

# Green Packaging Design and Green Customer Citizenship Behavior in Express Delivery Services: The Mediating Roles of Green Brand Image and Green Trust

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**Abstract:** Green packaging has become a visible service touchpoint through which logistics firms signal environmental responsibility, yet limited empirical research explains how customers translate such packaging cues into voluntary pro-environmental support for the firm. Drawing on the Stimulus–Organism–Response (S-O-R) framework and social identity theory, this study examines whether green packaging design stimulates green customer citizenship behavior through green brand image and green trust. Survey data were collected from 466 customers in Zhuhai, Guangdong Province, China, who had used S-courier express services within the previous six months. Structural equation modeling was used to validate the measurement model and test direct, parallel mediation, and sequential mediation effects. Results show that green packaging design significantly enhances green brand image and green trust and directly promotes green customer citizenship behavior. Green brand image also strengthens green trust and customer citizenship behavior, while green trust further predicts customer citizenship behavior. Bootstrapping confirms partial mediation through green brand image, green trust, and a serial pathway from green packaging design to green brand image, green trust, and customer citizenship behavior. The findings identify green packaging design as a strategic stimulus that converts sustainability cues into customer advocacy and feedback behaviors in express delivery services..

**Keywords:** green packaging design; green brand image; green trust; green customer citizenship behavior; S-O-R theory; express delivery.

## Introduction

Express delivery services have expanded rapidly with the growth of digital commerce, but this expansion has intensified public concern about packaging waste, plastic pollution, and the environmental consequences of logistics consumption. Packaging is no longer a purely functional container for protecting parcels. It is now a highly visible interface between service firms and customers, especially in courier services where customers directly observe materials, labels, recyclability, convenience, and perceived safety at the moment of delivery. Prior research suggests that sustainable packaging can reduce environmental impact through material reduction, recycling,

reusability, biodegradability, and lifecycle-oriented design (Magnier & Crié, 2015; Molina-Besch & Pålsson, 2016; Williams et al., 2012). However, the managerial problem facing logistics firms is not only whether green packaging reduces waste, but also whether customers perceive it as credible and meaningful enough to support the firm's broader sustainability agenda.

This issue is particularly important in China's express delivery market, where high parcel volumes make packaging sustainability a major operational and reputational challenge. Green packaging initiatives may communicate responsibility, but they may also be dismissed as superficial if customers perceive them as symbolic, inconvenient, or inconsistent with service performance. The practical challenge is therefore behavioral: logistics firms need to understand how green packaging design can encourage customers to engage in voluntary, extra-role green behaviors, such as recommending the firm, supporting environmental initiatives, and providing constructive feedback. These behaviors are conceptualized as green customer citizenship behavior, which extends the broader customer citizenship behavior literature into the environmental domain (Deng & Yang, 2022; Yi & Gong, 2013).

Existing research has examined green marketing, green purchase intention, green trust, green brand image, and sustainable packaging in different consumer contexts (Chen, 2010; Guerrero & Pacheco, 2021; Magnier & Schoormans, 2015; Tan et al., 2022; Yang & Zhao, 2019). Nevertheless, three gaps remain. First, much of the green packaging literature focuses on purchase intention or product evaluation, whereas fewer studies explain customers' voluntary post-consumption green behaviors in service encounters. Second, prior studies often treat green packaging as a single marketing cue without examining the psychological mechanism through which customers interpret it as a sign of environmental identity and credibility. Third, the express delivery context has received less attention than retail, hospitality, and food-service contexts, despite the high environmental salience of courier packaging.

The theoretical gap is that green packaging design has rarely been integrated into a focused Stimulus–Organism–Response model that connects environmental service cues to green customer citizenship behavior. The S-O-R framework proposes that external stimuli influence behavioral responses through internal psychological states (Mehrabian & Russell, 1974). In this study, green packaging design is the environmental stimulus, green brand image and green trust are internal organismic evaluations, and green customer citizenship behavior is the behavioral response. Social identity theory complements this framework by explaining why customers who perceive a firm as environmentally responsible may voluntarily support the firm because doing so reinforces their own green self-image and association with a desirable social group (Becerra et al., 2023).

Accordingly, this article restructures the dissertation into one focused empirical study. The research objective is to examine how green packaging design influences green customer citizenship behavior among customers of S-courier express services in China and to test whether green brand image and green trust mediate this relationship. The study contributes by showing that green packaging design is not only an operational sustainability practice but also a relationship-building stimulus that shapes customers' green image perceptions, trust judgments, and voluntary green support behaviors. It also advances S-O-R theory by specifying a serial psychological pathway in a green service-touchpoint context.

## Literature Review

### 2.1 Theoretical Framework

The S-O-R framework explains how environmental stimuli shape individuals' internal psychological states and subsequently influence behavioral responses. In consumer research, stimuli may include physical design, information cues, service atmospherics, or marketing signals; organismic states may include emotions, perceived value, image, trust, satisfaction, and identification; and responses may include intention, purchase, loyalty, advocacy, and other behavioral outcomes (Chen et al., 2019). This study applies the framework to sustainable logistics by conceptualizing green packaging

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design as a stimulus that customers observe during the delivery encounter. When packaging materials, symbols, convenience, safety, and environmental identification cues are interpreted positively, they may shape the customer's perception of the firm's green brand image and credibility.

Social identity theory further explains why perceived green image and trust may lead to voluntary customer citizenship behavior. Customers are not only economic decision-makers; they also use consumption and brand relationships to express identity and values. When a brand is perceived as environmentally responsible, customers may feel that supporting the brand is consistent with their self-concept and social identity as environmentally aware consumers (Becerra et al., 2023). Thus, green customer citizenship behavior can be understood as an identity-consistent response that goes beyond transactional purchase behavior.

## 2.2 Hypothesis Development

Green packaging design refers to packaging that reduces environmental harm by emphasizing recyclable, reusable, biodegradable, resource-saving, safe, and convenient design principles (Magnier & Crié, 2015; Williams et al., 2012). In courier services, customers do not usually evaluate the environmental performance of the firm's entire logistics system. Instead, they interpret highly visible cues, including packaging materials, structural design, labels, ease of handling, and the extent to which packaging communicates environmental responsibility. Packaging has long been described as a communicative device that conveys brand meaning and influences consumer evaluation (Underwood, 2003; Underwood et al., 2001). When packaging visibly reflects environmental values, customers may infer that the firm possesses a stronger green brand image. Green brand image refers to customers' perceptions of a brand as being associated with environmental commitment and environmentally responsible practices (Chen, 2010). The dissertation's original framework conceptualized green brand image through functional, symbolic, and experiential dimensions, consistent with brand image theory (Park et al., 1986). Green packaging design may strengthen functional image by signaling practical environmental performance, symbolic image by allowing customers to associate the firm with sustainability, and experiential image by improving the perceived quality and meaning of the delivery encounter. Therefore:

H1: Green packaging design is positively associated with green brand image.

Green trust is the customer's willingness to depend on a product, service, or brand based on expectations of environmental credibility, benevolence, and capability (Chen et al., 2015). Trust is especially important in green consumption because customers often cannot directly verify the environmental claims made by firms. In this situation, tangible cues such as packaging design may reduce uncertainty and function as evidence of environmental commitment. Prior research suggests that green attributes and transparency strengthen customers' confidence in green brands (Deng & Yang, 2022; Nuttavuthisit & Thøgersen, 2015). If customers perceive that courier packaging is recyclable, safe, convenient, and aligned with environmental values, they may judge the firm's green claims as more credible. Therefore:

H2: Green packaging design is positively associated with green trust.

Brand image helps customers reduce perceived risk and form expectations about firm behavior. A favorable green brand image indicates that the firm is not merely making isolated environmental claims but is consistently associated with environmental responsibility. Such an image can strengthen trust because customers perceive the brand as more credible, reliable, and committed to green promises (Chen, 2010; Flavián et al., 2005). In courier services, where customers may have limited information about internal logistics processes, green brand image becomes an important interpretive shortcut for evaluating the firm's environmental integrity. Therefore:

H3: Green brand image is positively associated with green trust.

Green customer citizenship behavior refers to voluntary customer actions that support a firm's green activities beyond the customer's formal role as a service buyer. In this study, it includes advocacy behavior and feedback behavior, such as recommending environmentally responsible firms,

encouraging others to choose them, and offering suggestions for green initiatives. The concept builds on customer citizenship behavior research, which views customers as voluntary contributors to service value creation (Yi & Gong, 2013).

A favorable green brand image may encourage customers to advocate for the firm because it provides symbolic and identity-based reasons to support the brand. Customers are more likely to recommend or defend firms whose environmental image aligns with their values. Likewise, green trust should encourage customer citizenship because trust reduces skepticism and increases willingness to cooperate with the firm's environmental activities. Prior research in green services indicates that trust and identification can foster supportive green behaviors (Deng & Yang, 2022; Hwang & Lyu, 2019; Waris et al., 2024). Therefore:

H4: Green brand image is positively associated with green customer citizenship behavior.

H5: Green trust is positively associated with green customer citizenship behavior.

Green packaging design may also directly stimulate green customer citizenship behavior. Customers who observe credible green packaging may be more willing to recommend the firm, support its green initiatives, or provide feedback even before forming broader brand evaluations. However, S-O-R theory suggests that this effect should also operate indirectly through organismic states. Green packaging design should improve green brand image and green trust, which in turn should foster citizenship behaviors. Moreover, green brand image may precede green trust because image creates a general perception of environmental responsibility that subsequently strengthens confidence in the firm's green promises. Therefore:

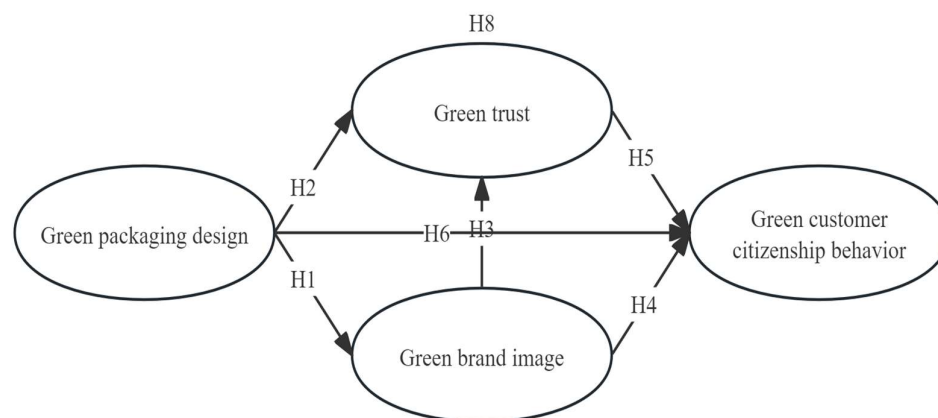
H6: Green packaging design is positively associated with green customer citizenship behavior.

H7: Green brand image mediates the relationship between green packaging design and green customer citizenship behavior.

H8: Green trust mediates the relationship between green packaging design and green customer citizenship behavior.

H9: Green brand image mediates the relationship between green packaging design and green trust.

**Figure 1 presents the original conceptual framework retained from the dissertation.**



**Figure 1. Conceptual framework of the study.**

## Methodology

### 3.1 Data Collection and Sample

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This study adopted a quantitative, cross-sectional survey design to empirically examine the proposed Stimulus–Organism–Response (S-O-R) model. The empirical setting was S-courier express services in Zhuhai, Guangdong Province, China. S-courier was selected as the research context because the company had implemented a series of green packaging initiatives, including packaging reduction, recycling, harmless treatment, and standardization. These practices provided an appropriate real-world service setting for investigating customers’ perceptions of green packaging design and their subsequent psychological and behavioral responses.

The target population comprised customers in Zhuhai who had used S-courier delivery services within the previous six months and were able to clearly recall the company’s packaging. Respondents without relevant service experience were excluded in order to ensure the contextual relevance and validity of the collected data. Based on Yamane’s sample-size formula, assuming an estimated population of 200,000 recent customers, a 95% confidence level, and a sampling error of .05, the minimum required sample size was calculated to be 399. To reduce the potential impact of invalid responses, a total of 500 questionnaires were distributed. Data were collected in April 2026 through an online questionnaire administered via Wenjuanxing. The survey link was disseminated through WeChat official accounts, social media groups, and WeChat Moments. In total, 494 questionnaires were returned. After screening the responses, questionnaires completed in less than 60 seconds or showing invalid response patterns were removed. As a result, 466 valid responses were retained for subsequent statistical analysis, representing a valid response rate of 94.33% among the returned questionnaires.

Table 1 presents the demographic profile of the respondents. Overall, the sample included slightly more female respondents than male respondents and was mainly concentrated in the 21–40 age range. In terms of education, more than half of the respondents held a bachelor’s degree. Regarding monthly income, the largest proportion of respondents reported earning between 6,001 and 8,000 CNY. These demographic characteristics indicate that the sample consisted largely of educated, economically active consumers with recent experience using S-courier services, making it suitable for examining customer perceptions of green packaging design in the express delivery context.

**Table 1 Demographic Characteristics of Respondents**

Characteristic	Category	Frequency	Percentage
Gender	Male	217	46.57%
Gender	Female	249	53.43%
Age	21–30	163	34.98%
Age	31–40	185	39.70%
Age	41–50	82	17.60%
Age	Above 51	36	7.73%
Education	Below high school	36	7.73%
Education	High school or equivalent	81	17.38%
Education	Bachelor’s degree	255	54.72%
Education	Above bachelor’s degree	94	20.17%
Occupation	Home-maker	9	1.93%
Occupation	Student	73	15.67%
Occupation	Official	241	51.72%
Occupation	Tradesman	74	15.88%
Occupation	Worker	25	5.36%
Occupation	Retired	18	3.86%

Characteristic	Category	Frequency	Percentage
Occupation	Other	26	5.58%
Income	Below 2,000 CNY	52	11.16%
Income	2,001–4,000 CNY	88	18.88%
Income	4,001–6,000 CNY	108	23.18%
Income	6,001–8,000 CNY	137	29.40%
Income	Above 8,001 CNY	81	17.38%

### 3.2 Measurement

All constructs in this study were measured using established scales adapted from prior studies. A five-point Likert scale was employed for all measurement items, ranging from 1 = strongly disagree to 5 = strongly agree. The use of previously validated measurement scales helped ensure the reliability and theoretical relevance of the questionnaire. Considering the specific research context of S-courier express services and green packaging practices, the wording of the items was adjusted where necessary to make them more suitable for customers' actual service experience and perceptions of courier packaging.

Green packaging design was measured using 15 items adapted from Wu (2013) and Yang and Zhao (2019). This construct captured customers' overall evaluation of the company's green packaging design from five dimensions: material, safety, green concept, environmental identification, and convenience. Specifically, the items reflected whether the packaging materials were environmentally friendly, safe, and reliable; whether the packaging design embodied green and sustainable ideas; whether environmental labels or green identification were clearly presented; and whether the packaging was convenient for customers to use, recycle, or dispose of. These dimensions were included to comprehensively assess customers' perceptions of green packaging design in the express delivery service context.

Green brand image was measured with nine items adapted from Park et al. (1986) and Porter and Claycomb (2000). The measurement covered three dimensions: functional image, symbolic image, and experiential image. Functional image reflected customers' perceptions of the practical value and environmental performance of the brand's green packaging. Symbolic image referred to the extent to which the brand conveyed environmental responsibility, social value, and a positive green identity. Experiential image captured customers' overall feelings and impressions generated through their interaction with the company's green packaging and delivery service. Together, these dimensions provided a multidimensional assessment of how green packaging design contributes to customers' perception of the courier brand.

Green trust was measured using 10 items adapted from Chen et al. (2015), Yang and Zhao (2019), and Deng and Yang (2022). The items assessed customers' confidence in the company's environmental claims, green packaging practices, and fulfillment of green commitments. This construct included aspects such as reliability, trustworthiness, satisfaction of expectations, and the company's ability to keep its environmental promises. In this study, green trust reflected the degree to which customers believed that S-courier's green packaging initiatives were credible, responsible, and consistent with its stated environmental intentions.

Green customer citizenship behavior was measured with five items adapted from Yi and Gong (2013), Deng and Yang (2022), Kuang and Lyu (2024), and related studies on green customer behavior. This construct focused on voluntary, extra-role behaviors performed by customers in support of the company's green practices. The items mainly covered advocacy and feedback behavior, including customers' willingness to recommend the company's green packaging practices to others, speak positively about the company's environmental efforts, and provide suggestions or feedback to help improve its green services. These behaviors go beyond basic purchase or usage behavior and represent customers' active participation in supporting the company's green development.

## Results

### 4.1 Descriptive Statistics

Table 2 shows the descriptive statistics of the four main constructs, namely green packaging design, green brand image, green trust, and green customer citizenship behavior. The mean scores of green packaging design, green brand image, and green trust were all 3.24, with standard deviations of 0.87, 0.93, and 0.93, respectively. These results suggest that respondents held moderately positive perceptions of S-courier's green packaging practices, its green brand image, and the credibility of its green-related commitments. Green customer citizenship behavior recorded a slightly higher mean value of 3.25, with a standard deviation of 0.99, indicating that respondents showed a moderate tendency to engage in voluntary behaviors that support the company's green practices, such as providing feedback or recommending green initiatives to others. In addition, the standard deviation values reveal a certain degree of variation in respondents' evaluations, suggesting that customers differed in their perceptions and behavioral tendencies. Such variation provides an appropriate empirical basis for further examining the relationships among the constructs in the proposed research model.

**Table 2 Descriptive Statistics of the Constructs**

Construct	Mean	Standard Deviation
Green packaging design	3.24	0.87
Green brand image	3.24	0.93
Green trust	3.24	0.93
Green customer citizenship behavior	3.25	0.99

### 4.2 Reliability and Convergent Validity

Table 3 reports the reliability and convergent validity results of the four constructs, including green packaging design, green brand image, green trust, and green customer citizenship behavior. The Cronbach's alpha coefficients ranged from .839 to .924, all of which exceeded the commonly recommended threshold of .70, indicating that the measurement items had satisfactory internal consistency. Among the constructs, green packaging design recorded the highest Cronbach's alpha value (.924), followed by green trust (.911), green brand image (.895), and green customer citizenship behavior (.839). Although green customer citizenship behavior had the lowest alpha coefficient, its value remained above the acceptable standard, suggesting that the items used to measure this construct were still reliable.

In addition to Cronbach's alpha, composite reliability was assessed to further evaluate the reliability of the latent constructs. The CR values ranged from .8951 to .9651, which were all substantially higher than the recommended minimum value of .70. Specifically, green packaging design had the highest CR value (.9651), while green customer citizenship behavior had the lowest CR value (.8951). These results further confirm that the constructs possessed strong internal reliability and that the observed indicators consistently reflected their corresponding latent variables.

Convergent validity was evaluated using the average variance extracted (AVE). The AVE values ranged from .8101 to .8925, exceeding the recommended threshold of .50 for all constructs. This indicates that each construct explained a substantial proportion of the variance in its measurement items. Green brand image reported the highest AVE value (.8925), followed by green trust (.8493), green packaging design (.8468), and green customer citizenship behavior (.8101). Therefore, the results provide strong evidence of convergent validity. Overall, the reliability and validity statistics in Table 3 demonstrate that the measurement model was acceptable and suitable for subsequent structural analysis and hypothesis testing.

**Table 3 Reliability and Convergent Validity Results**

Construct	Cronbach's Alpha	Composite Reliability	AVE
Green packaging design	.924	.9651	.8468
Green brand image	.895	.9614	.8925
Green trust	.911	.9575	.8493
Green customer citizenship behavior	.839	.8951	.8101

#### 4.3 Discriminant Validity and CFA Model Fit

Table 4 presents the results of the discriminant validity assessment based on the Fornell–Larcker criterion. The square roots of AVE are reported on the diagonal, while the off-diagonal values represent the correlations among the constructs. As shown in the table, the square root of AVE for each construct ranged from .719 to .760, and all diagonal values were higher than the corresponding inter-construct correlations. This indicates that each construct shared more variance with its own measurement items than with other constructs, thereby supporting adequate discriminant validity.

In addition, the correlations among green packaging design, green brand image, green trust, and green customer citizenship behavior were all positive and statistically significant, ranging from .426 to .617. These results suggest that the constructs were theoretically related but empirically distinct. Among them, the strongest correlation was observed between green trust and green customer citizenship behavior, indicating that customers with higher trust in S-courier's green practices were more likely to engage in voluntary green-supportive behaviors. Overall, the results confirm that the measurement model achieved satisfactory discriminant validity and was appropriate for subsequent structural model analysis.

**Table 4 Discriminant Validity Results**

Construct	GPD	GBI	GT	GCCB
Green packaging design	.719			
Green brand image	.426**	.729		
Green trust	.477**	.534**	.759	
Green customer citizenship behavior	.436**	.472**	.617**	.760

Note. Diagonal values represent the square root of AVE from the original dissertation table.  $p < .01$ .

The results of the confirmatory factor analysis indicate that the measurement model achieved a good overall fit to the data. As presented in Figure 2, the CFA model included the four key latent constructs and their corresponding dimensions, namely green packaging design, green brand image, green trust, and green customer citizenship behavior. The model fit indices were satisfactory:  $\chi^2 = 759.027$ ,  $df = 682$ , and  $\chi^2/df = 1.113$ , which is well below the commonly accepted threshold of 3. In addition, the RMR value was .050, while the GFI and AGFI values were .924 and .913, respectively, indicating an acceptable level of absolute model fit.

The incremental fit indices further supported the adequacy of the measurement model. Specifically, the NFI value was .917, and the IFI, TLI, and CFI values were .991, .990, and .991, respectively, all exceeding the recommended criterion of .90. Moreover, the RMSEA value was .016, suggesting a very low approximation error and further confirming the strong fit between the hypothesized model and the observed data. Taken together, these results demonstrate that the proposed measurement structure adequately represented the relationships between the observed items and their corresponding latent constructs. Therefore, the retained CFA model, illustrated in Figure 2,

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provides sufficient empirical support for the reliability and validity of the measurement model and serves as an appropriate foundation for the subsequent structural model analysis.

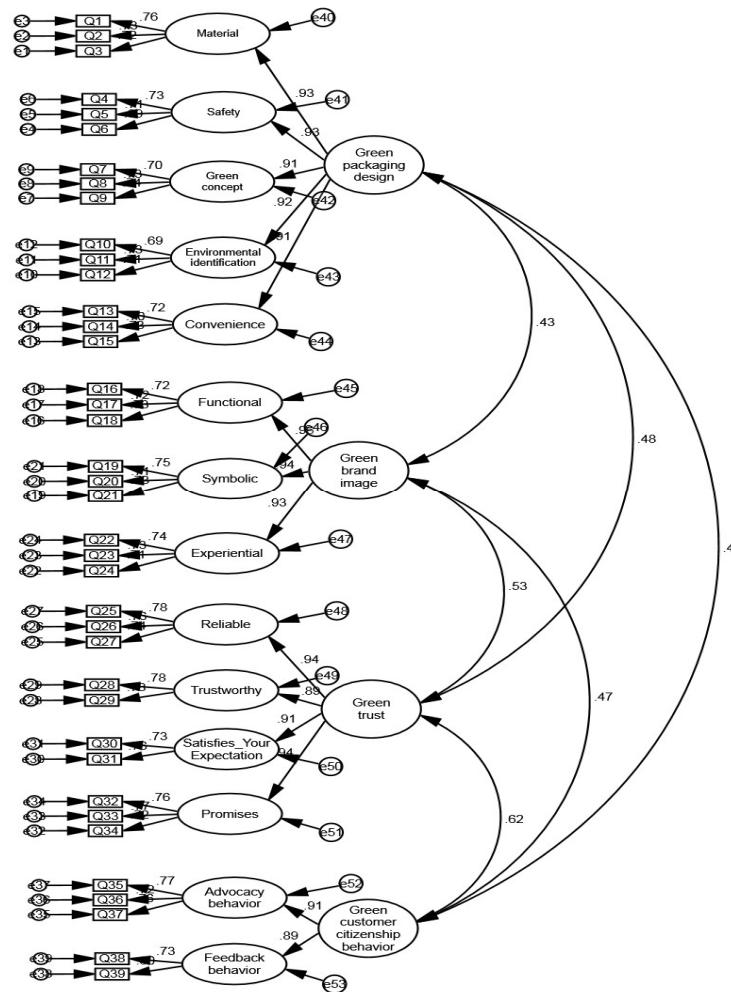


Figure 2. Confirmatory factor analysis model

Table 5 Model Fit Indices of the Confirmatory Factor Analysis

Fit Index	Recommended Criterion	Value	Assessment
$\chi^2/df$	< 3.00	1.113	Acceptable
RMR	< .08	.050	Acceptable
GFI	> .80	.924	Acceptable
AGFI	> .80	.913	Acceptable
NFI	> .90	.917	Acceptable
IFI	> .90	.991	Acceptable
TLI	> .90	.990	Acceptable
CFI	> .90	.991	Acceptable
RMSEA	< .08	.016	Acceptable

#### 4.4 Structural Model Testing

Table 6 reports the structural model path coefficients used to test the six direct hypotheses proposed in this study. The results indicate that all hypothesized relationships were statistically significant and positive; therefore, H1 to H6 were supported. Specifically, green packaging design had a significant positive effect on green brand image ( $\beta = .426$ ,  $B = .433$ ,  $SE = .058$ ,  $CR = 7.447$ ,  $p < .001$ ), supporting H1. This finding suggests that customers' favorable evaluations of S-courier's green packaging design can strengthen their perception of the company's green brand image. Green packaging design also significantly and positively influenced green trust ( $\beta = .305$ ,  $B = .324$ ,  $SE = .057$ ,  $CR = 5.655$ ,  $p < .001$ ), supporting H2, indicating that effective green packaging design helps enhance customers' confidence in the company's environmental commitments and practices.

Furthermore, green brand image had a significant positive effect on green trust ( $\beta = .404$ ,  $B = .423$ ,  $SE = .060$ ,  $CR = 7.055$ ,  $p < .001$ ), supporting H3. This result implies that when customers perceive the brand as environmentally responsible and credible, they are more likely to develop trust in its green initiatives. Regarding green customer citizenship behavior, green packaging design exerted the strongest direct effect among the three predictors ( $\beta = .460$ ,  $B = .471$ ,  $SE = .071$ ,  $CR = 6.612$ ,  $p < .001$ ), supporting H6. This suggests that customers who perceive S-courier's packaging design as environmentally friendly are more likely to engage in voluntary supportive behaviors, such as advocacy and feedback. Green brand image also positively predicted green customer citizenship behavior ( $\beta = .164$ ,  $B = .176$ ,  $SE = .066$ ,  $CR = 2.685$ ,  $p = .007$ ), supporting H4, while green trust had a significant positive effect on green customer citizenship behavior ( $\beta = .146$ ,  $B = .160$ ,  $SE = .062$ ,  $CR = 2.571$ ,  $p = .010$ ), supporting H5. Although the effects of green brand image and green trust were relatively weaker than the direct effect of green packaging design, both remained statistically significant, indicating that favorable brand perceptions and trust are also important factors in promoting green customer citizenship behavior.

**Table 6 Results of Hypothesis Testing**

Hypothesis	Path	$\beta$	B	SE	CR	p	Result
H1	D → GBI	.42	.43	.05	7.44	< .001	Supported
H2	D → GT	.30	.32	.05	5.65	< .001	Supported
H3	GBI → GT	.40	.42	.06	7.05	< .001	Supported
H4	GBI → GCCB	.16	.17	.06	2.68	.007	Supported
H5	GT → GCCB	.14	.16	.06	2.57	.010	Supported
H6	D → GCCB	.46	.47	.07	6.61	< .001	Supported

#### 4.5 Mediation Analysis

Table 7 presents the bootstrapping results for the direct, indirect, and serial mediation effects. The total effect of green packaging design on green customer citizenship behavior was significant, with a standardized effect of .475 and a bias-corrected 95% confidence interval of [.315, .651]. After introducing green brand image and green trust as mediating variables, the direct effect remained significant (standardized effect = .160, 95% BC CI [.020, .328]), indicating a partial mediation effect. This

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suggests that green packaging design not only directly encourages customers' voluntary green-supportive behaviors but also influences such behaviors through customers' psychological evaluations of the brand and its green practices.

The specific indirect effects further clarify the mediating mechanisms. The indirect effect through green brand image was significant (standardized effect = .076, 95% BC CI [.018, .170]), supporting H7, while the indirect effect through green trust was also significant (standardized effect = .153, 95% BC CI [.063, .286]), supporting H8. In addition, the serial indirect effect through green brand image and green trust was significant (standardized effect = .086, 95% BC CI [.050, .154]), supporting H9. These findings indicate that green packaging design, as an external stimulus, can enhance customers' green brand image perceptions, strengthen their green trust, and ultimately promote green customer citizenship behavior. Thus, the mediation results provide empirical support for the proposed S-O-R mechanism.

**Table 7 Results of Mediation Effect Analysis**

Effect	Standardized Effect	Bias-Corrected Lower 95% CI	Bias-Corrected Upper 95% CI	Interpretation
Total effect	.475	.315	.651	Significant
Direct effect	.160	.020	.328	Significant
Indirect effect via green brand image	.076	.018	.170	Significant
Indirect effect via green trust	.153	.063	.286	Significant
Serial indirect effect via image and trust	.086	.050	.154	Significant

## Discussion

### 5.1 Research Findings

This study demonstrates that green packaging design serves as an important strategic stimulus in express delivery services. The positive relationship between green packaging design and green brand image suggests that packaging communicates more than operational functionality. In the courier service context, packaging is one of the most visible touchpoints between the firm and customers. Therefore, customers may use packaging cues, such as environmentally friendly materials, safety, recyclability, green identification, and convenience, to infer whether the courier brand is environmentally responsible. This finding is consistent with packaging communication research, which argues that packaging can shape brand perceptions through visual, material, and symbolic meanings (Underwood, 2003; Underwood et al., 2001). In the green logistics context, environmentally designed packaging not only improves customers' evaluation of the packaging itself but also strengthens the broader perception that the firm is a green and responsible brand.

The findings also indicate that green packaging design significantly enhances green trust. This result is meaningful because customers often find it difficult to directly verify firms' green claims. Compared with internal environmental operations, packaging is visible, tangible, and repeatedly experienced during service use. As a result, credible green packaging practices can reduce customer uncertainty and provide concrete evidence of the firm's environmental commitment. This finding is consistent with previous research showing that environmental friendliness, transparent green attributes, and credible sustainability practices can strengthen trust in green brands (Chen et al., 2015;

Deng & Yang, 2022). For courier firms, green packaging therefore functions not only as a logistics tool but also as a trust-building mechanism when it is perceived as practical, safe, recyclable, and consistent with environmental promises.

Green brand image was found to positively predict green trust, indicating that customers' image-based evaluations can shape their confidence in the firm's green practices. When customers perceive a courier brand as functionally effective, symbolically responsible, and experientially aligned with environmental values, they are more likely to believe that the firm's green commitments are reliable. Moreover, both green brand image and green trust positively influence green customer citizenship behavior. This suggests that customers are more willing to advocate for and provide feedback to a courier firm when they perceive it as environmentally responsible and trustworthy. This finding extends customer citizenship behavior research by showing that voluntary customer support can be activated not only by satisfaction or loyalty, but also by sustainability-related psychological states. From the perspective of social identity theory, customers may engage in green citizenship behavior because supporting an environmentally responsible firm allows them to express and reinforce their own green values.

The mediation results provide the central theoretical insight of this study. Green packaging design influences green customer citizenship behavior not only directly, but also indirectly through green brand image, green trust, and the serial pathway from green brand image to green trust. This indicates that customers do not respond to green packaging merely as an isolated physical feature; rather, they interpret it through cognitive and relational processes. Green packaging design first helps customers form a favorable green brand image, which then strengthens green trust and ultimately encourages voluntary green-supportive behavior. This sequential mechanism supports the S-O-R framework, in which green packaging design acts as the external stimulus, green brand image and green trust serve as internal psychological states, and green customer citizenship behavior represents the behavioral response. Overall, the findings suggest that green packaging initiatives are more likely to mobilize customer support when they create both identity-based brand perceptions and credibility-based trust.

## 5.2 Theoretical Contributions

This study offers several theoretical contributions by extending existing research on the S-O-R framework, green branding, and green customer citizenship behavior in the context of express delivery services. First, this study advances the application of the S-O-R framework by introducing green packaging design as a concrete and customer-facing environmental stimulus. Previous S-O-R studies have mainly focused on online service environments, retail atmospherics, store environments, or broad green marketing cues. In contrast, this study shifts attention to green packaging design in express delivery services, a highly visible but relatively underexplored service touchpoint. By demonstrating that green packaging design significantly influences green brand image, green trust, and green customer citizenship behavior, this study confirms that sustainable packaging is not merely an operational or functional element, but also an important stimulus that shapes customers' internal psychological evaluations and subsequent extra-role behaviors.

Second, this study contributes to the literature by developing and validating a serial mediation mechanism involving green brand image and green trust. Prior studies have often examined green brand image and green trust as separate predictors of customer attitudes or behaviors. However, such an approach may overlook the sequential psychological process through which customers interpret green service cues. This study shows that green packaging design first enhances customers' perception of the firm's green brand image, which then strengthens green trust and ultimately promotes green customer citizenship behavior. Therefore, the innovation of this study lies in revealing a more complete cognitive-relational pathway from green design cues to voluntary customer support. This finding enriches the S-O-R framework by explaining not only whether green packaging design affects customer behavior, but also how and why this effect occurs.

Third, this study extends research on green customer citizenship behavior by identifying green packaging design as an important antecedent in a logistics-service setting. Existing studies on green

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customer citizenship behavior have largely been conducted in hospitality, tourism, restaurant, retail, or general green consumption contexts, where customer experiences are often more affective or interaction-intensive. In comparison, express delivery services are more routine, standardized, and functional. By focusing on this setting, the present study demonstrates that green customer citizenship behavior can also emerge from ordinary but environmentally salient service encounters. This finding broadens the boundary conditions of green customer citizenship behavior research and shows that even mundane service touchpoints, such as courier packaging, can activate customers' voluntary advocacy and feedback behaviors when they are perceived as environmentally meaningful and trustworthy.

### 5.3 Practical Implications

This study provides practical implications for multiple stakeholders, including express delivery firms, managers, customers, policymakers, and industry associations. For express delivery firms, the findings suggest that green packaging should be regarded not only as an operational tool for parcel protection and transportation, but also as a strategic customer-facing asset. Since customers form perceptions of green brand image and green trust based on packaging cues, courier companies should invest in packaging materials that are recyclable, reusable, safe, lightweight, convenient, and visibly consistent with environmental values. Green packaging design should also consider customer usability, such as ease of opening, ease of recycling, clear classification, and convenient return procedures. When green packaging is both environmentally meaningful and practically convenient, customers are more likely to perceive the firm as genuinely responsible rather than merely engaging in symbolic environmental actions.

For managers, the results indicate that green packaging initiatives should be integrated with brand communication and customer relationship management. Packaging itself should communicate clear environmental information, such as recycling instructions, reuse methods, material safety, degradability, and carbon-reduction benefits. However, such information must be specific and verifiable. Managers should avoid vague expressions such as "eco-friendly" or "green" without supporting details, because unclear claims may weaken green trust and increase customer skepticism. Instead, firms can use standardized labels, QR codes, certification marks, or brief explanations on packaging to help customers understand the environmental value of the design. In this way, green packaging can become a communication medium that strengthens both green brand image and customer confidence.

The findings also suggest that managers should connect green packaging with customer participation programs. For example, courier firms can encourage customers to return reusable packaging, participate in packaging recycling campaigns, provide feedback on packaging convenience, or share positive green delivery experiences through online platforms. These activities can transform customers from passive recipients of delivery services into active participants in green logistics practices. Since green customer citizenship behavior includes voluntary advocacy and feedback, firms should create accessible channels that allow customers to express support, make suggestions, and participate in environmental improvement. Reward mechanisms, membership points, green badges, or community-based recognition may further encourage customers to engage in these voluntary behaviors.

For customers, this study indicates that green packaging can become an important basis for evaluating the environmental responsibility of express delivery firms. When customers are exposed to clear, credible, and convenient green packaging practices, they may become more aware of the environmental impact of express delivery consumption. This awareness can encourage them to support sustainable logistics through small but meaningful actions, such as properly sorting packaging waste, returning reusable packages, recommending green delivery options, and providing suggestions for packaging improvement. Therefore, green packaging design does not only influence customer perception; it also provides customers with practical opportunities to participate in sustainable consumption.

For policymakers, the findings highlight the importance of improving institutional support for green packaging in the express delivery industry. Government departments can strengthen standards

for recyclable, reusable, degradable, harmless, and standardized courier packaging. Clearer policy guidelines can reduce uncertainty for firms and encourage more consistent implementation of green packaging practices across the industry. Policymakers should also improve environmental labeling systems and certification mechanisms so that customers can distinguish authentic green packaging from superficial or misleading claims. Such measures are important for reducing greenwashing and enhancing public trust in green logistics.

For industry associations, the study suggests the need to develop best-practice guidelines that integrate packaging design, green communication, recycling infrastructure, and customer participation. Industry associations can play a coordinating role by encouraging firms to adopt unified packaging standards, promote reusable packaging systems, and share successful green logistics practices. They may also cooperate with courier companies, packaging suppliers, e-commerce platforms, and recycling organizations to build a more complete green packaging ecosystem. Through such cooperation, green packaging can move beyond individual firm-level initiatives and become a more systematic industry practice.

### **5.3 Limitations and Future Research**

Several limitations should be acknowledged. First, this study employed a cross-sectional survey design, which restricts the ability to establish causal relationships among the constructs. Although the proposed model was theoretically grounded and empirically supported, future research could adopt longitudinal or experimental designs to provide stronger evidence of causality and to examine how customers' perceptions and behavioral responses evolve over time.

Second, the sample was limited to customers of a single courier firm in Zhuhai, Guangdong Province. As a result, the generalizability of the findings may be constrained. Future studies are encouraged to test the proposed model across different courier firms, regions, and cultural contexts. Comparative research across cities, countries, or logistics service providers would further enhance the external validity of the findings.

Third, this study relied on self-reported data, which may be subject to social desirability bias and common method variance. Future research could combine questionnaire data with behavioral indicators, such as actual participation in packaging recycling programs, reuse systems, or customer feedback activities. In addition, future studies should apply more comprehensive methodological tests, including HTMT ratios, Harman's single-factor test, common latent factor analysis, or marker-variable techniques.

Finally, this study focused on green brand image and green trust as the main mediating mechanisms. Future research could incorporate additional mediators and moderators, such as environmental concern, green skepticism, perceived greenwashing, price sensitivity, environmental knowledge, perceived environmental value, and prior experience with reusable packaging systems. Examining these factors would provide a more comprehensive understanding of how green packaging design shapes customer perceptions and voluntary green-supportive behaviors in express delivery services.

## **Conclusion**

This study elucidates the mechanism through which green packaging design influences green customer citizenship behavior within the express delivery sector. Grounded in the Stimulus-Organism-Response (S-O-R) framework and social identity theory, the empirical results demonstrate that green packaging design significantly enhances green brand image and green trust, which subsequently drive customer advocacy and supportive feedback. These findings substantiate that green packaging transcends its role as a mere technical solution for waste reduction; rather, it functions as a strategic service cue that actively shapes consumers' environmental perceptions, credibility judgments, and voluntary supportive behaviors. Consequently, for logistics firms striving for sustainable competitive advantage, effective green packaging design must holistically integrate environmental performance, functional convenience, credible communication, and mechanisms for active customer participation.

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