

**THE IMPACT OF ENVIRONMENTAL CORPORATE SOCIAL
RESPONSIBILITY ON GREEN AMBIDEXTROUS INNOVATION IN
ENTERPRISES WITHIN NORTHERN VIETNAM'S INDUSTRIAL
ZONES**

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ABSTRACT

This study examined the impact of environmental social responsibility on ambidextrous green innovation among enterprises operating in Northern Vietnam's Industrial Zones. Building on foundational theories, including stakeholder theory, organizational learning theory, dynamic capability theory, and ambidexterity theory, the study develops an integrated theoretical model in which environmental social responsibility serves as the independent variable, ambidextrous green innovation as the dependent variable, and green learning orientation, green intellectual capital, and green knowledge acquisition as mediating variables. Research data were collected from 474 valid survey responses from enterprises located in Northern Vietnam's Industrial Zones and were analyzed using Cronbach's Alpha, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM) with SPSS and AMOS. The findings indicate that environmental social responsibility has a positive and statistically significant impact on the mediating variables, with the strongest effect observed on green learning orientation, followed by green knowledge acquisition and green intellectual capital. These mediating factors, in turn, further promote firms' ambidextrous green innovation. The study contributes to the growing body of empirical evidence on the mechanism through which environmental social responsibility is transformed into green innovation outcomes in the context of industrial enterprises in Vietnam. It also offers several managerial implications to enhance innovation capability and foster sustainable development.

1.0 INTRODUCTION

In the era of globalization, escalating climate change, resource depletion, and environmental degradation have rendered the decoupling of economic growth from environmental impact an existential imperative for the corporate sector. Within the Vietnamese context, industrial zones in the Northern region serve as pivotal engines of national economic growth. However, these hubs are simultaneously confronting intensifying pressure to mitigate carbon emissions,

optimize resource efficiency, and comply with increasingly stringent environmental standards imposed by both domestic regulations and international markets. Consequently, Environmental Corporate Social Responsibility (ECSR) has evolved beyond mere legal compliance or a public relations instrument; it is now a core strategic orientation essential for cultivating sustainable competitive advantages.

Recent scholarship suggests that ECSR can catalyze green innovation by heightening environmental awareness, fostering organizational learning, and facilitating the accumulation of green knowledge resources. Nevertheless, a significant portion of existing literature treats green innovation as a monolithic construct or examines CSR as a broad, multi-dimensional concept. There remains a critical research gap in isolating ECSR as a distinct independent variable and elucidating its specific underlying mechanisms- particularly its impact on Green Ambidextrous Innovation (the balance between green exploratory and exploitative innovation). This gap is especially pronounced regarding enterprises within Northern Vietnam's industrial zones, which face unique institutional pressures, export-driven requirements, and an urgent need for green transformation.

Driven by these practical and theoretical exigencies, this study aims to examine the impact of ECSR on green ambidextrous innovation among enterprises in Northern Vietnam's Industrial Zones. Furthermore, it seeks to investigate the mediating roles of Green Learning Orientation, Green Intellectual Capital, and Green Knowledge Acquisition within this relationship. The findings are expected to contribute significantly to the literature by providing empirical evidence for foundational theories (such as Resource-Based View and Stakeholder Theory) while offering practical insights for firms seeking to integrate social responsibility and green innovation into their long-term sustainability strategies.

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2.0 THEORETICAL BACKGROUND AND RESEARCH MODEL

2.1 Theoretical Framework

i. Environmental Corporate Social Responsibility (ECSR)

Corporate Social Responsibility (CSR) constitutes a fundamental paradigm in contemporary management and sustainable development discourses. According to the seminal framework by Carroll (1991), CSR transcends mere economic maximization, explicitly integrating legal, ethical, and discretionary (philanthropic) responsibilities. Building upon this, Environmental Corporate Social Responsibility (ECSR) has emerged as a pivotal subset of CSR, encapsulating a firm's voluntary commitment to mitigating its adverse ecological externalities. ECSR extends beyond rudimentary regulatory compliance; it reflects proactive stewardship in resource conservation, emission containment, waste management, and capital allocation toward clean technologies. Mazurkiewicz (2004) conceptualizes ECSR as a comprehensive internalization of environmental impacts, wherein firms systematically evaluate the ecological footprints of their operations, product lifecycles, and physical infrastructures to curtail pollution and

optimize resource productivity. Furthermore, Rahman and Post (2012) posit that ECSR is operationalized through environmental disclosure, corporate reputation, and verifiable environmental performance. In the current global landscape, ECSR is increasingly recognized as a strategic imperative that enhances corporate image, satisfies multifaceted stakeholder expectations, and establishes a resilient foundation for long-term sustainability.

ii. Ambidextrous Green Innovation (AGI)

Green innovation entails the organizational process of developing or refining products, processes, and managerial practices to be environmentally benign, resource-efficient, and ecologically restorative. According to Chen (2008), green innovation manifests as the strategic application of green technologies, materials, and administrative protocols to coalesce economic value creation with environmental stewardship. Building upon this, Ambidextrous Green Innovation (AGI) is operationalized as a firm's capacity to simultaneously pursue green exploitative innovation and green exploratory innovation. Specifically, green exploitative innovation centers on the incremental refinement of existing technologies, processes, and products to augment current environmental efficiency. Conversely, green exploratory innovation is directed toward the conceptualization and development of disruptive green solutions, novel technologies, or paradigm-shifting business models. This dual pursuit enables firms to optimize short-term operational efficiency while cultivating sustained long-term competitive advantages. Viewed through the lens of the dynamic capabilities view (DCV), AGI reflects a firm's proficiency in adapting, reconfiguring resources, and seizing emergent green opportunities within a turbulent macroeconomic environment. Consequently, AGI is not merely a byproduct of technological capital expenditure but is intrinsically tethered to the firm's organizational capacities, learning trajectories, and knowledge accumulation mechanisms.

iii. Green Learning Orientation (GLO)

Green Learning Orientation denotes the extent to which an enterprise prioritizes the acquisition, accumulation, dissemination, and application of environmental knowledge throughout its organizational structure. Rooted in organizational learning theory, which posits learning as the foundational catalyst for adaptation and innovation, this concept builds upon the framework of Sinkula, Baker, and Noordewier (1997). They articulate that a learning orientation is manifested through a pervasive commitment to learning, a shared organizational vision, and robust open-mindedness. Transported into an ecological context, this orientation encompasses the systematic assimilation of paradigms related to environmental conservation, clean technologies, and sustainable development. Enterprises exhibiting a high GLO proactively assimilate emergent environmental knowledge, incentivize the intra-organizational exchange of green intellect across functional boundaries, and foster a rigorous learning culture oriented toward sustainable innovation. This strategic orientation significantly bolsters a firm's agility in responding to evolving market exigencies and stringent environmental regulations, thereby acting as a critical antecedent supporting Ambidextrous Green Innovation.

iv. Green Intellectual Capital (GIC)

Green Intellectual Capital comprises the aggregate of intangible, environment-centric knowledge resources that an enterprise possesses and deploys in its governance and innovation

endeavors. Adopting the taxonomy proposed by Chen (2008), GIC is systematically delineated into three constituent dimensions: green human capital, green structural capital, and green relational capital. Green human capital embodies the environmental acumen, competencies, and ecological awareness embedded within the firm's workforce. Green structural capital refers to the organizational architectures, technological systems, proprietary databases, and governance protocols that facilitate the realization of environmental objectives. Lastly, green relational capital encompasses the firm's network of external alliances - including engagements with clientele, suppliers, regulatory bodies, and broader stakeholders - anchored in the ethos of sustainable development. Within the paradigm of green competition, GIC functions as a quintessential strategic asset, instrumental in forging and sustaining long-term competitive parity. The robust accumulation of GIC unequivocally amplifies a firm's efficacy in conceptualizing green initiatives, orchestrating process refinements, and successfully executing Ambidextrous Green Innovation.

v. Green Knowledge Acquisition (GKA)

Green Knowledge Acquisition denotes an organization's proficiency in identifying, assimilating, and leveraging externally sourced environmental knowledge to augment its managerial practices and innovation pipelines. This construct is theoretically anchored in the absorptive capacity framework articulated by Zahra and George (2002), which contends that the assimilation of exogenous knowledge is an indispensable mechanism for expanding a firm's epistemic base, amplifying its learning capabilities, and catalyzing innovation. In the ecological domain, GKA emphasizes the systematic acquisition of intelligence pertaining to clean technologies, evolving environmental standards, regulatory mandates, sustainable business paradigms, and shifting green consumer preferences. Organizations exhibiting superior GKA are adept at monitoring emergent environmental trajectories, discerning latent innovation opportunities, and synergizing nascent knowledge with extant internal capabilities to engender highly efficacious green solutions. Consequently, GKA operates as a critical mediating mechanism that bridges Environmental Corporate Social Responsibility (ECSR) with Ambidextrous Green Innovation.

2.2 Hypothesis Development and Proposed Research Model

2.2.1 The Impact of Environmental Corporate Social Responsibility on Ambidextrous Green Innovation

Environmental Corporate Social Responsibility (ECSR) currently functions as a strategic driver for Ambidextrous Green Innovation (AGI), enabling organizations to strike a balance between exploiting extant technologies and exploring nascent ecological solutions (March, 1991; O'Reilly & Tushman, 2013). Grounded in the Dynamic Capabilities View (DCV) (Teece, 2007) and Organizational Learning Theory (Huber, 1991), ECSR facilitates the integration and reconfiguration of resources to adapt to volatile market conditions. Empirical evidence suggests that ECSR enhances technological proficiency, corporate reputation, and financial performance through green process and product innovation initiatives (Zhang et al., 2020; Xie et al., 2019). Furthermore, through knowledge governance mechanisms and the development of dynamic capabilities, ECSR creates optimal conditions for achieving organizational ambidexterity (Abbas & Sağsan, 2019; Li et al., 2022). Consequently, ECSR

not only drives individual types of innovation but serves as the foundational pillar for sustaining long-term ambidextrous innovation capabilities (Chen et al., 2014). Based on these theoretical foundations, we propose:

H1: Environmental Corporate Social Responsibility (ECSR) has a significant positive impact on Ambidextrous Green Innovation (AGI).

2.2.2 The Mediating Role of Green Learning Orientation

In accordance with Organizational Learning Theory (Sinkula et al., 1997), ECSR establishes a conducive environment for the emergence of a Green Learning Orientation (GLO) by incentivizing human capital development and fostering internal knowledge-sharing systems. Empirical research indicates that employee perceptions of CSR enhance creative motivation and consolidate the accumulation of green intellectual assets (Hur et al., 2018; Shahzad et al., 2020). Thus, ECSR is identified as a critical antecedent that elevates environmental knowledge management and learning orientation (Wang et al., 2022; García-Sánchez et al., 2021). Accordingly, we propose:

H2: Environmental Corporate Social Responsibility (ECSR) has a significant positive impact on Green Learning Orientation (GLO).

Conversely, GLO functions as a cognitive mechanism that transforms knowledge inputs into innovative outputs. From a Knowledge-Based View (KBV) (Grant, 1996), GLO empowers firms to simultaneously optimize existing technologies (exploitative innovation) and explore radical green solutions (exploratory innovation). This orientation effectively translates ECSR commitments into tangible innovation performance and sustainable competitive advantages (Li et al., 2021; Luo et al., 2021). Based on the aforementioned arguments, we hypothesize:

H3: Green Learning Orientation (GLO) mediates the relationship between Environmental Corporate Social Responsibility (ECSR) and Ambidextrous Green Innovation (AGI).

2.2.3 The Mediating Role of Green Intellectual Capital

Green Intellectual Capital (GIC) represents the core environmental knowledge resources that generate sustainable competitive advantages for an enterprise (Barney, 1991; Chen, 2008). Under the burgeoning pressure from multifaceted stakeholders and the strategic necessity for ecological adaptation (Freeman, 1984; Teece, 2007), Environmental Corporate Social Responsibility (ECSR) serves as a primary driver for GIC accumulation. Specifically, ECSR initiatives - such as specialized green human resource training, the implementation of robust environmental management systems, and the intensification of external eco-collaborations - facilitate the systematic buildup of intangible green assets (Chang & Chen, 2012; Singh et al., 2020). Accordingly, we posit:

H4: Environmental Corporate Social Responsibility (ECSR) has a significant positive impact on Green Intellectual Capital (GIC).

GIC, conceptualized through its three fundamental dimensions - green human capital, green structural capital, and green relational capital - enables firms to effectively create, disseminate,

and leverage environmental knowledge (Subramaniam & Youndt, 2005). Moreover, it provides the cognitive and infrastructural foundation requisite for maintaining a strategic equilibrium between exploitative and exploratory green innovation (March, 1991; O'Reilly & Tushman, 2013). The mediating function of GIC in the nexus between CSR and green innovation has been empirically substantiated in several contemporary studies (Chang & Chen, 2012; Shahzad et al., 2020). Therefore, we propose:

H5: Green Intellectual Capital (GIC) mediates the relationship between Environmental Corporate Social Responsibility (ECSR) and Ambidextrous Green Innovation (AGI).

2.2.4 The Mediating Role of Green Knowledge Acquisition

According to Absorptive Capacity Theory (Cohen & Levinthal, 1990; Zahra & George, 2002), an organization's ability to acquire external knowledge is contingent upon its prior knowledge base and strategic intent. In this context, Environmental Corporate Social Responsibility (ECSR) provides a strategic framework that encourages firms to proactively identify and assimilate environmental intellect through clean-tech R&D, strategic partnerships, and the advancement of environmental management systems. Furthermore, Stakeholder Theory (Freeman, 1984) posits that external pressures from consumers, regulatory bodies, and society compel firms to align with evolving environmental standards, thereby intensifying the demand for Green Knowledge Acquisition (GKA). Empirical studies by Shahzad et al. (2020), Xie et al. (2019), and Wang et al. (2022) corroborate that CSR initiatives facilitate knowledge governance and green innovation via the mechanism of knowledge acquisition. Consequently, we propose:

H6: Environmental Corporate Social Responsibility (ECSR) has a significant positive impact on Green Knowledge Acquisition (GKA).

From the Knowledge-Based View (KBV) (Grant, 1996) and Dynamic Capabilities View (DCV) (Teece, 2007), GKA enables firms to access cutting-edge clean technologies and sustainable managerial practices. It allows for the integration and reconfiguration of knowledge resources to support the duality of exploitative and exploratory innovation. The mediating role of knowledge acquisition in the nexus between CSR and innovation has been substantiated across various empirical settings (Xie et al., 2019; Luo et al., 2021). Thus, we hypothesize:

H7: Green Knowledge Acquisition (GKA) mediates the relationship between Environmental Corporate Social Responsibility (ECSR) and Ambidextrous Green Innovation (AGI).

2.2.5 Relationships between GLO, GIC, GKA, and Ambidextrous Green Innovation

Drawing on Organizational Learning Theory (Sinkula et al., 1997) and the KBV (Grant, 1996), GLO enables enterprises to continuously accumulate, share, and restructure environmental intellect. This provides the requisite foundation for both the efficient exploitation of existing processes and the exploration of breakthrough green technologies (O'Reilly & Tushman, 2013). Previous research by Calantone et al. (2002), Wang (2008), and Luo et al. (2021) has identified a robust positive correlation between learning orientation and ambidextrous innovation performance. Therefore, we propose:

H8: Green Learning Orientation (GLO) has a significant positive impact on Ambidextrous Green Innovation (AGI).

Based on the Resource-Based View (RBV) (Barney, 1991) and the Intellectual Capital framework (Subramaniam & Youndt, 2005), GIC serves as a strategic knowledge repository that facilitates simultaneous process refinement and the development of novel green products (Chen, 2008). Studies by Huang & Kung (2011) and Luo et al. (2021) confirm that GIC significantly augments ambidextrous green innovation by enhancing organizational capabilities. Accordingly, we hypothesize:

H9: Green Intellectual Capital (GIC) has a significant positive impact on Ambidextrous Green Innovation (AGI).

Under the KBV, GKA expands the organizational knowledge base, thereby amplifying innovation capacity and the development of eco-friendly solutions (Grant, 1996; Zahra & George, 2002). GKA serves as a platform that supports exploitative innovation through incremental improvements and exploratory innovation through radical technological shifts (March, 1991; O'Reilly & Tushman, 2013). Furthermore, according to DCV, the ability to acquire knowledge allows firms to discern and capitalize on innovative opportunities within volatile ecological environments (Teece et al., 1997). Empirical evidence from Xie et al. (2019) and Albort-Morant et al. (2018) underscores the role of absorptive capacity in driving sustainable innovation. We therefore suggest:

H10: Green Knowledge Acquisition (GKA) has a significant positive impact on Ambidextrous Green Innovation (AGI).

2.2.6 Proposed Research Model

Based on the theoretical framework and the development of research hypotheses, this study proposes a conceptual model where Environmental Corporate Social Responsibility (ECSR) serves as the independent variable, and Ambidextrous Green Innovation (AGI) acts as the dependent variable. Furthermore, Green Learning Orientation (GLO), Green Intellectual Capital (GIC), and Green Knowledge Acquisition (GKA) are integrated as mediating variables.

This model is designed to evaluate not only the direct impact of ECSR on AGI but also to elucidate the underlying mediating mechanisms. These mechanisms clarify how environmental commitments are transformed into green innovation outcomes within the specific context of enterprises operating in Northern Vietnam's industrial zones.

The proposed research model is illustrated in Figure 1 below:

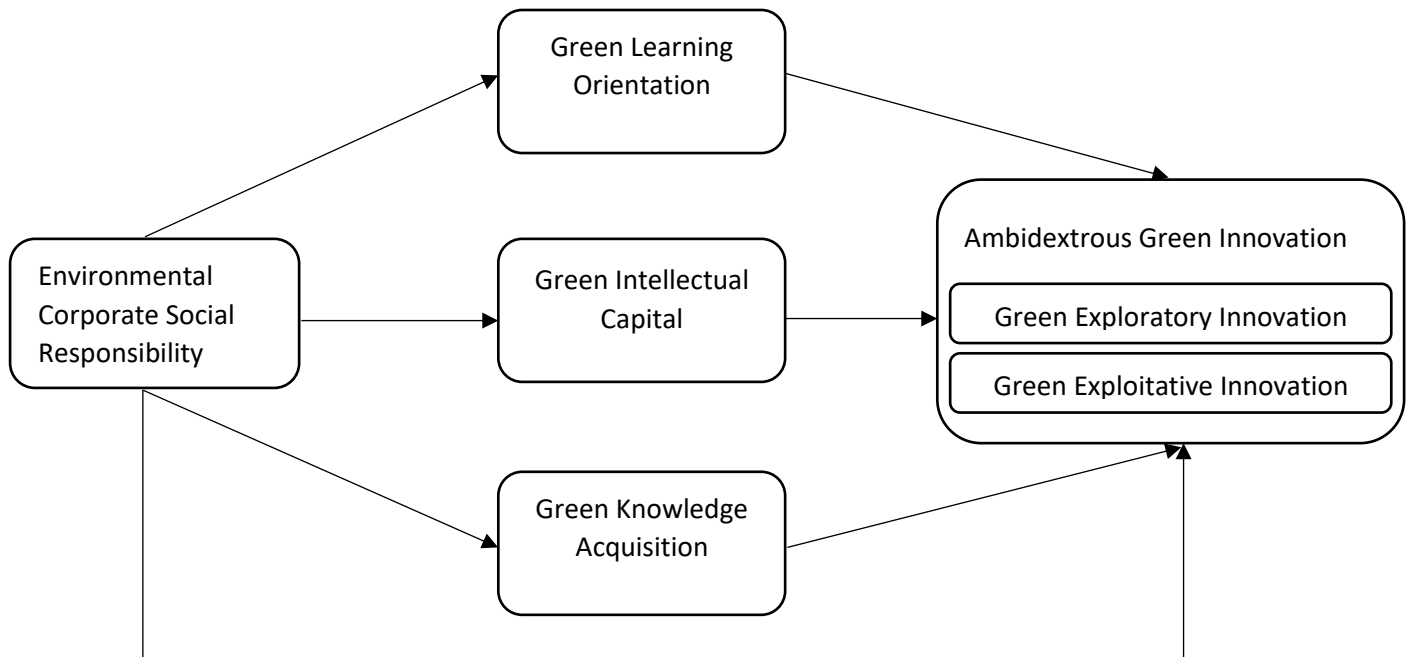


Figure 1. Proposed Research Framework

3.0 RESEARCH METHODOLOGY

3.1 Research Design

This study adopts a mixed-methods research design, integrating both qualitative and quantitative approaches. In the qualitative phase, we conducted a comprehensive review of domestic and international literature, followed by consultations with subject-matter experts. These steps were essential to refine and adapt the measurement scales to the specific context of manufacturing enterprises operating within Northern Vietnam's Industrial Zones.

In the quantitative phase, primary data were collected via a structured survey using a 5-point Likert scale. The measurement items were adapted from established literature: Environmental Corporate Social Responsibility (ECSR) draws on Turker (2009) and Kraus et al. (2020); Green Learning Orientation (GLO) is based on Sinkula et al. (1997) and Wang et al. (2021); Green Intellectual Capital (GIC) aligns with Chen (2008) and Yong et al. (2019); Green Knowledge Acquisition (GKA) follows Zahra and George (2002) and Albort-Morant et al. (2018); and Ambidextrous Green Innovation (AGI) is adapted from Jansen et al. (2006) and Li et al. (2018).

Data analysis was performed using SPSS and AMOS software, encompassing descriptive statistics, Cronbach's Alpha reliability testing, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM). This rigorous procedure ensures the reliability and validity of the measurement scales and facilitates the testing of the proposed research hypotheses.

3.2 Data Collection

The data for this study was collected through a quantitative questionnaire survey conducted between October 2025 and December 2025. The data collection process applied a non-probability convenience sampling method, directly approaching leaders, managers, and key personnel working in 82 enterprises within industrial parks in Northern Vietnam, specifically in Hai Phong, Bac Ninh, Thai Nguyen, and Hanoi. A total of 512 questionnaires were distributed, yielding 477 responses. After checking, screening, and removing incomplete or invalid responses, the study retained 474 valid questionnaires for data processing. This sample size (N = 474) exceeds the minimum requirement, fully ensuring the reliability and representativeness needed to perform multivariate statistical analyses such as Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM).

Table 1. Descriptive statistics of the research sample

Factor	Category	Quantity	%
Enterprise type	Government	68	14.3
	Private	140	29.4
	FDI	269	56.4
Workforce size	Under 50	128	26.8
	50-199	184	38.6
	200-499	102	21.4
	Upper 500	63	13.2
Main field of activity	manufacture	233	48.8
	Process	145	30.4
	Support Industry	99	20.8
Years of operation	Below 1 year	74	15.5
	1-5 years	237	49.7
	5-10 years	166	34.8

4.0 EMPIRICAL RESULTS

4.1 Measurement Reliability and Validity Assessment

To evaluate the internal consistency of the measurement scales, this study employed Cronbach's Alpha (α) coefficients and Corrected Item-Total Correlation indicators. According to established psychometric standards, a scale is considered reliable when the Cronbach's Alpha value exceeds 0.70 and the Corrected Item-Total Correlation of each item is greater than 0.30.

Table 2. Cronbach’s Alpha Reliability Results

Constructs	Cronbach's Alpha (α)
Environmental Corporate Social Responsibility (ECSR)	0.907
Green Learning Orientation (GLO)	0.884
Green Intellectual Capital (GIC)	0.924
Green Knowledge Acquisition (GKA)	0.841
Green Exploratory Innovation (EXP)	0.881
Green Exploitative Innovation (EXPL)	0.896

As presented in Table 2, the Cronbach’s Alpha coefficients for all constructs range from 0.841 to 0.924, significantly surpassing the recommended threshold of 0.70. Specifically, Green Intellectual Capital (GIC) exhibited the highest reliability ($\alpha = 0.924$), followed by Environmental Corporate Social Responsibility (ECSR) ($\alpha= 0.907$). These results confirm the high internal consistency of the measurement instruments across all six constructs. Consequently, all scales satisfy the rigorous requirements for subsequent multivariate analyses, including Exploratory Factor Analysis (EFA) and Structural Equation Modeling (SEM).

4.2 Exploratory Factor Analysis (EFA)

Following the reliability assessment, Exploratory Factor Analysis (EFA) was performed using Principal Component Analysis with Promax rotation to examine the underlying factor structure of the 28 observed variables. The results of the EFA, as summarized in Table 3, demonstrate high statistical adequacy for factor extraction.

Table 3. KMO and Bartlett’s Test Results

Metric	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.918
Bartlett's Test of Sphericity (Sig.)	0.000
Total Variance Explained (%)	65.147
Cumulative Eigenvalue	1.139

Specifically, the Kaiser-Meyer-Olkin (KMO) measure is 0.918 (surpassing the threshold of 0.50), and Bartlett’s Test of Sphericity yielded a significance level of $p = 0.000$. These indicators confirm that the data is well-suited for factor analysis and that significant correlations exist among the variables within the population.

Based on the Eigenvalue criterion (> 1.0), six distinct factors were extracted, with the lowest Eigenvalue recorded at 1.139. The Total Variance Explained is 65.147%, exceeding the required 50% threshold. This suggests that the six-factor model effectively accounts for approximately 65.15% of the total variance in the original 28 items.

The results of the Pattern Matrix (Table 4) reveal that all factor loadings exceed the 0.50 threshold, and no significant cross-loadings were observed. Consequently, all 28 original variables were retained, and the conceptual boundaries of the proposed constructs remained unchanged.

Table 4. Pattern Matrix Results

Items	Factor						Constructs
	1	2	3	4	5	6	
GIC6	0.840						Green Intellectual Capital (GIC)
GIC7	0.830						
GIC3	0.827						
GIC4	0.790						
GIC1	0.778						
GIC2	0.770						
GIC5	0.758						
ECSR3		0.921					Environmental Corporate Social Responsibility (ECSR)
ECSR4		0.900					
ECSR5		0.819					
ECSR2		0.701					
ECSR1		0.654					
GKA2			0.944				Green Knowledge Acquisition (GKA)
GKA3			0.814				
GKA1			0.660				
GKA4			0.609				
GKA5			0.518				
EXPL1				0.870			Green Exploitative Innovation (EXPL)
EXPL4				0.826			
EXPL2				0.815			
EXPL3				0.772			
GLO1					0.871		Green Learning Orientation (GLO)
GLO3					0.798		
GLO4					0.764		
GLO2					0.700		
EXP3						0.853	Green Exploratory Innovation (EXP)
EXP1						0.834	
EXP2						0.810	

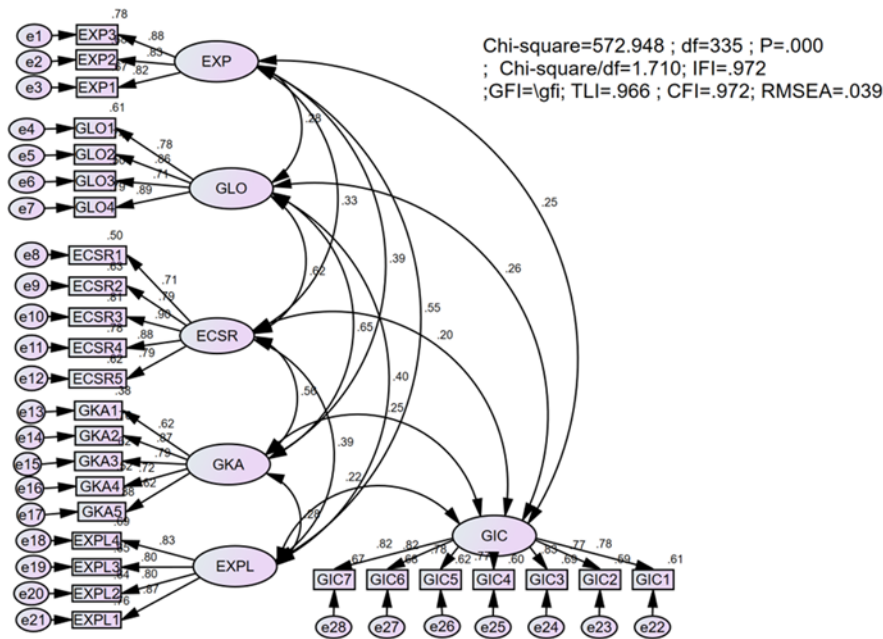
In summary, with a valid sample size of N = 474, the EFA confirms that the empirical structure aligns perfectly with the theoretical framework. As no items were excluded, the formal research model remains consistent with the proposed model. These validated constructs provide a robust foundation for the subsequent Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM).

4.3 Confirmatory Factor Analysis (CFA)

To ensure the unidimension of the observed variables and assess the goodness-of-fit between the theoretical model and the empirical data, a Confirmatory Factor Analysis (CFA) was conducted. Following the recommendations of Hu and Bentler (1999) and Hair et al. (2016), the model fit was evaluated using several key indices: CMIN/df, TLI, CFI, GFI, and RMSEA.

The CFA results indicate an excellent fit for the measurement model. Specifically, the χ^2/df (CMIN/df) ratio is 1.710, which is well below the threshold of 3.0. The incremental fit indices, including TLI (0.966), CFI (0.972), and GFI (approx. 0.90), all exceed the recommended 0.90 level, with several approaching the more stringent 0.95 benchmark. Furthermore, the RMSEA is 0.039 (below 0.05), indicating a very low approximation error (Taylor et al., 1993). These indicators collectively demonstrate that the measurement model possesses a high degree of statistical validity.

Figure 2: CFA Model Results



Additionally, the study assessed construct validity through Composite Reliability (CR), Average Variance Extracted (AVE), and Discriminant Validity. As shown in Table 5, all CR values range from 0.848 to 0.924, significantly exceeding the 0.70 threshold. The AVE values for all constructs are above 0.50, confirming strong convergent validity. For discriminant validity, the square root of the AVE for each construct (displayed on the diagonal) is greater than its correlation with any other construct. These results confirm that the measurement scales are both reliable and valid for hypothesis testing.

Table 5. Reliability and Validity Results from CFA

	CR	AVE	MSV	MaxR(H)	EXP	GLO	ECSR	GKA	EXPL	GIC
EXP	0.881	0.712	0.304	0.891	0.844					

GLO	0.886	0.662	0.419	0.893	0.277***	0.814				
ECSR	0.909	0.669	0.383	0.916	0.328***	0.619***	0.818			
GKA	0.848	0.533	0.419	0.852	0.390***	0.647***	0.562***	0.730		
EXPL	0.896	0.684	0.304	0.903	0.551***	0.398***	0.394***	0.280***	0.827	
GIC	0.924	0.635	0.069	0.934	0.250***	0.263***	0.197***	0.252***	0.223***	0.797

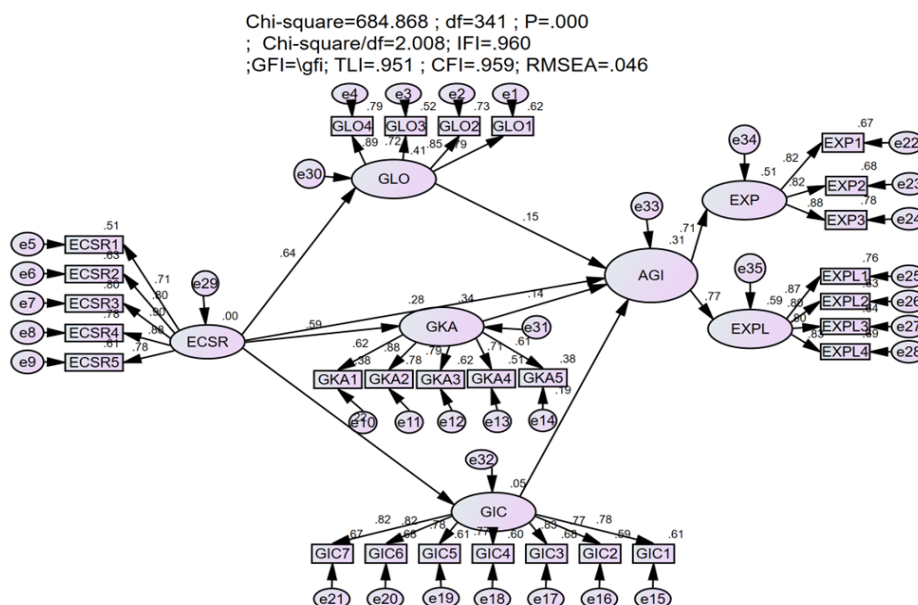
*** Note: $p < 0.001$. Diagonal values in bold represent the square root of AVE.

4.4 Structural Model Assessment and Hypothesis Testing

4.4.1 Goodness-of-Fit Analysis

To evaluate the theoretical framework, the author conducted Structural Equation Modeling (SEM) by integrating all validated observed and latent variables. Following the criteria established by Kline (2011), a model is considered integrated with market data when the Chi-square/df ratio is ≤ 3 . Additionally, according to Bentler and Bonett (1980), a "good fit" is achieved when the Goodness-of-Fit Index (GFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI) are ≥ 0.90 , and the Root Mean Square Error of Approximation (RMSEA) remains below 0.08.

Figure 3. Results of hypotheses testing via SEM



The empirical results for the modified SEM model indicate an excellent fit: $\chi^2/df = 2.008$; $GFI \approx 0.90$; $TLI = 0.951$; $CFI = 0.959$; and $RMSEA = 0.046$. These indices collectively confirm that the proposed model is highly compatible with the collected data.

4.4.2 Direct Effects and Hypotheses Testing

The structural equation model (SEM) was employed to estimate the direct relationships between the constructs. The results, summarized in Table X, provide empirical evidence to support all proposed hypotheses.

Table 6. Standardized Regression Weights for Direct Paths

Structural Path			Unstd. β	Std. β^*	P-value	Result
GLO	←	ECSR	0.734	0.641	***	Supported
GKA	←	ECSR	0.583	0.586	***	Supported
GIC	←	ECSR	0.228	0.216	***	Supported
AGI	←	ECSR	0.258	0.283	0.002	Supported
AGI	←	GLO	0.122	0.153	0.041	Supported
AGI	←	GKA	0.129	0.140	0.049	Supported
AGI	←	GIC	0.162	0.188	***	Supported
EXP	←	AGI	1.000	0.714	***	Supported
EXPL	←	AGI	1.185	0.765	***	Supported

(Note: *** denotes $p < 0.001$)

The SEM estimation indicates that Environmental Corporate Social Responsibility (ECSR) exerts a positive and statistically significant influence on all three mediating variables. Specifically, ECSR has the most substantial impact on Green Learning Orientation (GLO) ($\beta = 0.734$, $\beta^* = 0.641$, $p < 0.001$), while also significantly influencing Green Knowledge Acquisition (GKA) ($\beta = 0.583$, $\beta^* = 0.586$, $p < 0.001$). Although the effect on Green Intellectual Capital (GIC) is the lowest among the mediators ($\beta = 0.228$, $\beta^* = 0.216$, $p < 0.001$), it remains statistically robust.

Furthermore, ECSR exhibits a significant direct effect on Ambidextrous Green Innovation (AGI) ($\beta = 0.258$, $\beta^* = 0.283$, $p = 0.002$). This finding underscores the pivotal role of ECSR, suggesting that environmental commitment not only fosters internal green resources but also directly enhances a firm's capacity for adaptive innovation in volatile environments.

Regarding the mediating constructs, all three variables are found to positively influence AGI. Notably, Green Intellectual Capital (GIC) demonstrates the strongest impact on innovation outcomes ($\beta = 0.162$, $\beta^* = 0.188$, $p < 0.001$). Green Learning Orientation (GLO) and Green Knowledge Acquisition (GKA) also contribute significantly to AGI, with standardized coefficients of 0.153 ($p = 0.041$) and 0.140 ($p = 0.049$), respectively.

Finally, the results confirm that AGI positively drives both dimensions of green innovation. It is particularly noteworthy that the impact of AGI on Green Exploitative Innovation (EXPL) is remarkably strong ($\beta = 1.185$, $\beta^* = 0.765$, $p < 0.001$), indicating that the synergy of exploratory and exploitative capabilities is highly effective in optimizing existing green processes and products.

4.4.3 Mediation Effects Analysis (Bootstrapping Results)

To verify the magnitude and statistical significance of the mediating effects, this study employed the bootstrapping method with 5,000 resamples and a 95% confidence interval, as recommended by Preacher and Hayes (2008). This approach provides a robust estimation of indirect effects without assuming a normal sampling distribution.

Table 7. Results of Mediation Effect Testing

Mediation Path	Direct Effect	Indirect Effect	Total Effect	95% Boot CI [Lower, Upper]
ECSR --> GIC --> AGI	0.283**	0.078**	0.361**	[0.014, 0.080]
ECSR --> GLO --> AGI	0.283**	0.093**	0.376**	[0.015, 0.098]
ECSR --> GKA --> AGI	0.283**	0.084**	0.367**	[0.017, 0.088]

(Note: $p < 0.01$. Boot CI: Bias-corrected percentile bootstrap confidence interval.)

The empirical results demonstrate that all indirect paths from Environmental Corporate Social Responsibility (ECSR) to Ambidextrous Green Innovation (AGI) via Green Intellectual Capital (GIC), Green Learning Orientation (GLO), and Green Knowledge Acquisition (GKA) are statistically significant ($p < 0.01$). Crucially, the 95% confidence intervals for all indirect effects do not include zero (e.g., GLO: [0.015, 0.098]), thereby confirming the presence of reliable mediation effects. This evidence suggests that these three constructs serve as vital mechanisms through which environmental commitments are translated into innovation outcomes.

Regarding the magnitude of influence, the indirect effect through GLO (0.093) is the most substantial, followed by GKA (0.084) and GIC (0.078). This implies that among the three mediating mechanisms, GLO serves as the primary channel for converting CSR initiatives into green innovation. In other words, a firm's strategic orientation toward global green learning and adaptability exerts a more profound impact than localized knowledge accumulation or innovative capacity alone.

When considering the total effects, the combined impact ranges from 0.361 to 0.376, with the path via GLO achieving the highest aggregate value (0.376). This further reinforces the conclusion that Green Learning Orientation is the most prominent mediator within the proposed framework.

In summary, the research findings provide robust empirical support for the mediating roles of GIC, GLO, and GKA in the relationship between ECSR and AGI. Specifically, the results indicate a partial mediation model across all paths. The efficiency of GLO as a mediating mechanism suggests that enterprises should prioritize the development of learning capabilities and international integration to maximize the strategic impact of their social responsibility activities on green innovation performance.

5.0 MANAGERIAL IMPLICATIONS

The proposed research framework comprises five constructs measured by 31 observation variables, specifically ECSR (6 items), GLO (5 items), GIC (6 items), GKA (5 items), and AGI (9 items). Empirical results indicate high reliability and validity, with Cronbach's Alpha ranging from 0.841 to 0.924, a KMO index of 0.918, and a total variance extracted of 72.256%. Crucially, the independent variables account for 61.4% of the variance in green task innovation. These findings validate the measurement model's quality, establishing a robust empirical basis for discussing the subsequent theoretical and practical implications.

Theoretically, this study contributes to the literature in two significant directions. First, it extends Organizational Ambidexterity Theory (O'Reilly & Tushman, 2013) into the green domain by demonstrating that ECSR can simultaneously stimulate both green exploitative and exploratory innovation - a nuance often overlooked by previous research that treated green innovation as a unidimensional construct. Second, the study confirms the statistically significant mediating roles of GLO, GIC, and GKA. This provides further empirical support for Dynamic Capabilities Theory (Teece, 2007), Organizational Learning Theory (Sinkula et al., 1997), and Absorptive Capacity Theory (Zahra & George, 2002) within the specific context of industrial zones in an emerging economy like Vietnam.

From a strategic perspective, the results suggest that ECSR should be perceived not as a supplementary cost but as a strategic resource capable of generating innovative value. Firms that proactively integrate ECSR into their governance systems will possess a competitive advantage in activating green learning, accumulating intellectual capital, and absorbing environmental knowledge, thereby forming sustainable dual innovation capabilities. Furthermore, in a competitive regulatory landscape, it is imperative to establish green knowledge infrastructures at the industrial zone level to support enterprises in enhancing their innovation capacity. Consequently, shifting ECSR from a compliance-oriented role to a long-

term strategic pillar is essential. This requires embedding environmental objectives into the corporate strategy, establishing green KPIs within performance evaluation systems, and allocating specialized resources, all driven by a consistent commitment from senior leadership to diffuse a green organizational culture.

Systematizing green learning is also vital for organizational efficiency. Enterprises must foster cross-functional communities of practice, design individualized learning pathways linked to career advancement, and conduct periodic specialized training while integrating sustainability into the onboarding process. Simultaneously, green intellectual capital must be developed across three synchronized dimensions: human capital through the recruitment of environmental specialists; structural capital through management systems like ISO 14001 and knowledge databases; and relational capital through long-term partnerships with research institutions to co-develop green technologies.

To enhance green knowledge absorptive capacity, firms should establish mechanisms to internalize external knowledge through collaborations with universities, technology transfer programs, and global trend monitoring. It is critical to build internal processes that connect this new knowledge with existing systems to ensure substantive innovation. Furthermore, enterprises should simultaneously promote two types of innovation: green exploitative innovation by optimizing processes and resource efficiency through internal initiatives, and green exploratory innovation by establishing independent units with long-term resource security and risk-tolerant trial mechanisms.

Finally, regulatory authorities play a pivotal role in supporting this transition through three main avenues. These include providing financial incentives such as tax breaks and green credit, fostering a green knowledge ecosystem within industrial zones, and ensuring the transparency and stability of environmental policies. Such measures provide the necessary institutional foundation for enterprises to pursue and sustain green innovation in the long run.

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