인터넷 쇼핑몰 방문자의 행위 분석을 이용한 컨조인트 시장세분화 방법론에 대한 연구

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A Methodology of Conjoint Segmentation for Internet Shopping Malls Using Customer's Surfing Data

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Abstract

A lot of Internet shopping malls strive for obtaining a competitive advantage over others in an increasingly tighter electronic marketplace. To this end, understanding customer preference toward products (or services) and administering appropriate marketing strategy is essential for their continuous survival. However, only a few marketing researchers and practicioners focused on this issue, compared with academic and industry efforts devoted to traditional market segmentation. In this paper, we suggest a methodology of conjoint segmentation for electronic shopping malls. Traditional market segmentation methodologies based on customer's profile sometimes fail to utilize abundant information given while navigating around cyber shopping malls. In this methodology, we do not impose information overload to the customer for preference elicitation, but capture automatically generated surfing or buying data and analyze them to get useful market segmentation information. The methodology consists of 4-stages: 1) analyzing legacy homepages, 2) data preparation, 3) estimating and interpreting the result, and 4) developing marketing mix. Our methodology was to give useful guidelines for market segmentation to companies working in the electronic marketplace.

Key words: Electronic Commerce, Electronic markets, Conjoint Analysis, Market Segmentation, Benefit Segmentation, Customer Relation Management

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1. Introduction

Commerce on the Internet has grown considerably over the last few years and the World Wide Web (WWW) has created a fast growing electronic channel for marketing and the number of electronic stores has increased in an unprecedented speed (Liang & Huang, 1998). The ability of Internet marketplaces to reduce search costs for product (or service) information is significantly affecting competition environments. Bakos (1997) shows that lower buyer search costs in electronic marketplaces promote price competition among sellers. This effect will be most dramatic in commodity markets, where intensive price competition can eliminate much of seller profits. In this increasingly tighter market, organizations continue to search for means to get a competitive advantage over others.

As an alternative to this end, lots of electronic shopping malls employ one-to-one marketing strategy by using advanced database technology. But, inadequate uses of this strategy sometimes force their customers into being dissatisfied. For instance, companies engaged in business to customer electronic commerce (EC) e-mail to their customers indiscriminately who have been dropping into their shopping malls. And, their customers have to struggle against enormous amount of junk mails every day and night, which are hardly of interest to them.

Conjoint Market segmentation in view of the customer's benefits may be one of good solutions for this problem. By market segmentation, marketers who engage in shopping malls can find out what motivates customers to respond, how to communicate to each customer, and they are able to increase customer's lifetime value by increasing customer loyalty (Wells, Fuerst, & Choobinceh, 1999).

Market segmentation has long been considered one of the most fundamental concepts of modern marketing (Wind, 1978). Kotler & Armstrong (1999) suggested several variables for market segmentation which were geographic, demographic, psychographic and behavioral. Since there are too many consumers who have no membership to shopping malls in cyberspace, the prior three variables are not applicable to Internet shopping malls for the reason that they cannot be aware of the customers' profile for segmentation. Fortunately, electronic markets facilitate the storage and recall of each history of customer's footnotes (Arunkundram & Sundararajan, 1998), and these can be input data for behavior segmentation in their shopping mall. One of the most popular approaches for assessing these benefits is through the use of conjoint analysis (Green & Desarbo, 1979; Green & Srinivasan, 1990; Vriens, Wedel, & Wilms, 1996). The objective in conjoint segmentation is to identify groups of consumers having similar preferences that might be targeted more efficiently by specific marketing mixes. The dual goals are (1) to form groups of consumers who share a common utility function and (2) to estimate the aggregate utility functions that would best explain the preferences stated by the number of each segment (Kamakura, 1998). Nonetheless, little research efforts are exerted to the explicit application of conjoint analysis to market segmentation of Internet shopping malls which is rapidly substituting or complementing traditional marketplaces.

This paper suggests an architecture and methodology of adapting the conjoint model to electronic shopping malls for benefit segmentation.

The rest of the paper is structured as follows. Section 2 gives an overview of the electronic market and market segmentation. Section 3 suggests a

methodology and an architecture of adapting conjoint model for benefit segmentation in Internet shopping malls. In section 4, an example of a methodology suggested in chapter 3 is introduced for detailed comprehension. Finally, we conclude and highlight some directions for the future research in section 5.

2. Conjoint Segmentation in the cyber mall

Conjoint analysis has been used extensively by marketing researchers for understanding consumer's preferences (Green & Srinivasan, 1978). A comprehensive survey of its use in commercial research is presented by Cattin & Wittink (1982), who identify market segmentation as one of its major applications. Conjoint analysis is a multivariate technique used specifically to understand how respondents develop preferences for products or service. 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. Conjoint analysis is unique among multivariate methods in that the researcher first constructs a set of real or hypothetical products or services by combining the selected levels of each attribute (Hair, Anderson, Tatham, & Black, 1995)

Several alternate means exist for identifying the attributes which are relevant to consumers in forming their preferences. Preliminary data collection effort, questioning consumers about attributes considered important to them, usually helps in identifying those attributes that are most frequently regarded as relevant. Focus group interview or judgments of product managers, retailers and others knowledgeable about the product/service and its uses can be used for this purpose. The more difficult and often subjective task is to reduce the number of attributes to a manageable size so that the estimation procedures are reliable while accounting for consumer preference sufficiently well.

Hair et. al. (1995) suggests 7 steps of conjoint analysis as follows: 1) determining the objectives of conjoint analysis, 2) design of a conjoint analysis, 3) assumptions of conjoint analysis, 4) estimating the conjoint model and assessing overall fit, 5) interpreting the results, 6) validating the conjoint results, 7) applying conjoint analysis results. Different from traditional benefit segmentation, a new procedure adapted to cyber mall environment has to be developed to execute conjoint analysis. We describe general considerations in market segmentation, compared with those in electronic market situation.

In the design phase of conjoint model, marketer identifies attributes by analyzing customer's preference. These attributes are called the independent variables or factors. The possible value of an attribute is called factor levels. For conjoint analysis to explain a respondent's preference structure only from overall evaluations of a set of stimuli (alternatives), the analyst must make two key decisions regarding the underlying conjoint model: relationship between attributes (additive or interactive) and relationship between levels within an attribute (linear, quadratic, or part-worth). In this paper, we assume most common and basic additive model, with which the respondent simply add up the values for each attribute to get the total value for a combination of attributes and the assumption can be attained with well-organized attributes. Furthermore, the part-worth function model provides the greatest flexibility in allowing different shapes for the preference function along each level of the attribute. In the cyber mall environment, the part-worth function model can be used effectively due to the fact that the

number of homepages considered in a shopping mall is finite and the characteristics of homepages for conjoint analysis can be described as multi-attribute categorical values, where we are forced to use the part-worth function model if the attribute is categorical.

Data collection procedures in conjoint analysis are the most basic of choices (Reibstein, Bateson, & Boulding, 1988), and have largely involved variations on two basic methods: the two-factor-at-a-time procedure, and the full-profile approach. The two-factor-at-a-time procedure (i.e., trade-off procedure) considers factors on a two-at-a-time basis. The respondent is asked to rank the various combinations of each pair of factor levels form the most preferred to the least. The full-profile approach is the method of presenting stimuli to the respondent for evaluation that consists of a complete description of the stimuli across all attributes. Full-profile approach gives a more practical description of stimuli by defining the levels of each factor and possibly taking into account the potential environmental correlation between factors in real stimuli (Green & Srinivasan, 1978). An additional advantage of the full-profile method is its ability to measure overall preference judgments directly using behaviorally oriented constructs such as intentions to buy, likelihood of trial, chances of switching to a new brand, and so on. In cyber mall environment, the full-profile method might be appropriate for data collection because we utilize customer's buying data on a certain homepage representing a complete description of a product. And that implies that a certain homepage (e.g., a brand of product) is preferred to other homepages (e.g., other brands of products).

The stimulus descriptions can be constructed in either of two ways. The more popular method is defining a number of levels for each of the attributes over the range of attribute variation. If a full factorial design is used, the number of possible stimuli quickly becomes very large. Green (1974) has suggested the use of various types of fractional factorial designs to reduce the number of combination to a manageable size while maintaining orthogonality. An alternate procedure for creating the stimulus descriptions is that of random sampling from a multivariate distribution. Random sampling procedure is likely to be better if the attribute correlation are high or if most of the attribute part-worth functions are monotone with changes in attribute levels and ordinal overall preference judgments are obtained. In cyber mall environment, the fractional-factorial design for conjoint analysis can be used because part-worth functions are applied to the multi-attribute categorical values and the fractional-factorial design is considerably easier to develop.

The presentation of the stimuli in the full profile approach has involved variations and combinations of three basic approaches: verbal description (multiple cue stimulus cards), paragraph description, and pictorial representation. In cyber mall environment, all of three approaches are applicable. Especially pictorial presentation approach is natural due to the characteristics of current multimedia web.

The various alternatives for defining a measurement scale for the dependent variable can be roughly classified as metric (cardinal) or non-metric (ordinal or nominal). In cyber mall environment, metric or non-metric variable is available depending on the type of conjoint model considered, but metric requires additional information elicitation from the customer such that how the customer evaluates a product (homepage) in a rating scale. In our case, we only use rank order information derived on the basis of customer's footnotes in the cyber mall.

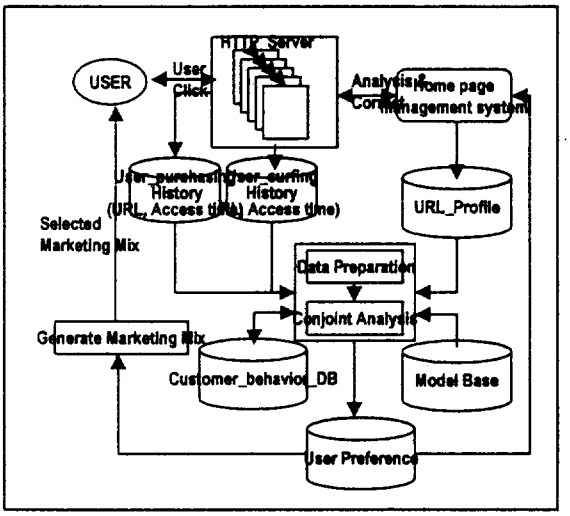
Rank order evaluations requires a modified form of analysis of variance specifically designed for ordinal data. Among the most popular and best known computer programs are MONANOVA (MONotonic ANalysis Of VAriance) and LINMAP. These programs give estimates of attribute part-worths, so that the rank order of their sum for each treatment is correlated as closely as possible to the observed rank order. If a metric measure of preference is obtained, many methods, even multiple regression can estimate the part-worths for each level.

3. A decision support system for Conjoint Segmentation

The overall system flow can be outlined as follows: a certain customer navigates through homepages for buying some products and his or her surfing or buying data are recorded automatically in the User_Visiting history database by homepage management system. The attributes and their levels of the homepages are already analyzed in URL_Profile database which will be used as source data for analysis along with customer's buying data. Further, one of various combinations of models assumed in the analysis can be selected from model base according to the situation considered. Finally, user preferences toward the attributes of products are derived and the results can be used for enhancing customer relationship in further transactions. The general architecture of conjoint analysis in electronic shopping malls is depicted in Figure 1.

In the stage of analyzing legacy homepage, a marketer analyzes the structure of Internet shopping mall homepages and then identifies the attributes and their levels of product or service.

Figure 1. DSS for Conjoint Segmentation



After creating attributes and attribute levels by analyzing legacy homepages, we construct full profile and put it to URL_Profile database in Figure 1. In data preparation, a marketer prepares data set for conjoint analysis by using information of customer's footnotes on the cyber mall, which is different method from traditional market conjoint analysis usually conducted by survey data. The method suggested in this paper requires two assumptions. The one is that a homepage in the cyber mall implies one profile for full profile method among data collection methods in conjoint analysis. The other is that the homepage on some product the customer finally bought is preferred to any other competing homepages a customer dropped by. The latter assumption implies that user holistically considers multi-attribute leveled homepages and decide product in his want when user enters into the selecting business. In a chosen time span, we can finally rank the competing homepages from the most and to the least and the rank order information is fed into conjoint model as values of dependent variables in estimation stage.

4. An illustrative example of benefit segmentation in cyber mall environment

This section offers simple example to explain the methodology suggested in section 3. We assume that there is a certain Internet shopping mall whose marketer will investigate customer's behavior and segment market.

In the stage of analyzing legacy homepage, a marketer has to analyze the structure of his Internet shopping mall and then identify the attributes and their levels of product/service displayed on it. We presume that he has identified three common attributes in homogeneous products as follows.

- Quality level: high price & high quality/ low price & low quality
- Type of product: shopping product / convenience product
- Product design: monotonic, fashionable

If three attributes with two values are selected, then eight combinations of stimuli can be formed. Subsequently, they make a table of homepage profile as shown in Table 1. Not all homepages have attributes and is denoted as N/A.

In the stage of data preparation, marketers prepare data set for analysis using customer's surfing and buying history. The key role of this step is to derive the ranking of profiles of product homepages from customer's surfing and buying history. A customer usually clicks several pages before buying some product. During browsing, he or she may click the same page several times. "Before Purchase" column tells the sequence of web pages the customer clicked before buying. The order of pages in "Before Purchase" is consistent with that of "Full History" except deleting recurrent numbers. Table 2 tells that a customer visited a shopping mall eleven times during September, 1999 and at each visit, he or she clicked web pages listed in "Full History" column, and he or she bought a product displayed on the page listed in "Purchase" column. Before deriving the ranking of profiles, we need to derive ordered pairs of preferences as shown in "Ordered Pairs" column in Table 2.

Table 1. Profiles

	Homepage address	Quality level	Product type	product design	profile
1	www.anymall.??/a1	high price & high quality	shopping product	monotonic	1
2	www.anymall.??/a2	high price & high quality	shopping product	fashionable	2
3*	www.anymall.??/a3	N/A	N/A	N/A	
4	www.anymall.??/a4	high price & high quality	convenience product	monotonic	3
5	www.anymall.??/a5	high price & high quality	convenience product	fashionable	4
6	www.anymall.??/a6	low price & low quality	shopping product	monotonic	5
7	www.anymall.??/a7	low price & low quality	shopping product	fashionable	6
8	www.anymall.??/a8	low price & low quality	convenience product	monotonic	7
9*	www.anymall.??/a9	N/A	N/A	N/A	
10	www.anymall.??/a10	low price & low quality	convenience product	fashionable	8

Table 2. Footnotes of a customer

Count	Access Time	Full History	Purchase	Before Purchase	Ordered Pairs
1	99/9/1 13:34	(5,4,5,8,1)*	1	(4,5,8)	(1,4),(1,5),(1,8)
2	99/9/3 14:39	(1,2,5,3,4,1,2,1,1,3, 2,2,5,1,2)	2	(1,3,4,5)	(2,1),(2,3),(2,4),(2,5)
3	99/9/7 06:37	(1,2,6,3,8,1,2,3)	3	(1,2,6,8)	(3,1),(3,2),(3,6),(3,8)
4	99/9/11 13:54	(3,5,7,5)	5	(3,7)	(5,3),(5,7)
5	99/9/15 19:23	(1,4,7,4,1,6,4,7,1)	1	(4,6,7,8)	(1,4),(1,6),(1,7),(1,8)
6	99/9/1917:24	(1,8)	8	(1)	(8,1)
7	99/9/20 13:39	(4,5,6,8,4,5)	5	(4,6,8)	(5,4),(5,6),(5,8)
8	99/9/21 14:14	(7,,2,3,4,2,7)	7	(2,3,4)	(7,2)(7,3),(7,4)
9	99/9/24 16:10	(5,7,1,8,5,1)	1	(5,7,8)	(1,5),(1,7),(1,8)
10	99/9/27 17:00	(6,2,7,6,2)	2	(6,7)	(2,6),(2,7)
11	99/9/29 17:00	(5,3,5,2,6,3)	3	(2,5,6)	(3,2),(3,5),(3,6)

We assume that a customer prefers the product he or she purchased to other products only considered. An ordered pair (a_1, a_2) means that product a_1 is preferable to product a_2. To make full ranking of profiles, we use the basic outranking concept. The number of a product being preferred to other products except itself is denoted in "Column Total" column. Similarly, the number of other products being preferred to a product except itself is denoted in "Row Total" row. The difference between "Column Total" and "Row Total" in each profile is denoted in "Net" column. According to the magnitude of "Net" value, we can give ranks with higher rank in larger net number. It is thought that if the user buy the same product more frequently than other competing products in a given time span, the product should be evaluated as high rank and thus the outranking concept directs to majority of dominance although exact dominance relationship does not hold. The calculation process is described in Table 3.

Table 3. Ranking of profiles

Profiles	1	2	3	4	5	6	7	8	Row Total	Net (Row-Col.)	Rank
1				2	2	1	2	3	10	7	1
2	1		1	1	1				4	1	4
3	1	1				2	1	1	6	3	2
4		1			1	1			3	-2	6
5			1	1		2	1	1	6	2	3
6									0	-6	8
7		1	1	1					3	-1	5
8	1								1	-4	7
Column Total	3	3	3	5	4	6	4	5			

Finally, in order to estimate the degree of consumer preference of each attribute, we use multiple regression with dummy variables instead of part-worth function model, where ordinary least square regression applied to integer ranks produces solutions that are very close, in terms of predictive validity (Green & Srinivasan, 1978).

$$Y = b_0 + b_1 QUALITY + b_2 TYPE + b_3 DESIGN$$

where:

Y = rank order of profiles , b0 = intercept

QUALITY = (1: high price & high quality, 0: low price & low quality) , TYPE = (1: shopping product, 0: convenience product), DESIGN = (1: monotonic design, 0: fashionable design)

Table 4. Results of multiple regression

Variable	B	SE B	Beta	t-test	p-value
DESIGN	-3.50	.612372	-.763763	-5.715	.0046
QUALITY	-2.50	.612372	-.545545	-4.082	.0151
TYPE	-1.00	.612372	-.218218	-1.633	.1778
(Constant)	8.00	.612372		13.064	.0002

Multiple R = .96362 , R Square = .92857 , Adjusted R Square = .87500
Standard Error = .86603, F test = 17.33333 Signif F = .0093
Observations = 8, DF of regression = 3, DF of residual = 4.

Table 4 shows that the variable of DESIGN is the first in importance, followed by QUALITY, and TYPE. We consider this result is only for one customer in private level. A marketer has to identify market segments on the basis of above result. Each attribute can be a segment. In this example, the consumer analyzed prefer monotonic design most of all and dislike a fashionable design of product. The marketer can e-mail to the customer an electronic handbill which will have a monotonic design of the product or shopping product or high price & high quality product. The marketer should not e-mail to the customer an electronic leaflet which was a fashionable design of the product or convenience product or low price & low quality product.

5. Concluding remarks

Lots of shopping malls continue to search for a competitive advantage in an increasingly tighter marketplace. Further, electronic market changes traditional market environment fundamentally and radically. To this end, marketers are trying to searching for intimate customer relationship for further transaction. One of those instruments for improved customer relationship may be e-mail. E-mailing to the customer indiscriminately without any consideration of customer's preferences sometimes frustrates his or her own real customers. So identifying customer's preferences and administering appropriate strategies are essential for continuous and favorable relationship with their customers. This paper suggests how to identify user's preferences in newly rising electronic markets. In detail, this paper focuses on market segmentation in Internet shopping malls. Different from traditional market segmentation, electronic market segmentation requires new data preparation procedure, where customer's footnotes through competing homepages are key data input for conjoint analysis in market segmentation. Combining appropriate conjoint model and input data automatically gathered from web server produces customer's preference toward product or service represented by Internet homepages. Finally the derived preferences are utilized for better understanding of the customer's behavior and further transactions such as e-mailing or advanced design of homepages.

The limitation of the paper to be mentioned is that customer's preferences toward products vary depending on the time span used to derive ordinal ranking of profiles. However, it is conceived that long term

investigation of a customer's footnotes on a shopping mall will reveal any tendency or convergence toward products. Otherwise, we conclude that his or her preferences are diversified and almost equal importance value should be given to the attributes.

Beyond individual evaluation, it is possible to extend the single customer's attribute estimation into representative multiple customers' case. Thus, various statistical analysis can be utilized to infer group attitude toward products, which is left as a further research.

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