

Consumers' eco-product purchase decision-making behavior from the perspective of ecological awareness

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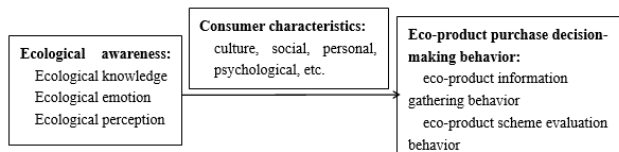
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Graphical abstract



Abstract

In this study, an ecological awareness rating scale and an eco-product purchase decision-making rating scale were developed based on literature and interviews with experts. The ecological awareness variables were subdivided into three aspects: ecological knowledge, ecological emotion, and ecological perception. The eco-product purchase decision-making behavior was also divided into eco-product information gathering behavior and eco-product scheme evaluation behavior. According to consumer decision-making theories, an ecological awareness-ecological product purchase decision-making behavior model was constructed to verify the relationships between variables. Based on regression analysis, the effects of ecological knowledge, ecological emotion, and ecological perception on the two dimensions of consumers' eco-product purchase decision-making behavior were discussed. It is concluded that ecological awareness has a significant positive impact on the eco-product purchase decision-making behavior, which provides a reference for the development of ecological society and the cultivation of consumers' ecological consumption habits and methods.

Keywords: Ecological awareness, eco-product, purchase decision-making behavior.

1. Introduction

In 2018, Chinese President Xi Jinping emphasized the need to strengthen the construction of socialist ecological civilization at the 19th National People's Congress. Studies have shown that consumers' unreasonable purchasing behaviors are influenced by their ecological awareness, environmental attitudes, individual values, and reference group behaviors. Eco-product refers to a product that is beneficial to resource conservation and environmental protection (Biswas and Roy, 2015; Guerrini *et al.*, 2018;

Kereselidze *et al.*, 2017; Khoo *et al.*, 2019). In this study, ecological awareness is divided into three dimensions in order: ecological knowledge, ecological emotion, and ecological perception; the impact of ecological awareness on the decision-making behavior of purchasing eco-products is investigated (Ahsan *et al.*, 2019; Daniel *et al.*, 2020; Fatin *et al.*, 2019; Muhammad *et al.*, 2020).

2. Research purpose

This paper aims to establish a relational model of ecological awareness-eco-product purchase decision-making behavior to study the impact of ecological awareness on the decision-making behavior of purchasing eco-products. The impact variables of ecological awareness and its subdimensions on the decision-making behavior of purchasing eco-products are investigated based on previous studies. The conclusions obtained from this study will contribute to promoting the sales of ecological products, so as to protect the ecological environment.

3. Research methods

A variety of research methods have been employed in this study. The main methods are summarized below.

3.1. Literature reviewing method

The authors screened a large amount of literature and relevant literature is organized based on variables such as ecological awareness and ecological product purchase decision-making behavior. A theoretical research model is proposed based on Nuccia's consumption decision model and social cognitive imbalance theory (Xie, 2014).

3.2. Interview method

A series of interviews were carried out with students, MBA students, adult education students, and professors of Xi'an Jiaotong University, Northwest University, Zhejiang University, Huazhong Agricultural University, and Chongqing University of Technology, as well as local residents around these universities, to understand their ecological awareness, the influencing factors of the purchase decision-making, etc., which facilitates in optimizing the experiment.

3.3. Experimental scenario method

In this method, experimental scenarios were employed to investigate the effects of the three dimensions of ecological awareness on the two dimensions of eco-product purchase decision-making behavior by varying consumer characteristic variables.

3.4. Questionnaire survey and statistical method

The Likert five-point scale was adopted in the questionnaire design. The collected data were analyzed by SPSS21.0, in which the relationship between variables of the study was assessed through variance mean analysis and regression analysis.

4. Experiment design

4.1. Theory

Cognitive psychologist Thomas first proposed that stimulating can cause customer buying behavior, where a closed loop of a completed consumer decision-making process is formed (Peattie, 2010). This closed-loop consists of purchase motivation generating, consumer decision making, purchase, and feedback. In this study, based on relevant consumer decision-making processes and consumer behavior theories, the impacts of various dimensions of ecological awareness on the dimensions of eco-product purchase decision-making behavior were investigated by taking ecological awareness as an independent variable, and eco-product purchase decision-making behavior as a dependent variable, shown in Figure 1.

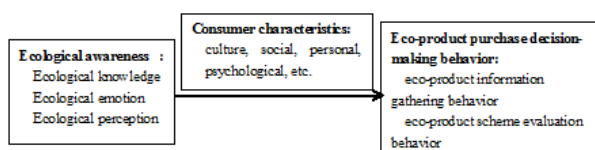


Figure 1. The model of the impacts of ecological awareness on eco-product purchase behavior

4.2. Definitions of variables

4.2.1. Ecological awareness

Ecological awareness is the understanding of the harmonious coexistence between humans and the ecological environment, between humans and society, and between society and the natural ecological environment, which includes three specific dimensions: ecological knowledge, ecological emotion, and ecological perception. Among them, ecological knowledge refers to the level of understanding of ecological products, ecological environmental protection functions, eco-products' ability to promotion of product consumption and economic development; Ecological emotion is the consumers' feelings about the environment they live in; Ecological perception is defined as the ecological consumption perceived by eco-conscious consumers can contribute to ecological environmental protection, which in line with the maximization of the interest of humanity (Zhu and Xiao, 2016). As awareness has a dynamic influence on behavior, this study is based on the role of ecological awareness in

the purchase behavior of ecological products (Ali *et al.*, 2019; Haidar *et al.*, 2019; Héctor *et al.*, 2020; Najatul *et al.*, 2020).

4.2.2. Eco-product purchase decision-making behavior

Eco-product purchase decision-making behavior, a stage of eco-consumption behavior and the most important part of the whole eco-consumption behavior process, refers to the information gathering behavior and the scheme evaluation behavior conducted by consumers during the process of purchasing eco-products. Advocating for the purchase of ecological products is in line with the current policy of building an ecological civilization in China (Kang *et al.*, 2018; Liu and Liu, 2010; Liu and Wang, 2017). In this regard, this study takes eco-product purchase decision-making behavior as a dependent variable to assess the influence of the three dimensions of ecological awareness on the two dimensions of eco-product purchase decision-making behavior.

4.3. Experiment and questionnaire design

In this study, The Likert five-point scale was employed to investigate the impacts of dimensions of ecological awareness on the dimensions of ecological product purchase decision-making behavior. Based on published literature, the following questionnaire survey was designed by taking the ecological awareness as an independent variable and the eco-product purchase decision-making behavior as a dependent variable. The questionnaire survey is shown as Table 1.

4.4. Research hypotheses

4.4.1. Ecological awareness positively affects eco-product purchase decision-making behavior

Sheth suggested that eco-conscious consumers tend to purchase products that have less impact on the environment (Sun and Jiang, 2013); Chen pointed out that ecological awareness, which governs the ecological behavior, is the basic understanding and attitude towards the ecological environment, when investigating the ecological awareness and behavioral characteristics of tourists (Chen and Yu, 2011); Wang (2013) proposed that ecological psychologists are another variables of ecological consumption behavior (Wang and Zheng, 2013). Based on mainstream opinions, in this study, it is assumed that ecological awareness has a positive influence on the decision-making behavior of eco-product purchases.

H: Ecological awareness positive affects eco-product purchase decision-making behavior.

4.4.2. Ecological knowledge positively affects eco-product purchase decision-making behavior

Peattie, Tamashiro, Li, and other researchers all agree that ecological awareness plays a positive role in ecological consumption behavior (Li, 2018). Feng proposed that that ecological knowledge has no direct effect on the ecological protection behavior of forest farmers when studying their environmental protection behavior in forest areas (Feng and Xue, 2017). Hence, we propose that ecological knowledge can enhance consumers' understanding of ecology to a certain extent and, as a result, they may pay

more attention to the ecological environment or ecological products. In this study, it is proposed that ecological knowledge, as a dimension of ecological awareness, may positively affect the purchasing behavior of ecological products.

- Ha: Ecological knowledge positively affects eco-product purchase decision-making behavior
- Ha1: Ecological knowledge positively affects eco-product information gathering behavior
- Ha2: Ecological knowledge positively affects eco-product scheme evaluation behavior

Table 1. Ecological awareness questionnaire survey

Variable	Item	Subjects	Reference
Ecological knowledge	1	Eco-products are products that are harmless or less harmful to the ecological environment.	[1, 6]
	2	Ecological products benefit ecological environment protection.	
	3	Ecological products have a positive effect on health.	
	4	Biodegradable plastics contribute to ecological environmental protection.	
Ecological emotion	1	When I see the living environments of animals and plants are destroyed, I will be very sad.	[1, 6, 17]
	2	When I learn that some companies do not pay attention to ecological protection, I will be very disgusted with the company's products and even stop buying their products.	
	3	I feel very guilty when I don't pay attention to ecological environment protection.	
	4	I am willing to choose eco-products when eco-products and non-eco-products are all available.	
Ecological perception	1	I believe my purchase of eco-products contributes to ecological protection.	[1, 5, 8]
	2	I believe eco-products contribute to ecological protection.	
	3	For the interest of society, I am willing to sacrifice a small portion of personal interest to purchase eco-products (Eco-products cost more).	
Eco-product purchase decision-making behavior	1	When deciding to buy a product, I will collect some relevant information about ecological products through the internet.	[1, 6, 14]
	2	When deciding to buy a product, I will refer to the opinions or suggestions from my friends regarding eco-products.	
	3	When deciding to buy a product, I always refer to environmental information as an important indicator.	
	4	I prefer ecological products when looking for alternative products.	
	5	I always buy products that are environmentally friendly or less polluting and beneficial to myself.	
	6	As long as a product is good for the environment, I will buy it, even if it has little benefit to myself.	
	7	I will try my best to choose products produced by companies that contribute to environmental protection.	

4.4.3. Ecological emotion may positively affect eco-product purchase decision-making behavior

Hines confirmed the correlation between environmental emotion and environmental behavior (Heinz and Jan, 2015). Wang (2015) proposed that environmental emotions have a greater impact on low-carbon consumption behavior than high-carbon consumption behavior, and positive environmental emotion has a greater impact on low-carbon emission behavior than negative emotion (Wang and Zhao, 2015). As most researchers believe that ecological emotions have a positive effect on ecological consumption, in this study, it is proposed that ecological emotion may positively affect the intention of consuming eco-products.

Hb: Ecological emotion may positively affect eco-product purchase decision-making behavior

Hb1: Ecological emotion positively affects eco-product information gathering behavior

Hb2: Ecological emotion positively affects eco-product scheme evaluation behavior

4.4.4. Ecological perception may positively affect eco-product purchase decision-making behavior

Qingping concluded that the more customers believe eco-friendly consumption behavior can bring benefits to the environment and themselves, the stronger the willingness of purchasing eco-friendly vegetables will be, and vice versa (Qing *et al.*, 2015). Lu *et al.* concluded that consumers' positive perception of the functional value and emotional value of B2B products is positively correlated with the willingness of purchasing (Lu *et al.*, 2017). Therefore, based on the literature on perceived value and perceived effectiveness studies, in this study, it is proposed that ecological perception may positively influence eco-product purchasing decision-making behavior.

Hc: Ecological perception positively affects eco-product purchase decision-making behavior

Hc1: Ecological perception positively affects eco-product information gathering behavior

Hc2: Ecological perception positively affects eco-product scheme evaluation behavior

5. Empirical study on the impact of ecological awareness on eco-product purchase decision-making behaviors

5.1. Questionnaire and data collection

In this study, 400 volunteers were invited to participate in the experiment, during which the experimental variables were controlled, and questionnaire data were collected on-site. To ensure the objectivity of the data, these volunteers are senior Ph.D. and master candidates, social personnel, and MBA students. These sample data cover 5 universities in different provinces of China to ensure complexity. A total of 379 questionnaires were collected, and the

Table 2. Basic statistical data

Item	Classification	Frequency	Percentage	Effective percentage	Calculated percentage
Gender	Male	146	38.5	38.5	38.5
	Female	233	61.5	61.5	100
Age	23-26	151	39.8	39.8	39.8
	27-30	136	35.9	35.9	75.7
	30-35	73	19.3	19.3	95
	≥35	19	5	5	100
	Unmarried	246	65	65	65
Marital status	Married	133	35	35	100
	Master candidates	269	70.9	70.9	70.9
Level of education	Doctoral candidates	68	17.9	17.9	88.8
	MBA students	42	11.2	11.2	100
Purchase plan	Yes	301	79.4	79.4	79.4
	No	78	21.6	21.6	100

As shown in Table 2, the majority of volunteers participated in this study are female, accounting for 61.5% of the overall volunteers; Most volunteers are between 25-35 years old, accounting for 75.7% of the overall volunteers; The percentage of unmarried volunteers is relatively large, accounting for 65% of the overall volunteers; In terms of education, the majority of volunteers are master students, accounting for 70.9% of the overall volunteers, which agrees with the education qualification of volunteers that we selected. Besides, 79.4% of the volunteers have specific plans for cars that they are going to purchase, which enhances the credibility of the questionnaire. In summary, the majority of volunteers who participated in this study are unmarried and well educated and they have car purchasing plans, which coincide with the current status of ecological product consumption, making this study a general representative case.

5.2.2. Reliability analysis of the questionnaire

In this study, each question was scored based on the Likert five-point scale. All these questions were modified on the basis of the classic scales published in the literature. Cronbach's Alpha coefficient was employed to evaluate the internal consistency of the questionnaire. When

questionnaire recovery rate was 94.75%; 356 questionnaires were valid, which was 89.0% of the collected questionnaires. These valid questionnaires met the data analysis requirements of this empirical study.

5.2. Basic statistical analysis and verification of this empirical study

5.2.1. Basic descriptive statistical analysis

Previous studies have shown that sociodemographic variables, such as education, gender, age, and household income, affect the effectiveness of experimental results. Therefore, to exclude interference from information, in this study, consumers' characteristic variables were employed as control variables to regulate the variables that have no significant impact on eco-consumers' eco-product purchase behavior. Volunteers' statistical characteristics of this survey are shown in Table 2.

Cronbach's Alpha coefficient is 0.7 and above, the degree of continuity and internal consistency of the questionnaire data is at an appropriate level.

5.3. Empirical analysis

In this study, the purpose of data collection and analysis is to verify the impact of each dimension of ecological awareness on each dimension of eco-product purchase decision-making behavior; Correlation analysis and regression analysis are the main methods used to verify the hypothesis.

5.3.1. Pearson's correlation analysis

Person's correlation analysis was adopted in this study to evaluate the degree of relationship between two variables. The hypothesis involves two variables: ecological awareness and eco-product purchase decision-making behavior. Ecological awareness is divided into three dimensions: ecological knowledge, ecological emotion, and ecological perception. Eco-product purchase decision-making behavior is divided into two dimensions: information gathering behavior and scheme evaluation behavior. The detailed correlation analysis results are listed as Table 3.

Correlation analysis was carried out between the three dimensions of ecological awareness and the two dimensions of consumers' eco-product purchase decision-making behavior. As shown in Table 3, the correlations between ecological knowledge and the two dimensions of eco-product purchase decision-making behavior (information gathering behavior and scheme evaluation behavior) is significant at the 0.01 level with correlation coefficients of 0.618 and 0.590, respectively, indicating a positive correlation between ecological awareness and eco-product purchase decision-making behavior; The correlation coefficients between ecological emotion and the two dimensions of eco-product purchase decision-making behavior (information gathering behavior and scheme evaluation behavior) are 0.701 and 0.688, respectively, indicating the correlation is also significant at the 0.01 level and ecological emotion is positively correlated with eco-product purchase decision-making behavior; The correlations between ecological perception and the two dimensions of eco-product purchase decision-

making behavior (information gathering behavior and scheme evaluation behavior) are significant with coefficients of 0.593 and 0.729, respectively, implying the relationship between ecological perception and eco-product purchase decision-making behavior is positive.

5.3.2. Regression analysis

To further investigate the relationships between ecological awareness and eco-product purchase decision-making behavior, in this study, the three dimensions of ecological awareness are independent variables, and the two dimensions of eco-product purchase decision-making behavior are dependent variables. Based on the multi regression analysis results with the Enter method and the correlation analysis results obtained in the previous section, the three dimensions of ecological awareness have positive correlations between eco-product purchase decision-making behavior. The regression analysis results are shown in Table 4.

Table 3. Correlation analysis results

	X1	X2	X3	Y1	Y2
X	X1 Ecological knowledge	1			
	X2 Ecological emotion	107**	1		
	X3 Ecological perception	062**	-.313**	1	
Y	Y1 eco-product information gathering behavior	618**	701**	593**	1
	Y2 eco-product Scheme evaluation behavior	590**	688**	729**	440**

Note: ** indicates the correlation is significant at the 0.01 level (two-tailed test)

Table 4. Regression analysis of the relationships between ecological awareness and eco-product purchase decision-making behavior

Independent variable	Dependent variable		
	Eco-product purchase decision-making behavior	Information gathering behavior	Program evaluation behavior
	Y	Y1	Y2
Constant	872	931	1.508
X Ecological awareness	631		
X1 Ecological knowledge		812	899
X2 Ecological emotion		605	617
X3 Ecological perception		799	554
R ²	414	375	412
Adjusted R ²	401	362	398
DW	1.921	1.862	1.614
F	226.432	242.109	201.923
Sig	000	000	000

The regression analysis was carried out with eco-product purchase decision-making behavior as the dependent variable and ecological awareness as the independent variable. The DW statistic value is 1.921, indicating that there is no autocorrelation in the residuals. The F value is 226.432, with a significance value of 0.000<0.01, which indicates that the collected questionnaire data shows a good fit to the regression model and the regression result is extremely significant. The adjusted R2 of the multiple regression is 0.401, indicating that the three dimensions of ecological awareness can interpret 40.1% of the variations of eco-product purchase decision-making behavior. Therefore, the obtained regression equation is:

$$\text{Eco-product purchase decision-making behavior} = 0.872 + 0.631 \text{ ecological awareness}$$

Hence, the hypothesis H is accepted: ecological awareness positively affects eco-product purchase decision-making behavior.

The regression analysis was carried out with information gathering behavior as the dependent variable and the dimensions of ecological awareness as the independent variable. The obtained DW statistic value is 1.862, indicating that there is no autocorrelation in the residuals; the F value is 242.109, with a significance value of 0.000<0.01, indicating the collected questionnaire data shows a good fit to the regression model and the regression

result is extremely significant. The adjusted R² of the multiple regression is 0.362, suggesting the three dimensions of ecological awareness can interpret 36.2 % of the variations of eco-product purchase decision-making behavior. Hence, the obtained regression equation is:

$$\text{Information gathering behavior} = 0.931 + 0.812 \text{ ecological knowledge} + 0.605 \text{ ecological emotion} + 0.799 \text{ ecological perception.}$$

Based on this equation, the ecological knowledge has the largest impact factor (0.812), followed by the ecological perception (0.799), and the ecological emotion has the smallest impact factor.

In this regard, the hypotheses Ha₁, Hb₁, and Hc₁ are accepted: the three dimensions of ecological awareness positively affect information gathering behavior.

The regression analysis was carried out with scheme evaluation behavior as the dependent variable and the dimensions of ecological awareness as the independent variable. The obtained DW statistic value is 1.614, meaning

Table 5. Summary of Statistical Hypothesis testing Results

Hypothesis ID	Hypothesis content	Testing result
H	Ecological awareness positive affects eco-product purchase decision-making behavior.	Accepted
Ha	Ecological knowledge positively affects eco-product purchase decision-making behavior	Accepted
Ha ₁	Ecological knowledge positively affects eco-product information gathering behavior	Accepted
Ha ₂	Ecological knowledge positively affects eco-product scheme evaluation behavior	Accepted
Hb	Ecological emotion may positively affect eco-product purchase decision-making behavior	Accepted
Hb ₁	Ecological emotion positively affects eco-product information gathering behavior	Accepted
Hb ₂	Ecological emotion positively affects eco-product scheme evaluation behavior	Accepted
Hc	Ecological perception positively affects eco-product purchase decision-making behavior	Accepted
Hc ₁	Ecological perception positively affects eco-product information gathering behavior	Accepted
Hc ₂	Ecological perception positively affects eco-product scheme evaluation behavior	Accepted

5.4. Summary of empirical study

The empirical study of this study consists of two parts: Part 1 is a descriptive statistic of the collected samples; Part 2 is the testing of the relevant hypotheses with regression analysis. The testing results are summarized as Table 5.

6. Summary and discussion

6.1. Summary

Consumers' characteristics and the changes in the external environment promote the trend of the behavior of choosing eco-products. The majority of the previous studies focus on the influence of external factors, such as price, income level, and personal preference, on consumer behavior, and only a small portion of studies cover the influence of internal factors (values, awareness).

In this study, with a background of ecological awareness, through the analysis of published literature and the using of SPSS21.0 data analysis software, the ecological awareness is divided into three dimensions based on an increasing trend: ecological knowledge, ecological emotion, and ecological perception; the eco-product purchasing decision behavior is divided into two dimensions: eco-product information gathering behavior and eco-product scheme evaluation behavior. Next, the correlation analysis was employed to study the relationship

that there is no autocorrelation in the residuals; the F value is 201.923, with a significance value of 0.000 < 0.01, suggesting the collected questionnaire data shows a good fit to the regression model and the regression result is extremely significant. The adjusted R² of the multiple regression is 0.398, implying the three dimensions of ecological awareness can interpret 39.8 % of the variation of the eco-product purchase decision-making behavior. Therefore, the obtained regression equation is:

$$\text{Information gathering behavior} = 1.508 + 0.899 \text{ ecological knowledge} + 0.617 \text{ ecological emotion} + 0.554 \text{ ecological perception.}$$

According to this equation, the ecological knowledge has the largest impact factor (0.899), followed by the ecological emotion (0.617), and the ecological emotion has the smallest impact factor (0.554).

In this regard, the hypotheses Hb₁, Hb₂, and Hc₂ are accepted: the dimensions of ecological awareness positively affect the scheme evaluation behavior.

between the independent variables (ecological awareness) and the dependent variables (eco-product purchase decision-making behavior); And the regression analysis was adopted to investigate the influence of various dimensions of ecological awareness on each dimension of eco-product purchase decision-making behavior. Based on the data analysis, it is concluded that all 10 hypotheses are accepted and none of them are rejected.

The results obtained from the empirical study indicate that human beings with ecological awareness have no right to overconsume natural resources and this extensive development approach should not be adopted. While advancing economic development, human beings should protect nature and live in harmony with nature. At the time of purchase, product information regarding whether the product is beneficial or harmful to the ecological environment should be gathered first before evaluating the purchase plan of each product and making the decisions that can contribute to ecological environment protection and the longevity of human's living environment.

6.2. Discussion

In this study, empirical studies were employed to verify the impact of ecological awareness on the purchasing behavior of ecological products. Consumers' ecological awareness affects their co-product purchase decision-making

behavior as they believe that their shopping behaviors will have a positive effect on environmental protection. The conclusions obtained from this study provide theoretical support for the construction of ecological society and the cultivation of consumers' ecological consumption habits and routines. Policymakers can develop relevant measures from the aspects of government, consumers, enterprises, and media to promote the construction of ecological civilization, contributing to the developing of a beautiful China.

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