The Impact of Green Packaging on Vietnamese Students' Green Purchase Intention: Driving Environmental Sustainability in Digital Commerce

Cam-Tu Tran Hoang, *Nhat-Phuong* Vu*

Faculty of Business Administration, Nguyen Tat Thanh University, Ho Chi Minh City, 700000, Vietnam.
**Corresponding author: vnphuong@ntt.edu.vn (V. N.Phuong).*

Abstract. This study explores the impact of green packaging on green purchase intention among Vietnamese students in online shopping settings, applying the Stimulus-Organism-Response Theory. It examines the mediating roles of green satisfaction and green loyalty in the link between green packaging and purchase intentions. Data were collected from 281 Vietnamese students and analysed using PLS-SEM methodology. Results show that green packaging has an indirect effect on green purchase intention through green loyalty, with both green satisfaction and green loyalty exerting significant positive influences on purchase intentions. The findings reveal that green loyalty has the strongest impact ($\beta = 0.49$, $p < 0.001$), followed by green satisfaction ($\beta = 0.348$, $p < 0.001$), while green packaging exhibits a weaker direct effect ($\beta = 0.105$, $p = 0.007$). These results contribute to understanding the relationship between green packaging, consumer psychology, and green purchase intention in e-commerce contexts, offering vital guidance for designing effective green marketing strategies in emerging markets.

1 INTRODUCTION

Environmental issues have become a pressing global concern, necessitating urgent action. The rapid development of technology, globalisation, and increased industrial activities has caused significant environmental impacts. Among notable environmental challenges, waste management is one of the most critical issues facing society today. Poor waste management practices have led to severe ecological consequences, particularly in communities that lack proactive environmental protection measures. In response to these challenges, businesses are increasingly pressured to develop environmentally friendly products while also educating consumers about environmental protection through green product promotion. A key strategic approach is to use eco-friendly materials, particularly green packaging. Green packaging helps bring consumers closer to environmentally friendly packaging solutions [1].

Vietnam, as an emerging market with over 100 million inhabitants [2], plays a vital role in the global green consumption movement. However, plastic consumption in Vietnam is rising by 10% annually, reaching over 41 kg per person per year. This places Vietnam among

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the top five countries, including China, Indonesia, Thailand, and the Philippines, that together generate 50% of the world's plastic waste [3].

Given this situation, promoting green consumer behaviour should be a priority in both government policies and manufacturer strategies in Vietnam. To establish a sustainable consumption culture in this emerging market, understanding Vietnamese consumers' motivations for green consumption, in general, and environmentally friendly packaging, in particular, is essential. Although green production and consumption policies in Vietnam have not been effectively implemented, encouraging initiatives from Vietnamese manufacturers aim to reduce single-use plastic production and consumption.

At the same time, e-commerce in Vietnam is experiencing rapid growth, with a 20% increase in 2022, reaching a value of $16.4 billion USD [2]. Green consumption trends are gradually emerging, especially among young and highly educated consumer groups. In this context, research on the impact of green packaging on online shopping behaviour becomes particularly significant.

Based on the Stimulus-Organism-Response Theory, this study seeks to explore the impact of green packaging on green purchase intention in online shopping environments among Vietnamese students, through the mediating roles of green satisfaction and green loyalty. This theory proposes that environmental factors (such as green packaging) can influence individuals' internal states (satisfaction and loyalty), thereby affecting their behaviour (purchase intention). The specific objectives of this research include:

- Assessing the impact of green packaging on green satisfaction and green loyalty among Vietnamese students in online shopping scenarios.
- Examining the mediating roles of green satisfaction and green loyalty in the connection between green packaging and green purchase intention.
- Recommending suitable solutions and marketing strategies for Vietnamese e-commerce businesses to implement green packaging and encourage sustainable consumption.

This research offers valuable insights into green consumer behaviour among Vietnamese students—an important customer segment with significant potential in the e-commerce market. The findings will help businesses develop sustainable marketing strategies while fostering awareness and responsible consumption within the Vietnamese student community.

2 LITERATURE REVIEW

2.1 Theoretical Framework

Green packaging refers to the use of environmentally friendly materials as packaging. The aim of using these materials is to minimise the negative environmental impacts of product disposal. Zhang and Zhao [4] suggest that green packaging, also known as “ecological packaging” or “environmentally friendly packaging,” is defined as packaging that can be reused or recycled and does not harm humans, the environment, or animals.

Packaging plays a vital role in protecting products, improving logistics efficiency, and boosting sales. Therefore, it is an essential part of the goods circulation process. Herbes et al. [5] argue that green packaging is made entirely from natural plants, can be reused or recycled, is easily biodegradable, and supports sustainable development. Throughout its lifecycle, green packaging does not damage the environment or the health of humans and animals.

The SOR theory is a fundamental model used to explain consumer behaviour patterns. It proposes that external stimuli influence consumers' perceptions, which in turn generate specific motivations and attitudes [6]. This theory has been widely applied in consumer

behaviour research across both online and offline settings. The SOR theory comprises three components:

Stimulus component: refers to environmental stimuli that individuals receive.

Organism component: refers to the individual's internal state

Response component: refers to the behaviour generated

Based on this theory, green packaging is viewed as an external stimulus that influences consumers' internal perception, including customer satisfaction and loyalty, thereby determining their purchase intentions.

2.2 Research Hypotheses and Proposed Model

Today, most companies worldwide strive to promote environmentally friendly packaging. Research by Klaiman et al. [7] shows that modern consumers prefer and favour products with environmentally friendly packaging that can be reused and made from eco-friendly materials. Previous studies have shown that the packaging, design, features, and warranties of purchased products-if of high quality-are more likely to be accepted by consumers, leading to satisfaction, loyalty, and a higher intention to repurchase [7]. Consumer satisfaction refers to the level of fulfilment relating to consumption or post-consumption evaluation [8]. It is defined as the overall degree of satisfaction or contentment derived from meeting consumer expectations, desires, and needs related to the quality of a product or service. Liang et al. [9] define green satisfaction as the level of satisfaction from consuming products that meet environmental desires, sustainability expectations, and customers' green needs. Based on the above studies, the following hypotheses are proposed:

H1: Green packaging has a positive impact on green satisfaction

H2: Green packaging has a positive effect on green loyalty

H3: Green packaging has a positive impact on green purchase intention

Customer satisfaction is closely tied to customers' emotions when their consumption experience is rewarding, as the product's performance exceeds their expectations. In contrast, customer loyalty involves maintaining a relationship with a company through repeated purchases. Customer loyalty is often seen as a strong commitment to repurchase a product in the future [10]. Repurchase intention directly reflects loyalty from a behavioural perspective, while attitudinal loyalty focuses on emotional connection and a strong preference for a specific brand or product. In the context of environmental consumption, green purchase intention is defined as the likelihood that a consumer will choose a particular product to address their environmental concerns.

Furthermore, green customer loyalty refers to customers' desire to sustain relationships with an environmentally conscious or 'green' organisation and their commitment to regularly repurchase a preferred product in the future [11]. Similarly, green customer satisfaction can be described as the overall fulfilment of customers' needs, goals, and desires related to environmental or green issues. Consequently, satisfied customers are more inclined to repurchase, recommend products to friends and family, are less likely to seek suggestions from other companies, and tend to remain loyal to green product consumption.

Based on these studies, the following hypotheses are proposed:

H4: Green satisfaction has a positive impact on green loyalty

H5: Green satisfaction has a positive impact on green purchase intention

H6: Green loyalty has a positive effect on green purchase intention

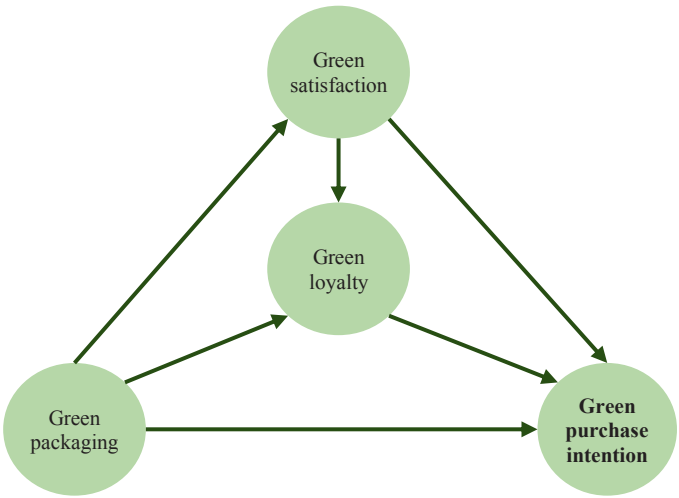


Fig. 1. Proposed research model

3 RESEARCH METHODOLOGY

3.1 Measurement Scales

All main variables were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Based on a literature review, observed variables were selected in line with previous research to measure each construct. Green packaging was assessed with three items focusing on environmental friendliness display, recyclable symbols, and recyclability identification in online shopping contexts. Green loyalty was evaluated using four items from Chen [12] that gauged continued purchase intention influenced by environmental features and preference for green alternatives. Green satisfaction was measured with four items from Chen [13], reflecting satisfaction with the brand's environmental efforts and ecological responsibility. Green purchase intention was assessed through four items adapted from Chen [12] and Yadav & Pathak [14], examining willingness to purchase due to environmental benefits and information-seeking behavior regarding ecological impact.

3.2 Sample Selection and Data Collection

To determine the minimum sample size for PLS-SEM analysis, the "10 times rule" was applied [15]. The minimum sample size should be ten times the number of structural paths directed towards a specific construct in the model. In this research, "Green purchase intention" receives the most paths (three paths), therefore:

$$\text{Minimum sample size} = 10 \times 3 = 30 \text{ sample}$$

The actual sample size of 281 significantly exceeds this minimum requirement, enabling reliable subsequent analyses.

Through survey instruments, 292 responses regarding green purchase intention were collected. After data cleaning and removing 11 invalid responses, the research team obtained 281 valid responses. The descriptive statistics of survey participants' characteristics are presented in Table 1.

Table 1. General Information of Survey Participants.

No.	General Information	Quantity	Percentage
Sample Size (n)		281	100.00%
Gender			
1	Male	102	36.30%
2	Female	178	63.35%
3	Other	1	0.36%
Age			
1	Maximum	25 years	
2	Minimum	20 years	
3	Average age	21.8 years	
Average Monthly Income			
1	Maximum	Over 30 million VND/month	
2	Minimum	Below 3 million VND/month	
3	Average income	3,677,936 VND/month	
Primary Residence			
1	Northern Midlands and Mountains	2	0.71%
2	Red River Delta	2	0.71%
3	North Central and Central Coast	25	8.90%
4	Central Highlands	28	9.96%
5	Southeast	171	60.85%
6	Mekong Delta	53	18.86%

Statistics on shopping frequency indicate that most survey participants shop online quite often. The most common shopping frequency is about 2-3 times a month, accounting for 39%. Of the remaining participants, the group of frequent shoppers, who shop once a week or more, makes up 38.79%. At this relatively regular shopping level, participants' views on the influence of green packaging on green purchase intentions will be objective and will provide a crucial basis for the research team's analysis and evaluation.

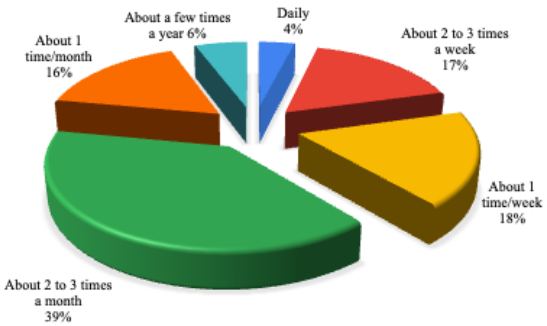


Fig. 2. Statistics on the frequency of online purchases

4 RESULTS AND DISCUSSION

4.1 Measurement Model Assessment

4.1.1 Reliability Assessment

To assess the reliability of the measurement scales, both Cronbach's Alpha and Composite Reliability (CR) coefficients must be 0.7 or higher to achieve optimal levels. Based on Table 2, the Cronbach's Alpha reliability coefficients for Green Loyalty, Green Satisfaction, and Green Purchase Intention all exceeded 0.7. The Green Packaging factor had a Cronbach's Alpha coefficient of 0.649, which, although not optimal, can still be accepted in exploratory research as it exceeds 0.6 [15]. For Composite Reliability (CR) coefficients, all four factors had indices of 0.81 or higher, indicating that the measurement scale used in the model performs very well.

Table 2. Summary Results of Factor Loadings in the PLS-SEM Model

Construct	Indicator	Factor Loading	Cronbach's Alpha	Composite Reliability (CR)	AVE
Green Packaging	GP1	0.725	0.649	0.810	0.588
	GP2	0.814			
	GP3	0.758			
Green Loyalty	GL1	0.741	0.749	0.840	0.568
	GL2	0.701			
	GL3	0.768			
	GL4	0.802			
Green Satisfaction	GS1	0.803	0.832	0.887	0.664
	GS2	0.776			
	GS3	0.855			
	GS4	0.822			
Green Purchase Intention	GPI1	0.808	0.781	0.859	0.605
	GPI2	0.711			
	GPI3	0.841			
	GPI4	0.746			

4.1.2 Convergent Validity

To evaluate the convergent validity of latent variables, researchers often use the Average Variance Extracted (AVE). According to the standard, a construct is considered to have convergent validity when its AVE exceeds 0.5. In this study, the results indicate that the AVE of all factors exceeds 0.5, confirming that the model's convergent validity meets the criteria (see Table 2). Regarding discriminant validity, two frequently used methods are the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. According to the Fornell-Larcker criterion, a measurement scale demonstrates discriminant validity if the square root of each latent variable's AVE is greater than its correlations with other constructs in the model.

Table 3. Discriminant Validity (Fornell-Larcker Criterion)

	Green Loyalty	Green Packaging	Green Purchase Intention	Green Satisfaction
Green Loyalty	0.754			
Green Packaging	0.242	0.767		
Green Purchase Intention	0.668	0.264	0.778	
Green Satisfaction	0.439	0.117	0.576	0.815

The analysis results in Table 3 indicate that the model's constructs exhibit discriminant validity. This is evidenced by the square root values of AVE (bolded on the diagonal) being greater than the correlation coefficients off the diagonal. Another way to assess discriminant validity is by using the HTMT index. According to the standard, HTMT values should be below 1.0 to confirm discriminant validity. The results in Table 4 indicate that all HTMT values are less than 1.0; therefore, it can be concluded that the constructs in the model have discriminant validity.

Table 4. Heterotrait-Monotrait Ratio

	Green Loyalty	Green Packaging	Green Purchase Intention	Green Satisfaction
Green Loyalty				
Green Packaging	0.345			
Green Purchase Intention	0.853	0.372		
Green Satisfaction	0.525	0.152	0.704	

4.2 Structural Model Assessment

Table 5. Adjusted R^2 Index

Construct	Adjusted R^2
Green Loyalty	0.227
Green Purchase Intention	0.552
Green Satisfaction	0.012

R^2 is also known as the coefficient of determination, which measures the overall effect size for the structural model. According to the results in Table 6, the adjusted R-squared value for Green Purchase Intention is 0.552. Therefore, the model explains 55.2% of the variance in Green Purchase Intention. The remaining variation is due to systematic errors or influences from other factors not accounted for in the model. With this result, the model is explained at a reasonably good level.

Additionally, the adjusted R^2 for Green Loyalty and Green Satisfaction are 22.7% and 1.2%, respectively. This suggests that Green Packaging has a minimal impact on Green Satisfaction. Moreover, both factors affecting Green Loyalty are Green Packaging and Green Satisfaction; however, these relationships account for only 22.7% of the model's explanation. Hence, it can be seen that neither factor strongly impacts nor significantly creates loyalty to using green products among consumers.

To evaluate the extent of influence between variables in the model, the study employed the Bootstrap analysis method. This is a statistical technique based on repeated sampling from the original data, enabling error estimation without assumptions about data distribution.

The results of the Bootstrap process are presented in Table 6, which includes key parameters related to path coefficients in the structural model.

Table 6. Results of Relationships Between Constructs in the Model

Hypothesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	P Values	Conclusion
H1: Green Packaging → Green Satisfaction	0.117	0.124	0.062	0.058	Rejected
H2: Green Packaging → Green Loyalty	0.242	0.250	0.058	0.000	Accepted
H3: Green Packaging → Green Purchase Intention	0.264	0.272	0.057	0.000	Accepted
H4: Green Satisfaction → Green Loyalty	0.417	0.420	0.061	0.000	Accepted
H5: Green Satisfaction → Green Purchase Intention	0.552	0.552	0.054	0.000	Accepted
H6: Green Loyalty → Green Purchase Intention	0.490	0.490	0.061	0.000	Accepted

Results from Bootstrap analysis show that, except for hypothesis H1: Green Packaging's impact on Green Satisfaction, all other hypotheses are accepted and statistically significant.

4.3 Discussion

PLS-SEM analysis showed that Green Packaging, Green Satisfaction, and Green Loyalty all positively influence Green Purchase Intention. Green Loyalty had the strongest influence ($\beta = 0.49$, $p < 0.001$), followed by Green Satisfaction ($\beta = 0.552$, $p < 0.001$), while Green Packaging had the weakest direct impact ($\beta = 0.264$, $p < 0.001$). Notably, Green Packaging did not significantly impact Green Satisfaction ($p = 0.058 > 0.05$), indicating that green satisfaction arises from multiple factors beyond external packaging and labeling. This suggests that consumers' green satisfaction is driven more by meaningful environmental actions and product quality than by packaging alone. The findings imply that to boost green satisfaction, businesses should go beyond superficial marketing like packaging printing and promotion. Instead, they should focus on establishing credibility through tangible environmental practices and enhancing product quality.

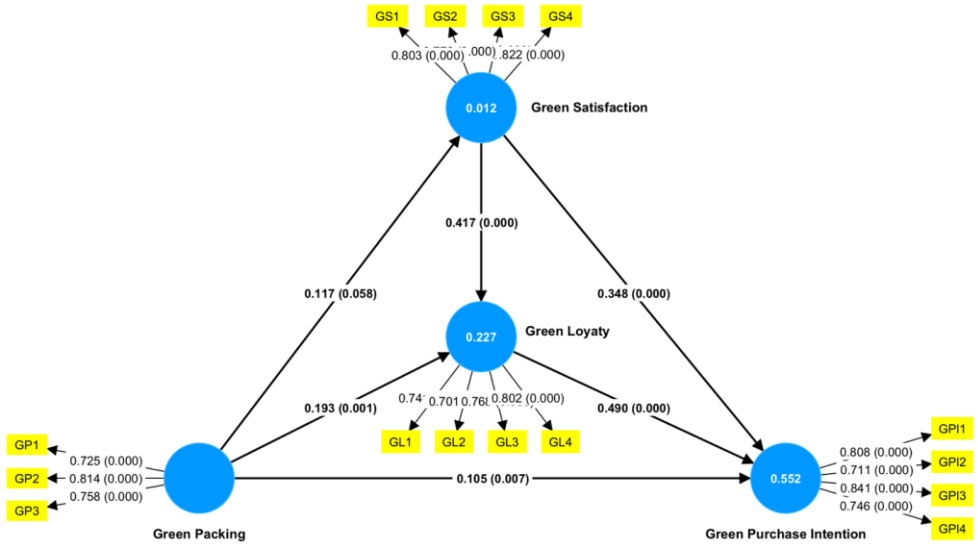


Figure 3. Standardised research model

5 CONCLUSION

This study examined the relationships between green packaging, consumer psychology, and purchase intentions among Vietnamese students in e-commerce contexts, employing the PLS-SEM methodology. The findings reveal that green purchase intention is mainly driven by green loyalty ($\beta = 0.49$) rather than packaging appearance alone. Notably, green packaging does not significantly influence green satisfaction ($p = 0.058$), indicating that authentic environmental commitment goes beyond superficial marketing elements. The research shows that Vietnamese consumers' green satisfaction stems from meaningful environmental actions rather than external packaging design. This challenges conventional marketing approaches that focus on visual packaging aspects without addressing actual environmental performance. As a result, businesses need to shift from superficial green marketing tactics to establishing genuine sustainability credentials through concrete environmental initiatives and higher product quality. The practical implications suggest that e-commerce companies should prioritise educating consumers about environmental benefits and long-term value rather than just aesthetic packaging changes. Firms should strive to establish genuine relationships with environmentally conscious consumers by adopting transparent sustainability practices and quantifiable environmental impacts. These insights contribute to the literature on sustainable consumer behaviour in emerging markets and offer strategic guidance for developing effective green marketing strategies in Vietnam's rapidly growing digital marketplace.

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