waste-reduction and energy-efficiency programs. |
| Outcome Orientation | Adaptive capability for sustainable competitiveness. | Innovative capability through collaborative networks. | Performance capability through balanced exploration + exploitation. |

Source: Author own compilation

Theoretical Framework and Hypotheses Development

Grounded in the Resource-Based View (RBV) (Barney, 1991) and Dynamic Capabilities Theory (Teece et al., 1997), this study posits that hotels can achieve superior sustainability outcomes by developing and deploying Green Dynamic Capabilities (GDC). These capabilities enable firms to sense, seize, and reconfigure resources in response to environmental opportunities and pressures (Chen, 2024; Li, 2022). However, to translate such internal capabilities into tangible performance outcomes, organizations must engage in knowledge exchange beyond their boundaries through Green Open Innovation (GOI). GOI entails both the integration of external environmental

knowledge (outside-in) and the dissemination of internal green knowledge (inside-out) (Yang & Roh, 2019). Accordingly, it is hypothesized that GDC positively influence GOI (H1).

Furthermore, GOI serves as a catalyst for Green Ambidexterity (GA) - the organization's ability to balance explorative and exploitative green innovations (Úbeda-García et al., 2022). Through external collaboration and knowledge sharing, GOI stimulates exploration by sourcing novel ideas while simultaneously reinforcing exploitation by refining existing green processes, leading to H2: GOI positively influences GA. Ambidexterity, in turn, is a well-established driver of superior performance (Junni et al., 2013), particularly in dynamic and innovation-intensive environments; thus, H3 proposes that GA positively affects Hotel Green Performance (HGP).

Finally, drawing on prior hospitality research (Muisyo et al., 2022), this study advances a sequential mediation model in which GDC enhance performance through GOI and GA (H4). Conceptually, the development of internal green capabilities strengthens a firm's absorptive capacity, enabling more effective boundary spanning and knowledge sharing with external stakeholders. The resulting outside-in and inside-out knowledge flows expand and integrate the organizational knowledge base, facilitating a balanced interplay between exploratory and exploitative green innovations that underpins sustained green performance.

Methodology

A quantitative, cross-sectional design was adopted to empirically test the proposed model. Data were collected from 264 managerial-level employees working in three-star, four-star, and five-star hotels across four major Pakistani cities: Peshawar, Islamabad, Rawalpindi, and Lahore. These hotels were chosen due to their engagement in sustainability-oriented practices. Respondents possessed sufficient knowledge of environmental management, innovation, and sustainability. Validated scales were adapted from prior studies, including Zhang et al. (2020) for green dynamic capabilities, Chen et al. (2015) for green open innovation, Úbeda-García et al. (2022) for green ambidexterity, and Úbeda-García et al. (2022) for hotel green performance. All items were rated on a five-point Likert scale. PROCESS macro Model 6 was applied to test the sequential mediation, with bootstrapping used for indirect effects. Ethical procedures were followed, and participation was voluntary and anonymous.

Results and Discussion

Findings revealed that green dynamic capabilities significantly influence green open innovation and green ambidexterity. Furthermore, green open innovation positively affected green ambidexterity, confirming. However, the direct effect of GOI on green performance was insignificant, suggesting that open innovation alone does not guarantee improved performance without ambidexterity. The sequential mediation effect was significant, confirming H4. These findings emphasize that green dynamic capabilities are the foundational enablers of sustainability transitions, but their impact materializes through dual innovation mechanisms. This reinforces the integrated logic of dynamic capabilities, open innovation, and ambidexterity frameworks. Theoretically, this suggests that hotels must go beyond mere openness and develop structures that balance exploration and exploitation. Practically, managers should invest in systems that support both inbound and outbound knowledge sharing, translating into ambidextrous innovation and higher performance.

Implications and Conclusion

This study contributes to sustainability management literature by empirically validating how green dynamic capabilities influence hotel green performance through green open innovation and green ambidexterity. Theoretically, it extends the dynamic capabilities framework by identifying a sequential process linking internal capabilities to external knowledge flows and dual innovation outcomes. From a managerial perspective, hotel leaders should adopt open innovation strategies that enable collaboration with external partners while fostering internal ambidexterity. Training programs focused on absorptive capacity, environmental learning, and innovation management can enhance these capabilities. Policymakers may leverage these findings to design initiatives that encourage collaborative green innovation aligned with the UN Sustainable Development Goals (SDG 8, 9, and 12). Future studies could explore cross-country validation and longitudinal designs to examine the enduring impact of dynamic capabilities on sustainability performance. In sum, achieving hotel sustainability requires not only green capabilities but also the strategic orchestration of open innovation and ambidexterity.

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