“Drivers of managers’ intentions to adopt the E-commerce Green Index in Vietnam”

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DRIVERS OF MANAGERS' INTENTIONS TO ADOPT THE E-COMMERCE GREEN INDEX IN VIETNAM

Abstract

Green E-commerce Index (ECGI) represents an important policy-oriented framework that encourages enterprises to align their online business practices with environmental sustainability goals. In developing countries such as Vietnam, ECGI (proposed by WWF-Vietnam in 2024) is a newly introduced set of criteria; consequently, empirical evidence on its feasibility and adoption remains limited. This study aims to examine the factors influencing managers' attitudes and their intention to adopt ECGI within online business enterprises in Vietnam. Data were collected through a perception-based survey of 860 managers working in firms engaged in e-commerce activities from the second to the fourth quarter of 2025. The research model was tested using partial least squares structural equation modeling (PLS-SEM). The findings reveal that perceived usefulness, perceived ease of implementation, facilitating conditions, and existing e-commerce legal regulations have significant positive effects on the intention to adopt ECGI, both directly and indirectly through managerial attitude. Among these determinants, legal regulations exert the strongest influence. In contrast, performance expectancy and social influence do not show statistically significant effects. Additionally, corporate reputation, governmental support, and managerial attitude directly and positively affect adoption intention, while firm size does not play a significant moderating role. Overall, this study provides empirical support for institutional and regulatory theories, emphasizing their foundational role in guiding the adoption of green e-commerce criteria in developing economies and promoting sustainable development.

Keywords green e-commerce, ESG practices, adoption intention, online business enterprises

JEL Classification M31, M10, L81, Q56

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INTRODUCTION

Amid rapid globalization and digital transformation, e-commerce has emerged as a key driver of global economic growth, with Vietnam standing out as one of the fastest-growing markets in Southeast Asia. However, the rapid expansion of this sector has generated significant environmental pressures through increased energy consumption, greenhouse gas emissions from logistics activities, and substantial packaging waste. In developing economies such as Vietnam, the absence of effective governance mechanisms and strategic orientation may exacerbate sustainability challenges associated with online business operations.

In response, green e-commerce has become an inevitable trend, emphasizing the integration of environmental considerations into business operations, including green logistics, eco-friendly packaging, and sustainable supply chain management. The adoption of these practices not only mitigates environmental impacts but also enhances corporate image and strengthens long-term competitive advantage. To measure and monitor this transition, the E-commerce

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Green Index (ECGI) was introduced by WWF-Vietnam in 2024 as an effective governance tool, providing structured criteria to assess firms' sustainability performance across technological, operational, and logistics dimensions.

Despite the increasing importance of green indices, their effectiveness largely depends on firm-level acceptance, particularly among managers. However, existing studies have predominantly focused on the demand side, examining consumers' green purchase intentions and behaviors, while the supply-side perspective – specifically managers' attitudes and intentions toward adopting green assessment tools – remains underexplored. Furthermore, foundational behavioral theories such as the Theory of Planned Behavior (TPB), the Technology Acceptance Model (TAM), and the Unified Theory of Acceptance and Use of Technology (UTAUT) have rarely been applied to investigate the adoption of sustainability tools in e-commerce within emerging markets.

Vietnam provides an appropriate research context to address this gap, as the regulatory framework for green e-commerce remains underdeveloped, rendering ECGI adoption largely voluntary and dependent on managerial perceptions. Accordingly, this study aims to examine the factors influencing managers' intentions to adopt ECGI in Vietnamese online enterprises. The study is expected to contribute theoretically by shifting the analytical focus from consumers to managers in the context of a specific green assessment tool. Practically, the findings offer insights for policymakers in designing appropriate incentive mechanisms and support firms in developing sustainable e-commerce strategies.

1. LITERATURE REVIEW

The ECGI proposed by WWF-Vietnam in 2024 was developed through a comprehensive synthesis of Vietnam's legal and policy framework governing e-commerce, environmental protection, and related sectors, such as logistics, foreign trade, and last-mile delivery, while also drawing on international standards and best practices. The ECGI comprises six criteria groups with nineteen sub-criteria covering green business commitment, products, order fulfillment, consumer engagement, internal operations, and sustainability initiatives. Detailed descriptions of these criteria are provided in Appendix A. Applicable to key actors across the e-commerce value chain, the framework supports firms in identifying environmentally responsible practices, reducing environmental footprints, and enhancing credibility and business performance in markets increasingly oriented toward sustainability (WWF-Vietnam, 2024).

From a behavioral perspective, adopting ECGI is primarily driven by managerial cognition rather than purely technical or regulatory considerations. Within the TPB and TAM, managerial attitude is widely recognized as a central construct linking perceptions to behavioral intention. Empirical studies consistently show that positive managerial attitudes significantly increase the likelihood of adopting green technologies, ESG practices, and sustainability standards (Cheungsirakulvit et al., 2024; Tay et al., 2018). In e-commerce environments characterized by digital platforms and complex logistics networks, favorable attitudes toward green criteria such as ECGI serve as an intrinsic motivational mechanism that strengthens adoption readiness and mediates the effects of perceptual and institutional factors.

Building on this foundation, intention to adopt ECGI reflects managers' commitment to integrating the framework into organizational strategies and operations. Adoption intention represents a long-term strategic orientation associated with corporate reputation, stakeholder expectations, and sustainable competitiveness. Recent empirical evidence indicates that intentions to adopt ESG practices, green IT, and sustainability standards are strongly shaped by attitudes, perceived benefits, institutional pressures, and supportive organizational conditions (Hrnjica et al., 2024; Muafi et al., 2024). In e-commerce firms, where operations depend on interconnected digital and logistical systems, adoption intention plays a decisive role in translating sustainability commitments into tangible outcomes (WWF-Vietnam, 2024; Emon & Nahid, 2023; Hai & Hung, 2024).

Within the integrated TAM-TPB-UTAUT framework, perceived usefulness (USE) captures managers' evaluations of the benefits associated with ECGI adoption, including efficiency gains, environmental impact reduction, and sustainable competitive advantage. Prior studies confirm that USE significantly influences attitudes and indirectly affects behavioral intention through attitudinal mediation (Wang et al., 2025a; Shafique & Khan, 2020; Andika et al., 2025; Ramayah & Ignatius, 2005). Similarly, perceived ease of use (EAS) reflects the extent to which ECGI is perceived as clear, compatible, and manageable. When sustainability frameworks are viewed as easy to implement, managers tend to form more favorable attitudes, whereas perceived complexity weakens adoption likelihood (Davis, 1989; Venkatesh et al., 2003; Andika et al., 2025; Wang et al., 2025b; Shafique & Khan, 2020).

Facilitating conditions (CON), encompassing resources, infrastructure, managerial support, and governance mechanisms, further shape attitudes and intentions toward adopting green frameworks. Empirical studies demonstrate that adequate facilitating conditions significantly enhance managers' evaluations of sustainability-oriented tools (Ramayah & Ignatius, 2005; Bouteraa et al., 2023). Performance expectancy (PER) is defined as the anticipated improvement in organizational performance resulting from adoption. It is also a powerful predictor of attitude and intention, particularly when green initiatives are expected to generate both economic and reputational benefits (Venkatesh et al., 2003; Shatta et al., 2020; Bouteraa et al., 2023; Islam et al., 2023; Sun et al., 2021).

Social influence (SOC) reflects normative pressures from stakeholders such as customers, regulators, business partners, and industry peers. In sustainability-related adoption contexts, strong social influence has been shown to foster positive managerial attitudes toward green standards and practices (Wang et al., 2025b; Shafique & Khan, 2020; Bouteraa et al., 2023; Bansal & Roth, 2000). For online businesses, where reputation and consumer trust are critical, ECGI may be perceived as an emerging industry norm that aligns firms with stakeholder expectations.

Institutional and legal factors (LEG) also play a significant role. Contemporary e-commerce regulations increasingly integrate sustainability and environmental responsibility, shaping how managers evaluate governance tools such as ECGI (WWF-Vietnam, 2024). Empirical evidence indicates that regulatory clarity and sustainability-oriented legal frameworks positively influence attitudes and adoption of green initiatives (Sousa et al., 2022; Emon & Nahid, 2023; Shatta et al., 2020).

In promoting sustainable development and green transformation in e-commerce, government support (GOV) is widely recognized as a key driver of firms' adoption of new initiatives and standards. Such support includes incentive-based policies, technical guidelines, training programs, financial assistance, awareness-raising activities, and collaborative platforms involving key stakeholders. In the case of ECGI adoption, the role of government agencies and industry associations is particularly critical, as ECGI is a newly introduced criteria-based framework that requires firms to allocate resources and adjust existing managerial and operational practices (WWF-Vietnam, 2024). Empirical evidence indicates that government support and a favorable regulatory environment significantly enhance firms' intentions to adopt e-commerce and sustainability-related practices (Awiagah et al., 2016; Almaaf Bader Ali et al., 2018). Moreover, well-defined regulations strengthen consumer trust and adoption intentions in e-commerce systems. Industry associations play an important role in disseminating information, sharing best practices, and promoting commitment to sustainability-oriented standards (Shou et al., 2023; Shatta et al., 2020; WWF-Vietnam, 2024).

In highly competitive and transparent e-commerce environments, corporate reputation (REP) represents a strategic intangible asset that strongly influences managerial decision-making. It reflects stakeholders' perceptions of a firm's business ethics, social responsibility, and commitment to sustainable development. Adopting assessment frameworks such as ECGI not only improves operational performance but also serves as an effective instrument for strengthening corporate reputation (WWF-Vietnam, 2024). Prior studies demonstrate that corporate reputation significantly motivates managers' intentions to adopt ESG standards, environmental management systems, and green business initiatives, thereby enhancing

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corporate social responsibility, competitiveness, and financial performance (Olaleye, 2023; Gidage & Bhide, 2025).

Accordingly, in the Vietnamese e-commerce context, where stakeholder pressure regarding environmental and social responsibility is intensifying, corporate reputation is expected to exert a direct and positive influence on managers' intention to adopt ECGI.

Finally, firm size (SIZ) is widely recognized as a critical organizational characteristic shaping how firms respond to strategic, institutional, and social drivers in innovation adoption and sustainable management. Prior studies consistently treat firm size as a moderating factor that influences the strength and direction of the relationships between key determinants and firms' intentions and behaviors. Larger firms generally benefit from greater financial resources, more formalized structures, and higher public visibility, enabling them to absorb external pressures and translate strategic intentions into concrete actions. In contrast, smaller firms often face resource constraints and operational limitations that may weaken or alter these relationships.

In the e-commerce context, firm size may significantly condition how managers respond to reputational considerations, attitudes, and government support. Reputational pressures tend to exert stronger effects on larger firms due to heightened stakeholder scrutiny, making corporate reputation a powerful driver of their intention to adopt sustainability-related criteria such as CSR and ECGI (Schreck & Raithel, 2018). Conversely, smaller firms often prioritize short-term cost efficiency, which may attenuate the influence of reputation on adoption intention (Zhang & Sharon, 2023; WWF-Vietnam, 2024).

Similarly, firm size may moderate the attitude–intention link, as larger firms possess superior resources and managerial capabilities to translate positive attitudes into adoption decisions, whereas this relationship may be weaker in smaller firms (Bordonaba-Juste et al., 2012; Bertschek & Fryges, 2002; Yang et al., 2015). Finally, government support (GOV) is expected to have a stronger impact on adoption intention among SMEs, which rely more heavily on external incentives and capacity-building mechanisms, while larger firms are relatively less dependent on such support (Tran et al., 2025; Almaaf Bader Ali et al., 2018).

This study aims to examine the key perceptual determinants influencing managers' attitudes and intentions to adopt the ECGI in Vietnamese online businesses. Drawing on the integrated TAM and TPB, the paper investigates how managers' cognitive evaluations of ECGI shape their attitudinal responses and subsequent adoption intentions. Specifically, the study proposes that managers' attitudes toward ECGI play a pivotal mediating role between perceptual factors and adoption intention. Based on this theoretical foundation, the conceptual model (Figure 1) and following hypotheses are developed:

H1: Perceived usefulness of ECGI positively influences attitude.

H1a: Attitude positively mediates the relationship between perceived usefulness and intention to apply ECGI.

H2: Perceived ease of use positively influences attitude.

H2a: Attitude positively mediates the relationship between perceived ease of use and intention to apply ECGI.

H3: Performance expectancy has a positive effect on attitude.

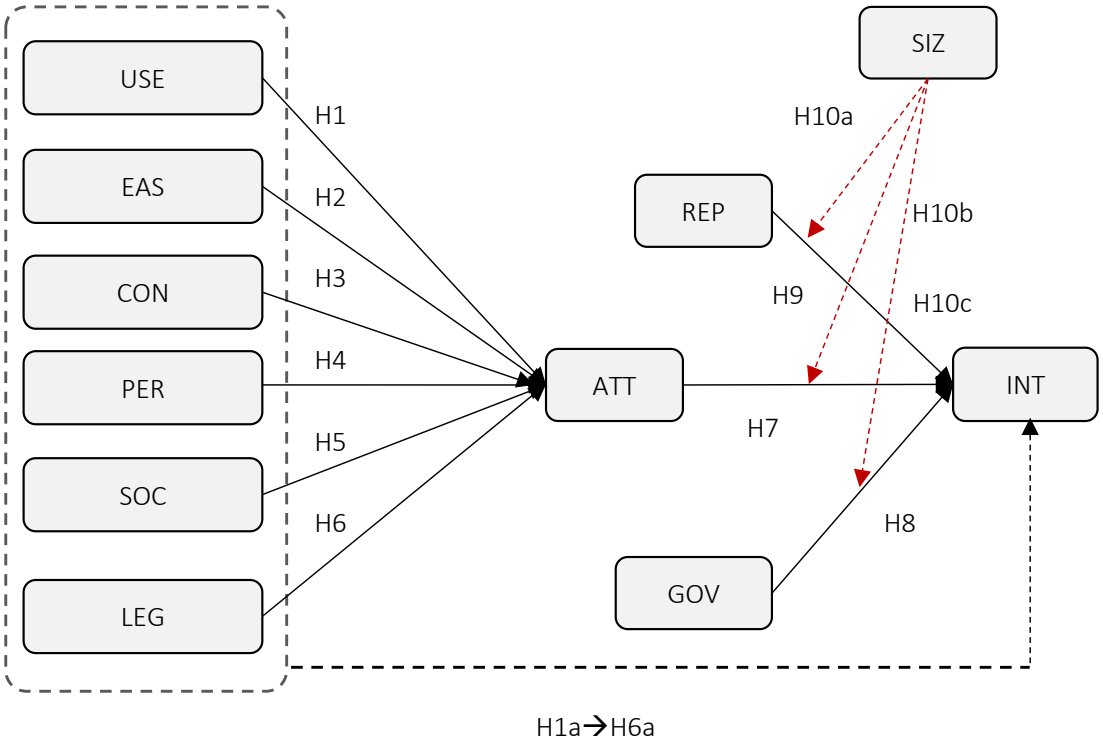
H3a: Attitude positively mediates the relationship between facilitating conditions and intention to apply ECGI.

H4: Performance expectancy positively influences attitude.

H4a: Attitude positively mediates the relationship between corporate reputation and intention to apply ECGI.

H5: Social influence positively affects attitude.

H5a: Attitude positively mediates the relationship between social influence and intention to apply ECGI.



Note: USE = Perceived usefulness; EAS = Perceived ease of use; CON = Facilitating conditions; PER = Performance expectancy; SOC = Social influence; LEG = Legal regulations on e-commerce; ATT = Attitude toward using ECGI; REP = Firm reputation; GOV = Government support; INT = Intention to apply ECGI; SIZ = Firm size. Direct relationship: Black line. Moderating relationship: Black dotted line. Mediating relationship: Red dotted line.

Figure 1. Proposed research model with hypothesized paths

H6: Institutional and legal factors positively affect attitude.

H6a: Attitude positively mediates the relationship between institutional and legal factors and intention to apply ECGI.

H7: Attitude positively affects intention to apply ECGI.

H8: Government support positively affects intention to apply ECGI.

H9: Corporate reputation positively affects intention to apply ECGI.

H10a: Firm size positively moderates the relationship between corporate reputation and intention to apply ECGI.

H10b: Firm size positively moderates the relationship between attitude and intention to apply ECGI.

H10c: Firm size positively moderates the relationship between government support and intention to apply ECGI.

2. METHOD

The research process of this study was conducted through five sequential steps. First, measurement scales were selected based on established instruments adopted from prior related studies. Second, in-depth interviews with experts were conducted to refine and adapt the measurement items to ensure their relevance to the research context and target population. Third, a pilot survey was administered to a group of managers to preliminarily test and reassess the measurement scales. Fourth, the questionnaire was revised and subsequently distributed to the predetermined sample size for data collection. Finally, valid responses were screened and retained for data analysis.

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2.1. Research instruments

The measurement scales for the constructs presented in Figure 1 were adapted from prior studies, including Ramayah and Ignatius (2005), Bouteraa et al. (2023), Shatta et al. (2020), and Hasan et al. (2022). In addition, relevant legal and institutional documents – such as Vietnam's E-commerce Law and related regulations, as well as the ECGI issued by the Vietnam National Assembly (2025), WWF-Vietnam (2024), and the Vietnam Government (2021), were also consulted (see Appendix B).

Based on these initial scales, we sought feedback from an expert panel comprising ten members, divided into two groups. The first group consisted of five senior executives, including chairpersons, vice chairpersons, secretaries, and chief executive officers who are members of the executive committee of the Vietnam E-commerce Association, each possessing nearly 20 years of professional experience in managing and supervising e-commerce activities. The second group included five academic experts, namely professors and associate professors specializing in e-commerce law at universities. The experts reviewed the wording of the measurement items, the conceptual linkages among constructs, and the overall suitability of the questionnaire for surveying managers in online business firms. Several items were revised to enhance clarity and contextual relevance to the e-commerce sector, while redundant items were removed following expert consensus. All expert feedback was documented through group discussion records and subsequently incorporated into the refinement of the measurement scales to ensure alignment with the specific context of e-commerce enterprises. All constructs were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

2.2. Research data

This study was conducted in Vietnam, a developing country in Southeast Asia with rapidly growing potential in e-commerce. According to the Vietnam E-commerce Association (VECOM), the size of Vietnam's e-commerce market reached USD 32 billion in 2024, with an annual growth rate of 27%. Of this total, online retail sales amounted to USD 22.5 billion, representing a 30% increase compared to 2023. E-commerce thus accounted for approximately 12% of total retail sales of goods and consumer service revenues, while online retail sales represented about 11% of total retail goods turnover. Looking ahead, Vietnam's e-commerce market is projected to reach between USD 90 and 200 billion by 2030. Moreover, a survey conducted by VECOM indicates that 44% of the 5,000 surveyed enterprises have established their own websites, 58% engage in sales via social media platforms, and more than 24% participate in e-commerce marketplaces (VECOM, 2025).

The target population of this study comprised managers at the department-head level or above who are currently employed at reputable e-commerce firms in Vietnam, such as FPT Shop, Tiki Corporation, Shopee Vietnam, VNP Group, Lazada Vietnam, Sendo, VNPay, VCCorp, Dien May Xanh, and The Gioi Di Dong. Data collection was conducted during the third and fourth quarters of 2025, using information provided by the human resources departments of the participating companies. Data were collected through an online survey administered via Google Forms. All participating managers took part voluntarily after being informed of the research objectives, survey procedures, and assurances regarding the confidentiality of personal information. Respondents were explicitly informed about anonymity and data protection prior to completing the questionnaire.

From July 2025 to the end of December 2025, a total of 1,300 questionnaires were distributed, of which 920 responses were received. This resulted in a response rate of 70.7%, indicating that the collected data were adequate for subsequent statistical analyses. During this period, we continuously monitored and verified the accuracy and completeness of the submitted responses. Questionnaires were deemed invalid if they contained substantial missing information or exhibited signs of careless responding, as identified through reverse-coded items. After data screening and validation, 860 responses were considered valid and retained for data analysis. Detailed information on the sample characteristics is presented in Table 1.

Table 1. Descriptive statistics about the samples

Profile	Category	Frequency (N = 860)	Percentage (%)
Sex	Male	357	41.5
	Female	503	58.5
Age	Under 25 years	77	9.0
	From 25 to under 35 years	184	21.4
	From 35 to under 45 years	216	25.1
	Over 45 years	383	44.5
Degree Status	Bachelor/Engineer or equivalent	371	43.2
	Postgraduate	489	56.8

2.3. Data analysis

The proposed research model is a multi-construct framework comprising eight independent variables, one mediating variable, one dependent variable, and one moderating variable. Given the complexity of the model and the research objectives, partial least squares structural equation modeling (PLS-SEM) was employed to evaluate the measurement properties and test the proposed hypotheses. The assessment of the PLS-SEM model followed a two-step approach, including the evaluation of the measurement model and the structural model. This procedure ensures the reliability, validity, and accuracy of the estimated measurement and structural relationships in complex research models (Henseler & Chin, 2010). Data analysis was conducted using SmartPLS version 4.0.

2.4. Ethical approval

This study was reviewed and approved by the Scientific Council of the University of Law, Hue University, under Decision No. 2447/QĐ-ĐHH dated December 23, 2025.

3. RESULTS

3.1. Measurement model assessment

The measurement model was evaluated using several established criteria. Specifically, outer loadings were required to exceed 0.70, while internal consistency reliability was assessed using Cronbach's alpha, with values greater than 0.70 considered acceptable. Convergent validity was examined through composite reliability (CR), which should be higher than 0.70, and average variance extracted (AVE), which should exceed 0.50 (Hair et al., 2014). In addition, discriminant validity was assessed using the heterotrait-monotrait ratio (HTMT). HTMT values between construct pairs were required to be below 0.85 to confirm adequate discriminant validity (Fornell & Larcker, 1981).

Based on the results presented in Table 2, several conclusions can be drawn. First, all outer loading values of the 49 observed indicators ranged from 0.763 to 0.962, exceeding the recommended threshold of 0.70. Second, Cronbach's alpha values ranged from 0.841 to 0.914, while composite reliability values varied between 0.875 and 0.915, all of which are well above the acceptable level of 0.70. Third, AVE values ranged from 0.650 to 0.759, surpassing the minimum requirement of 0.50. Collectively, these results indicate that the measurement scales demonstrate strong internal consistency, satisfactory convergent validity, and robust overall reliability.

Based on the results reported in Table 3, the HTMT values among all construct pairs in the proposed model range from 0.201 to 0.808, which are below the recommended threshold of 0.85. Therefore, the measurement scales fully satisfy the requirement of discriminant validity in accordance with the criterion proposed by Fornell and Larcker (1981).

3.2. Evaluation of the PLS-SEM structural model

According to Hair et al. (2019) and Hu and Bentler (1999), the evaluation of a PLS-SEM structural model requires examining multicollinearity issues, assessing the model's goodness of fit with the collected data, and evaluating its predictive capability. Multicollinearity is commonly assessed using the inner variance inflation factor (VIF), with

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Table 2. Descriptive statistics, internal reliability, and convergent reliability

Constructs	Items	Outer Loading	Mean	CA	C.R	AVE
Attitude toward using ECGI (ATT)	ATT1	0.833	3.93	0.874	0.876	0.666
	ATT2	0.780	3.88			
	ATT3	0.822	3.87			
	ATT4	0.841	3.87			
	ATT5	0.803	3.90			
Facilitating conditions (CON)	CON1	0.863	3.61	0.878	0.878	0.732
	CON2	0.839	3.50			
	CON3	0.867	3.57			
	CON4	0.854	3.57			
Perceived ease of use (EAS)	EAS1	0.852	3.71	0.881	0.884	0.737
	EAS2	0.868	3.72			
	EAS3	0.862	3.76			
	EAS4	0.852	3.67			
Government support (GOV)	GOV1	0.800	3.85	0.865	0.866	0.650
	GOV2	0.790	3.83			
	GOV3	0.799	3.79			
	GOV4	0.810	3.81			
	GOV5	0.832	3.79			
Intention to apply ECGI (INT)	INT1	0.846	3.62	0.905	0.905	0.677
	INT2	0.843	3.64			
	INT3	0.827	3.62			
	INT4	0.803	3.65			
	INT5	0.836	3.66			
	INT6	0.782	3.65			
Legal regulations on e-commerce (LEG)	LEG1	0.879	4.00	0.914	0.915	0.745
	LEG2	0.854	3.98			
	LEG3	0.866	4.04			
	LEG4	0.862	3.99			
	LEG5	0.854	3.97			
Performance expectancy (PER)	PER1	0.834	3.76	0.859	0.861	0.703
	PER2	0.843	3.79			
	PER3	0.843	3.74			
	PER4	0.835	3.74			
Firm reputation (REP)	REP1	0.807	3.71	0.876	0.876	0.669
	REP2	0.815	3.65			
	REP3	0.820	3.66			
	REP4	0.834	3.68			
	REP5	0.813	3.66			
Social influence (SOC)	SOC1	0.849	3.75	0.871	0.875	0.720
	SOC2	0.832	3.70			
	SOC3	0.830	3.72			
	SOC4	0.883	3.74			
Perceived usefulness (USE)	USE1	0.864	3.58	0.894	0.895	0.759
	USE2	0.861	3.59			
	USE3	0.877	3.52			
	USE4	0.882	3.48			
Firm size (SIZ)	SIZ1	0.805	4.42	0.841	0.884	0.719
	SIZ2	0.763	4.40			
	SIZ3	0.962	4.46			

Note: CR: Composite Reliability; AVE: Average Variance Extracted, CA: Cronbach's Alpha.

Table 3. Discriminant validity assessment (HTMT ratio)

Construct	ATT	CON	EAS	GOV	INT	LEG	PER	REP	SIZ	SOC	USE
ATT											
CON	0.612										
EAS	0.589	0.687									
GOV	0.781	0.602	0.563								
INT	0.821	0.761	0.718	0.781							
LEG	0.807	0.583	0.564	0.767	0.808						
PER	0.607	0.753	0.684	0.550	0.792	0.604					
REP	0.773	0.616	0.608	0.759	0.800	0.737	0.580				
SIZ	0.310	0.028	0.043	0.290	0.057	0.486	0.059	0.201			
SOC	0.590	0.721	0.626	0.576	0.739	0.619	0.734	0.588	0.087		
USE	0.613	0.694	0.703	0.606	0.743	0.540	0.647	0.602	0.059	0.667	

Note: USE = Perceived usefulness; EAS = Perceived ease of use; CON = Facilitating conditions; PER = Performance expectancy; SOC = Social influence; LEG = Legal regulations on e-commerce; ATT = Attitude toward using ECGI; REP = Firm reputation; GOV = Government support; INT = Intention to apply ECGI; SIZ = Firm size.

values below 3 considered acceptable. In addition, higher values of R^2 (coefficient of determination) and Q^2 (predictive relevance) indicate greater explanatory power and stronger predictive capability of the model.

As shown in Table 4, the inner VIF values range from 1.674 to 2.329, all of which are below the recommended threshold of 3, confirming that multicollinearity is not a critical concern and that the model is appropriate for the collected data. The R^2 values for ATT and INT are 0.583 and 0.682, respectively, indicating that 68.2% of the variance in INT is explained by the model's predictors. Furthermore, the Q^2 values range from 0.384 for ATT to 0.455 for INT, suggesting varying levels of predictive relevance across the constructs. According to Hair et al. (2019), constructs exhibit strong predictive relevance when $Q^2 > 0.50$, moderate predictive relevance when $0.25 < Q^2 \leq 0.50$, and weak predictive relevance when $Q^2 \leq 0.25$. Accordingly, as illustrated in Table 4, both ATT ($Q^2 = 0.384 > 0.25$) and INT ($Q^2 = 0.455 > 0.25$) demonstrate a moderate level of predictive capability.

According to Hair et al. (2014), hypothesis testing for direct, indirect, and moderating relationships is conducted using path coefficients and corresponding *p*-values as the primary evaluation criteria. In addition, to obtain more robust estimates given the relatively large sample size, the reliability of the model was further assessed using the bootstrapping procedure with 5,000 resamples. The results of the hypothesis testing are presented in Tables 5, 6, and 7, as well as in Figure 2.

With regard to the direct relationships corresponding to hypotheses H1 to H9, the results pre-

Table 4. Structural model assessment

Constructs/ Path	Inner VIF	R^2	R^2 adjusted	Q^2
ATT		0.583	0.580	0.384
INT		0.682	0.679	0.455
ATT → INT	2.306			
CON → ATT	2.329			
EAS → ATT	2.059			
GOV → INT	2.192			
LEG v ATT	1.674			
PER → ATT	2.256			
REP → INT	2.163			
SOC → ATT	2.185			
USE → ATT	2.074			

Note: USE = Perceived usefulness; EAS = Perceived ease of use; CON = Facilitating conditions; PER = Performance expectancy; SOC = Social influence; LEG = Legal regulations on e-commerce; ATT = Attitude toward using ECGI; REP = Firm reputation; GOV = Government support; INT = Intention to apply ECGI; SIZ = Firm size.

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Table 5. Testing direct effects

Path	Hypothesis	β	STDEV	T statistics	P values	f^2	Confidence Interval (CIs)		Decision
							2.5%	97.5%	
ATT → INT	*H7*	0.391	0.029	13.648	0.000	0.209	0.330	0.443	Yes
CON → ATT	*H3*	0.083	0.034	2.442	0.015	0.007	0.016	0.150	Yes
EAS → ATT	*H2*	0.064	0.032	1.994	0.046	0.005	0.002	0.127	Yes
GOV → INT	*H8*	0.272	0.030	9.139	0.000	0.106	0.208	0.326	Yes
LEG → ATT	*H6*	0.539	0.026	20.584	0.000	0.416	0.487	0.590	Yes
PER → ATT	*H4*	0.057	0.033	1.738	0.082	0.003	–0.007	0.121	No
REP → INT	*H9*	0.303	0.027	11.121	0.000	0.133	0.252	0.359	Yes
SOC → ATT	*H5*	0.005	0.033	0.161	0.872	0.000	–0.057	0.071	No
USE → ATT	*H1*	0.153	0.031	4.902	0.000	0.027	0.090	0.215	Yes

Note: USE = Perceived usefulness; EAS = Perceived ease of use; CON = Facilitating conditions; PER = Performance expectancy; SOC = Social influence; LEG = Legal regulations on e-commerce; ATT = Attitude toward using ECGI; REP = Firm reputation; GOV = Government support; INT = Intention to apply ECGI; SIZ = Firm size.

sented in Table 5 and Figure 2 indicate that 7 out of 9 hypotheses are supported. Specifically, hypotheses proposing that USE, EAS, CON, LEG, GOV, and REP have positive effects on ATT are confirmed. In addition, ATT exert a significant and positive influence on INT among online business enterprises.

Among these factors, LEG exhibited the strongest effect on ATT, with a large effect size (f^2 = 0.416 > 0.35). Meanwhile, GOV, REP, and USE demonstrate small effect sizes, with f^2 values of 0.106, 0.133, and 0.027, respectively (0.02 ≤ f^2 < 0.35). As reported in Table 4, CON and EAS show negligible effects on ATT, with f^2 values of 0.007 and 0.005, both below the threshold of 0.02. The criteria for evaluating effect sizes follow the guidelines proposed by Cohen (1988).

Furthermore, the results in Table 5 reveal that SOC and PER do not reach statistical significance in explaining managers' attitudes toward ECGI.

With respect to the indirect relationships corresponding to hypotheses H1a to H6a, the bootstrapping results (N = 5,000) reported in Table 6 and Figure 2 indicate that four out of six hypotheses are supported. Specifically, the indirect effects

Table 6. Testing specific indirect effects

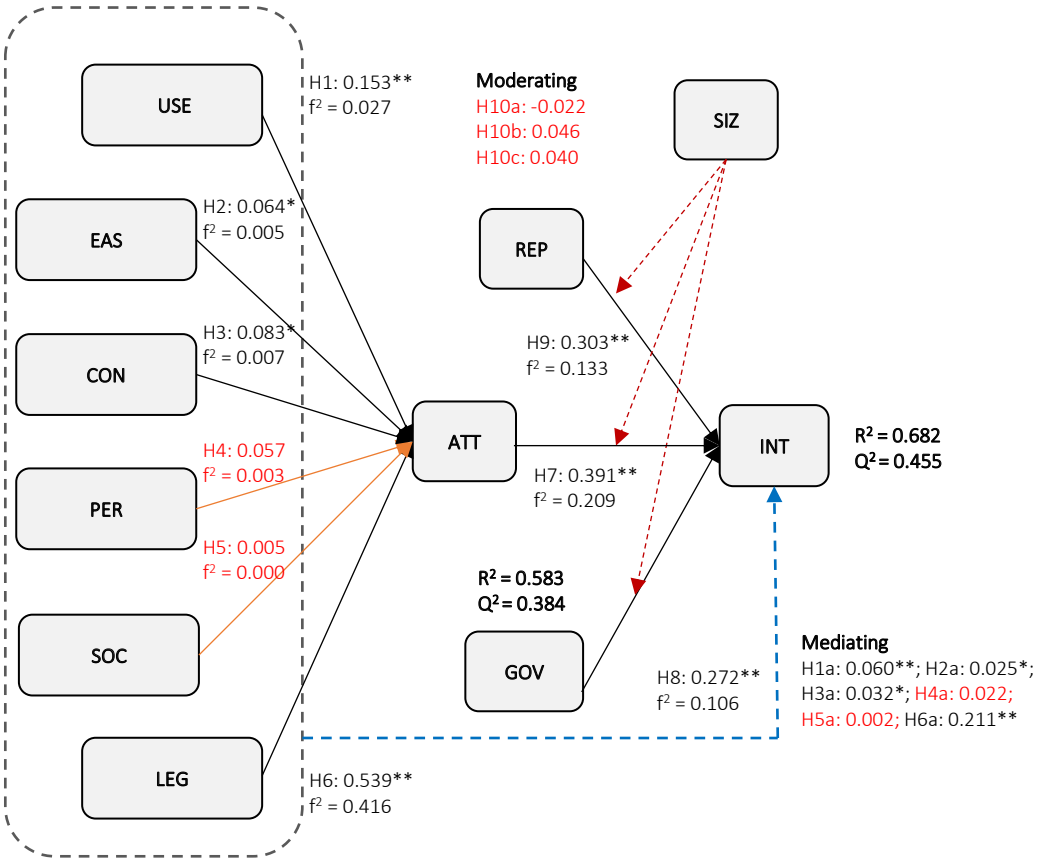
Path	Hypothesis	β	STDEV	T statistics	P values	CIs		Decision
						2.5%	97.5%	
LEG → ATT → INT	*H6a*	0.211	0.020	10.651	0.000	0.169	0.247	Yes
CON → ATT → INT	*H3a*	0.032	0.013	2.445	0.015	0.006	0.058	Yes
PER → ATT → INT	*H4a*	0.022	0.013	1.716	0.086	–0.003	0.048	No
SOC → ATT → INT	*H5a*	0.002	0.013	0.162	0.871	–0.022	0.028	No
EAS → ATT → INT	*H2a*	0.025	0.013	1.984	0.047	0.001	0.050	Yes
USE → ATT → INT	*H1a*	0.060	0.013	4.752	0.000	0.034	0.084	Yes

Note: USE = Perceived usefulness; EAS = Perceived ease of use; CON = Facilitating conditions; PER = Performance expectancy; SOC = Social influence; LEG = Legal regulations on e-commerce; ATT = Attitude toward using ECGI; REP = Firm reputation; GOV = Government support; INT = Intention to apply ECGI; SIZ = Firm size.

Table 7. Testing moderating effects

Path	Hypothesis	β	STDEV	T statistics	P values	CIs		Decision
						2.5%	97.5%	
SIZ × GOV → INT	*H10c*	0.040	0.029	1.372	0.170	–0.017	0.098	No
SIZ × REP → INT	*H10a*	–0.022	0.034	0.658	0.510	–0.085	0.048	No
SIZ × ATT v INT	*H10b*	0.046	0.036	1.267	0.205	–0.037	0.112	No

Note: ATT– Attitude toward using ECGI; GOV – Government support; INT – Intention to apply ECGI; REP – Firm reputation; SIZ – Firm size.



Note: USE = Perceived usefulness; EAS = Perceived ease of use; CON = Facilitating conditions; PER = Performance expectancy; SOC = Social influence; LEG = Legal regulations on e-commerce; ATT = Attitude toward using ECGI; REP = Firm reputation; GOV = Government support; INT = Intention to apply ECGI; SIZ = Firm size. Direct relationship: Black line – Significant relationship; Red line – Insignificant relationship; Moderating relationship: Red dotted line; Mediating relationship: Blue dotted line. **$p < 0.01$; *$p < 0.05$.

Figure 2. PLS-SEM structural model results

of e-commerce legal regulations on adoption intention through managers' attitudes toward ECGI (LEG → ATT → INT) (β = 0.211, p = 0.000), facilitating conditions through attitudes (CON → ATT → INT) (β = 0.032, p = 0.015), perceived ease of adoption through attitudes (EAS → ATT → INT) (β = 0.025, p = 0.047), and perceived usefulness through attitudes (USE → ATT → INT) (β = 0.060, p = 0.000) are all statistically significant, thereby supporting the corresponding hypotheses. In contrast, hypotheses H4a and H5a are not supported, as the indirect effects of performance expectancy (PER → ATT → INT) (β = 0.022, p = 0.086) and social influence (SOC → ATT → INT) (β = 0.002, p = 0.871) fail to reach statistical significance.

Regarding the moderating effects, the results reported in Table 7 indicate that none of the three hypotheses (H10a, H10b, and H10c) are supported, as all corresponding interaction effects fail to reach statistical significance.

4. DISCUSSION

4.1. Direct relationships

Based on the official quantitative results obtained from 860 valid survey responses collected from managers working at online business enterprises in Vietnam, seven hypotheses are supported, while two hypotheses are rejected. However, when considering both effect size (f^2) and statistical significance (p-values), the discussion of the findings can be categorized into five distinct groups, as follows.

First, only one relationship exhibits a large effect size (f^2 = 0.416 > 0.35), namely LEG → ATT. This finding indicates that the legal framework related

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to e-commerce in general, and green e-commerce in particular, exerts a strong positive influence on managers' attitudes toward adopting green and sustainability-oriented evaluation criteria such as ECGI. This result is fully consistent with prior studies (Emon & Nahid, 2023; Shatta et al., 2020; WWF-Vietnam, 2024). The finding confirms that green e-commerce–oriented legal policies play a critical and positive role in shaping managerial attitudes toward adopting green identification and assessment frameworks such as ECGI. A clear, consistent, and sustainability-oriented regulatory framework not only enhances awareness of the strategic benefits of green transformation but also strengthens managers' confidence in the feasibility and effectiveness of green evaluation standards in practice. Consequently, the legal framework functions as a key institutional mechanism, fostering managerial acceptance and commitment to integrating ECGI into decision-making and corporate governance processes, thereby promoting sustainable e-commerce development.

Second, only one relationship demonstrates a moderate effect size, namely ATT → INT ($0.15 \leq f^2 = 0.209 < 0.35$). The positive association between managerial attitude and intention identified in this study aligns well with previous research (Bouteraa et al., 2023; Muafi et al., 2024; Hasan et al., 2022). The results indicate that managers' attitudes toward adopting ECGI exert a moderately positive influence on the intention to implement ECGI in green identification and sustainability assessment activities within Vietnamese online business enterprises. This relationship suggests that while positive perceptions of ECGI are a necessary condition, implementation intentions are simultaneously shaped by contextual factors such as organizational resources, compliance costs, and technological readiness. This finding is consistent with behavioral models, which posit that attitudes contribute to the formation of intentions but must be reinforced by supportive conditions to translate into practical adoption.

Third, several relationships exhibit small effect sizes ($0.02 \leq f^2 < 0.15$), including GOV → INT, REP → INT, and USE → ATT. The positive GOV → INT relationship is consistent with prior studies (Almaaf Bader Ali et al., 2018; Shatta et al., 2020; WWF-Vietnam, 2024), indicating that GOV positively – but modestly – affects INT in Vietnam. This suggests that although policy support, technical guidance, and awareness campaigns play an initial encouraging role, their influence remains limited due to the voluntary nature of ECGI and the strong dependence on firms' intrinsic motivation and implementation capacity. Therefore, to enhance adoption intentions, support mechanisms should be designed to be more concrete, substantive, and linked to appropriate incentives or regulatory instruments within the Vietnamese e-commerce context.

Similarly, the REP → INT relationship aligns with prior studies (WWF-Vietnam, 2024; Olaleye, 2023; Gidage & Bhide, 2025), indicating that REP has a positive but relatively weak effect on INT. Although firms with stronger reputations tend to be more concerned with legitimacy and image maintenance through green practices, reputation alone does not constitute a sufficiently strong driver for ECGI adoption. This finding implies that reputation plays a complementary role and must be combined with institutional, strategic, and resource-based factors to strengthen adoption intentions.

Moreover, the USE → ATT relationship is positive and significant, consistent with prior research (Wang et al., 2025a; Shafique & Khan, 2020; Andika et al., 2025; Ramayah & Ignatius, 2005). The findings suggest that perceived usefulness of ECGI positively – but weakly – influences managerial attitudes toward adopting the index. Although ECGI is perceived as offering certain value in green identification and assessment, its practical benefits are not yet sufficiently salient to strongly shape managerial attitudes, largely because ECGI was only introduced in 2024. This implies that enhancing transparency, applicability, and tangible value-added outcomes of ECGI is essential to strengthening managerial support and accelerating adoption in the Vietnamese e-commerce sector.

Fourth, two relationships exhibit very small and nearly negligible effects ($f^2 < 0.02$), namely CON → ATT and EAS → ATT. Although the CON → ATT relationship is directionally consistent with prior studies (Ramayah & Ignatius, 2005; Bouteraa et al., 2023), it indicates that CON exert only a mar-

ginal influence on ATT. This finding suggests that resource readiness, infrastructure, and technical capacity are not perceived as decisive factors in shaping positive attitudes toward ECGI. Instead, managerial attitudes appear to be driven primarily by cognitive and institutional considerations, particularly given that ECGI remains at an early, orientation-stage of implementation. Similarly, the EAS → ATT relationship demonstrates that EAS has a positive but negligible effect on ATT. This indicates that simplicity or convenience of ECGI implementation is not yet a critical determinant of attitudes. Rather, managerial perceptions are more strongly influenced by strategic considerations, sustainability values, and institutional pressures than by usability assessments during the early adoption phase.

Fifth, two relationships are statistically insignificant ($p > 0.05$), namely PER → ATT and SOC → ATT. This finding contrasts with several prior studies (Bouteraa et al., 2023; Islam et al., 2023; Sun et al., 2021; Wang et al., 2025b; Shafique & Khan, 2020). The insignificance of PER → ATT suggests that expected performance benefits of ECGI are not yet sufficiently clear or consistent to translate into positive managerial attitudes. The lack of empirical evidence and successful real-world cases may weaken the role of performance expectancy in shaping attitudes toward ECGI in its early stage of diffusion. Additionally, the SOC → ATT relationship indicates that social influence exerts a positive but statistically insignificant effect on managerial attitudes. This suggests that pressures or expectations from stakeholders such as competitors, partners, or the broader community are not yet strong enough to shape managerial attitudes toward ECGI adoption. In the absence of ECGI becoming an established market norm, managerial attitudes are primarily formed through internal strategic considerations rather than external social pressures.

4.2. Indirect relationships

Only four out of six hypotheses concerning indirect relationships are supported by the empirical results. These findings are largely consistent with several prior studies (Shafique & Khan, 2020; Andika et al., 2025; Ramayah & Ignatius, 2005; Bouteraa et al., 2023; WWF-Vietnam, 2024). Specifically, the results indicate that e-commerce–related LEG, CON, USE, and EAS exert positive indirect effects on INT among Vietnamese online business enterprises through the mediating ATT.

This finding highlights that institutional, resource-related, and cognitive factors do not directly drive adoption intention, but instead primarily influence intention by shaping managers' attitudes. Accordingly, managerial attitude is identified as a key psychological mechanism that translates contextual and perceptual influences into behavioral intention in the process of ECGI adoption within Vietnam's e-commerce sector.

In contrast, the indirect relationships PER → ATT → INT and SOC → ATT → INT reveal that performance expectancy regarding ECGI adoption and social influence related to ECGI exert positive but statistically insignificant indirect effects on INT through ATT. This result suggests that although both factors tend to influence attitudes and intentions in a positive direction, their effects are neither strong nor stable enough to generate meaningful behavioral outcomes.

These findings imply that, given the novelty and limited standardization of ECGI, expected performance benefits and social pressures have not yet functioned as effective mediating mechanisms in promoting ECGI adoption intentions among online business enterprises in Vietnam. This exploratory result contrasts with several previous studies (Bouteraa et al., 2023; Islam et al., 2023; Shafique & Khan, 2020), suggesting that the mediating role of attitude may be context-dependent and contingent upon the maturity and institutionalization of green evaluation frameworks such as ECGI.

4.3. Moderating relationships

All three proposed moderating relationships in this study are not supported, as they fail to reach statistical significance. The results indicate that SIZ does not play a statistically significant moderating role in the relationships between GOV and INT, between REP and INT, nor between ATT and INT among online business enterprises in Vietnam.

Specifically, with regard to the GOV → INT relationship, the findings suggest that the influence

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of the legal and regulatory framework on ECGI adoption intention is relatively homogeneous across firms of different sizes, implying that regulatory pressure and policy orientation exert a similar effect on both small and large enterprises. For the REP → INT relationship, the role of REP in motivating ECGI adoption intention does not significantly depend on SIZ. This finding suggests that concerns related to image preservation and organizational legitimacy are more universal in nature rather than scale-dependent. Finally, concerning the ATT → INT relationship, positive ATT are translated into INT in a relatively consistent manner regardless of SIZ. This result underscores the central role of managerial attitude in shaping behavioral intention, largely independent of firm size characteristics within the context of Vietnam's e-commerce sector. These findings represent novel empirical insights and diverge from several prior studies that have reported significant moderating effects of SIZ in technology and sustainability adoption contexts.

4.4. Managerial implications

All three proposed moderating hypotheses (H10a–H10c) are rejected due to a lack of statistical significance. The results indicate that firm size does not exert a significant moderating effect on the relationships between GOV and INT, between REP and INT, nor between ATT and INT among online businesses in Vietnam.

Specifically, for the GOV → INT relationship, the influence of the regulatory framework on ECGI adoption intention appears relatively homogeneous across firms of different sizes, suggesting that institutional pressure and legal guidance affect both small and large enterprises in a similar manner. Regarding the REP → INT relationship, the role of corporate reputation in motivating ECGI adoption intention does not significantly vary with firm size, implying that concerns over legitimacy and image protection are more universal rather than scale-dependent.

Finally, in the ATT → INT relationship, positive managerial attitudes are translated into adoption intention in a largely consistent way regardless of firm size, underscoring the central role of attitude in shaping behavioral intention without being substantially conditioned by organizational scale in the Vietnamese e-commerce context. These findings diverge from several prior studies that emphasize firm size as a key contingency factor, thereby offering new empirical insights into the adoption dynamics of green governance instruments in emerging e-commerce markets.

4.5. Limitations and suggestions for future research

Despite offering several novel insights, this empirical study is subject to certain limitations that should be acknowledged. First, the research was conducted within the context of Vietnam's e-commerce market, an emerging economy characterized by evolving institutional and regulatory frameworks. As a result, the generalizability of the findings to countries with different levels of institutional maturity and market development may be limited. Second, the study employs a cross-sectional research design, capturing managerial perceptions, attitudes, and intentions toward ECGI adoption at a single point in time. This design does not allow for an examination of the dynamic evolution of attitudes and intentions or the transition from intention to actual adoption behavior over time. Third, the analysis relies primarily on self-reported data provided by managers of online businesses, which may be subject to perceptual bias and social desirability bias. Fourth, ECGI is conceptualized as an aggregated construct, while the differential effects of its specific dimensions are not explicitly examined, potentially obscuring nuanced mechanisms through which individual components influence managerial attitudes and intentions.

Building on these limitations, several directions for future research can be proposed. Future studies may extend the research scope to other countries or regions to conduct comparative analyses and test the robustness of the proposed model across diverse institutional contexts. Adopting a longitudinal research design would enable scholars to better capture the dynamic process through which managerial attitudes are formed and translated into actual ECGI adoption behavior. In addition, future research could integrate qualitative approaches or secondary data sources to complement survey data, thereby mitigating self-report

bias and enriching the depth of analysis. Finally, decomposing ECGI into its specific dimensions and examining the roles of additional moderating or mediating variables – such as competitive pressure, digital maturity, or sustainability-oriented strategic orientation – would contribute to advancing theoretical understanding and enhancing the practical relevance of future studies.

CONCLUSION

This study aims to examine the factors influencing managerial attitudes and intentions to adopt the ECGI in online businesses within Vietnam, an emerging market context. The findings reveal that ECGI adoption intention is primarily driven by institutional factors, particularly the legal and regulatory framework, alongside managerial perceptions and resource-related conditions. Managerial attitude plays a significant mediating role in translating these influences into behavioral intention, while performance expectancy and social influence are not found to be significant at this early stage of implementation. Additionally, firm size does not significantly moderate the proposed relationships, suggesting a relatively uniform applicability of ECGI across different types of online businesses. These findings lead to several important conclusions. First, regulatory governance is a critical driver in promoting the adoption of green practices in e-commerce, highlighting the need for stronger institutional support in emerging economies. Second, managerial cognition and attitudes serve as key mechanisms through which external pressures are internalized and transformed into strategic actions. Finally, the limited role of expected benefits and social influence indicates that the diffusion of ECGI is still in its early phase, requiring enhanced awareness, clearer incentives, and more robust policy frameworks to accelerate adoption. Overall, this study reinforces the importance of aligning institutional mechanisms with managerial perspectives to foster sustainable e-commerce development.

AUTHOR CONTRIBUTIONS

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DECLARATION ON THE USE OF AI STATEMENT

During the preparation of this manuscript, the authors did not use generative AI or any AI tools, and take full responsibility for the content of the publication.

DATA AVAILABILITY STATEMENT

The data presented in this study may be obtained on request from the corresponding author.

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APPENDIX A. Green E-Commerce Index (ECGI) proposed by WWF-Vietnam (2024)

Table A1. Criterion Group 1: Commitment to implementing green e-commerce based on a sustainable business model

Criteria	Enterprise Actions
Criterion 1: Commitment to Green E-Commerce Implementation	**Common actions applicable to all four types of business entities:** - Publicly disclose a formal commitment to implementing Green E-Commerce in a visible position on the company's website, application, or digital platform. [1] - Establish tools enabling customers to rate, comment on, and evaluate the level of Green E-Commerce implementation. - Communicate clearly to consumers that the merchant is a Green and Sustainable E-Commerce entity. [2] Publicly announce business channels as a priority policy for cooperation with service providers and merchants that have formally disclosed Green E-Commerce commitments. [3] - Develop tools allowing customers to rate, comment on, and evaluate the level of Green E-Commerce implementation of both the platform and affiliated merchants. - Communicate to consumers that the platform qualifies as a Green and Sustainable E-Commerce entity. [4] - Establish tools enabling customers to rate, comment on, and evaluate the level of Green Logistics implementation. - Communicate clearly to consumers the enterprise's commitment to providing Green Logistics services.

Table A2. Criterion Group 2: Products (Goods)

Criteria	Enterprise Actions
Criterion 1: Prohibition of Advertising and Trading Environmentally Illegal Products	Common actions applicable to all business entities: [1] Do not manufacture or trade products that violate environmental protection laws. [2] - Ensure product traceability and transparency regarding the origin of goods. - Do not provide services related to products that violate environmental regulations. [3] - Establish policies and detection mechanisms (human resources and technological tools) to identify merchants and products that violate environmental laws. - Publicly disclose enforcement measures applied to violating merchants, including warnings, service termination, and reporting to competent authorities. [4] - Maintain internal policies and operational tools (human and technological) to continuously monitor and detect environmentally illegal products. - Publicize corrective and punitive actions against merchants trading environmentally illegal goods, including service suspension and notification to relevant authorities.
Criterion 2: Compliance with Conditional Environmental Goods Regulations	[1] Restrict or prohibit trading activities involving environmentally conditional goods in accordance with legal requirements. [2] Restrict or provide services only under specific conditions for environmentally regulated goods. [3] Establish procedures to identify, screen, and notify merchants trading conditional environmental goods. [4] Issue internal regulations for detecting, monitoring, and notifying merchants engaged in the trading of environmentally conditional products.

Table A3. Criterion Group 3: Order fulfillment and last-mile delivery services

Criteria	Enterprise Actions
Criterion 1: Prohibition of Legally Banned Plastic Packaging and Materials	Common actions applicable to all business entities: [1] Do not use packaging, materials, or plastic tools that are legally prohibited. [2] - Notify merchants on the platform, as well as merchants directly, of plastic packaging materials prohibited from use from January 1, 2026, and December 31, 2030, in accordance with regulatory roadmaps. - Conduct regular screening and verification of merchants' packaging practices. - Establish warning mechanisms and remove merchants who repeatedly violate packaging regulations. - Do not provide services related to products or shipments that violate environmental regulations. - Introduce and recommend environmentally friendly packaging and packing solutions to merchants. [3] - Provide advance notifications to merchants regarding banned packaging materials effective from January 1, 2026, and December 31, 2030. - Inspect and verify merchants' packaging practices prior to order acceptance, including classification, warehousing, and transportation stages. - Implement warning, suspension, or removal mechanisms for repeated violations after reminders. - Promote and support the adoption of eco-friendly packaging and green packing solutions among merchants.

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Table A3 (cont.). Criterion Group 3: Order fulfillment and last-mile delivery services

Criteria	Enterprise Actions
Criterion 2: Reduction of Packaging, Materials, Plastic Tools, and Environmentally Harmful Products in Order Fulfillment Services	Common actions applicable to all business entities: [1] Publicly disclose information on websites, applications, and platforms regarding the negative environmental impacts of plastic packaging, materials, and tools, while encouraging consumers to choose environmentally friendly alternatives. [2] Design functional features on websites, applications, or platforms that allow customers to: Select environmentally friendly packaging materials and tools; or Opt out of plastic packaging and tools provided by sellers, where feasible. [3] - Introduce and recommend eco-friendly packaging and green packing solutions to merchants. - Proactively supply or facilitate access to environmentally friendly packaging materials for merchants. [4] - Introduce and recommend environmentally friendly packaging and packing solutions to merchants. - Proactively supply or facilitate merchants' access to environmentally friendly packaging materials.
Criterion 3: Environmentally Friendly Packaging Optimization	Common actions across the four types of enterprises: [1] - Package products appropriately, avoiding excessive or unnecessary packaging. - Optimize packaging operations by minimizing the use of plastic-containing materials. [2] Use alternative materials to replace plastic-based packaging materials. [3] Introduce advanced, environmentally friendly packaging technologies and solutions to merchants. [4] Introduce and recommend environmentally friendly packaging and packing solutions to merchants.
Criterion 4: Environmentally Friendly Warehouse Management and Delivery Operations	Common actions across the four types of enterprises: - Apply information technology solutions to optimize warehouse management and order fulfillment processes. - Design features on websites, applications, or platforms that allow customers to choose delivery time options (e.g., express, standard, economy). - Provide information on carbon emission reductions associated with different delivery time options to support environmentally responsible choices. [1] Prioritize cooperation with green logistics and environmentally friendly delivery service providers. [2] Prioritize partnerships with certified green delivery companies. [3] Provide information about green delivery service providers, enabling merchants and consumers to easily select appropriate logistics partners. [4] - Use environmentally friendly transportation modes, including electric vehicles and other low-emission transport options. - Digitally transform last-mile delivery operations to optimize routing efficiency and reduce environmental impacts.
Criterion 5: Environmentally Friendly Returns Management	Common actions across the four types of enterprises: - Reduce product return rates. - Publicly disclose product return policies and conditions. - Ensure that returned goods are handled using environmentally friendly processes. [1] Ensure product quality and provide accurate, non-misleading product information and advertising in order to reduce returns caused by discrepancies between advertised and received products. [2] Promote truthful and transparent product advertising [3] - Publicly disclose and enable access to return rates of individual merchants operating on the platform. - Establish standardized procedures for handling returned products. [4] Improve technologies and operational processes related to order fulfillment, delivery, transportation, and packaging in order to minimize product return rates.
Criterion 6: Eco-label Certification for Environmentally Friendly Products and Services	Common actions across the four types of enterprises: - Conduct research and implement activities that comply with both general and specific criteria of environmentally friendly practices. - Register for and obtain Vietnam Eco-label certification for their products and services.

Table A4. Criterion Group 4: Supporting consumers' participation in environmental protection

Criteria	Enterprise Actions
Criterion 1: Raising Awareness and Encouraging Consumers to Engage in Environmental Protection and Become Green Consumers	Common actions across the four types of enterprises: - Develop and publicly disseminate green-related content on their websites, applications, and digital platforms. - Provide guidance to consumers on how to properly handle packaging materials and plastic products after use.

Table A4 (cont.). Criterion Group 4: Supporting consumers' participation in environmental protection

Criteria	Enterprise Actions
Criterion 2: Supporting Consumers in Avoiding or Reducing the Use of Plastic Products	Common actions across the four types of enterprises: - Introduce and promote options that help consumers avoid or reduce the use of plastic products, including plastic bags and single-use plastics.
Criterion 3: Supporting Consumers in Choosing Low-Carbon Delivery Options, Including Express Delivery Services	Common actions across the four types of enterprises: - Study consumers' purchasing behaviors and preferences for fast delivery after placing orders, even when such preferences may involve higher emissions. - Advise consumers on delivery options that benefit both individuals (e.g., cost savings) and the environment by selecting delivery modes that best fit their actual needs. - Enhance service quality and consumer satisfaction when using environmentally friendly delivery options instead of express delivery. [3] Provide information on carbon emission levels, traffic congestion, and noise pollution associated with each delivery option. [4] Provide information on carbon emission levels, traffic congestion, and noise pollution corresponding to different delivery methods.
Criterion 4: Encouraging Consumers to Become Responsible Consumers	Common actions across the four types of enterprises: -Promote environmentally friendly lifestyles, with a particular focus on Generation Z (born 1997–2010) and the early Alpha Generation (born from 2011 onwards). - Foster consumption trends that emphasize purchasing only truly necessary products. - Encourage consumers to limit fast fashion consumption and reduce impulse buying.
Criterion 5: Supporting Consumers in Providing Feedback on Merchants' Environmental Protection Practices	Common actions across the four types of enterprises: - Develop functions on websites, applications, and digital platforms that allow consumers to rate, review, and provide feedback on merchants' environmental protection performance.

Table A5. Criterion Group 5: Green commitment in internal operations

Criteria	Enterprise Actions
Criterion 1: Developing and Publicly Disclosing Environmental Protection Policies for Internal Operations	Common actions across the four types of enterprises: -Develop and publicly disclose environmental protection policies applicable to the enterprise's internal operations. - Disseminate these environmental policies to all employees, with clear mechanisms and resources in place to monitor and ensure effective implementation. - Ensure that internal environmental policies comprehensively address key environmental dimensions, including: + Packaging and plastic waste management; + Greenhouse gas emissions; + Energy consumption; + Resource efficiency and conservation (e.g., water, paper, and other materials).
Criterion 2: Energy Efficiency and the Use of Renewable and Clean Energy Sources	Common actions across the four types of enterprises: - Review and comply with legal regulations on energy efficiency and energy-saving practices. - Promote the efficient use of energy in internal operations and progressively increase the adoption of renewable and clean energy sources.

Table A6. Criterion Group 6: Research and implementation of activities promoting green e-commerce under a sustainable model

Criteria	Enterprise Actions
Criterion 1: Research and implementation of the circular economy	Common actions for all types of enterprises: - Conduct research on and apply the circular economy model throughout business operations, covering the entire product life cycle, including design, production, distribution, consumption, and post-consumption treatment. - Implement the 3R principles: Reduce, Reuse, and Recycle, within green e-commerce activities.
Criterion 2: Implementation of the Guidelines on Responsible Business Conduct for Consumer Protection in E-commerce in Viet Nam	Common actions for all types of enterprises: - Study and adopt the Guidelines on Responsible Business Conduct for Consumer Protection in E-commerce in Vietnam, issued by the Vietnam Competition and Consumer Authority (VCCA), Ministry of Industry and Trade, in collaboration with UNDP. [1] Integrate and implement the Guidelines in e-commerce business operations. [2] Disseminate the Guidelines to merchants and business partners and encourage compliance.
Criterion 3: Research and implementation of the Corporate Sustainability Index (CSI)	Common actions for all types of enterprises: - Study and progressively apply the Corporate Sustainability Index (CSI) developed by the Vietnam Business Council for Sustainable Development (VBCSD). [3] Disseminate the CSI and encourage merchants and partners to adopt sustainability-oriented business practices in line with the CSI framework.

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APPENDIX B

Table B1. Survey

Construct	Statement	Resource
Perceived Usefulness of ECGI (USE)		
USE1	Implementing ECGI helps the company achieve sustainable development goals while enhancing environmental friendliness.	Andika et al. (2025), Ramayah and Ignatius (2005), Expert Adjustment, Our Development
USE2	Implementing ECGI helps the company optimize operational efficiency in e-commerce activities.	
USE3	Implementing ECGI helps stakeholders easily assess and recognize the company's sustainability orientation.	
USE4	Implementing ECGI helps create differentiation and competitive advantage for the company in the e-commerce market.	
Perceived Ease of Adopting ECGI (EAS)		
EAS1	I find that implementing and operating ECGI is very easy for my company.	Ramayah and Ignatius (2005), Expert Adjustment, Our Development
EAS2	I find the criteria defined in ECGI to be clear and easy to understand.	
EAS3	I find the stages involved in implementing the ECGI criteria to be clear and easy to follow.	
EAS4	Overall, implementing and complying with the ECGI criteria is easy for my company.	
Facilitating Conditions of Adopting ECGI (CON)		
CON1	My company has sufficient knowledge to implement and adopt ECGI.	Bouteraa et al. (2023), Expert Adjustment, Our Development
CON2	My company has adequate resources to implement and adopt ECGI.	
CON3	The use of ECGI is compatible with my company's working environment and organizational culture.	
CON4	The use of ECGI is compatible with my company's business transactions.	
Performance Expectancy of Adopting ECGI (PER)		
PER1	Using ECGI helps make my company's business transactions more effective.	Bouteraa et al. (2023), Shatta et al. (2020), Expert Adjustment, Our Development
PER2	Using ECGI helps my company save time in conducting business transactions.	
PER3	Using ECGI facilitates smoother and more efficient business transactions for my company.	
PER4	Using ECGI is beneficial for managing both financial and non-financial performance indicators of my company.	
Social Influence (SOC)		
SOC1	People who are important to my company think that I should use ECGI	Bouteraa et al. (2023), Expert Adjustment, Our Development
SOC2	People who know my company believe that the company should use ECGI.	
SOC3	People who influence my company think that I should use ECGI	
SOC4	Using ECGI in the sustainable development of companies is a growing trend	
Legal Regulations on E-commerce (LEG)		
LEG1	Green e-commerce–related policies have been promulgated and actively promoted for implementation and compliance.	Vietnam National Assembly (2025), WWF-Vietnam (2024), Expert Adjustment, Our Development
LEG2	Legal regulations governing transactions on e-commerce platforms are clear and stringent.	
LEG3	Legal regulations on the management and operation of e-commerce platforms are clear and stringent.	
LEG4	Legal provisions related to cross-border e-commerce have been promulgated and effectively implemented.	
LEG5	Legal regulations concerning inspection and sanctioning in the field of e-commerce are sufficiently deterrent and effective in preventing violations.	
Company Reputation (REP)		
REP1	My company consistently keeps its promises to customers.	Bouteraa et al. (2023), Expert Adjustment
REP2	My company has a strong reputation in the online business industry.	
REP3	My company has a high level of customer trust.	
REP4	My company has a well-established reputation among the public.	
REP5	My company is well known for its customer transaction practices.	
Government Support (GOV)		
GOV1	Government authorities and e-commerce industry associations encourage the adoption of ECGI.	Bouteraa et al. (2023), WWF-Vietnam (2024), Expert Adjustment
GOV2	Government authorities and e-commerce industry associations actively promote the implementation of ECGI.	
GOV3	Government authorities and e-commerce industry associations provide policy support for the adoption of ECGI.	
GOV4	Government authorities and e-commerce industry associations provide assurance and guidance on the implementation of ECGI.	
GOV5	Government authorities and e-commerce industry associations encourage innovation related to ECGI.	

Table B1 (cont.). Survey

Construct	Statement	Resource
	Attitude Toward Adopting ECGI (ATT)	
ATT1	I believe that implementing ECGI will be beneficial for my company.	Emon and Nahid (2023), Hasan et al. (2022), Expert Adjustment
ATT2	I am optimistic about my company's plan to implement and adopt ECGI in the near future.	
ATT3	I find the implementation and adoption of ECGI interesting.	
ATT4	I believe that implementing and adopting ECGI will enhance my company's online business performance.	
ATT5	I believe that implementing and adopting ECGI still involves many challenges for my company.	
	Intention to Adopt ECGI among Online Business Enterprises (INT)	
INT1	I intend to use ECGI for my company in the future.	Bouteraa et al. (2023), Hasan et al. (2022), Expert Adjustment
INT2	I expect my company to adopt ECGI in the future.	
INT3	My company has a clear plan to adopt ECGI in the future.	
INT4	I am willing to invest in adopting ECGI to enhance my company's business performance.	
INT5	I am interested in using ECGI in my company's operations.	
INT6	I intend to introduce ECGI to other companies and business partners.	
	Firm Size (SIZ)	
SIZ1	Small-sized enterprise (fewer than 50 employees; annual revenue below VND 100 billion or total capital below VND 50 billion).	Vietnam Government (2021)
SIZ2	Medium-sized enterprise (50–100 employees; annual revenue below VND 300 billion or total capital below VND 100 billion).	
SIZ3	Large-sized enterprise (more than 100 employees; annual revenue above VND 300 billion or total capital above VND 100 billion).	

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