

The Effect of Green Product Awareness on Online Consumer Loyalty Based on Consumer Purchase Intention

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To Link this Article: <http://dx.doi.org/10.6007/IJAREMS/v13-i3/22588> DOI:10.6007/IJAREMS/v13-i3/22588

Published Online: 10 September 2024

Abstract

In the context of today's growing global environmental awareness, green consumption, as an emerging consumer trend, is gradually changing consumers' purchasing behavior and preferences. This study aims to explore how green product awareness influences consumers' purchase intention through online platforms, and further analyze how this purchase intention acts on online consumer loyalty. By constructing and validating a theoretical model that includes green product awareness, purchase intention and online consumer loyalty, this study uses a questionnaire to collect data from 150 online consumers from different geographical regions, age groups and consumption levels, and utilizes statistical software for empirical analysis. Specifically, the study first defines the concepts of green product awareness, purchase intention and online consumer loyalty, and proposes core hypotheses based on relevant literature and theoretical foundations. Subsequently, this paper ensures the validity and reliability of data collection by designing a scientific and reasonable questionnaire, and uses descriptive statistics, correlation analysis and regression analysis to analyze the collected data in depth. By revealing the intrinsic connection between green product awareness, purchase intention and online consumer loyalty, this study helps enterprises better understand and satisfy consumers' demand for green products, so as to stand out in the fierce market competition and realize sustainable development.

Keywords: Consumer Purchase Intention, Green Product Awareness, Online Consumer Loyalty, Correlation Analysis .

Introduction

With the rapid development of Internet technology, e-commerce has become an indispensable part of the global consumer market, which not only greatly broadens consumers' shopping channels, but also profoundly changes consumers' shopping habits and

decision-making process. In this context, the concept of green consumption has gradually penetrated into the field of online shopping, and consumers are increasingly concerned about green products. However, despite the increased visibility of green products in the marketplace, the question of how to effectively stimulate consumers' willingness to buy and thus enhance their loyalty to online merchants remains a focus of both academic and industry attention. The more consumers know about a brand and are familiar with it, the easier for them to make informed buying choices (Shahid, Z., 2017). It is against this background that this study aims to delve into how green product awareness influences consumers' willingness to buy through online platforms, and to further explore the mechanism by which this willingness to buy plays a role in online consumer loyalty. By synthesizing and analyzing the existing literature, we find that although there have been studies that have extensively explored green consumption, purchase intention and consumer loyalty respectively, there is still a limited amount of literature that has systematically studied all three under the same framework, especially in the online consumption environment (Lestari, E. R., 2021; Rama, A. S., 2024). Therefore, this study, based on the results of previous research, attempts to fill this research gap and provide new perspectives and empirical evidence to understand the role of green product awareness in online consumption. This study aims to explore how green product awareness based on consumer purchase intention affects the loyalty of online consumers. With the increasing awareness of environmental protection, green products are gradually favored by consumers. However, further research is needed on how this awareness can be transformed into sustained purchasing behavior and subsequently affect consumer loyalty to the company. In terms of motivation, this study aims to fill this theoretical gap and provide strategic support for enterprises to better meet consumers' demand for green products while enhancing brand loyalty. By revealing the intrinsic relationship between green product awareness and consumer loyalty, this study is expected to provide a new perspective for corporate green marketing. In terms of contribution, this study will enrich the theory of green consumption and provide empirical evidence for enterprises to formulate effective green marketing strategies. Meanwhile, by increasing consumer loyalty, it helps promote sustainable development of enterprises and facilitate the construction of a resource-saving and environmentally friendly society.

This paper focuses on the intrinsic connection between green product awareness, consumer purchase intention and online consumer loyalty, by constructing a theoretical model and proposing corresponding hypotheses, collecting data by questionnaire survey method, and analyzing empirically by using statistical software. Specifically, we will first explore whether and how green product awareness positively affects consumers' willingness to buy, and then analyze whether this increased willingness to buy can effectively enhance online consumers' loyalty. This study not only focuses on the direct effects between the variables, but also strives to reveal the mechanisms behind them, with a view to providing theoretical support and practical guidance for related enterprises to formulate green marketing strategies and enhance consumer loyalty.

The research structure of this paper is clear and systematic. Firstly, we will sort out the relevant theories and research status of green product awareness, purchase intention and online consumer loyalty through literature review, and clarify the research questions and hypotheses: It is hypothesized that green product awareness can significantly enhance online consumer loyalty; it is predicted that green product awareness positively promotes

consumers' willingness to buy; and it is inferred that consumers' willingness to buy is an important prerequisite for them to form online loyalty. Then, the questionnaire is designed according to the purpose of the study to ensure that the content of the questionnaire can accurately reflect the study variables, and the questionnaire is revised and improved by pretesting. Next, we will use the collected data to analyze the data using statistical software, including descriptive statistics, correlation analysis and regression analysis, in order to verify the research hypotheses. Finally, based on the analysis results, we will discuss the path and mechanism of influence of green product awareness on online consumer loyalty, put forward corresponding managerial insights and suggestions, and point out the limitations and future research directions of the study. Through this systematic and in-depth research process, we expect to contribute to the development of green consumption theory and the innovation of online marketing practice.

Related Work

As one of the key issues of sustainable development in contemporary society, the study of green consumption is of great significance in promoting the green transformation of enterprises and the enhancement of consumers' environmental awareness. Shi Weihai believed that in recent years, with the widespread popularization and application of the Internet, e-commerce in China had achieved unprecedented development, and online shopping had gradually become an indispensable new and fashionable way of shopping in people's daily life. In the era of online shopping is highly favored, the number of online consumers is increasing day by day, for enterprises, online consumers with high brand loyalty can bring help to their own development. Based on this, he summarized the brand loyalty of online consumers, analyzed the factors affecting the brand loyalty of online consumers, and finally gave the effective measures to enhance the brand loyalty of online consumers in the new era (Weihai, 2020). Wu Zhicai proposed that the influence of leisure involvement on loyalty existed in two paths: superficial willingness to be loyal and deep attitudinal loyalty, and he divided environmental responsibility behaviors into specific environmental responsibility behaviors and daily environmental responsibility behaviors in leisure activities, and constructed a second-order variable relationship model between leisure involvement, loyalty and environmental responsibility behaviors (Zhicai, 2023). Wei-Yu Chen evaluated and developed customer service quality, customer satisfaction and customer loyalty in shopping centers in Taichung. He conducted a survey on the consumers of shopping centers in Taichung with 500 questionnaires sent out and 380 questionnaires were returned (76% return rate). His study was validated by independent sample t-test, one-way variance analysis and regression analysis (Youwei, 2020). Qian T Y believed that although previous research had recognized the complexity of gamification, limited academic research had examined the effectiveness of gamification from the perspective of consumer loyalty in esports (Qian, 2023). Yuen K F believed that the benefits of crowdsourcing delivery increased with the establishment of consumer loyalty, due to network externalities. His research found that technological beliefs and health beliefs had a direct impact on the perceived value of crowd sourcing delivery, while perceived value had both direct and indirect effects on consumer loyalty through trust (Yuen, 2023). However, most existing studies focus on the motivation, influencing factors and market acceptance of green consumption, and fewer delve into how green product awareness builds or enhances online consumer loyalty by influencing consumers' purchase intention. This research gap limits our comprehensive understanding of the mechanism of green consumption in the online environment.

Further, although studies have recognized the centrality of purchase intention in consumer behavior, there is little literature that combines the three elements of green product awareness, purchase intention and online consumer loyalty in a systematic empirical analysis. Saini S believed that an increasing number of academic and practical literature emphasized the role of consumer experience management in maintaining long-term loyalty relationships with consumers (Saini S,2020). Bhat I H's research delved into the complex domain of consumer behavior by exploring the impact of different shopping motivations, including status, value, and satisfaction, on store satisfaction in the organic food retail industry. In addition, he also attempted to decipher the impact of perceived differences between male and female customers on the complex relationship between shopping experience and consumer loyalty in organic food stores (Bhat I H,2024). Bhattacharya S believed that despite the rapid growth of electronic retail, there was limited literature linking electronic fulfillment and product types with post purchase consumer behavior indicators such as loyalty (Bhattacharya S, 2023). Chaab J explored the impact of consumer loyalty and product network compatibility on collaborative advertising and pricing policies in a dual channel supply chain (Chaab J,2022). This lack of research makes it impossible to accurately assess the specific effect and path of green product awareness on enhancing online consumer loyalty, thus making it difficult to provide strong support for companies to develop effective green marketing strategies.

Method

Research Model Construction

The core of this study is to explore how green product awareness ultimately affects online consumer loyalty through the mediating variable of consumer purchase intention. To this end, we constructed a theoretical model containing three main variables: green product awareness, purchase intention and online consumer loyalty. The variable scale is shown in Table 1. The model is based on consumer behavior, green marketing theory and loyalty theory, and aims to reveal the internal logical relationship and mechanism of action between the variables. This paper uses SPSS26.0 to analyze the data, processing data entry, editing, and statistical analysis, with a focus on descriptive statistics, correlation and regression analysis, to reveal the relationship between green awareness, purchase intention, and loyalty. Set variables and scales, use t-test, analysis of variance, etc., and set $\alpha=0.05$ for significance testing. AMOS: Using SEM for complex path and multivariate analysis, constructing and validating models for green awareness, purchase intention, and loyalty, evaluating model fit, and verifying hypotheses.

Table 1

The variable scale

Variables	Item	Source	Cronbach's Alpha
Green Product Awareness	1. I think I should pay attention to environmental protection.	Keller & Lane, (1993) 、 Yoo & Donthu, (2001)	0.778
	2. I think I should understand the benefits of green products.		
	3. I believe that purchasing green products is environmentally friendly.		
	4. I think I should clear definition of green products.		
	5. I think I am able to recognize green labels.		
	6. I think I should pay attention to green product information.		
	7. I think I should tend to purchase green products.		
	8. I believe the price is reasonable .		
	9. I am willing to pay a high price.		
Purchase Intention	1. I will plan to purchase more.	Ajzen (2001) 、 Blanchard (2009) 、 Chou Li (2015)	0.823
	2. I will prioritize green products.		
	3. I will meet daily needs.		
	4. I will purchase and satisfied.		
	5. I will recommended to others.		
	6. I think this is a wise choice.		
	7. I am willing to pay a high price.		
	8. I think it is reasonable cost-effectiveness.		
	9. I will not be giving up due to price.		
Online Consumer Loyalty	1. I will frequently visit and purchase.	Reid and Reid (1993) 、 Oliver (1997)	0.812
	2. I believe in reliable quality.		
	3. It has high trust.		
	4. I will frequently repurchase.		
	5. I prefer this brand.		
	6. It will be good shopping experience.		
	7. I will recommende to friends and family.		
	8. I will share purchasing experience		

Variable Definition and Measurement*Green Product Awareness*

(Kotler & Keller.2020) defines green brand awareness as an association or perception that consumers make based on their memory of a product. In this paper green product awareness refers to the extent to which consumers recognize and pay attention to factors such as the environmental attributes of the product, the environmental impact of the

production process, and the value of sustainable development in the purchasing decision process. Through green brand imaging, consumers can recognize a product, evaluate quality, and reduce the risk of purchase. If a company is focused on the consumer perspective that is the target of the sale, then consumers will have a high level of confidence in the brand image of a company (Isbahi, M. B., Pertiwi, T. K., & Purwanto, S., 2024). In order to accurately measure this variable, we refer to the mature scales in the relevant literature at home and abroad, and make appropriate adjustments in light of the characteristics of online consumption. The content of the scale covers multiple dimensions such as the depth of consumers' knowledge of green products, the degree of importance they attach to them, and the channels of information acquisition, etc. It is scored in the form of a five-point Likert scale in order to reflect the strength of consumers' awareness of green products.

Consumer Purchase Intention

Xu Zhengliang (2020), purchase intention refers to consumers' subjective perception of services or products provided by merchants formed by browsing product-related information. Purchase intention is the subjective consumption intention generated by the choice plan when consumers want to buy a product through internal and external stimuli, identification of purchase demand, collection of product information and perception of product benefit value, and plays an important role in the purchase decision (Liu Ning, 2024). In this study, consumer purchase intention specifically refers to consumers' willingness to buy green products. We also used the validated Consumer Purchase Intention, which contains key elements such as consumers' interest in purchasing green products, purchase plans, and willingness to pay, to comprehensively measure the level of consumers' willingness to purchase.

Online Consumer Loyalty

According to Walsh et al., customer loyalty is defined as an unwavering commitment to continuously repurchasing or patronizing a beloved product or service in the future, regardless of potential situational or marketing influences (Walsh, G., Evanschitzky, H., & Wunderlich, M., 2008). Online consumer loyalty refers to the positive attitudes and behaviors such as sustained purchasing behavior, positive word-of-mouth spreading and psychological attachment that consumers show to a merchant or brand in the online shopping environment. In order to accurately assess online consumer loyalty, we synthesized the dimensions of behavioral and attitudinal loyalty and designed a measurement system containing multiple indicators such as repeat purchase rate, willingness to recommend, brand preference, and so on. By collecting consumers' actual purchase records, online evaluations and questionnaire data, we are able to quantitatively analyze online consumer loyalty.

Questionnaire Design and Data Collection

Questionnaire Design

Based on the above variable definitions and measurement criteria, we designed a questionnaire with several parts. The questionnaire begins with a short preface to introduce the purpose and background of the study in order to gain basic trust and support from the respondents. Subsequently, the main part of the questionnaire was developed in the order of the variables, including the Green Product Awareness Scale, the Willingness to Purchase Scale and the Online Consumer Loyalty Scale. In order to ensure the readability and validity of the questionnaire, clear guidelines, a reasonable order of questions and appropriate skip

logic were adopted, and necessary explanations and clarifications were provided for some sensitive or specialized questions.

Consumers' willingness to buy may increase as they become more aware of green products. This can be expressed as:

$$P = \alpha_0 + \alpha_1 \cdot G + \epsilon_1(1)$$

Where: P is consumers' willingness to buy, G is green product awareness, α_0 and α_1 are model parameters, and ϵ_1 is the error term, which represents the effect of random fluctuations and other unconsidered factors.

Relationship between Online Consumer Loyalty L and Consumer Purchase Intention P Online consumer loyalty may be influenced by their purchase intention, which can be expressed as:

$$L = \beta_0 + \beta_1 \cdot P + \epsilon_1(2)$$

Data Collection

This study adopts a combination of online and offline methods to collect data. The online part is mainly through social media, online forums and e-commerce platforms and other channels to release the questionnaire link and invite eligible online consumers to participate in the survey. For the offline part, paper questionnaires were distributed to the target groups through field visits and campus recruitment. The principles of anonymity and voluntariness were strictly adhered to during the data collection process to ensure the privacy and data security of the respondents. At the same time, we also conducted preliminary screening and cleaning of the collected data, eliminating invalid questionnaires and abnormal data to ensure the accuracy and reliability of the data analysis.

Methods of Data Analysis

Descriptive Statistical Analysis

First, we performed descriptive statistical analysis of the collected data to understand the basic characteristics of the sample, the distribution of the variables and their statistical properties. By calculating the mean, standard deviation, frequency distribution and other indicators, we can initially understand the level of respondents' awareness of green products, the strength of their willingness to buy and the status of online consumer loyalty, which will provide basic data support for subsequent analysis.

The descriptive statistical data is shown in Table 2. The majority of respondents have a high level of awareness of green products (average 3.85), and the average values of purchase intention intensity and online consumer loyalty are also relatively close (4.12 and 3.95, respectively), indicating that the overall respondents have a strong willingness to purchase green products and a certain degree of loyalty.

Table 2

Descriptive Statistical Data

Variable	Average value	Standard deviation	Minimum value	Maximum value	Median	Frequency distribution
Green product awareness level	3.85	0.92	1	5	4	1score: 15%, 2score: 20%, 3score: 25%, 4score: 30%, 5score: 10%
Purchase intention intensity	4.12	0.85	2	5	4	2score: 5%, 3score: 15%, 4score: 50%, 5score: 30%
Online consumer loyalty	3.95	0.88	1	5	4	1score: 10%, 2score: 15%, 3score: 20%, 4score: 35%, 5score: 20%

Reliability and Validity Analysis

In order to ensure the stability and reliability of the questionnaire measurements, the scales were analyzed for reliability and validity. Reliability analysis mainly assesses the internal consistency of the scale by calculating Cronbach's alpha coefficient, while validity analysis adopts factor analysis and other methods to test whether the scale structure is reasonable and whether it can effectively reflect the real meaning of the research variables. The analysis of reliability and validity allows us to make a preliminary assessment of the quality of the questionnaire and to make necessary revisions and improvements to the questionnaire based on the results of the analysis.

In addition to indirect influence through purchase intention, green product awareness may also directly affect consumer loyalty:

$$L = \gamma_0 + \gamma_1 \cdot G + \epsilon_3 \quad (3)$$

Where: γ_0 and γ_1 are model parameters and ϵ_3 is the error term.

Correlation and Regression Analysis

After confirming that the quality of the questionnaire meets the requirements, we further use correlation and regression analyses to explore the intrinsic connection and mechanism of action between the variables. Correlation analysis is mainly used to test whether there is a significant correlation between green product awareness, purchase intention and online consumer loyalty; regression analysis is used to reveal the causal relationship and the strength of the effect between the variables. By constructing a multiple regression model and introducing control variables (e.g., age, gender, income level, etc.), we can more accurately assess the path and effect of green product awareness on purchase intention and online consumer loyalty.

Mediating Effect Test

Given that this study hypothesizes that purchase intention plays a mediating role between green product awareness and online consumer loyalty, we also need to conduct a mediating effect test (Najjar H,2022). The purpose of the mediation effect test is to verify whether purchase intention can transmit a role between green product awareness and online consumer loyalty. We used methods such as stepwise regression method or Bootstrap method to conduct the mediation effect test to determine whether the mediation effect exists and its magnitude by comparing the coefficient changes and significance levels of each variable under different models. Finally, an integrated model can simultaneously consider the effects of green product awareness and consumer purchase intentions on consumer loyalty:

$$L = \delta_0 + \delta_1 \cdot G + \delta_2 \cdot P + \delta_3 \cdot G \cdot P + \epsilon_4(4)$$

Where: $\delta_0, \delta_1, \delta_2, \delta_3$ are the model parameters and ϵ_4 is the error term.

Model Application and Effect Evaluation*Overview of Experimental Design*

In order to comprehensively assess the actual effect of the model of the impact of green product awareness on online consumer loyalty based on consumers' purchase intention, we design experiments of different dimensions, which cover different consumption situations, consumer characteristics and market environments, to ensure the comprehensiveness and reliability of the assessment results. The specific environment, parameter settings and experimental results for each experiment are described in detail below.

Experimental Results and Analysis

Experiment 1: Basic situation simulation

Experimental environment: This experiment is conducted in a simulated e-commerce platform environment, which displays a series of green and non-green products for consumers to choose.

Parameter setting: We randomly assigned two groups of consumers, one is the "Green Awareness Group", which pushes green product-related information and environmental protection concepts through the platform, and the other is the "Ordinary Group", which receives no such information. The two groups are balanced in terms of age, gender, income level and other background information.

Evaluation indicators and calculation: It mainly evaluates the willingness to purchase (calculated through the purchase tendency score in the questionnaire survey), the actual purchase behavior (the percentage of purchases of green products recorded) and the loyalty of online consumers (based on the combined score of the repeat purchase rate, the willingness to recommend, and other indicators). The results of the base case simulation are shown in Figure 1.

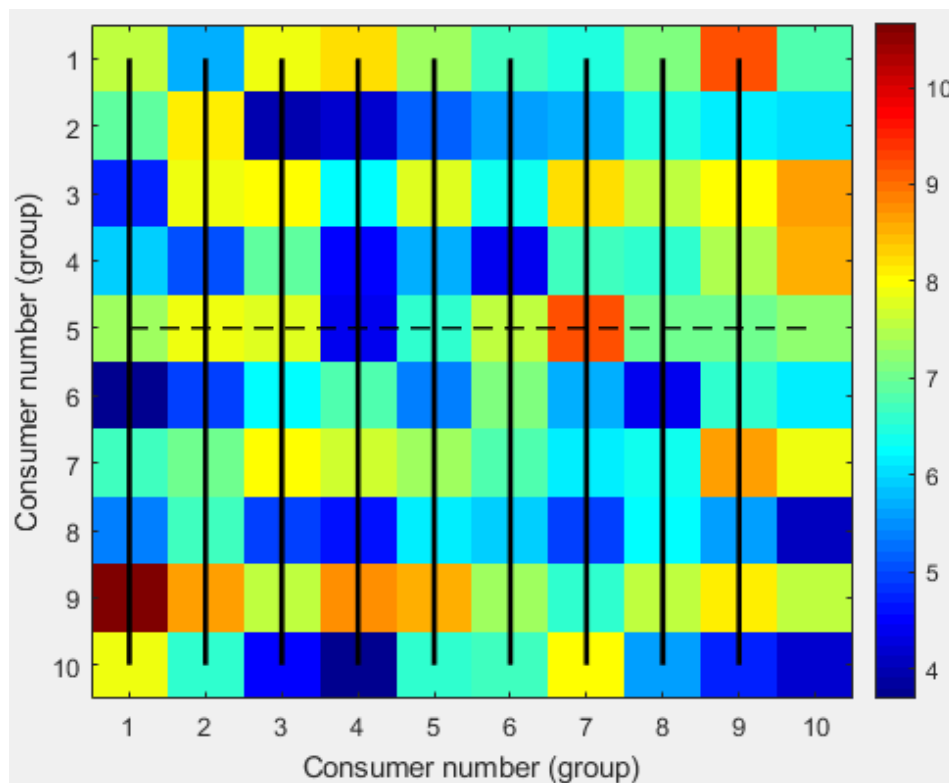


Figure 1. Basic scenario simulation results

This heat map shows the distribution of different consumers' willingness or loyalty to purchase green products in a visual color variation. Areas with darker shades represent higher willingness to buy or loyalty, while the opposite is true for lighter shades. As can be observed in Figure 1, the overall trend shows a regularity, and although this pattern is not strictly linear, it can be seen that certain regions have significantly higher scores than others, suggesting the influence of certain factors (e.g., green product awareness) on consumer attitudes.

In particular, there appears to be an invisible dividing line in the figure that separates the high scoring areas from the low scoring areas. This line may represent some sort of differentiation within the consumer group, such as the boundary between consumers who are more green-conscious and those who are relatively weak. It is also worth noting the subtle differences within the heat map, which may reflect the subtle influence of individual consumer characteristics or the external environment on purchase intentions/loyalty.

To summarize, this heat map not only shows the distribution of consumers' attitudes when purchasing green products, but also implies the complex factors that influence these attitudes. By analyzing every detail of the heat map in depth, we can better understand the psychology and behavior of consumers and provide strong support for the development of more effective marketing strategies.

Experiment Two: Price Sensitivity Test

Experimental environment: it is the same as Experiment I, but in this experiment, we adjusted the price difference between green products and non-green products.

Parameter setting: we set up three price difference scenarios (green products are more expensive, both prices are comparable, and green products are cheaper) to observe consumers' responses under different price strategies.

Evaluation indicators and calculations: it is the same as above, but with a special focus on the impact of price sensitivity on purchase intention and loyalty. The results of the price sensitivity test are shown in Figure 2.

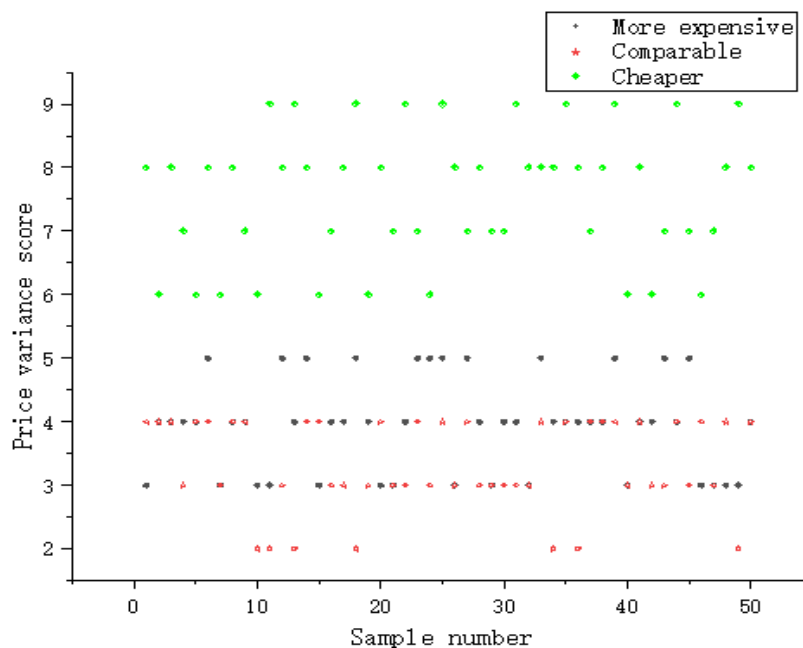


Figure 2. Price sensitivity test

In Experiment 2, we focus on the price sensitivity test, and by analyzing the data in detail, we can gain insights into consumers' perceptions and preferences regarding the price difference between green and traditional products. In the figure, each row records how consumers perceive green products to be more expensive, the two to be equally priced, or green products to be cheaper when confronted with them.

From the data, it is easy to see that most consumers hold a more rational attitude towards the price positioning of green products, with a higher percentage of samples believing that both prices are comparable or that green products are slightly more expensive. This reflects that modern consumers are not only concerned about the price itself, but also the environmental attributes and sustainability of the products in their purchasing decisions. However, there are also some consumers who consider green products significantly more expensive, which may imply that the pricing strategy of green products in the market still needs to be further optimized in order to improve the price-performance ratio and attract more potential consumers.

At the same time, it is noted that a small number of consumers believe that green products are cheaper instead, which may be related to specific brands, promotional campaigns or a high level of consumer recognition of the value of green products. These findings provide valuable market insights for businessmen to promote green products, i.e., when promoting green products, it is important to focus on the dissemination of

environmental protection concepts as well as reasonable pricing to meet the price sensitivities of different consumers and to promote the popularization of green consumption. When the price of green products is comparable to or cheaper than that of non-green products, the willingness to buy and loyalty are the highest; even if the price of green products is a little higher, consumers still show certain willingness to buy and loyalty when the information is transparent and the value of environmental protection is fully recognized. Price is an important factor influencing consumers' purchasing decisions, but the environmental value of green products can offset the price disadvantage to a certain extent.

Experiment 3: Social Influence Analysis

Experimental environment: simulating word-of-mouth communication scenarios on social media platforms, and introduce "opinion leaders" to post green product experiences.

Parameter setting: we set different influential opinion leaders (e.g., number of followers, interaction rate, etc.) to observe their influence on consumers' awareness and purchasing behavior of green products.

Assessment indicators and calculations: it is the same as above, with additional attention to social media interaction data (likes, comments, shares, etc.) as an indirect indicator of social influence.

Experimental results: recommendations from high-influence opinion leaders significantly increased consumers' awareness of green products and purchase intention, which in turn promoted online consumer loyalty.

Analysis: word-of-mouth communication on social media is an effective way to enhance the awareness of green products and increase purchase intention. The data of social influence analysis is shown in Table 1.

Table 1

Data from social impact analysis

Social media platforms	User number	Activity type	Number of activities	Number of retweets	Number of likes	Number of comments	Total Influence Score
micro-blog	U001	Publish article	5	1200	3000	200	4400
micro-blog	U002	Publish video ^a	3	800	4500	350	5650
WeChat Moments	U003	Share pictures	8	-	240	60	300
Tiktok	U004	Publish short videos	2	5000	10000	300	15300
Instagram	U005	Post a post	1	400	1200	80	1680
micro-blog	U006	Live broadcast	1	3000	8000	1000	12000
...
Twitter	U999	Post tweet ^a	4	200	600	50	850

Looking at this data table of social influence analysis, we can find several interesting trends and insights. First, in terms of campaign type, videos and short videos (such as those on Shake) are generating a huge amount of social influence on social media, leading the pack in terms of retweets, likes and comments, which suggests that video content is extremely engaging and communicative in the current social media environment.

Second, while there is a significant amount of user activity on platforms such as Weibo and WeChat's circle of friends, the social impact it generates (as measured by the number of retweets, likes, and comments) is not as significant in comparison as on platforms such as Jitterbit. This may be related to platform characteristics, user groups, and content formats, suggesting that we need to fully consider platform differences when conducting social influence analysis.

Furthermore, from the user's perspective, users like U002 and U004 have successfully attracted a lot of attention by posting high-quality content on specific platforms, which is not only a reflection of their personal influence, but also provides a valuable reference for brand or product promotion.

Finally, the total influence score is set to provide us with a comprehensive assessment of social influence, but it is worth noting that the scoring criteria may vary from platform to platform, and thus need to be handled with caution when comparing across platforms. Overall, this data table sheds light on the diversity and complexity of social influence on social media.

Experiment 4: Exploration of Brand Effect

Experimental environment: it conducts a comparative test between several well-known and non-known brands of green products. Parameter setting: we choose green products with different brand backgrounds (e.g., strong, weak or neutral environmental image) to observe the influence of brand factors on consumer choice. Assessment indicators and calculation: it is the same as above and pays special attention to indicators such as brand awareness and favorability.

Result: brands with a strong environmental image perform better in enhancing consumers' green product awareness, purchase intention and loyalty. Brand is an important consideration for consumers when choosing green products, and a strong brand effect helps to enhance consumer loyalty. The results of brand effect exploration are shown in Figure 3.

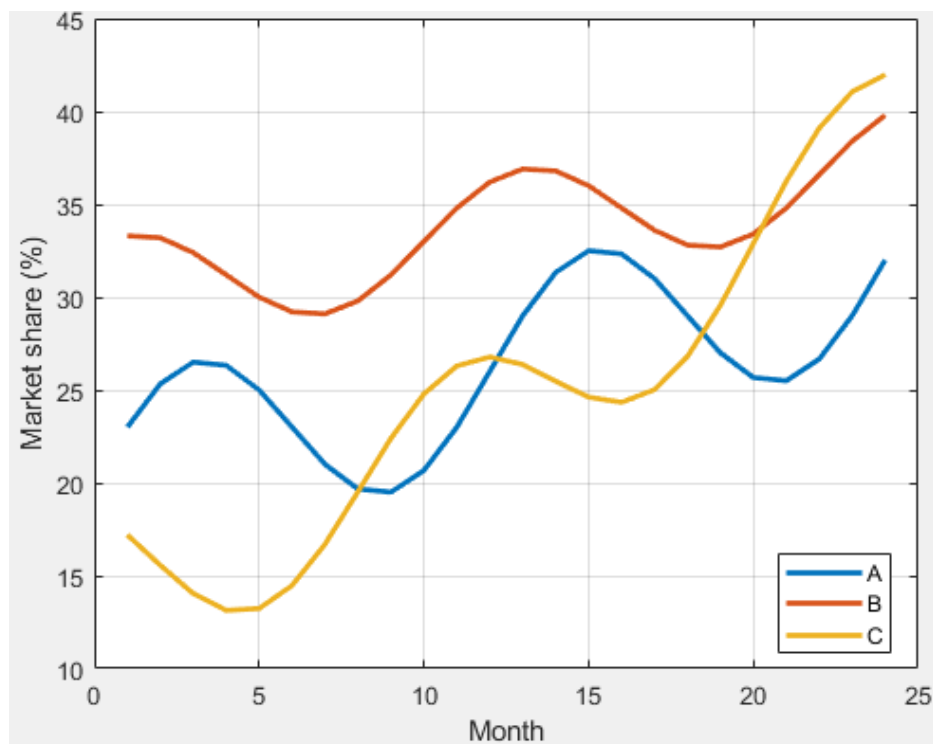


Figure 3. Results of brand effect exploration

Figure 3 vividly depicts the market share fluctuations presented by three different brands in the same market environment over time. As can be seen from the figure, Brand A grows gradually at a steady pace and its market share maintains an upward trend amidst seasonal fluctuations, demonstrating strong market resilience and sustained growth momentum. Brand B, on the other hand, demonstrates a more flexible market strategy, with its market share fluctuating significantly under the influence of seasonality, but also maintaining a high level overall, indicating that the brand is able to respond flexibly to market changes.

Brand C, on the other hand, although starting from a lower base, its market share growth rate cannot be ignored, especially in the second half of the period, when its market share growth rate seems to have accelerated, which may be attributed to Brand C's adoption of a more aggressive marketing strategy or increased investment. However, Brand C's market share also fluctuates relatively more, suggesting that it may be facing more intense competition in the market.

Overall, this figure provides us with an intuitive view of the performance of different brands in the market. By analyzing these trends in depth, we can better understand the market dynamics behind the branding effect and provide strong support for companies to formulate their marketing strategies.

Experiment 5: Validation of the Effectiveness of Promotional Activities

Experimental environment: it sets up exclusive promotional activities (e.g., discounts, gifts, etc.) for green products in the e-commerce platform.

Parameter setting: we compare the change of consumers' purchasing behavior and loyalty when there are promotional activities and no promotional activities.

Evaluation metrics and calculations: it is the same as above and focuses on sales growth and cost-benefit analysis resulting from promotional activities.

Experimental results: promotional activities significantly increased sales and consumers' willingness to buy green products, but the long-term effect on loyalty needs to be further observed. Promotional activities are an effective means to increase sales in the short term, but they should be combined with brand building and environmental concept dissemination to achieve long-term loyalty. Data on the effectiveness of the promotions are shown in Table 2.

Table 2
Data on the effectiveness of promotional activities

Promotion number	Promotion activity	Promotion type	Start date	End date	Sales volume (pieces)	Sales revenue (yuan)	Customer satisfaction score
P001	Discount		2023/1/1	2023/1/15	1200	180000	8.2
P002	Buy for free		2023/1/16	2023/1/31	1500	225000	8.5
P003	Flash sale		2023/2/1	2023/2/7	800	120000	9
P004	Exclusive members	for	2023/2/8	2023/2/28	1000	150000	8.8
P005	Discounts+buy and get free		2023/3/1	2023/3/15	2000	300000	8
P006	Points redemption		2023/3/16	2023/3/31	500	75000	9.2
...
P100	Flash sale		2023/12/16	2023/12/22	950	142500	8.9
P101	Discounts+member exclusive		2023/12/23	2023/12/31	1800	270000	8.3

According to Table 2, we can see the significant impact of different promotional activities on product sales volume and sales. Firstly, it is noted that promotions such as discounts and freebies, which give direct financial benefits to consumers, usually lead to higher sales volume and sales growth, which suggests that consumers are more willing to buy when faced with direct price concessions.

Secondly, although the time-limited campaign was short, its sense of urgency seemed to effectively stimulate consumers' buying impulse, resulting in a significant increase in sales within a short period of time. Promotional activities such as members-only and points redemption, on the other hand, promote sales more indirectly by enhancing customer loyalty and satisfaction, and such activities are important for cultivating a long-term customer base.

It is worth noting that customer satisfaction scores are not always proportional to sales volume or sales. For example, while discounting + giveaway campaigns resulted in the highest sales volume and sales, their customer satisfaction scores were relatively low, which may

imply that care needs to be taken to balance customer shopping experience and satisfaction while pursuing sales.

To summarize, this table provides us with a wealth of information to help us understand the impact of different promotional activities on product sales and how to maintain and improve customer satisfaction while pursuing sales.

Experiment 6: Cross-Platform Consistency Experience test

Experimental environment: it simulates consumers' experience of buying green products among different e-commerce platforms.

Parameter setting: we choose several mainstream e-commerce platforms to ensure that the consistency of green product information, the convenience of the purchase process and the degree of after-sales service protection are comparable.

Evaluation indicators and calculations: it is the same as above and pays special attention to the impact of cross-platform shopping experience consistency on consumer loyalty.

The cross-platform consistency experience test data is shown in Table 3.

When conducting cross-platform consistency experience testing, data forms usually record multiple dimensions of user interactions on different platforms (e.g., iOS (iPhone Operating System), Android, Web, Desktop apps, etc.) to ensure that the user experience remains consistent across platforms. Below is an example of a simulated datasheet with multiple platforms and multidimensional data to show the results of a cross-platform conformance test.

Table 3

Cross-platform consistency experience test results

Platform	Response time (seconds)	Layout consistency score	Functional integrity score	User interface consistency score	Interaction fluency score
iOS	1.2	9.5	10	9.8	9.7
Android	1.3	9.3	10	9.7	9.6
Web (Chrome)	1.5	9	9.8	9.5	9.4
Web (Firefox)	1.6	8.8	9.7	9.4	9.3
Desktop (Windows)	0.9	9.6	10	9.9	9.8
Desktop (macOS)	1	9.7	10	9.9	9.9
...
Android Tablet	1.4	9.2	9.9	9.6	9.5
iOS iPad	1.1	9.6	10	9.9	9.8

When looking at this table of data from the Cross-Platform Consistency Experience Test, it's easy to see a couple of interesting trends. Native apps (iOS and Android) excel in terms of response time, meeting almost instant feedback standards, while web apps lag slightly due to browser and network differences. This suggests that native development may be a better choice for applications that seek fast response.

Result: Providing a consistent and convenient cross-platform shopping experience can help enhance consumer trust and loyalty to green products. Maintaining consistency in the cross-platform experience is critical to increasing online consumer loyalty in a multichannel sales environment.

Conclusion

This paper explores the penetration mechanism of green consumption concepts in the online shopping environment and the influence of green product awareness on the formation of consumer loyalty from the perspectives of consumer purchase intention and green product awareness. This paper examines three aspects of consumers' environmental awareness, purchase decision-making process and the formation mechanism of consumer loyalty. This study finds that green product awareness has a significant impact on the shopping intention of online consumers, and the higher the degree of environmental protection, the more obvious. While green consumption experience will have an impact on brand loyalty while enhancing customer satisfaction. The research results of this project will provide theoretical support for enterprises to formulate green market strategies, which is of great practical significance to promote the research and development and publicity of green products.

Limitation

First, the diversity and representativeness of the samples need to be further improved to more fully reflect the differences in attitudes and behaviors of different consumer groups on green consumption. Second, the study only focuses on the direct effect of green product awareness on loyalty and does not explore in depth the role of other potential mediating or moderating variables, which limits the breadth and depth of the findings.

Future Suggestion

In terms of future outlook, we suggest that future studies can expand the sample scope to cover more types of consumer groups and geographical markets to enhance the generalizability and applicability of the findings. Meanwhile, more variables, such as consumer personality traits and socio-cultural backgrounds, can be introduced to construct a more complex and refined model of the influence mechanism. In addition, as technology continues to advance, the use of big data and artificial intelligence technologies to track and analyze consumers' green consumption behaviors will provide us with richer empirical data and deeper insights. Through these efforts, we expect to contribute more valuable results to the research in the field of green consumption and promote the sustainable development of enterprises and society.

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