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The Role of Eco-Innovation and Environmental Management Accounting in Fostering Performance Effect by Green Dynamic Capabilities in the Hotel Industry

Avni Zafer Acar [1], Pınar Acar [2,*], Mustafa Aslan [3], İpek Yaylalı [4] and Onur Kemal Yılmaz [5]

[1] Logistics Management Department, Faculty of Applied Sciences, Dolapdere Campus, Istanbul Bilgi University, 34440 Istanbul, Türkiye; zafer.acar@bilgi.edu.tr
[2] Human Resourse Management Department, Faculty of Business and Management Sciences, Güney Campus, Istanbul Medipol University, 34815 Istanbul, Türkiye
[3] Aviation Management Department, Faculty of Applied Sciences, Dolapdere Campus, Istanbul Bilgi University, 34440 Istanbul, Türkiye; mustafa.aslan@bilgi.edu.tr
[4] International Trade and Finance Department, Faculty of Business and Management Sciences, Güney Campus, Istanbul Medipol University, 34815 Istanbul, Türkiye; ipek.yaylali@medipol.edu.tr
[5] Tourism Administration Department, Burhaniye Applied Science Faculty, Balıkesir University, 10145 Balıkesir, Türkiye; onurkemal.yilmaz@balikesir.edu.tr
* Correspondence: pinar.acar@medipol.edu.tr

Abstract

Despite growing attention to sustainability in the global tourism industry, empirical evidence explaining how internal organizational capabilities translate into superior environmental performance remains scarce—particularly in emerging markets. This study investigates the performance effects of green dynamic capabilities (GDC) in driving environmental performance in the hotel industry, with a particular focus on the mediating effect of eco-innovation (ECI) and the moderating effect of environmental management accounting (EMA). Although environmental sustainability in tourism has become a global imperative, limited empirical evidence exists on how internal capabilities and accounting practices jointly enhance hotels' green performance—particularly within emerging economies such as Türkiye. Drawing on dynamic capabilities theory and resource orchestration perspectives, this study addresses this research gap by analyzing survey data collected from 108 managers of Green Key-certified hotels in Türkiye. The developed research framework was tested through Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4. The results reveal that GDCs positively influence environmental performance, and this relationship is significantly mediated by ECI. Moreover, EMA strengthens the positive effect of GDCs on ECI, highlighting its role as an enabling internal infrastructure. These findings suggest that the realization of sustainability outcomes depends not only on the presence of capabilities but also on how these are embedded within innovation processes and internal organizing systems. The study contributes to sustainability and management literature by offering a context-specific understanding of the capability–infrastructure–performance nexus and providing actionable insights for hotel managers in emerging tourism markets.

Keywords: green dynamic capabilities; eco-innovation; environmental management accounting; organizational performance; resource-based view; dynamic capabilities theory

Academic Editor: Fabrizio D'Ascenzo

Received: 12 September 2025
Revised: 14 October 2025
Accepted: 21 October 2025
Published: 24 October 2025

Citation: Acar, A.Z.; Acar, P.; Aslan, M.; Yaylalı, İ.; Yılmaz, O.K. The Role of Eco-Innovation and Environmental Management Accounting in Fostering Performance Effect by Green Dynamic Capabilities in the Hotel Industry. *Sustainability* **2025**, *17*, 9487. https://doi.org/10.3390/su17219487

1. Introduction

Although travel has been a constant since the early ages of humanity for sightseeing, healing, and participating in religious and social activities, the economic and socio-cultural importance of tourism began to increase after the 1950s [1]. Today, tourism is one of the fastest-growing sectors, considered an essential part of the world economy and a leading segment of the service industry in many countries [2]. According to the World Bank [3], the global GDP distribution by sectors is 4.32% for agriculture, 28.04% for industry, and 67.64% for services, within which tourism accounts for a significant portion [4,5]. This is because tourism interacts with and relies on multiple other service industries, such as transportation, accommodation, entertainment, insurance, and food and beverage [6,7].

However, while global tourism continues to grow, the industry faces increasing environmental and competitive pressures, particularly in emerging markets such as Türkiye. According to the Turkish Statistical Institute (TÜİK) [8], international tourist arrivals exceeded 62.2 million in 2024, generating over USD 61.1 billion in revenue. However, this economic success has also led to environmental challenges—rising carbon emissions, intensive energy and water consumption, and significant waste generation. Consequently, the tourism sector now stands at a critical juncture where sustainable competitiveness and environmental responsibility must coexist.

Tourism plays a dual role in climate dynamics: it is both a contributor to and a victim of environmental degradation. While air travel, energy-intensive accommodation, and food services contribute to global warming [9–11], the sector itself is highly vulnerable to climate change. Rising temperatures, droughts, and coastal erosion threaten the long-term competitiveness of major destinations. For example, in Mediterranean regions such as Antalya, Muğla, and İzmir, higher temperatures and water scarcity are projected to alter tourist patterns and increase operational costs for hotels [12,13]. These realities underline the need for sustainability-oriented strategies that integrate innovation, accounting, and environmental management.

To sustain competitiveness, tourism enterprises must adopt eco-innovative strategies aligned with the principles of sustainable development and the EU Green Deal. Achieving this transition depends on firms' ability to reconfigure internal resources and processes to respond to environmental pressures—what the literature defines as Green Dynamic Capabilities (GDC) [14–16]. Through GDCs, organizations can integrate, build, and renew internal competencies that enhance adaptability, innovation, and environmental performance.

At the same time, eco-innovation (ECI) serves as a key mechanism through which GDCs are operationalized. Eco-innovation refers to the development and implementation of new ideas, practices, and technologies that minimize environmental harm while generating business value [17]. The tourism sector, as a multidimensional service ecosystem, provides fertile ground for such innovations—from waste reduction technologies and energy-efficient building systems to sustainable procurement and digital environmental monitoring.

Another critical yet often overlooked component is Environmental Management Accounting (EMA), which facilitates the measurement, management, and internalization of environmental costs into decision-making processes [18,19]. EMA supports hotels in identifying cost-saving opportunities while improving environmental performance, thereby linking environmental sustainability with economic outcomes [20]. In this regard, recent evidence shows that "businesses in competitive and unpredictable environments should prioritize the implementation of environmental management accounting practices to improve their environmental performance" [20]. Despite its importance, EMA adoption in the tourism sector remains largely voluntary, as the industry is not currently subject to environmental taxation or strict reporting obligations. Hence, understanding how EMA interacts with GDCs and ECI to drive sustainable performance is crucial.

While prior research has investigated GDC, ECI, and EMA individually [21–23], empirical studies examining their interrelationships within the hospitality context remain limited. Most existing studies focus on manufacturing or general service industries, overlooking the specific dynamics of tourism, where environmental initiatives are predominantly self-regulated. Moreover, no empirical study has yet explored how EMA systems enhance the effect of GDC on ECI, or how this interplay contributes to environmental and economic performance within hotel settings.

Addressing this gap, the present study develops and tests a capability–infrastructure–performance framework that positions GDC as a strategic enabler, ECI as an operational mediator, and EMA as an informational moderator influencing sustainable outcomes. This model extends the Dynamic Capabilities Theory (DCT) by integrating sustainability accounting and innovation perspectives, providing both conceptual depth and contextual relevance for emerging economies [24].

The empirical context of this research involves Green Key-certified hotels in Türkiye, which represent leading sustainability-oriented accommodation providers. These hotels voluntarily adopt eco-innovation and environmental management practices beyond regulatory requirements, making them suitable for testing the proposed relationships.

Accordingly, this study aims to answer the following research questions:

i. How do Green Dynamic Capabilities (GDC) affect environmental and economic performance in hotels?
ii. Does Eco-Innovation (ECI) mediate the relationship between GDC and performance?
iii. Does Environmental Management Accounting (EMA) moderate the relationship between GDC and ECI?

To address these questions, a quantitative research approach was adopted. Data were collected through an online survey distributed to senior managers of Green Key-certified hotels across Türkiye. Of the 148 hotels contacted, 109 provided usable responses. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS 4, enabling the examination of both direct and moderating effects among constructs.

Finally, the structure of the paper is as follows: Section 2 reviews the theoretical background and hypotheses; Section 3 describes the methodology and sampling; Section 4 presents empirical findings; and Section 5 discusses theoretical and managerial implications, followed by conclusions.

2. Theoretical Framework and Research Hypotheses

2.1. Theoretical Background

The theoretical roots of this study are anchored in the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT). This theoretical foundation was expanded to clarify how both RBV and DCT jointly explain organizational sustainability performance and to investigate how GDCs [25] affect sustainable performance outcomes in the tourism industry. According to RBV, firms gain competitive advantage through valuable, rare, inimitable, and non-substitutable resources, whereas DCT emphasizes the ability to reconfigure these resources in response to environmental changes [26,27]. In particular, this study aims to investigate whether GDC, when supported by EMA [28], can enhance ECI practices, which in turn leads to a competitive advantage in the hotel industry that can be measured with the performance outcomes related to economic and environmental metrics. Within the framework of this basic information and assumptions, the building blocks technique was used to develop the theoretical model of the research while discussing the impacts of the main factors according to the literature. Then, an integrated research model is presented.

In this study, sustainable performance is considered to have three main dimensions—economic, environmental, and social. However, the current empirical model focuses on the economic and environmental aspects, which are the most measurable outcomes in the tourism context.

2.2. GDC, Economic and Environmental Performance

Dynamic capabilities refer to a firm's ability to reconfigure its resources and capabilities to adapt to changing environments and achieve a sustainable competitive advantage [29]. Regarding the competitive advantage [30], internal resources such as dynamic capabilities create value for organizations [31,32]. In the tourism sector, such adaptive abilities are vital for long-term competitiveness, particularly under sustainability pressures. A company's competitiveness increasingly depends on its capability to organize and utilize networks of related and unrelated firms instead of relying solely on its internal resources and capabilities [33]. Regarding this argument, it has been observed that several studies focus on the role of organizational resource capability in determining organizations' strategic responses to dynamic environmental conditions [34]. Based on this discussion, the following hypothesis is proposed to examine the impact of GDC on economic performance:

H1: *Green Dynamic Capabilities (GDC) have a positive effect on Economic Performance.*

In addition to economic performance, other studies elaborate on the various functions and activities undertaken within the scope of different environmental strategies [35]. Moreover, some studies have explored the relationship between dynamic capabilities and environmental accounting, suggesting that firms possessing strong environmental capabilities are more likely to achieve a competitive advantage. In parallel, several studies have also investigated the role of dynamic capabilities in establishing the link between lean practices and sustainable business performance. Therefore, based on these arguments, the following hypothesis is proposed, concluding that GDCs may play an important role in enhancing environmental performance and achieving sustainable competitive advantage.

H2: *Green Dynamic Capabilities (GDC) have a positive effect on Environmental Performance.*

2.3. Green Dynamic Capabilities and Eco-Innovation

In the context of sustainable development and green transformation, dynamic capabilities are pivotal in enabling firms to sense and seize environmentally oriented opportunities and to reconfigure resources accordingly [26]. In particular, GDCs serve as an essential framework through which organizations internalize ecological concerns into their operational and strategic routines. Chen and Chang [25] argue that GDCs enhance green creativity and green transformational leadership, both of which are directly linked to innovation [36] in environmental products and processes. Similarly, Lin and Chen [37] emphasize that GDCs are central to facilitating green service innovation and shaping ECI outcomes. Therefore, the following hypothesis is proposed:

H3: *Green Dynamic Capabilities (GDC) have a positive effect on Eco-Innovation (ECI).*

2.4. The Moderating Role of Environmental Management Accounting (EMA)

Although GDCs promote ECI, accurate and timely data are required to support planning, cost management, and strategic decision-making [20]. This role is fulfilled through EMA. EMA provides critical information on environmental costs, enhances strategic decision-making, and supports innovation planning [28,38,39]. In line with this, recent research emphasizes that "businesses in competitive and unpredictable environments should prioritize the implementation of environmental management accounting practices to improve their environmental performance" [20]. When integrated with GDCs, EMA can act as an enabling condition that amplifies the effectiveness of GDCs in fostering outcomes of ECI. Ferreira et al. [39] show that EMA promotes innovation by improving internal transparency and cost awareness, while Christ and Burritt [28] argue that EMA adoption is contingent on an organization's innovation orientation. Therefore, it is hypothesized that EMA moderates the relationship between GDC and ECI by offering operational feedback and fostering a culture of accountability for green initiatives.

H4: *Environmental Management Accounting (EMA) positively moderates the relationship between Green Dynamic Capabilities (GDC) and Eco-Innovation (ECI).*

2.5. Eco-Innovation and Performance Outcomes

Innovation has been defined in various ways in the literature; however, in its most general sense, it is expressed as the adoption of new systems, processes, products, practices, and services [40–42]. Utterback and Abernathy [43] emphasized product and process innovations in their research. Furthermore, product and process innovation are widely recognized as important cornerstones for enhancing the profitability of businesses [44]. Eco-Innovation (ECI) extends this by explicitly targeting environmental benefits and resource efficiency. In recent decades, environmental concerns regarding innovation have gained prominence. In response to these concerns, ECI has become increasingly significant for achieving or maintaining competitive advantage [30], particularly in sectors closely tied to environmental conditions, such as tourism. Tourism is widely regarded as one of the key sectors prioritizing innovation, profitability, and the generation of employment and economic development. According to the World Tourism Organization," tourism contributes 5% of the world's GDP. It accounts for 6% of the world's exports in services, being the fourth largest export sector after fuels, chemicals, and automotive products. Tourism is responsible for 235 million jobs, or one in every 12 jobs worldwide." These facts underscore a highly competitive business environment in which success depends increasingly on the adoption of innovative products, processes, and services. Based on this context, the following hypothesis is proposed to examine the relationship between ECI and economic performance:

H5: *Eco-Innovation (ECI) has a positive effect on Economic Performance.*

Beyond economic contributions, ECI plays a critical role in advancing environmental performance. ECI is defined as the creation, integration, or utilization of a novel product, process, method, or service that reduces ecological risk, pollution, and other adverse environmental impacts throughout its life cycle [45]. In the tourism context, ECI has been described as "the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for everyone with a whole-life-cycle minimal use of natural resources (materials including energy and surface area) per unit output, and a minimal release of toxic substance" [46]. ECI has been found to be closely related to sustainable performance within the tourism industry [47]. Moreover, the intensification of global competition and the growing awareness of sustainability have positioned ecologically based innovations as key differentiators among destinations and companies, while quality management and contributions to sustainable development are increasingly emphasized [47]. Accordingly, it is assumed that businesses adopting ECI practices will strengthen their environmental performance [38] in response to increasing sustainability expectations, leading to the following hypothesis:

H6: *Eco-Innovation (ECI) has a positive effect on Environmental Performance.*

2.6. The Mediating Role of Eco-Innovation

Dynamic capabilities stimulate ECI by integrating green knowledge and supporting organizational transformation [25,37]. Accordingly, ECI serves as a pathway through which GDCs translate into improved performance [29]. In other words, GDCs manifest themselves in performance outcomes through the mechanism of ECI [36]. This understanding is reflected in the following hypotheses:

H7: *Eco-Innovation (ECI) mediates the effect of Green Dynamic Capabilities (GDC) on Economic Performance.*

H8: *Eco-Innovation (ECI) mediates the effect of Green Dynamic Capabilities (GDC) on Environmental Performance.*

3. Methodology

According to conceptual relationships and the evidence in literature, our understanding is illustrated in Figure 1. It illustrates the preliminary research model based on proposed conceptual relationships, which is an integrated form of the above-mentioned hypotheses based on the proposed relationships. These hypotheses form the basis of the conceptual framework evaluated in this study, which will be analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM).

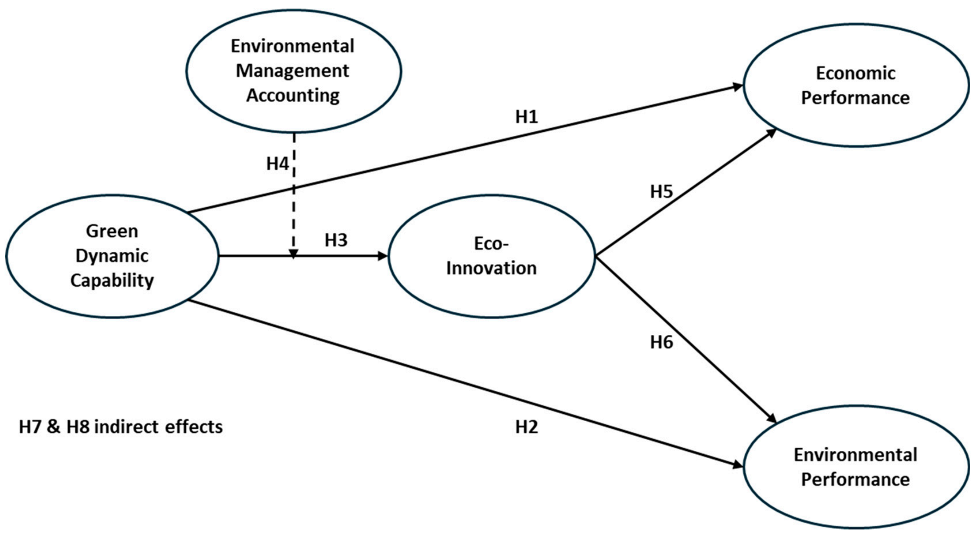

Figure 1. Preliminary Research Model Based on Proposed Conceptual Relationships.

3.1. Measurement Scales

The questionnaire deployed in this study consisted of three parts and was developed by adapting items from previously validated scales. In the first part, demographic information about the respondents and their hotels was collected, including managerial status, education, experience, gender, and age.

In the second part of the questionnaire, validated measurement scales were employed for each construct. The EMA scale, comprising 13 items under a single dimension, was adapted from Gunarathne et al. [48], drawing on the earlier works of Ferreira et al. [39] and Christ and Burritt [28]. The ECI scale, also one-dimensional and consisting of eight items, was synthesized from previous studies (e.g., [49–52]. The GDC scale, consisting of nine items under one dimension, was initially developed by Pavlou and El Sawy [53], further supported by Chen and Chang [25] and Yousaf [54], with two additional items adapted from Lin and Chen [37] and Yu et al. [15].

Lastly, in the third part, the organizational performance scale, comprising 17 items across two dimensions—Environmental Performance (10 items) and Economic Performance (7 items)—was adapted from Bansal [55], Huang and Li [49], Asadi et al. [47] and Momayez et al. [52], and was structured in line with the methodological approaches of Gunarathne et al. [48] and Momayez et al. [52].

Some items from the scales employed are as follows:

i. Environmental Management Accounting (EMA) Scale
- Our hotel applies the practice of "environmental cost identification."
- Our hotel applies the practice of "product life cycle cost assessments."

ii. Eco-Innovation (ECI) Scale
- Our hotel's production/service processes efficiently reduce hazardous chemical or waste emissions.
- Our hotel has an effective system for managing waste.

iii. Green Dynamic Capabilities (GDC) Scale
- Our hotel has effective routines for identifying and developing new green knowledge.
- Our hotel has the capability to successfully engage in the decision-making process to promote green initiatives.

iv. Environmental Performance Scale
- The environmental impacts associated with our business are decreasing.
- Waste is utilized as input within our own processes.

v. Economic Performance Scale
- Our sales growth is at a satisfactory level.
- The quality of our services is improving.

Given the high presence of foreign managers in the tourism sector, the questionnaire was administered in both English (the original language) and Turkish. Each item was first presented in English, followed by its Turkish translation, to ensure linguistic equivalence and full comprehension among all respondents. For the Turkish translation, all items in the scale were subjected to the translation and back-translation procedure [56] by bilingual language experts with advanced proficiency in both languages, to ensure a high level of translation accuracy and semantic equivalence [57].

In all scales, participants' responses were collected using a 5-point Likert-type scale ranging from "1: Totally Disagree" to "5: Totally Agree."

3.2. Sampling

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Participation was voluntary, and all respondents were informed about the purpose of the study, assured of the confidentiality of their responses, and given the right to withdraw at any stage without penalty. No personal or identifying information was collected, and the data were used solely for academic research purposes.

The data were curated in May 2024, and as of that date, only 148 hotels in Türkiye, an emerging market, had been awarded the Green Key certificate. All participating hotels were 5-star establishments, thereby maintaining a relatively homogeneous operational structure in terms of service quality, scale, and management systems. Furthermore, the research population was inherently limited, as only 148 hotels in Türkiye held the Green Key certificate at the time of data collection, and 108 valid responses were obtained. Given both the homogeneity of hotel characteristics and the small population size, introducing control variables such as hotel size, years of operation, or brand type would not yield meaningful differentiation and could reduce statistical power. Therefore, no control variables were included in the empirical model. These hotels constitute the research universe of this study. The list of Green Key hotels was obtained from the Foundation for Environmental Education in Türkiye (Türkiye Çevre Eğitimi Vakfı—TURCEV), a member of the International Foundation for Environmental Education (FEE). TURCEV is a non-governmental, non-profit organization that promotes sustainable development through environmental education and administers programs such as Eco-Schools, the Blue Flag for coastal areas, and the Green Key for hotels. While the Blue Flag program focuses on sustainable coastal development based on water quality, environmental education, environmental management, and safety criteria, the Green Key program encourages sustainable tourism practices related to water and energy consumption, as well as waste management.

Given the manageable size of the population, a web-based questionnaire was distributed to the senior managers of all 148 Green Key hotels, accompanied by a cover letter. As for the hotel types, 60 of them (approximately 56%) were chain hotels, and 96 of them (approximately 89%) had a Company Environmental Sustainability Certificate, like ISO 14001, which focuses on "how the company manages environmental risk" systematically [58]. Anonymity, privacy, and confidentiality were strictly upheld throughout the process. Responses were received from 109 hotel company managers, resulting in a response rate of 73%. Participation is accepted only at the CEO, General, and C-level manager levels because of the nature of the study. The study is related to the strategies and performance outcomes of the hotels, the aspects that are known only to the CEO and General Managers, and C-level managers. However, one of the 109 responses was incomplete and excluded from the analysis. Consequently, data collection concluded with 108 valid participants, meeting the minimum required sample size to ensure a 95% confidence level and a 5% margin of error, as recommended by Krejcie and Morgan [59].

$$s = [X^2NP(1 - P)]/[d^2(N - 1) + X^2P(1 - P)]$$

The required sample size is calculated as 107.06 by using the formula above, where:

s = required sample size

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (0.05)

Hence, this sample size not only satisfies statistical adequacy but also provides sufficient empirical grounding for conducting advanced multivariate analysis. Furthermore, the descriptive characteristics of the respondents were as follows: among 109 participants, 48.7% were male (n = 38) and 51.3% female (n = 40). The majority (81 out of 109; 74.3%) held undergraduate degrees, while 16.5% (n = 18) were graduate degree holders. In terms of managerial position, 29.4% were general managers, 25.7% CEOs, 20.2% vice general managers, and 24.7% C-level executives. Regarding age, most respondents (45.8%) were between 26 and 45 years old. Concerning tenure, 56.4% had more than 10 years of experience in their current organization, while 70.9% reported 1–5 years of experience in their present company.

Moreover, due to the complexity of the proposed model and the predictive nature of our hypotheses, Partial Least Squares Structural Equation Modeling (PLS-SEM), which is particularly suitable for predictive modeling and theory development with smaller sample sizes, was employed in the analysis [60].

3.3. Data Analysis

PLS-SEM (using SmartPLS version 3.2.9) is used to analyze collected data to test the proposed hypotheses. Before testing the hypotheses, the validity and reliability of the scales were tested alongside the assessment of the acceptability of the model.

The criteria for Convergence Validity and reliability, the Average Variance Extracted (AVE) is expected to be $\geq$0.50 [60,61], Composite Reliability (CR) is expected $\geq$0.70, and square root of the AVE value [60,61], and finally Cronbach's Alpha (α) is expected to be $\geq$0.70 [60,61].

For Discriminant Validity, Heterotrait-Monotrait Ratio (HTMT) is expected to be $\leq$0.90 for the theoretical concepts close to each other and $\leq$0.85 for those distinct [62], and the Variance Inflation Factor (VIF) is expected to be smaller than 5 [63,64].

For the model acceptability, the coefficients of determination (R^2) $\geq$ 0.10 [60,65], and the Q^2 value (the prediction relevance) > 0 [66].

4. Results

In the first run, the Economic Performance AVE value was measured below the threshold value of 0.50 [60], and the items with the lowest outer loadings were removed one by one, and analysis was repeated after each item was removed. Consequently, ECP1 and ECP4 from the Economic Performance construct, ENVP8 from the Environmental Performance construct, and GRIN6 and GRIN7 from the Green ECI construct were removed. The final run results (Table 1) satisfied all convergence validity and reliability criteria. As per the results reported in Table 1, it is concluded that the internal consistency, reliability, and convergent validity conditions were satisfied.

Table 1. Factor Loadings, Cronbach's Alpha, CR, and AVE Values of the Constructs.

Construct	Item	Factor Loadings	Cronbach's Alpha	AVE	CR
Green Dynamic Capabilities	DC1	0.908	0.973	0.977	0.827
	DC2	0.956			
	DC3	0.847			
	DC4	0.950			
	DC5	0.934			
	DC6	0.797			
	DC7	0.893			
	DC8	0.953			
	DC9	0.935			
Eco-Innovation	ECI1	0.818	0.858	0.894	0.587
	ECI2	0.704			
	ECI3	0.785			
	ECI4	0.775			
	ECI5	0.818			
	ECI8	0.685			
Environmental Management Accounting	EMA1	0.938	0.981	0.982	0.809
	EMA10	0.818			
	EMA11	0.892			
	EMA12	0.892			
	EMA13	0.897			
	EMA2	0.938			
	EMA3	0.920			
	EMA4	0.912			
	EMA5	0.904			
	EMA6	0.920			
	EMA7	0.898			
	EMA8	0.912			
	EMA9	0.843			

Table 1. *Cont.*

Construct	Item	Factor Loadings	Cronbach's Alpha	AVE	CR
Economic Performance	ECP2 ECP3 ECP5 ECP6 ECP7 ECP2	0.591 0.698 0.752 0.755 0.818 0.591	0.810	0.847	0.528
Environmental Performance	ENVP1 ENVP10 ENVP2 ENVP3 ENVP4 ENVP5 ENVP6 ENVP7 ENVP9	0.751 0.825 0.869 0.886 0.814 0.694 0.513 0.868 0.756	0.917	0.933	0.613

The highest HTMT value was measured as 0.684 between GDCs and Environmental Performance (see Table 2).

Table 2. HTMT Values of the Constructs.

Construct	1	2	3	4	5
1-Green Dynamic Capabilities					
2-Eco-Innovation	0.616				
3-Environmental Management Accounting	0.226	0.178			
4-Economic Performance	0.407	0.399	0.171		
5-Environmental Performance	0.684	0.510	0.261	0.359	

The Variance Inflation Factors (VIF) of the constructs were assessed and reported in Table 3.

Table 3. VIF Values.

	1	2	3	4	5	6
1-DC x EMA		1.159				
2-Eco-Innovation			1.473		1.473	
3-Economic Performance						
4-Environmental Management Accounting		1.058				
5-Environmental Performance						
6-Green Dynamic Capabilities		1.221	1.473		1.473	

The highest Variance Inflation Factor (VIF) was observed between Economic Performance and Environmental Performance, with a value of 1.473, which is well below the threshold of 5, thereby satisfying the multicollinearity criteria set forth by Rahman et al. [63] and Aslan et al. [64]. Hence, it was concluded that the discriminant validity is satisfied.

The acceptability of the model is assessed by R^2 and Q^2 values reported in Table 4. As per the results reported in Table 4, the measurement model has prediction power and is acceptable.

Table 4. R^2 and Q^2 Values.

Construct	R^2	R^2 Adjusted	Q^2
Eco-Innovation	0.373	0.355	0.209
Economic Performance	0.235	0.219	0.077
Environmental Performance	0.436	0.425	0.225

The final path model, according to the test results of the proposed conceptual relationships, is given in Figure 2.

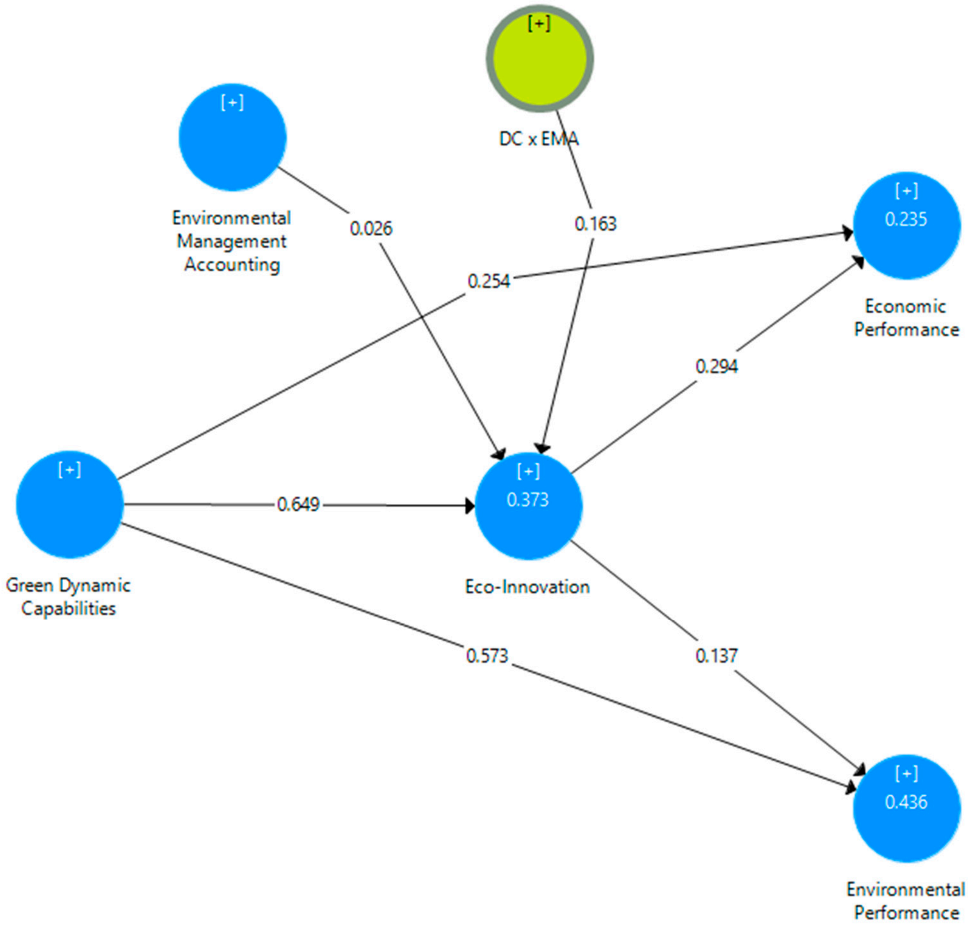

Figure 2. Final Path Model.

In covariance-based structural equation modeling (CB-SEM), overall model-fit indices are typically used to assess how closely the hypothesized model reproduces the observed covariance structure. In contrast, such a concept of global model fit cannot be directly applied to partial least squares structural equation modeling (PLS-SEM) because the estimation logic of PLS-SEM fundamentally differs from that of CB-SEM. Rather than minimizing the discrepancy between covariance matrices, PLS-SEM aims to maximize the explained variance (R^2) of endogenous constructs, thereby enhancing the model's predictive capability [67]. Consequently, absolute and incremental fit measures such as CFI, TLI, or RMSEA are not meaningful within the PLS-SEM framework. Although approximate fit indicators (e.g., SRMR, RMStheta, and exact-fit tests) have been introduced [67,68], prior research shows that they offer limited sensitivity to model misspecifications in applied settings. Therefore, following the methodological recommendations of Hair et al. [67] and Henseler et al. [68], the present study evaluated the model primarily through its explanatory and predictive power (R^2 and Q^2), as well as SRMR and RMStheta, rather than traditional CB-SEM fit indices. The SRMR values of 0.083 (saturated) and 0.087 (estimated) were both below the 0.10 threshold. The RMStheta value was 0.232; since RMStheta does not have a clearly defined threshold [69], a value close to zero [68,70] or at least below 0.30 [71] is typically considered acceptable. Thus, this value also indicates an acceptable level of model fit. The model's explanatory power (R^2) and predictive relevance (Q^2) (see Table 4) demonstrated substantial values across all endogenous constructs, confirming that the structural relationships are meaningful and stable. Furthermore, the information criteria—including Akaike's

Information Criterion (AIC), Bayesian Information Criterion (BIC), and Hannan–Quinn Criterion (HQ)—were assessed to examine model parsimony and comparative adequacy. Among the three endogenous constructs, Eco-Innovation and Environmental Performance exhibited the smallest AIC and BIC values, suggesting that these models achieved the most efficient balance between explanatory power and simplicity. Collectively, these results confirm that the proposed model is well specified, statistically stable, and robust, exhibiting reliable predictive capability under alternative estimation conditions.

Following the establishment of the scales' validity and reliability and confirmation of the measurement model's adequacy, PLS-SEM path analysis was conducted. The complete bootstrapping procedure was performed using 9000 subsamples, and the results are presented in Table 5.

Table 5. Results of the Path Analysis.

					95% CI	
Direct Effects	**β**	**SD**	**t-Value**	***p*-Value**	**2.5%**	**97.5%**
DC x EMA → ECI	0.163 *	0.076	2.105	0.035	−0.044	0.273
ECI → Economic Performance	0.294 **	0.112	2.572	0.010	0.077	0.519
ECI → Environmental Performance	0.137	0.106	1.299	0.193	−0.042	0.378
EMA → ECI	0.026	0.106	0.250	0.802	−0.187	0.234
GDC → ECI	0.649 **	0.108	5.944	0.000	0.451	0.877
GDC → Economic Performance	0.254 **	0.087	2.883	0.004	0.074	0.424
GDC → Environmental Performance	0.573 **	0.139	4.117	0.000	0.222	0.769
Indirect Effects						
GDC → ECI -> Economic Performance	0.191 *	0.077	2.470	0.014	0.053	0.361
EMA → ECI -> Economic Performance	0.008	0.036	0.213	0.831	−0.057	0.092
GDC → ECI -> Environmental Performance	0.089	0.068	1.316	0.188	−0.028	0.240
EMA → ECI -> Environmental Performance	0.004	0.019	0.187	0.852	−0.035	0.046

Note: * $p < 0.05$; ** $p < 0.01$.

Grounded in the RBV and DCT, this study examined the role of GDCs, ECI, and EMA in influencing economic and environmental performance within the Turkish hotel sector.

The SEM analysis revealed significant relationships among GDC, ECI, and performance outcomes. GDC had a strong, positive effect on ECI (β = 0.649, t = 5.94, $p < 0.001$), confirming its role as a key driver of innovation activities in the organization. This finding supports the RBV assertion that unique organizational capabilities, when valuable, rare, inimitable, and non-substitutable, can create competitive advantages. GDCs, as an extension of dynamic capabilities, reflect a firm's ability to integrate environmental concerns into strategic routines, thereby enhancing its capacity for outputs of ECI.

ECI significantly influenced Economic Performance (β = 0.294, t = 2.57, $p = 0.010$), aligning with the DCT, which emphasizes the importance of sensing, seizing, and transforming in rapidly changing environments. This supports the argument that sustainability initiatives, operationalized through ECI, can generate competitive advantages [72]. Firms that effectively reconfigure their resources toward ECI practices are better able to capitalize on emerging green market opportunities, enhancing economic returns.

However, ECI's effect on Environmental Performance was weaker and not statistically significant (β = 0.137, t = 1.30, $p = 0.193$). This result suggests that while green innovation can provide economic benefits relatively quickly, achieving measurable environmental outcomes may require a longer time frame or more mature implementation. It also highlights that operational or infrastructural limitations may dilute the immediate environmental benefits of innovation [73].

GDC also had direct, positive effects on both Economic Performance (β = 0.254, t = 2.88, $p = 0.004$) and Environmental Performance (β = 0.573, t = 4.12, $p < 0.001$), suggesting that GDCs not only foster ECI but also contribute directly to performance outcomes. This is consistent with RBV and DCT perspectives, emphasizing that dynamic capabilities are not merely indirect enablers but also exert direct strategic effects by enhancing firms' ability to adapt and thrive in dynamic contexts.

The moderating effect of Environmental Management Accounting (EMA) on the relationship between Green Dynamic Capabilities (GDC) and Eco-Innovation (ECI) was found to be positive and marginally significant (β = 0.163, t = 2.10, $p = 0.035$). Although the 95% confidence interval (–0.044 to 0.273) slightly includes zero, this is not uncommon in moderation analyses, particularly in studies with limited sample sizes and interaction terms characterized by higher standard errors. As Hair et al. [67] explain, "*a confidence interval that includes zero indicates that the path coefficient may not be significantly different from zero at the chosen confidence level. However, this does not necessarily imply that no relationship exists—it may rather suggest a lack of statistical power or a small sample size*" (p. 147). In a similar vein, Kline [74] emphasizes that "*if the confidence interval for a parameter estimate includes zero, the researcher should interpret the result cautiously. The finding does not prove the absence of an effect but indicates that the precision of the estimate is limited, often due to sampling variability or model complexity*" (p. 190). Supporting this reasoning, Hayes [75] clarifies that "*because a bootstrap confidence interval is not derived based on any assumption about the size of the parameter, it is not correct to say that $p < 0.05$ if a 95% confidence interval does not include zero*" (p. 102), illustrating that p-values and bootstrap confidence intervals may diverge in small-sample or resampling-based analyses. Taken together, these methodological authorities suggest that when a confidence interval slightly encompasses zero, it reflects low statistical precision rather than the absence of an underlying relationship, especially in moderation models estimated with limited sample sizes.

Figure 3 illustrates the DCxEMA slope analysis which displays the moderating effect of EMA on the relationship between GDC and ECI. On the x-axis, GDCs are plotted, while the y-axis represents ECI levels. The meaning of the three regression lines in Figure 3 is explained as follows:

- The red line represents the relationship at low levels of EMA (−1 standard deviation),
- The blue line represents the relationship at the mean level of EMA,
- The green line represents the relationship at high levels of EMA (+1 standard deviation).

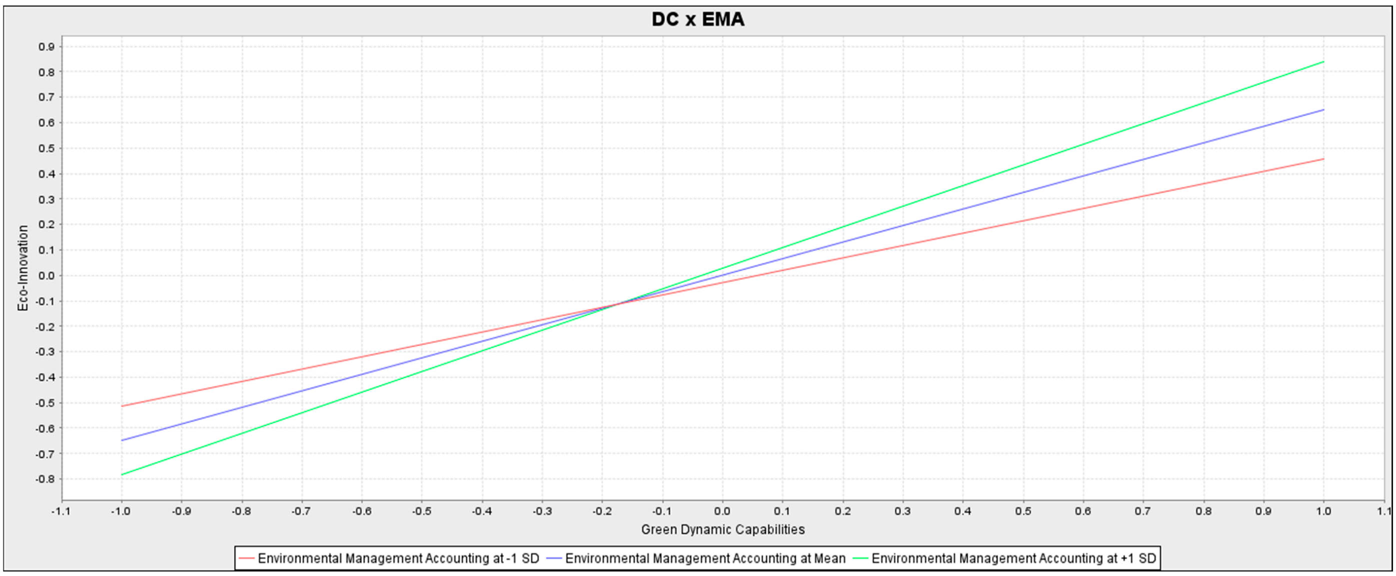

Figure 3. The DCxEMA Slope.

The figure clearly shows that the positive effect of GDCs on ECI becomes stronger as the level of EMA increases. Specifically, when EMA is high (green line), the slope is steeper, indicating that organizations with strong EMA practices are better able to leverage their

GDCs to drive ECI. Conversely, when EMA is low (red line), the slope is flatter, suggesting that without strong EMA practices, the ability of GDCs to foster ECI is diminished.

The findings confirm the significant positive moderating role of EMA, reinforcing the idea that internal EMA systems amplify the strategic impact of GDCs on ECI outcomes.

The model explained about 37.3% of the variance in ECI, 23.4% of the variance in Economic Performance, and 43.7% of the variance in Environmental Performance, suggesting that the model has moderately strong explanatory power.

5. Discussion

This study has shown that GDCs significantly influence environmental performance in the hotel industry and that this relationship is mediated by ECI and moderated by EMA. These results support previous findings that suggest dynamic capabilities play a critical role in shaping sustainable performance outcomes [15,16,36,52], particularly when supported by internal routines and information-based infrastructures [14,26]. From an organizational perspective, this finding highlights that capabilities require activation through mechanisms that translate intent into tangible change.

The mediating role of ECI confirms that environmental capabilities do not inherently yield improved environmental performance [23,29,38]. Instead, capabilities must be directed through innovation processes embedded in the organization's operational systems [73,75]. In this sense, ECI acts as a transformation layer that connects strategic capability with outcome, reinforcing the idea that innovation is not only a goal but a structural conduit for capability expression [54].

Moreover, the significant moderating effect of EMA suggests that internal accounting systems, traditionally regarded as reactive tracking tools, can indeed be active elements in organizational learning and sustainability execution [19,20,51]. EMA provides not only environmental cost visibility but also enables forward-looking coordination, resource planning, and internal alignment [18,28,39]. This finding supports the proposition that EMA can play an organizing role, structuring the processes through which capabilities are deployed and monitored.

This finding also aligns with the view that GDCs must be integrated into the firm's organizational logic, encompassing its information systems, reporting routines, and feedback loops. While GDCs are often treated as abstract strategic assets, our study suggests that their impact depends on being embedded in cross-functional practices and decision structures, a notion aligned with resource orchestration theory and the microfoundations of dynamic capabilities [27,34].

Another important contribution of this study lies in revealing how ECI, enabled by EMA, serves as a form of strategic renewal. Rather than viewing innovation as an isolated outcome, our findings suggest it functions as a reconfiguration mechanism that updates and aligns the firm's routines with sustainability goals [15,25]. This implies that firms seeking to implement GDCs effectively must focus not only on strategic intent, but also on the organizational structures that allow innovation to emerge, be tracked, and be integrated into operations.

Finally, the synergistic interaction of GDCs, ECI, and EMA highlights the importance of internal alignment mechanisms, a topic that is less frequently studied and explored in the sustainability literature [20,23,52]. Organizations that successfully align their strategies are likely to achieve stronger environmental outcomes, which suggests that the translation of capabilities into performance is not linear but rather conditioned by how firms organize themselves for environmental accountability. Thus, our study contributes to the broader understanding of how sustainability is operationalized not only through what organizations aim to achieve, but also through how they structure, coordinate, and monitor their strategic efforts.

Despite the relatively modest sample size, the high response rate (73%) and the near-complete coverage of the target population (108 out of 148 hotels) enhance empirical credibility of the findings. Most importantly, all participants were among the senior-level decision-makers (e.g., CEOs, General Managers, or C-level executives) of the participating hotels, ensuring that the responses reflect strategic-level insights rather than operational or mid-tier perspectives. Moreover, the use of PLS-SEM—recognized for its robustness in studies with small to medium-sized samples—further supports the reliability of the model estimations [60]. In this context, the statistically significant path coefficients and high factor loadings reported in the results provide additional validation that the sample was sufficient to detect the hypothesized effects within acceptable statistical power. Therefore, concerns regarding sample size limitations should be reconsidered in light of the methodological rigor, participant expertise, and the population-specific representativeness achieved in this study.

5.1. Implications for Theory

This study offers several theoretical implications for the literature on sustainability-oriented organizational capabilities. First, it contributes to the understanding of how GDCs translate into performance outcomes by proposing and empirically validating a mechanism where ECI mediates this relationship. While previous studies have focused on GDCs as a strategic resource, this study emphasizes their dependence on internal innovation routines and information systems. This confirms that GDCs cannot be viewed as isolated competencies, but rather as interdependent constructs that require structural embedding within the organization.

Second, the study highlights the organizing role of EMA, not just as a control mechanism, but as a strategic enabler that conditions the performance effects of GDCs. This shifts the perception of EMA from being a compliance-based tool to being an integral component of sustainability execution, suggesting that accounting systems should be theorized as part of the broader organizational infrastructure that supports environmental transformation.

Third, the findings support a relational view of organizational capabilities, where outcomes are not only a function of what capabilities a firm has, but also of how those capabilities are supported by coordinating systems, internal feedback mechanisms, and innovation channels. This view complements the DCT by drawing attention to the microfoundational and processual elements that enable capability deployment in sustainability contexts.

Finally, this study extends the theoretical discussion on how sustainability can be operationalized in service industries—particularly tourism—by offering a framework that connects strategic capabilities, innovation behavior, and internal organizing systems. This framework can inform future research seeking to unpack the structural and cultural conditions under which green strategies succeed or fail in complex, service-intensive environments.

5.2. Implications for Practice

The results of this study also offer important implications for practice, particularly for sustainability managers, hotel operators, and policymakers in the tourism sector. First, the strong impact of ECI as a mediating factor suggests that investment in innovation processes, such as green technology adoption, sustainable service redesign, and eco-friendly supply chains, is crucial for realizing the potential of dynamic capabilities.

Second, the role of EMA as a moderator indicates that internal accounting and reporting systems should be redesigned to not only capture environmental costs but to enable learning, cross-departmental coordination, and forward-looking planning. Managers should consider EMA not just as a financial tool but also an organizing resource that helps align sustainability objectives with everyday operations.

Third, the findings underline the importance of cross-functional collaboration in sustainability implementation. Because GDCs and ECI touch multiple departments, from operations and procurement to marketing and HR, there must be strong internal alignment and communication supported by formal structures.

Lastly, the framework developed in this study can help hotel businesses benchmark their sustainability maturity by assessing whether they merely possess green strategic intent or have also developed the organizational infrastructure needed to turn that intent into performance outcomes. Policymakers and industry associations may also draw from this model to create assessment tools, training programs, or guidelines for firms seeking to develop integrated environmental strategies.

6. Conclusions

This study aimed to investigate the relationship between GDCs, ECI, EMA, and environmental performance in the hotel industry. The results demonstrated that ECI plays a mediating role between GDCs and environmental performance, while EMA serves as a significant moderator. These findings collectively suggest that environmental capabilities in the tourism and hospitality sector are most effective when supported by innovation processes and formalized internal control systems.

The study contributes to the growing body of knowledge DCT regarding sustainability by introducing a framework that links capabilities with innovation and internal accounting structures. Unlike prior research that often treats these elements in isolation, this study emphasizes their interdependence and alignment, providing new insights into how sustainability strategies are organized and executed in service-intensive industries like tourism. Furthermore, the empirical validation of EMA as a strategic enabler adds a fresh dimension to the role of accounting tools in supporting organizational transformation.

6.1. Limitations

Despite its contributions, the study has several limitations. First, the data is cross-sectional, which limits the ability to draw causal inferences. Second, the research focuses on the hotel sector within selected regions, which may affect the generalizability of findings to other service contexts or geographies. Third, while the study captures firm-level perceptions, it does not fully explore how these practices are implemented at the operational level or how they evolve over time. Additionally, certain cultural and regulatory factors, which may influence the deployment of ECI and EMA practices, are not explicitly modeled.

6.2. Future Research Directions

Future studies could employ longitudinal designs to explore how the relationship between GDCs, ECI, and EMA evolves over time. There is also a need to examine the organizational routines and decision-making processes that underpin the development of these capabilities. Further exploration of cross-national comparisons would help clarify the impact of institutional environments, regulatory pressures, and cultural values on sustainability organizing. Finally, mixed-methods research involving interviews or case studies could complement the quantitative results and offer a more nuanced understanding of the microfoundations of environmental capabilities.

Author Contributions: Conceptualization, A.Z.A. and P.A.; Methodology, P.A. and M.A.; Software, P.A. and M.A.; Validation, P.A.; Formal analysis, P.A. and M.A.; Investigation, İ.Y. and O.K.Y.; Resources, A.Z.A., İ.Y. and O.K.Y.; Data curation, A.Z.A., P.A., İ.Y. and O.K.Y.; Writing—original draft, A.Z.A., P.A. İ.Y. and O.K.Y.; Writing—review & editing, A.Z.A. and M.A.; Visualization, A.Z.A. and M.A.; Supervision, A.Z.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of T.C. Istanbul Gelisim Üniversitesi Etik Kurul Baskanlıgı (Project 2021-23-12) on [30 June 2021].

Informed Consent Statement: Informed consent for participation was obtained from all subjects involved in the study.

Data Availability Statement: The authors declare that the data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

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