GREEN TECHNOLOGY ADOPTION AND BUSINESS SUSTAINABILITY: THE ROLE OF CONSUMER AWARENESS IN DONG NAI

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ABSTRACT

This study examines the relationship between consumer awareness, green technology adoption, and business sustainability in Dong Nai, Vietnam. As environmental concerns escalate , businesses encounter mounting pressure to adopt sustainable methods and technologies. This study research investigates how consumer perceptions affect the adoption of green technologies and how these factors collectively contribute to business sustainability. The study used a mixed approach, combining quantitative surveys with qualitative interviews to gather data from 220 samples from local businesses and consumers in Dong Nai. The data is cleaned and analyzed through SmartPLS software. These findings highlight the significant positive correlation between consumer awareness and green technology adoption, highlighting the important role of savvy consumers in promoting sustainable practices. Moreover, businesses that adopt green technology report enhanced sustainability in terms of environmental, economic, and social efficiency. The study provides useful insights for policymakers, businesses, and stakeholders, advocating for educational campaigns and supportive policies to enhance the adoption of green technologies and promote a sustainable business ecosystem in Dong Nai.

1. INTRODUCTION

Sustainability has become a critical priority for businesses worldwide driven by increasing environmental concerns, regulatory pressures, and consumer demand for eco-friendly products and services. Green technology adoption, defined as the implementation of environmentally friendly technologies to reduce the ecological footprint, has emerged as a cornerstone of sustainable business practices (Chen et al., 2023).

However, the extent to which businesses adopt green technologies often depends on consumer awareness, which shapes market demand and influences organizational strategies (Nguyen & Tran, 2021; Thompson & Lee, 2024).

In the context of Dong Nai, a rapidly industrializing province in Vietnam, understanding the interplay between consumer awareness, green technology adoption, and business sustainability is particularly pertinent (Patel et al., 2025). The province's economic growth has led to environmental challenges such as increased pollution and resource depletion, necessitating a shift toward sustainable practices (Pham, 2020). Consumer awareness in this region is evolving, with growing interest in green products and services, which in turn pressures businesses to adopt sustainable technologies (Vu & Le, 2022).

This study examined the role of consumer awareness in promoting green technology adoption and its impact on business sustainability in Dong Nai. By addressing this gap, this study seeks to provide valuable insights for businesses, policymakers, and stakeholders striving to create a sustainable economic ecosystem. This study also contributes to the broader literature on sustainability and green technology by focusing on a developing economy, where the dynamics of consumer behavior and business practices may differ significantly from those in developed markets (Martinez et al., 2025).

The novelty of this study lies in its comprehensive examination of the interconnected roles of consumer awareness, green technology adoption, and business sustainability within the socioeconomic context of a developing region. Unlike previous studies, which often isolate these variables or focus on developed markets, this study provides an integrated framework that captures the dynamic interactions among these elements in an emerging economy. This approach enables a deeper understanding of how consumer-driven sustainability pressure translates into technological transformation and long-term strategic changes at the enterprise level.

Furthermore, this study introduces and empirically tests the mediating role of green technology adoption in the relationship between consumer awareness and sustainable development, an aspect rarely addressed in the literature (Chen et al., 2023; Thompson & Lee, 2024; Martinez et al., 2025). This adds an important theoretical contribution by clarifying the mechanism through which consumer behavior affects organizational sustainability outcomes.

These findings are intended to offer actionable guidance for businesses and policymakers in crafting effective strategies to support long-term sustainability.

To achieve this, the authors posed the following research question (Q):

Q1: How *does consumer awareness of green products influence businesses'sustainable development?*

This question seeks to understand the extent to which consumer perceptions and knowledge of green products drive businesses to adopt sustainable development practices. Previous studies suggest that consumer awareness plays a critical role in shaping demand for eco-friendly products, which in turn influences business strategies and priorities (Chen et al., 2018; Nguyen & Tran, 2021).

Q2: How do *relationships in the implementation of green technology affect businesses'sustainable development?*

This question examines the dynamics and challenges businesses face when integrating green technologies into their operations, and how these relationships impact sustainable development outcomes. Effective implementation requires collaboration between internal and external stakeholders as well as the alignment of organizational goals with

sustainability objectives (Pham, 2020).

Q3: What role does green technology play as a mediator between consumer awareness and businesses'sustainable development?

This question explored the mediating role of green technology in translating consumer awareness into tangible sustainability outcomes for businesses. The adoption of green technology not only meets consumer demand, but also enhances the environmental and economic performance of businesses, establishing a vital link between awareness and sustainable development (Vu & Le, 2022).

2. THEORETICAL BASIS

2.1. Theoretical Basis

2.1.1. What is the Green Technology?

Green technologies refer to processes, products, and designs aimed at minimizing environmental harm and promoting the sustainable use of resources. These technologies span multiple sectors, including renewable energy (such as wind, solar, and hydropower), energy-efficient solutions, wastewater management, eco-friendly material production, and effective waste-management systems. The main goals of green technology are to protect the environment, reduce pollution, conserve natural resources, and support sustainable development (Ma et al., 2022). Adopting green technology not only mitigates environmental damage, but also offers economic benefits, such as cost savings and the creation of new employment opportunities in the green economy.

2.1.2. Consumer awareness of green products

Consumer awareness of green technologies involves individuals' knowledge of and attitudes toward eco-friendly products. This includes recognizing the benefits of such products, such as reducing environmental harm, conserving resources, and promoting health (Zheng et al. 2022). It also reflects consumer concerns about sustainability, environmental protection, and corporate social responsibility. Positive perceptions often lead to purchasing decisions that favor green products, which in turn motivates businesses to adopt more sustainable practices (Shehawy et al., 2024).

2.1.3. Sustainable development of businesses

Sustainable development in businesses refers to an approach that integrates economic, social, and environmental goals in a balanced manner, ensuring long-term viability while meeting present needs. This concept emphasizes the importance of businesses not only focusing on immediate profits but also considering the broader and lasting impacts of their operations on the community, the environment, and the economy (Klemun et al., 2023). It involves companies making decisions that support environmental stewardship, social responsibility, and economic stability, recognizing that these elements are interdependent. For businesses, sustainable development means adopting practices that minimize environmental harm, promote fair and equitable social outcomes, and contribute to long-term economic prosperity. By prioritizing sustainability, businesses can foster innovation, improve efficiency, and build stronger relationships with stakeholders, ensuring that their operations do not compromise the ability of future generations to thrive. Sustainable business practices also help companies navigate challenges, such as regulatory changes, resource scarcity, and shifting consumer preferences, positioning them for success in a rapidly changing global landscape. Ultimately, the sustainable development of businesses requires a forward-thinking strategy that aligns profitability with the well-being of society and the world.

2.1.4. The role of consumer awareness of green products, green technology and businesses'sustainable development

Consumer awareness of green products and technologies plays a vital role in driving sustainable business development. When consumers understand and appreciate the

benefits of eco-friendly products, such as their environmental advantages, they are more inclined to make purchasing decisions that support sustainable production. This heightened awareness not only influences consumer behavior but also motivates businesses to improve their operations and adopt greener solutions, fostering long-term environmental benefits. In addition, as businesses respond to this demand, they can strengthen their brand image, enhance customer loyalty, and differentiate themselves in competitive markets. Recognition of green product value also encourages innovation, driving companies to develop new sustainable technologies and processes that align with environmental goals. By integrating sustainability into their strategies, businesses can contribute to environmental protection, while simultaneously expanding their market opportunities. This alignment between consumer preferences and corporate practices leads to a mutually beneficial cycle, in which both businesses and consumers are invested in supporting sustainable development. As consumer awareness continues to grow, it presents an essential catalyst for businesses to enhance their sustainability efforts and innovate ways to promote environmental stewardship (Li et al., 2022).

2.2. Theoretical Framework

The theories outlined in this study offer a comprehensive foundation for understanding the crucial relationship between consumer awareness, adoption of green technologies, and sustainable development of businesses. These theoretical perspectives provide valuable insights into how consumer behavior and corporate sustainability are interconnected, and guide businesses in formulating effective strategies.

Cognitive Theory (1970) posits that consumers' perceptions significantly influence their purchasing behavior, especially when it comes to green products and technologies. This theory suggests that if consumers are aware of the environmental benefits of a product, such as its ability to reduce pollution or conserve resources, they are more likely to make environmentally conscious choices. This heightened awareness leads to increased demand for eco-friendly products, pushing businesses to adopt more sustainable practices to meet consumer preferences and expectations. By fostering a consumer understanding of the benefits of green products, businesses can create a demand that supports the broader adoption of green technologies, ultimately contributing to environmental protection and sustainability.

The theory of Sustainable Development (1987) provides a broader framework for understanding how businesses can achieve sustainability by balancing the three key pillars: economic, social, and environmental. This theory emphasizes that, to achieve sustainable development, businesses must move beyond short-term profit maximization and consider the long-term impacts of their activities. Sustainable development requires companies to integrate social responsibility and environmental stewardship into their business model. This suggests that businesses must not only aim for economic growth, but also prioritize the well-being of society and the environment. In the context of green technology adoption, this theory highlights how companies that invest in sustainable practices are better equipped to adapt to environmental challenges while maintaining a competitive edge in the market.

Perceived Value Theory (1988) offers another important lens for understanding consumer behavior. They argue that consumers are more likely to purchase green products when they perceive a significant value in using them. This perceived value can stem from a variety of factors such as environmental benefits, cost savings, and health improvements associated with eco-friendly products. This theory suggests that when consumers recognize the tangible benefits of adopting sustainable products, they are more inclined to support businesses that

incorporate green technologies. By emphasizing the value of green products, businesses can enhance consumer loyalty, boost sales, and reinforce commitment to sustainability.

The Sustainable Consumer Behavior Theory (1990) extends this idea by asserting that sustainable consumer behavior is fundamentally driven by heightened awareness of social and environmental issues. This consciousness of environmental impact encourages consumers to support businesses that align with their values, such as those that adopt green technologies and pursue development goals. This theory underscores the importance of consumer education in fostering long-term behavioral changes that support environmental sustainability. Recognizing the importance of environmental issues, consumers not only make more sustainable purchasing decisions, but also push businesses to invest in technologies that benefit society and the environment.

Finally, the Corporate Sustainability Framework (2015) outlines key sustainability criteria such as waste reduction, energy efficiency, resource conservation, and enhanced social responsibility. These criteria serve as practical guidelines for businesses to integrate green technology into their operations. This framework helps companies identify effective strategies to promote sustainable practices, such as adopting energy-efficient technologies, reducing carbon footprints, and improving supply chain sustainability. By following these criteria, businesses can align their operations with sustainability goals, attract eco-conscious consumers, and contribute to global environmental and social wellbeing.

Together, these theories provide a robust foundation for understanding the connections among consumer awareness, green technology adoption, and business sustainability. They highlight the importance of fostering consumer knowledge of eco-friendly products and technologies and aligning business strategies with sustainability goals. In doing so, businesses can enhance their long-term viability, create competitive advantages, and contribute to a more sustainable future. For businesses in Dong Nai and other similar regions, these insights can guide the development of strategies that foster green technology adoption, enhance consumer awareness, and support sustainable business practices.

2.3. Research overview

The studies highlighted in this research provide valuable insights into the various aspects of green technology adoption and its role in fostering sustainable development. The following summaries of each research contribution emphasize key findings and their implications for businesses and policymakers.

Ma et al. (2022) employed the SBM-DDF method to analyze green factor productivity across 279 cities in China using a spatial Durbin model (SDM). The study shows a nonlinear spillover effect of environmental regulations on green factor productivity, with an inverted U-shaped relationship. Green technological innovation plays a positive role in enhancing the effects of dual environmental regulations, particularly in neighboring areas, demonstrating that regional cooperation can enhance the impact of green technology.

Che and Wang (2023) investigated the integration of the digital economy with the energy sector to enhance productivity while addressing environmental constraints. The digital economy significantly boosts business productivity, particularly in eastern cities and state-owned enterprises in China. This effect is driven by green technology innovations, internet development, and digital finance, underscoring the importance of leveraging digital tools to drive green energy solutions.

Liu et al. (2023) examined how carbon emission regulations motivate high-consumption businesses to adopt lower emission operational models. This study identifies green technological innovation as a key solution for improving

carbon efficiency. It uses Monte Carlo simulations and geometric Brownian motion to evaluate investment strategies, offering optimal solutions for businesses to invest in green technologies, especially those with a high carbon footprint.

Liu et al. (2024) focused on an index system to assess the effectiveness of green technological innovation using a super-efficient SBM model. This study emphasizes that the success of green technology innovation depends on strong collaboration among businesses, governments, and markets. They find that businesses can achieve high efficiency when they are fully committed to sustainability and when the market economy is thriving. Collaboration is crucial for driving green innovation.

Xu (2024) explores the role of green technology as a key driver of low-carbon development, particularly through green credits that facilitate innovation financing. The study, which uses data from 2005 to 2022 in China, concludes that green credit has a more significant positive impact on green technological innovation in provinces with average technological development. This further suggests that technological innovation spreads spatially with stronger effects in low- and medium-tech regions. This study encourages local governments to develop green finance policies that support innovation.

Cheng et al. (2024) analyzed the impact of geopolitical risk (GPR) on the international diffusion of green technology through foreign direct investment (FDI) and imports. The study found that GPR hinders the spread of green technologies in developing countries, particularly through these channels. However, advancements in green technology, marketization, and intellectual property protection can mitigate the negative effects of GPR, facilitating a greater global diffusion of green technologies.

These studies provide a broad spectrum of insights into the various drivers and challenges of green technology adoption, ranging from financing mechanisms and government regulations to technological innovation and international cooperation. This research highlights the interconnectedness of these factors and provides valuable guidance for businesses and policymakers aiming to foster sustainable development. In the context of Dong Nai, the findings suggest that the successful implementation of green technologies requires a coordinated approach, including government support, financial incentives, and consumer awareness, to drive business sustainability forward.

2.4. Hypothesis Development

The level of consumer awareness significantly affects manufacturing companies' adoption of green technologies. Informed consumers are more likely to prefer environmentally friendly products, creating market incentives for businesses to integrate green technologies into their production process. Research has shown that heightened consumer awareness drives companies to adopt sustainable practices that align with market demands and enhance their competitive advantage (Chen et al., 2021; Chen et al., 2018). This relationship suggests that, as consumer awareness of environmental issues increases, businesses are more likely to invest in green technologies to meet these expectations.

H_1: Consumer awareness influences manufacturing companies' adoption of green technologies in a proportional manner.

Consumer awareness plays a pivotal role in shaping manufacturing businesses'sustainable

development strategies. As consumers become more informed about environmental issues and the benefits of sustainable practices, their purchasing decisions increasingly favor businesses that prioritize sustainability. This creates a direct relationship in which higher consumer awareness drives companies to adopt environmentally and socially responsible practices to remain competitive in the market (Nguyen & Tran, 2021). Moreover, studies indicate that sustainability-oriented consumer behavior compels businesses to innovate and align their operations with development goals, thus fostering long-term economic, environmental, and social benefits (Chen et al., 2018).

H_2: Consumer *awareness proportionally affects* manufacturing *businesses'sustainable development.*

The adoption of green technologies is widely recognized as a critical driver of sustainable development for manufacturing enterprises. By integrating environmentally friendly technologies into their operations, companies can reduce waste and emissions and improve resource efficiency, thereby enhancing their environmental performance (Chen et al., 2018). Furthermore, the implementation of green technologies can lead to cost savings, increased innovation, and improved market competitiveness, which collectively contribute to economic sustainability (Pham, 2020).

Research also suggests that adopting green technologies positively influences the social dimension of sustainability, as businesses are perceived as more responsible and gain trust from stakeholders (Vu & Le, 2022). This proportional relationship indicates that, as manufacturing enterprises increase their commitment to green technology implementation, their overall sustainable development outcomes improve significantly.

H_3: The implementation *of green technology has a proportional effect on manufacturing businesses'sustainable development.*

2.5. Research Model

The development of the conceptual model in Figure 1 is grounded in the synthesis of the relevant literature on sustainability, consumer behavior, and green technology adoption. Drawing on the Theory of Planned Behavior (Ajzen, 1991) and the technology-organization-environment (TOE) framework (Tornatzky & Fleischer, 1990), this study integrates individual-level factors (consumer awareness) with organizational responses (green technology adoption) and outcomes (business sustainability) to create a holistic view of sustainable development in emerging markets.

Previous studies (Chen et al., 2018; Nguyen & Tran, 2021) have shown that consumer awareness plays a pivotal role in shaping demand for green products, influencing firms to adapt their strategies. However, these studies often treat green technology adoption as an isolated outcome rather than as a mediator that operationalizes the transition from market awareness to sustainable business practice. This study addresses this gap by explicitly modeling green technology as a mediating variable, linking external market pressures with internal sustainability outcomes.

The choice to position green technology adoption as a mediator rather than a direct outcome is informed by the idea that technology serves as a strategic enabler, a bridge that transforms external expectations into internal capacities for sustainability (Vu & Le, 2022). This aligns with organizational change theories, which view innovation not only as a response to environmental pressures, but also as a driver of

performance and strategic renewal.

Situating the study within the context of Dong Nai, an emerging economy facing both rapid industrialization and growing environmental awareness, the model reflects the real-world dynamics of developing regions, where external consumer influence is increasingly shaping internal business transformation. This context-specific perspective enhances the theoretical robustness and practical relevance of a model.

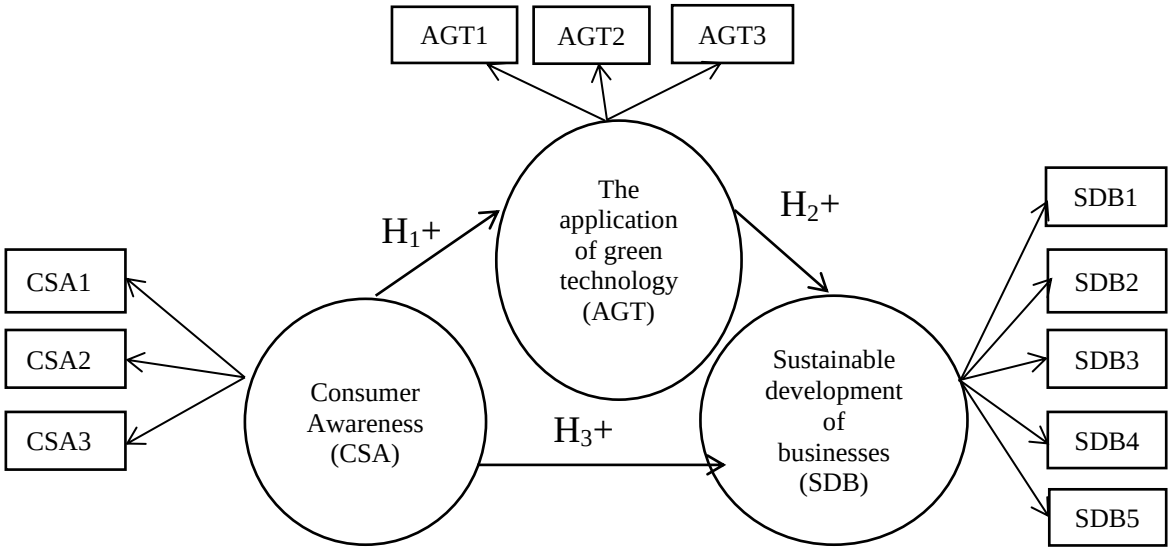

Figure 1. Research Model

Source: Suggested author

3. RESEARCH METHODOLOGY

The study was conducted in several stages, starting with the analysis of the measurement model, followed by the structural model analysis, and concluding with an evaluation of intermediary roles. Data were collected from both consumers and managers in Dong Nai Province. Initially, a preliminary survey was conducted with 20 samples to refine the questionnaire and ensure clarity. Although opinions on sample size selection vary, larger samples are generally preferred to increase reliability. Using the formula $n = 50 + 8 \times m$ (where m represents the number of independent variables), 220 surveys were distributed. This resulted in 198 completed responses being gathered from June to October 2024. The collected data provided the necessary insights to assess the relationships among consumer awareness, green technology adoption, and sustainable business development in the region, with a focus on understanding the key drivers and impacts of these factors on businesses in Dong Nai.

4. RESULTS AND DISCUSSIONS

The author applied a two-step structural equation modeling (SEM) approach in which the measurement and structural models were assessed independently. Analyses were conducted on a covariance matrix, utilizing maximum likelihood estimation (ML) to validate the measurement models and test the research hypotheses.

4.1. Descriptive Statistics Analysis

Table 1 provides a descriptive analysis of the study's sample, comprising 220 respondents categorized by gender and role. The gender distribution is relatively balanced, with 113 male respondents (51.4%) and 107 female respondents (48.6%). This near-equal representation ensures diverse perspectives in the data, reflecting both male and female viewpoints regarding green technology and sustainability. In terms of respondent roles, the majority are consumers, accounting for 163 participants (74.1%), while businesses represent 57 participants (25.9%). This breakdown highlights the study's emphasis on understanding consumer awareness, as consumers play a crucial role in shaping market demand for green products and influencing businesses to adopt sustainable practices. At the same time, the inclusion of businesses provides insights into their efforts to implement green technologies and align with sustainability objectives.

This diverse composition of respondents strengthens the reliability and relevance of the findings. By incorporating both consumer and business perspectives, the study effectively addresses its research goals of exploring how consumer awareness influences green technology adoption and sustainable business practices. The balanced gender distribution further ensures the results are reflective of broader societal trends, offering valuable insights for policymakers and businesses aiming to foster sustainability in Dong Nai.

Table 1. Descriptive Statistics of the Sample

Demographic variables	Classification	Valid research sample	
		Survey sample size	Percentage (%)
Gender	Male	113	51,4
	Female	97	48.6
Total		**220**	**100**
Subjects	Consumers	163	74.1
	Businesses	57	25.9
Total		**220**	**100**

Source: Extracted from PLS

4.2. Measurement Model

Table 2. Scale Statistics (n=198)

Scale	Mean	SD	Outer Loadings	α	rho_A	CR	AVE
Consumer Awareness				0.779	0.812	0.870	0.691
CSA1	2.732	0.918	0.827				
CSA2	2.561	0.987	0.782				
CSA3	2.838	1.066	0.883				
The application of green technology				0.814	0.822	0.889	0.728
AGT1	2.763	1.123	0.853				

Scale	Mean	SD	Outer Loadings	α	rho_A	CR	AVE
AGT2	2.707	1.037	0.871				
AGT3	2.788	1.042	0.835				
Sustainable Development				0.857	0.859	0.897	0.636
SDB1	2.990	0.964	0.834				
SDB2	2.929	0.992	0.818				
SDB3	2.914	0.984	0.792				
SDB4	2.934	0.949	0.745				
SDB5	2.076	0.904	0.796				

Source: Extracted from PLS

Table 2 demonstrates the statistical evaluation of three primary constructs: consumer awareness (CSA), application of green technology (AGT), and sustainable development (SDB). The metrics indicate strong reliability and validity across the constructs, with Cronbach's alpha values exceeding 0.7 (CSA: 0.779, AGT: 0.814, SDB: 0.857), ensuring internal consistency. The composite reliability (CR) values were also above 0.8, reinforcing the robustness of the scales. Moreover, the average variance extracted (AVE) values surpass the 0.5 threshold, confirming convergent validity. The mean values suggest moderate levels of consumer awareness, green technology adoption, and sustainable development perceptions among the respondents, with CSA indicators ranging from 2.561 to 2.838, AGT from 2.707 to 2.788, and SDB from 2.076 to 2.990.

Notably, the outer loadings for all indicators exceeded 0.7, verifying their contribution to the constructs. However, the variability in responses, particularly for SDB indicators, such as SDB5 (mean: 2.076), highlights potential areas for targeted improvement. These findings provide a reliable foundation for a structural model analysis, emphasizing the critical role of consumer awareness and green technology in fostering sustainable business practices. This study suggests that enhancing public understanding of green initiatives could bridge the gap between consumer perceptions and sustainability outcomes.

Table 3. Correlation matrix (Fornell-Lacker)

	CSA	AGT	SDB
CSA	0.831		
AGT	0.480	0.853	
SDB	0.463	0.524	0.798

Source: Extracted from PLS

Table 3 presents the correlation matrix, which assesses the relationships among the three constructs: consumer awareness (CSA), application of green technology (AGT), and sustainable development (SDB). The diagonal values represent the square roots of the average variance extracted (AVE), indicating good discriminant validity, since these values (CSA: 0.831, AGT: 0.853, SDB: 0.798) are higher than the correlations between constructs. The interconstruct correlations revealed moderate positive relationships, with CSA and AGT showing a correlation of 0.480, CSA and SDB at 0.463, and AGT and SDB at 0.524.

These results suggest that consumer awareness has a direct and positive influence on both green technology adoption and sustainable development, whereas the application of green technology demonstrates a slightly stronger correlation with sustainable development. This

aligns with the research hypothesis that consumer awareness promotes green technology adoption, which, in turn, facilitates sustainable business practices. The moderate correlation levels indicate that, while these constructs are related, they are distinct and contribute uniquely to the research model. These findings highlight the significance of fostering consumer awareness and promoting green technology implementation to enhance business sustainability, thus supporting the theoretical framework's emphasis on the interconnectedness of these factors.

Table 4. Heterotrait - Monotrait ratio (HTMT)

	CSA	AGT	SDB
CSA			
AGT	0.590		
SDB	0.550	0.623	

Source: Extracted from PLS

Table 4 presents the heterotrait-monotrait (HTMT) ratio, assessing discriminant validity among consumer awareness (CSA), application of green technology (AGT), and sustainable development (SDB). The HTMT values were below the threshold of 0.85, with CSA-AGT at 0.590, CSA-SDB at 0.550, and AGT-SDB at 0.623, thus confirming adequate discriminant validity. These results indicate that the constructs are empirically distinct, thus supporting the model's reliability and validity. The moderate HTMT values further validate the conceptual separation between CSA, AGT, and SDB, reinforcing their unique roles in explaining the relationships that drive sustainable business practices.

Table 5. Model Fit

	Saturated Model	Estimated Model
SRMR	0.067	0.067
Chi-Square	140.863	140.863
NFI	0.849	0.849
d_ULS	0.298	0.298
d_G	0.118	0.118

Source: Extracted from PLS

Table 5 evaluates the model fit indices, which provide insights into the adequacy of the proposed structural equation model. The standardized root mean square residual (SRMR) value was 0.067, below the threshold of 0.08, indicating a good fit between the observed data and hypothesized model. Similarly, the normed fit index (NFI) was 0.849, which, although slightly below the ideal value of 0.9, is still acceptable for exploratory research.

Other indicators, such as the chi-square statistic (140.863), were within the acceptable ranges for a model of this complexity. The d_ULS (0.298) and d_G (0.118) values further confirmed the consistency of the model with the data. These fit indices collectively demonstrate that the structural model is robust, well-specified, and capable of explaining the relationships among consumer awareness (CSA), the application of green technology (AGT), and sustainable development (SDB).

The results highlight that the proposed model effectively captures the dynamics between these constructs, thus supporting the research hypotheses. Moreover, the acceptable fit indices validated the theoretical framework and measurement approach, reinforcing the study's findings that green technology adoption mediates the relationship between consumer awareness and sustainable development.

Table 6. Inner VIF

	CSA	AGT	SDB
CSA		1.000	1.300
AGT			1.300
SDB			

Source: Extracted from PLS

Table 6 examines the Inner Variance Inflation Factors (VIF), focusing on the relationships among consumer awareness (CSA), the application of green technology (AGT), and sustainable development (SDB). The VIF values

highlight the absence of multicollinearity, which is crucial for the reliability of the structural model. Specifically, the VIF for CSA was 1.000, and for AGT, it was 1.300. These values were well below the commonly accepted threshold of 5.0, indicating that the predictors were not excessively correlated and could independently explain the variance in the dependent variables. This ensured the robustness of the relationships within the model. The moderate VIF value for AGT (1.300) suggests that although AGT is influenced by CSA, its role in predicting SDB remains distinct and impactful.

The results reflect a theoretical framework in which consumer awareness significantly drives green technology adoption, which in turn supports sustainable development. These findings emphasize the importance of maintaining a balance between variables in models that address sustainability and consumer behavior. By confirming the reliability of the model, this study effectively highlights the mediating role of green technology in linking consumer awareness to business sustainability, further validating its recommendations for fostering eco-consciousness and technological innovation among stakeholders.

4.3. Structural Model

Table 7. Impact Relationship Assessment

Relationship	Original Sample (O)	Sample Mean (M)	STDEV	t Statistics	P Values
CSA→AGT	0.480	0.485	0.054	8.828	0.000
CSA→SDB	0.275	0.279	0.052	4.803	0.000
AGT →SDB	0.392	0.393	0.061	6.390	0.000

Source: Extracted from PLS

Table 7 presents the impact relationship assessment, showing the structural path coefficients among consumer awareness (CSA), application of green technology (AGT), and sustainable development (SDB). The findings revealed that all hypothesized relationships were statistically significant, with p-values below 0.05, indicating strong support for the research model. The CSA to AGT path showed a coefficient of 0.480 ($t = 8.828$, $p < 0.001$), highlighting the significant positive influence of consumer awareness on the adoption of green technology. Similarly, CSA's direct effect on SDB has a coefficient of 0.275 ($t = 4.803$, $p < 0.001$), confirming that consumer awareness positively contributes to sustainable development.

The AGT to SDB path demonstrates a stronger influence, with a coefficient of 0.392 ($t = 6.390$, $p < 0.001$), underscoring the pivotal role that green technology plays in enhancing business sustainability. These results collectively validate the hypothesis that consumer awareness and the adoption of green technology are key drivers of sustainable development. The slightly stronger effect of AGT on SDB suggests that green technology acts as a critical mediator that amplifies the impact of consumer awareness. This underscores the importance of investing in and promoting green technologies to achieve sustainability goals, thus supporting the study's recommendations for fostering collaboration and policy incentives.

4.4. Analyzing the role of intermediate variables

Table 8. Results of intermediate variable analysis

Relationship	Original Sample (O)	Sample Mean (M)	STDEV	t Statistics	P Values
CSA→AGT	0.480	0.485	0.054	8.828	0.000
CSA→SDB	0.463	0.469	0.053	8.686	0.000
AGT→SDB	0.392	0.393	0.061	6.390	0.000

Source: Extracted from PLS

Table 8 provides insights into the role of green technology (AGT) as a mediating variable between consumer awareness (CSA) and sustainable development (SDB). The analysis confirms that all the examined relationships are statistically significant, with p-values below 0.001, highlighting the robustness of the proposed structural model. The CSA → AGT pathway shows a strong positive relationship (coefficient = 0.480, t = 8.828), indicating that higher consumer awareness significantly promotes green technology adoption. Additionally, the CSA → SDB direct effect is significant (coefficient = 0.463, t = 8.686), suggesting that consumer awareness directly contributes to sustainable development outcomes.

The AGT→SDB relationship (coefficient = 0.392, t = 6.390) emphasizes the critical role of green technology in supporting sustainable business practices. Importantly, the mediation effect observed in the CSA → AGT → SDB pathway underscores AGT’s role of AGT in amplifying the influence of consumer awareness on sustainable outcomes. These results demonstrate that, while CSA directly impacts SDB, its effect is significantly enhanced through the adoption of AGT, confirming its role as an intermediary.

This reinforces the finding that fostering consumer awareness and incentivizing green technology adoption are pivotal for achieving sustainability goals. These results align with the study's recommendations, emphasizing targeted awareness campaigns, stakeholder collaboration, and policy-driven incentives to promote green technology in business ecosystems.

5. CONCLUSIONS AND POLICY IMPLICATIONS

This study highlights the link between consumer awareness, green technology adoption, and the sustainable development of businesses in Dong Nai. The findings reveal that positive perceptions of green technology not only drive consumer purchasing behavior but also encourage businesses to pursue sustainable practices. Green technology acts as a crucial intermediary, reinforcing the impact of consumer awareness on business sustainability. These insights offer practical implications for both enterprises and policymakers in shaping sustainable strategies and promoting green consumer behavior. Based on the results, the study recommends: (1) enhancing consumer awareness through education and outreach activities; (2) promoting green technology adoption via financial incentives and supportive policies; (3) strengthening collaboration among stakeholders to create unified sustainability efforts; (4) regularly monitoring the impact of green initiatives; and (5) advancing research and development through institutional partnerships. Despite its contributions, the study has

limitations. It lacks an industry-specific focus, which may affect the applicability of the findings across sectors, and its small sample size may limit statistical robustness. Future research should target specific industries, expand sample sizes, and explore additional variables—such as environmental regulations, organizational culture, and corporate social responsibility—to develop a more comprehensive understanding of sustainable business practices.

REFERENCES

Ajzen, I. (1991). *The theory of planned behavior*. Organizational Behavior and Human Decision Processes, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Chen, H., Zhang, Y., & Wang, J. (2018). *Green supply chain management and firm performance: The* mediating *role of green innovation*. Journal of Cleaner Production, 183,1142–1151. https://doi.org/10.1016/j.jclepro.2018.02.019

Chen, R., Lin, Z., & Wu, J. (2021). *Consumer awareness and the implementation of green manufacturing*. Sustainability, 13(7), 3681. https://doi.org/10.3390/su13073681

Chen, Y., Li, M., & Zhou, Q. (2023). *Green technology adoption and sustainable development: Empirical evidence from manufacturing firms*. Journal of Cleaner Production, 386, 135765. https://doi.org/10.1016/j.jclepro.2023.135765

Che, L., & Wang, Q. (2023). *The digital economy and energy efficiency: Evidence from Chinese cities*. Energy Economics, 117, 106363. https://doi.org/10.1016/j.eneco.2023.106363

Cheng, C., Fang, Y., & Li, W. (2024). *Geopolitical risks and global green technology diffusion*. Technological Forecasting and Social Change, 198, 122896. https://doi.org/10.1016/j.techfore.2023.122896

Klemun, M. M., Pérez, T., & Scott, M. (2023). Sustainable *development in business: From theory to practice*. Business Strategy and the Environment, 32(1), 15–29. https://doi.org/10.1002/bse.3017

Li, H., Zhou, W., & Lin, D. (2022). *Consumer behavior and* green *product adoption: The role of* environmental *knowledge*. Journal of Consumer Marketing, 39(2), 204–215. https://doi.org/10.1108/JCM-02-2021-4479

Liu, F., Sun, Y., & Zhang, Y. (2023). *Carbon emission regulation and green investment behavior: A Monte Carlo simulation approach*. Energy Policy, 170, 113213. https://doi.org/10.1016/j.enpol.2023.113213

Liu, W., Wang, X., & Ren, S. (2024). *Measuring the efficiency of green technology innovation using super-efficiency SBM*. Journal of Cleaner Production, 425, 139456. https://doi.org/10.1016/j.jclepro.2023.139456

Ma, X, Xu, J.,&Tang, H. (2022). *Environmental* regulation *and green factor productivity in Chinese cities*. Ecological Indicators, 142, 109210. https://doi.org/10.1016/j.ecolind.2022.109210

Martinez, C., Kim, J., & Smith, A. (2025). Green innovation and business sustainability in emerging economies. International Journal of Sustainability in Higher Education, 26(2), 111–132.

Nguyen, T. T., & Tran, H. T. (2021). Consumer behavior and green products: A study in Vietnam. Asia Pacific Journal of Marketing and Logistics, 33(1), 79–94. https://doi.org/10.1108/APJML-05-2020-0359

Patel, R., Bui, H., & Singh, A. (2025). Environmental pressure and sustainable innovation in Vietnamese industry.

Environmental Science and Policy, 139, 105–117.

Pham, T. M. (2020). Green technology and sustainable business in Vietnam: Challenges and strategies. Journal of Asian Business and Economic Studies, 27(4), 425–438. https://doi.org/10.1108/JABES-06-2020-0083

Shehawy, Y. M., Zhang, Y., & Mohamed, M. A. (2024). Drivers of green product awareness and sustainable consumption behavior. Sustainability, 16(1), 123. https://doi.org/10.3390/su16010123

Thompson, L. M., & Lee, K. W. (2024). *Adoption of green technologies: Role of consumer perception and corporate strategy*. Business Strategy and the Environment, 33(3), 445–462.

Tornatzky, L. G., & Fleischer, M. (1990). The processes of technological innovation. Lexington Books.

Vu, M. T, & Le,T. H.(2022). Green technology and sustainable business practices in Vietnam: Empirical analysis from SMEs. *Journal of Cleaner Production*,375, 133679. https://doi.org/10.1016/j.jclepro.2022.133679

Xu, X. (2024). The role of green credit in facilitating low-carbon development. Ecological Economics, 210, 107839. https://doi.org/10.1016/j.ecolecon.2024.107839

Zheng, Y., Liu, L., & Chen, W. (2022). Consumer awareness and willingness to pay for green products *in developing countries*. Environmental Development, 42, 100686. https://doi.org/10.1016/j.envdev.2022.100686

ÁP DỤNG CÔNG NGHỆ XANH VÀ TÍNH BỀN VỮNG TRONG KINH DOANH: VAI TRÒ CỦA NHẬN THỨC CỦA NGƯỜI TIÊU DÙNG Ở ĐỒNG NAI

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THÔNG TIN CHUNG

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TỪ KHÓA

Công nghệ xanh;
Đồng Nai;

TÓM TẮT

Nghiên cứu này khám phá mối quan hệ giữa nhận thức của người tiêu dùng, việc áp dụng công nghệ xanh và tính bền vững của doanh nghiệp ở Đồng Nai, Việt Nam. Khi mối quan tâm về môi trường ngày càng tăng trên toàn cầu, các doanh nghiệp phải đối mặt với áp lực ngày càng tăng trong việc áp dụng các phương pháp và công nghệ bền vững. Nghiên cứu này điều tra cách nhận thức của người tiêu dùng ảnh hưởng đến việc áp dụng công nghệ xanh và các yếu tố này đóng góp chung vào tính bền vững

Nhận thức người tiêu dùng; Phát triển bền vững.

của kinh doanh như thế nào. Nghiên cứu sử dụng cách tiếp cận hỗn hợp, kết hợp khảo sát định lượng với phỏng vấn định tính để thu thập dữ liệu từ 220 mẫu từ các doanh nghiệp và người tiêu dùng địa phương tại Đồng Nai. Dữ liệu được làm sạch và phân tích thông qua phần mềm SmartPLS. Những phát hiện này làm nổi bật mối tương quan tích cực đáng kể giữa nhận thức của người tiêu dùng và việc áp dụng công nghệ xanh, làm nổi bật vai trò quan trọng của người tiêu dùng hiểu biết trong việc thúc đẩy các hoạt động bền vững. Hơn nữa, các doanh nghiệp áp dụng công nghệ xanh báo cáo tăng cường tính bền vững về hiệu quả môi trường, kinh tế và xã hội. Nghiên cứu cung cấp những hiểu biết hữu ích cho các nhà hoạch định chính sách, doanh nghiệp và các bên liên quan, ủng hộ các chiến dịch giáo dục và hỗ trợ các chính sách để tăng cường áp dụng công nghệ xanh và thúc đẩy hệ sinh thái kinh doanh bền vững tại Đồng Nai.