

Development of Brand Selection Model Considering Customer Service

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Abstract. In many companies, customer service becomes one of the critical factors of the brand evaluation. It is important for the companies to know the customer's utility functions about the customer service and repurchase of the products considering customer service. One of our main aims of this study is to develop brand selection model which considering utility of the customer service in order to propose promotion method for customer service of the company. In this study, we add some types of the customer services to utility in the models, and develop brand selection models. By the use of the questionnaire survey for the real companies, we confirm the adaptability of the proposed model, and we show the importance of the customer service.

Keywords: Brand selection model, customer service, customer satisfaction, maximum likelihood estimation, utility function.

1 Introduction

Companies that manufacture electronic device such as digital cameras and television provide customer service to assure customer satisfaction after purchase. Where the customer service means all activities served by the company to the customers after purchase the product, e.g. customer inquiry at call center, repairing the products etc. If the consumers are satisfied by the customer service, then customers will purchase the product of the same company again. It will be contribute to future sales of the company. It is important for the companies to know the customer's utility functions about the customer service and repurchase of the products considering customer service.

There are some studies about brand selection model which analyze to select products. Choice probability of the products was formulated by Multinomial logit model on the assumption that consumers choose brands whose utility was the highest [1]. Brand selection models evaluating the effects of the price promotion were proposed [2], [3], [4]. Brand selection models for evaluating the customer satisfaction was also proposed [5]. These studies mainly concern the price at the purchase of the products. But in the brand selection model, the utility of the customer service is not considered. Since all customers may not receive the customer service, whether the customers receive the customer service or not is a very important factor for brand selection

model. One of our main aims of our study is to develop a brand selection model which considering utility of the customer service in order to propose a promotion method for customer service of the company. In this study, we add the customer services to utility model, and develop a brand selection model for products created by companies and customer service received by customer. By the use of the questionnaire survey for the real products, we confirm the adaptability of the proposed model, and we show the importance of the customer service.

2 Brand Selection Model

A feature of this study is that brand selection model considers after purchase utility depending to the situation whether received customer service or not. Here we develop a brand selection model using a multinomial logit model. We then consider the utility of each brand. The following is the definition of the utility U_{it}^n , when consumer n selects brand i at the term t .

$$U_{it}^n = V_{it}^n + \varepsilon_{it}^n \quad (1)$$

Where V_{it}^n is the settled part of U_{it}^n , and ε_{it}^n is the probability part of U_{it}^n .

We assume that each ε_{ij}^n obeys the same double exponential independent distribution. Then, the following is the definition of the probability in which a consumer n will selects a brand i at the term t .

$$P_i^n(i) = \frac{\exp(V_{ij}^n)}{\sum_k \exp(V_{ij}^n)} \quad (2)$$

3 Brand Selection Model Considering Customer Service

3.1 Market Data

In order to develop a brand selection model considering customer service, we use the following market data about the digital camera. The attributes of the market data is shown in Table 1. We use the customer satisfaction data about the customer service (CS) (Copyright(C) 2011 and 2012 Nikkei BP Consulting, Inc.), and the product quality (PQ) data researched by kakaku.com. In Table 1, CS2011 means the customer satisfaction data about customer service of each company at fiscal year 2011.

PS 2011 means the customer satisfaction data about product quality of each company at fiscal year 2011. Customer satisfaction data involve the selected product numbers and repurchase intention of each company.

Table 1. Market data

Brand name	CS 2011	CS 2012	PQ 2010	PQ 2011	PQ 2012	Selected number	Repurchase intention
A	****	****	****	****	****	****	****
B	****	****	****	****	****	****	****
C	****	****	****	****	****	****	****

3.2 Model Development

In this paper we introduce 3 types of the brand selection models (Table 2). We follow the definitions (1) and (2). The difference of the models is the difference of the definitions of the settled part of utility V_{it}^n . First model is the following model considering reference satisfaction of product quality only and shown by the RS model in Table 2.

$$V_{it}^n = \alpha_i + \beta RS_{it}^n \quad (3)$$

Where RS_{it}^n means reference satisfaction of the product quality and is defined by equation (4).

$$RS_{it}^n = \sigma PS_{i(t-1)}^n + (1 - \sigma) RS_{i(t-1)}^n \quad (4)$$

Second model is the model considering customer service and shown as CS model in Table 2.

$$V_{it}^n = \alpha_i + w_{it}^n \gamma CS_{it}^n \quad (5)$$

Where w_{it}^n is a dummy variable for customer service. If the customer n receive a customer service of brand i in the term t then w_{it}^n is 1, and otherwise w_{it}^n is 0.

We propose the following third model which considering both the product quality and customer service.

$$V_{it}^n = \alpha_i + \beta RS_{it}^n + \gamma * w_{it}^n CS_{it}^n \quad (6)$$

Table 2. Brand selection models

	Mode name	Definition of utility
1	2013-RS	$V_{it}^n = \alpha_i + \beta RS_{it}^n$
2	2013-CS	$V_{it}^n = \alpha_i + \gamma CS_{it}^n$
3	2013-RSCS	$V_{it}^n = \alpha_i + \beta RS_{it}^n + \gamma CS_{it}^n$

3.3 Estimation Method

We used the maximum likelihood estimation as the estimation method. The following equation shows the likelihood function L .

$$L = \prod_i^I \prod_t^T \prod_n^N P_i^n(i)^{y_{it}^n} \quad (7)$$

y_{it}^n is a dummy variable for representing the customer's brand selection. If a consumer n selects brand i then y_{it}^n is 1, otherwise y_{it}^n is 0.

The following is the equation for the logarithm likelihood function.

$$\ln L = \sum_i^I \sum_j^J \sum_n^N y_{it}^n \left[\exp(V_{it}^n) - \ln \left[\sum_{k=1} \exp(V_{kt}^n) \right] \right] \quad (8)$$

We will estimate model parameters $\alpha_i, \beta, \gamma, \sigma$ where the logarithm likelihood function is maximized. For parameter estimation, we use Mathematica.

4 Application of Brand Selection Model

4.1 Estimation of the Parameters in the Models

Table 3 shows the estimated parameters of RSCS model. AIC in Table 3 is an index of model fitness, and the lower AIC model means better fitness model to the real data. In this sense, the proposed model 2013-RSCS is the best model within the 3 models. The parameters β, γ , are weight parameters of product quality and customer service, and the ratio is $0.1737=0.62/3.57$. This means the importance of the customer service is 17.37% of product quality.

Table 3. Estimated parameters in each model

Parameters	2013-RS	2013-CS	2013-RSCS
α_1	2.51	1.80	3.05
α_2	1.21	0.59	1.66
α_3	0.84	0.42	1.08
β	1.27	no	3.57
γ	no	0.59	0.62
σ	0.88	no	0.69
AIC	-2321.80	-1106.43	-3011.58

By the use of this model, we can easy to predict the utility and the selection probability as shown in Table 4. The prediction errors are 0, and the model 3 is well fit for the prediction of the real share of the companies.

Table 4. Estimation of utility and selection probability

Company	Utility	Selection probability	Prediction error
A	5.29	64.49%	0.00
B	4.07	19.14%	0.00
C	3.91	16.36%	0.00

4.2 Customer Service Promotion

Table 5 shows the growth rate of market share when customer satisfaction index of customer service increase 1 point, where customer satisfaction index of customer service is scored by 1 to 5 degree. In company B and C, the growth rate increase more than 10%. As shown in Tables 4 and 5, the selection probability of company C is smaller but the growth rate of company C is greater than company A and B.

Table 5. Growth rate of market share

Company	Growth rate
A	4.21%
B	10.55%
C	10.97%

5 Conclusion

We developed brand selection model by considering customer service and we estimate model parameters by the use of the market data of questionnaires related to purchasing, and we confirm the adaptability of the proposed model. From the estimated parameters, we show that customer service effects 17.37% in the whole brand utility. By the model we can estimate the market share of each brand according to the improvement of the customer service. This paper will contribute the brand planning considering appropriate balance among product quality and customer service. In this way, we consider promotion by comparing each company's utility. We hope that this knowledge contributes to the performance of customer service for companies.

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