CONJOINT ANALYSIS FOR PORTABLE AUDIO PLAYER IN JAPAN

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Abstract This paper attempts to discover what type of portable audio player consumers generally preferred via a conjoint analysis. In addition, we investigate customers' willingness to pay (WTP) using a conditional logit model. The study helps with the decision-making procedure for designing portable audio player adaptable to new technology development.
Key words portable audio player, choice-based conjoint analysis, conditional logit model, willingness-to-pay

1 Introduction

Japan has already become an important market for the portable digital music player industry. Since its sales concept was "Good bye, MD.", now we can say Apple Computer Inc. succeeded in marketing strategy. The major factor why iPod took the market of a portable audio player from MD player which had rushed the top of Japanese market was an iPod's concept itself; the system of carrying music files in personal computers without carrying recording medias. To successfully establish the market for portable audio players and on-line music services, it is thus essential to understand the customers' preferences.

In their study of portable multimedia player (PMP) mobile device, Lee, Lee, and Sohn (2009) estimate customers' preferences for four major PMP contents: movies, music, games, and education. This study also analyzes the relative importance of each content and estimates willingness-to-pay (WTP) using a multinomial logit model. We investigate these estimations in portable digital music players that are different from PMP. So, the main purpose of this paper is to conduct a conjoint analysis to determine customers' preferences for portable digital music devices. This study focuses on estimating customers' preferences for seven portable audio device characteristics: brand names, design, price, capacity, type of system importing music files, availability of one-segment broadcasting service, and method of operation. This study also analyzes the relative importance of each characteristic and estimates willingness-to-pay (WTP) using a conditional logit model.

2 Method

This research uses choice-based conjoint analysis, a method for analyzing customer attitudes towards a product with attributes or features. It is based on the simple premise that consumers evaluate the value or utility of a product or service by combining the separate amounts of utility provided by each attribute. Including price as a factor in the conjoint analysis study allows WTP estimations for increases in the quality of the attributes tested.

Based on the related reviews and our pilot survey, seven attributes and corresponding levels have been selected; (1) brand name, (2) design, (3) price, (4) capacity, (5) type of system importing music files, (6) availability of one-segment broadcasting service and (7) method of operation. Attributes and their levels are summarized in Table 1. Because there are five attributes with three levels and two attribute with two levels, there are 972 possible profiles of portable digital music players for investigating customer's preference. However, a fractional factorial design reduces the number of profiles to 18 for responders to evaluate. Consequently, this study has obtained 16 profiles after deleting 2 unrealistic profiles. In order to decrease the problem of choosing among many profiles, we divided 16 profiles into four subsets (tests) and each test has four combinations of portable digital music player attributes.

We follow the approach of Louviere and Woodworth (1983) to use choice-based conjoint analysis, which integrates conjoint analysis with discrete choice analysis. Our study applies a survey to ask respondents to make concrete choices, like "Given option A, B, C, and D with different attributes and prices, which one would you buy?" from each of the four choice sets. They are also asked to rank the order of the levels of each attributes. The study designates each attribute as being the most preferred level (3), the second preferred level (2), and the least preferred level (1). Additionally, this survey asks respondents for demographic information.

Table 1 Specific levels of each attributes for conjoint analysis

Attributes	Level		
Brand name	Apple	Sony	Panasonic
Design	A 	B 	C 
Price (Japanese yen)	29,800	37,800	19,789
Capacity	120 gigabytes	16 gigabytes	Memory card
System of importing music files	Through PC	By Sony format	Through audio component
One-segment broadcasting	Available	Not available	Not available
Method of operation	Click wheel	Button	Touch sensor

2.1 Modeling portable digital music player choice

We thus used McFadden's (1974) conditional logit model. The basis of this model is the indirect utility function of an individual. The indirect utility function of the individual *i* who chooses alternative *j* in the alternative set can be written in the form $U_{ij} = V_{ij} + e_{ij}$, where V_{ij} is a vector of portable digital music player attributes that varied among all players in the choice set, and e_{ij} is stochastic and reflects error term. The probability that individual *i* would choose the music player *j* instead of for the other players in the choice set is a function of a vector of attributes. The estimation model is:

Probability(y_{ij} = 1) = exp(βV_{ij}) / Σ_j exp(βV_{ij}), where the dependent variable y_{ij} is the dummy variable equaled 1 if individual *i* choose the music player *j*, for the remaining players in the individual *i* 's choice set, y_{ij} equaled 0. V_{ij}, observable part of indirect utility function that is presented before, is linear function of Z = (Z_1, Z_2, Z_3, Z_4, Z_5, Z_6, Z_7) = (Brands, Designs, Capacity, Music-importing system, One-segment broadcasting service, Operation method, Price)

$V_{ij} = \beta_1 Z_{1,ij} + \beta_2 Z_{2,ij} + \beta_3 Z_{3,ij} + \beta_4 Z_{4,ij} + \beta_5 Z_{5,ij} + \beta_6 Z_{6,ij} + \beta_7 Z_{7,ij}$, where are estimate coefficients for each attribute that affect respondents' utility. And we can get $WTPz_k = \beta_k/\beta_7$, k = 1,…,6.

2.2 Survey and data

A total of 22 people participated in this survey; 13 men and 9 women. The surveys are conducted in a undergraduate class at Nanzan University in Japan. Our study sample contained 88(=4×22) unique respondent-player observations. Our estimation sample included, in addition to the study sample, all the players not chosen in each of the 88 cases. The final estimation sample thus consisted of 352 observations.

3 Analysis and Result

The coefficients of conditional logit model were estimated using TSP Version 4.5. The estimated results are reported in Table 2. From this investigation, we now can see in what factors consumers put priorities when considering which portable audio player to purchase. Among the results, it must be noted that we can see the positive and significant coefficient of brand name, capacity and system of importing music files, and the negative and significant coefficient of price. Availability of one-segment broadcasting service does not have significance in this research even though it is one of the biggest feature of "Galápagos Revolution" in Japanese market and it has become an essential function of portable products in Japan. In addition, preliminary research revealed that more than half of the respondents answered they do not need one-segment broadcasting service. Also, click wheel, the symbolic function of iPod lines, does not have significance here as well.

Table 2 Estimation results(all respondents)

Parameter	Estimate	t-statistic	p-value
Brand	0.429	2.345	0.019
Design	0.104	1.187	0.235
Price	- 0.0007	- 3.873	0.000
Capacity	0.640	3.518	0.000
System of importing	0.976	5.053	0.000

music files			
One-segment broadcasting	0.242	0.841	0.400
Method of operation	0.238	0.782	0.434

Using the coefficients, we calculate willingness-to-pay (WTP) for each attribute as displayed in Table 3. WTP is expressed in terms of a monetary unit which means the change of consumers' utility for the change of special attribute.

Table 3 WTP for each attribute

Parameter	WTP (Japanese yen)
Brand	5,933
Capacity	8,862
System of importing music files	13,512

The respondents are more willing to pay for type of system importing music files (13,512 Japanese yen) and capacity (8,862 Japanese yen) than for brand (5,933 Japanese yen). Also, the willingness to pay for design is insignificant.

Table 4 Estimation results(iPod users)

Parameter	Estimate	t-statistic	p-value
Brand	0.474	2.20	0.028
Design	0.107	0.60	0.549
Price	- 0.0006	- 3.075	0.002
Capacity	0.499	2.535	0.011
System of importing music files	0.961	4.470	0.000
One-segment broadcasting	0.391	1.184	0.237
Method of operation	- 0.179	- 0.528	0.598

Table 4 presents the estimated results of the conditional logit model done by using iPod user respondent group. The results for iPod user respondents shows that there are slight differences from that of all examinees; nevertheless, biggest priorities are brands, price, capacity and system of importing music files. Among them, system of importing music files turns out to be the most significant. As a pilot survey shows, the respondents prefer to importing music files from computers into portable audio players. It describes that iTunes' importing system is well-accepted by users.

According to another questionary survey for iPod users which is performed in 2007 by us, as for the point of purchasing iPod, the largest answer was the design of products. However, by having it analyzed statistically, we can see that what users put first priority in their deep psychology is the system of importing music files.

4 Conclusion

This paper uses conjoint analysis and WTP analysis to provide insight into estimating customers' preferences for the components of a mobile music player devices. We consider attributes such as brand names, design, capacity, type of system importing music files, availability of one-segmentation broadcasting service, method of operation and price.

The respondents have to rank each level of attribute, and choose one that they wanted to purchase among choice sets. Using conjoint analysis, we obtain several significant results and determine the structure of the respondents' preferences for the mobile music player. In addition, we use WTP analysis to estimate how much money customers are willing to pay for each attribute. The results show a significant WTP for brand names, capacities and types of system importing music files. This study will be useful for internet retailers, specifically for effective customer management in the changing environment brought on by technological development (Lee, Lee and Sohn 2009).

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