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Discriminant Analysis of Consumer Intention to Use Green Packaging in Thailand

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Abstract: Plastic pollution and waste management, especially single used plastic from food consumption has become one of serious issues in Thailand. Green packaging has been developed for alleviating plastic problems, but it is unacquainted for Thai consumers. This research aims to analyze factors segmenting consumer intention to use green packaging by using discriminant analysis technique. Empirical results from 281 Thai consumers reveals a significant relationship between consumer intention to use green packaging and the factors based on consumer attitudes, value for money and consumption values. Findings show that consumer perceive in term of added cost on green packaging is the most influential in segmenting consumer intention to use green packaging followed by the social value, consumer attitude toward environmental concern, and the conditional value. The classification result show that overall 80.1% were correctly classified. For marketing implication, marketing communications on environmental costs and perceived value, building a positive image for green packaging, and offering environmental campaigns are mainly suggested to influencing consumers to use green packaging.

Keywords: discriminant analysis; green packaging; consumer behavior; Thailand

1. Introduction

The numbers of plastic packaging consumption have been increasing in Thailand, especially single used plastic from food consumption with the expected growth around 8-10 percent annually. Food plastic packaging is divided into several types where one type that causes disposed waste is single used plastic including plastic food pan, spoon, folk and knife plastic, plastic bag, plastic grass, and plastic straw. With a high demand for convenient, inexpensive, and time-efficient foods, the quick service restaurant (QSR) and a high number of convenience stores are the main channel for single used plastic [1,2]. Furthermore, a rapid growth of food delivery service and food events in Thailand reach to 1 Billion USD in 2018 [3]. Incorrect use of plastic packaging affects not only environment pollution and waste management problems, but also hygiene issue. According to report on waste disposal sites in Thailand, the amount of garbage is about 27.37 million tons and can divided into 43 percent for properly disposed, 31 percent for recycle garbage, and 26 percent for incorrect disposed [4]. The percentage of plastic garbage is 12 percent of incorrect disposed waste or 339,400 tons/year [5]. In 2015, Thailand is one of the top five countries in the world with plastic waste in the ocean [6].

Nowadays, several alternative eco-friendly choices are applied to cope the environment challenge such as cloth bag, substituting materials (e.g. paper). Bioplastic packaging or green packaging is one of alternative way for alleviating plastic problems. Currently, composable bioplastic packaging has been applied in the past 10 years, but the application uses are limited with a small market. One reason is that the production cost of bioplastic is high when compared with the regular plastic. Another reason is Thai consumers are unacquainted with bioplastic due to technology adoption. Moreover, consumer awareness of environmental needs is uncertain. Previous literatures on segmenting consumer intention

to use green packaging have been studied in various countries, but a few researches have been done in Thailand. Study on factors affecting to use bioplastic packaging in Bangkok by author [7] found that environmental exposure factors, environment concern factor, perceived consumer effectiveness factor, impact of using plastic factor, participation in environmental protection factor and environment knowledges have positive effect to choose green packaging, while author [8] found that green marketing communications, green product attitude, environment concern, trust in the green product, green brand, environmental knowledge affect to green products purchasing behavior of the consumer. Author [9] studied about segmentation consumer into active green activists and passive green activists by using discriminant analysis. Author [10] mainly focused on classifying environmental concerned segment and found that environmental knowledge is the greatest value for classifying consumer followed by perceived consumer effectiveness, environmentally friendly buying behavior, recycling, environmental activism, resource saving, economic factor, environmental concern and skepticism towards environmental claims. A consumer loyalty in green perspective based on consumption value was studied by author [11] and the result showed that functional value, economic value, emotional value and social value have a significant on consumer perspective.

The objective of this research is to analyze factors segmenting consumer intention to use green packaging by using discriminant analysis technique. The results will become a guideline of consumer study for food service business and marketer to encourage consumers to use green packaging products instead of plastic packaging.

2. Materials and Methods

Both primary and secondary data were conducted in this study. In-depth interview was conducted with an expert on green plastic packaging. The preliminary data related to green packaging knowledges and property of green packaging was collected from the discussion and developed in the questionnaire. The questionnaires were divided into 3 sections: (1.) respondents' general demographic information (2.) The consumer attitude toward environment concern and value for money (3.) Consumption values on buy or not buy a green packaging including emotional value, functional value, social value, conditional value and epistemic value regarding to the theory of consumption value [12]. These data were conducted by using 5-point Likert Scale which are 1 = strongly disagree and 5 = strongly agree. Surveys on consumer intention to use green packaging was conducted during April to July 2018 by face to face interview. The cluster random sampling method was applied by collecting data from Thai consumers who over 20 years old in Bangkok. The data were analyzed by using descriptive statistics and discriminant analysis.

2.1. Discriminant Analysis

This technique is appropriate statistic when independent variable is categorical and the independent variables are quantitative. This method is used to predict group membership from a set of metric predictors (independent variable, x). The model is composed of a discriminant function based on linear combinations of predictor variables as called "Linear Discriminant Analysis (LDA)" [13]. The model is derived as follows:

$$D = v_1x_1 + v_2x_2 + \ldots + v_ix_i + a \quad (1)$$

where D = discriminant function
v = discriminant coefficient
xi = independent variable
a = a constant
i = the number of predictor variables

In this study, two distinct groups were defined to intention to use green packaging (D=1) and do not use green packaging (D=0). The independent variables included three type of factors: consumer attitude toward environment concern (x_1- x_3), value for money (x_4), and consumption value (x_5-x_{12}) where the definition of each variable was presented in Table 2. The stepwise method was selected for

discriminant analysis because this technique is suitable for the model that contains several predators and selects the best model by entering the predators at each step based on F to Enter value that exceeds the entry criteria value [14].

3. Results

3.1. Descriptive

Total number of respondents were 281 as presented in Table 1. The majority of respondents are female (71.5%). Most respondents are 20 to 30 years old accounted for 61.6% and 74.4% of sample respondents have education level on graduate. Almost half of respondents have income lower than 20,000 Baht/month. In addition, private employee represent majority with 42.0% followed by student accounted for 25.3% and government service accounted for 14.9%.

Table 1. Sample Descriptive

Variable	Range	Frequency	Percentage
Gender	Male	80	28.5
	Female	201	71.5
Age	20-30 years old	173	61.6
	31-40 years old	52	18.5
	41-50 years old	39	13.9
	51-60 years old	12	4.3
	Over 60 years old	5	1.8
Education	Undergraduate	17	6
	Graduate	209	74.4
	Post graduate	55	19.6
Occupation	Private employee	118	42
	Student	71	25.3
	Government service	42	14.9
	Business	20	7.1
	Contractors	13	4.6
	Unemployed	8	2.8
	Other	4	1.4
Income	less than 10,000 Baht/month	65	23.1
	10,001-20,000 Baht/month	69	24.6
	20,001-30,000 Baht/month	67	23.8
	30,001-40,000 Baht/month	28	10
	40,001-50,000 Baht/month	14	5
	Over 50,000 Baht/month	38	13.5

3.2. Reliability Statistics of Measure

Reliability test is the degree of consistency or dependability with which an instrument measures the attribute [15]. The reliability coefficient between 0.70 to 0.90 is considered as acceptable range with the reliability of items [16]. As presented in Table 2, Cronbach's alpha was computed to be 0.830 with item-to-total reliability of all twelve statements (X1-X12), interpreting that the statements have relatively high internal consistency.

Table 2. Reliability Statistics of dependent variable

Factors	Variable name	Statement	Item-to-total Cronbach's reliability	Cronbach's Alpha
Consumer attitude toward environment concern	Reduce Plastic (x_1)	You want to reduce using plastic packaging to save the world.	0.818	0.830
	Long term Solve (x_2)	Green packaging can alleviate long term environment problem.	0.814	
	Laws (x_3)	Laws have helped propel the use of green packaging.	0.838	
Value for money	Accept Added Cost (x_4)	You accept the added cost of using green products.	0.811	
Emotional value	Unique (x_5)	The unique characteristic of green products makes you feel good to green products.	0.807	
	Biodegradable Word (x_6)	"Biodegradable 100%" on the products make you trust in green products.	0.804	
Functional value	Heat Resistant (x_7)	You concern about heat resistant of packaging product.	0.831	
Social value	Social (x_8)	Using green packaging impact on society and well-being.	0.812	
	Be Accepted (x_9)	Using green product make you feel be accepted and have a good image.	0.821	
Condition value	Shop Provide (x_{10})	If the restaurants provide green packaging option, you will choose it.	0.808	
	Campaign (x_{11})	If environment campaign is promoted, you will choose green products.	0.804	
Epistemic value	Try New Thing (x_{12})	You want to try new green packaging which you have never used it before.	0.832	

3.3 Discriminant Analysis

The summarized results of the stepwise discriminant analysis were shown in Table 3. Most variables preformed statistically significant canonical functions at alpha 0.01 level, excepting one variable: Laws (x_3). The Wilks' lambda value explains a spread between the clusters' mean, which Laws variable (x_3) had the highest value that could be interpreted as a larger spread between the clusters' mean or the least of membership of the group. F-test presents the test of mean of each variable among the groups. If the value is significant, it indicated that the mean of the variable in intention to use green packaging group is significantly different from the mean of that variable in intention to do not use green packaging group [17].

Table 3. Tests of Equality of Group Means

Variable	Wilks' lambda	F
Reduce Plastic (x_1)	0.829	57.428***
Long term Solve (x_2)	0.931	20.742***
Laws (x_3)	0.989	3.158*
Accept Added Cost (x_4)	0.784	77.039***
Unique (x_5)	0.874	40.269***
Biodegradable Word (x_6)	0.856	47.001***

Table 3. Tests of Equality of Group Means (continued)

Variable	**Wilks' lambda**	**F**
Heat Resistant (x_7)	0.972	8.003***
Social (x_8)	0.913	26.727***
Be Accepted (x_9)	0.864	43.772***
Shop Provide (x_{10})	0.894	33.080***
Campaign (x_{11})	0.853	48.173***
Try New Thing (x_{12})	0.964	10.435***

Note: * significant at 0.10 level; ** significant at 0.05 level; *** significant at 0.01 level

In Table 4, the stepwise discriminant analysis performed the best 4 variables for classify group: Accept added cost (x_4), Be accepted (x_9), Reduce plastic (x_1) and Campaign (x_{11}) with an acceptable tolerance value. Note that a variable with low tolerance value (< 0.20) suggests that little information contributed to the model, thus it is removed from the model [18].

Table 4. Variable in the analysis

Variable	Tolerance	F to enter
Accept added cost (x_4)	0.863	21.644
Be accepted (x_9)	0.942	12.123
Reduce plastic (x_1)	0.842	8.691
Campaign (x_{11})	0.872	7.597

After the discriminant function was derived with 4 variables (Table 5.), the performance of the model was explained by the statistical test. The eigenvalue of 0.481 and the canonical relation of 0.570 demonstrated a function is quite strong and discriminates well. Moreover, Wilks' lambda indicated the significance of the discriminant function at alpha 0.01 level [17].

The interpretation of discriminant coefficients was explained by the important of each predictor as higher value as more important [17]. Results of discriminant function indicated that the accept added cost (x_4) variable was strongest predictor to classify the group of consumers intention to use green packaging followed by Be accepted (x_9), Reduce plastic (x_1) and Campaign (x_{11}), respectively. All variables presented the positive correlation with the intention to use green packaging, given the insight into the marketing potential of green consumers.

Table 5. Standardized canonical discriminant function's coefficients

Variable	Coefficients
Reduce Plastic (x1)	0.334
Accept added cost (x4)	0.509
Campaign (x11)	0.307
Be accepted (x9)	0.371
Eigenvalue	**0.481**
Canonical Relation	**0.570**
Wilks' lambda	**0.675*** **

Note: *** significant at 0.01 level

After the discriminant function was derived, the test on the correction rate was shown in Table 6. The result indicated that the model was correctly classified at 80.1%. The class 'Intention to use green packaging group' can predict correctly at the correction rate of 88.5%, while the class 'Intention to do not use green packaging group' can forecast properly at the correction rate of 66.4%.

Table 6. Classification result

Real Group	Predicted Group		Total	Correction rate
	Intention to use green packaging	Intention to do not use green packaging		
Intention to use green packaging	154	20	174	88.5%
Intention to do not use green packaging	36	71	107	66.4%
Overall	190	91	281	**80.1%**

4. Discussion

The results showed that several dimensions of variables were the key element to determine the intention to use of green packaging. The value for money carried the most influential factor. According to value for money literature, consumers choose products what satisfied them as per usage and as per the money spent on it [19]. In this study, the value for money is interpreted as consumers' willingness to accept added cost of green packaging. Therefore, the retailers and food service business should focus on the pricing of green packaging products including the way to communicate benefit and cost of green packaging in order to encourage consumers using environmentally friendly products. In addition, social value was one of driven factors to use green packaging because the use of eco-friendly products may build a personal positive image and be accepted from the society. Author [11] stated that perceived social value is one of the most important for green consumers.

Intention to reduce using plastic is one of attitude toward environmental concerns, thus consumers who have viewpoint of decrease the use of plastic packaging are more likely to use the eco-friendly packaging. Studies by author [20] and [21] indicated that having a positive attitude and green perceived value toward green products affected to intention of customers to buy green products. Lastly, consumers perceived on condition value in the aspect of environmental campaign. If environmental campaign is promoted heavily and it can acknowledge consumer understanding of green products including change their attitudes toward environment and accumulate consumers' confidence on green products, consumers tend to use environmentally friendly products [22]. This condition value related to media exposure of consumer which may motivate the attitude or habits of consumers. Media exposure of environment campaign though social media, poster, exhibition and influencers has a positive impact to intention to use green products [7]. Hence, building a positive image for green packaging and offering environmental campaigns are mainly suggested to influencing consumers to use green packaging.

5. Conclusions

As green packaging has been implemented as one of eco-friendly choices, technology adoption of Thai consumers can be a challenge to reduce environmental pollution problems. According to discriminant analysis, added cost, be accepted, reduce plastic, and campaign were considered as predictor whether Thai consumer intention to use green packaging or not. The cross validated classification showed that the classifying model performed at the correction rate of 80.1%. Four key factors are mainly suggested to food service business and the marketer to encourage consumers to have pro-environmental behavior and decide to use green packaging. Moreover, the outcome can used as the guideline to create the position of the business and launch the marketing campaign.

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