

The application of fuzzy logic in measuring consumption values: Using data of Chinese consumers buying imported fruit

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Abstract

The conventional approach used to examine consumption values of consumers for a given product category is the Means-End Chain (MEC) approach. The MEC retrieves values through establishing links between product attributes and consumption values by an interviewing technique called laddering. The laddering technique is a qualitative approach with limited ability to deal with segments of consumers who hold multiple consumption values. In this research fuzzy logic theory is applied in conjunction with laddering to measure the consumption values of Chinese consumers purchasing imported fruit. Results demonstrate that fuzzy logic is not only an effective approach to quantifying the consumption values that consumers pursue in a give context, but also, when consumers hold multiple values of unequal weights, it can reveal how consumption values are mingled.

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1. Introduction

Marketers need to understand why consumers buy certain products. A common approach to addressing this issue is to examine the importance of attributes of the product and position it based on the performance of the most important attributes. However, in markets where competing products have very similar attributes this approach does not always work (Welch, 2000). Product positioning based on information about multiple product attributes is also difficult for consumers to interpret (Vriens & ter Hofstede, 2000). To position a product successfully, marketers need to categorize information about that product's attributes into the consumption values that the product can provide.

The conventional approach used to examine consumers' values in a given product category is the Means-End Chain

(MEC) theory, which assumes that the attributes of a product and consumers' consumption values are linked through the consequences of consumption (Reynolds & Gutman, 1984). MEC data are gathered through a qualitative interviewing technique known as laddering (Hinkle, 1965; Reynolds & Gutman, 1984). Laddering assumes that a homogeneous group of respondents' knowledge is organized as a poly-hierarchy, i.e., multidimensional sets of hierarchies, and also assumes that this knowledge is categorical, i.e., consisting of nominal values arranged in categories. Laddering is a form of structured interviewing in which the interviewer uses a limited set of standardized questions or probes to explore the structure and nature of the respondent's knowledge.

Although laddering has the ability to identify and establish the relationship between values and product attributes, the presumed hierarchical value structure in laddering limits its ability to deal with consumers who hold multiple values, or mixed values. It is known that consumers may not always be motivated exclusively by one consumption value (Douglas & Craig, 1997); many consumers can hold multiple values, and the degree of belonging to each value may

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differ (Hofstede, Audenaert, Steenkamp, & Wedel, 1998; Malhotra, 1996; Rugg & McGeorge, 1995). It would be helpful to be able to identify segments of individuals with similar mixed values.

Fuzzy logic is an analytical approach that allows for multiple membership of sets and different levels of belonging to any one set. The basic assumption is that no clear boundaries exist between members and non-members of a set, which has been defined as a collection of distinct things considered as a whole. The notion of fuzzy logic has been used in a wide range of topics in marketing research such as fuzzy market segments and fuzzy market structures (Hruschka, 1986; Wedel & Steenkamp, 1989; Wedel & Steenkamp, 1991); consumer preference (Mela & Lehmann, 1995); and measures of product categorization (Loken & Ward, 1990; Ozanne, Brucks, & Grewal, 1992; Viswanathan & Childers, 1999). In doing so, it presents marketing researchers with a new way to capitalize on a concept or process that contains inherent imprecision (Hruschka, 1986; Mela & Lehmann, 1995; Smithson, 1987; Varki, Cooil, & Rust, 1997; Wedel & Steenkamp, 1991; Zadeh, 1965). However, the notion of fuzzy logic theory has not been developed in marketing research as a means of assessing the consumption values that consumers pursue. In this research, we use Chinese who purchased imported fruit as a case to demonstrate that fuzzy set theory can be used as an effective approach to examining consumers' consumption values, particularly when consumers hold multiple values with different levels of emphasis.

Imported fruits have been available on a large scale in China since 1993, and the imported fruit business has since experienced burgeoning demand and high profits (Instate Pty Ltd., 1997). Though imported fruit sells in China for many times the price of its local equivalent, and sometimes at prices higher than in developed countries, there are still many willing buyers despite a much lower income of local people than that of people in developed countries and that abundance of fresh, cheap local fruit available in the market. This raises the question, "What consumption values are Chinese consumers seeking in imported fruit?" Understanding this issue is important for positioning and branding imported fruit in Chinese markets.

Zhang and Jolibert (2000) classified Chinese consumption values into three categories: symbolic values, health values and utility values based on three main Chinese doctrines, Buddhism, Taoism and Confucianism, which these authors refer to as the three pillars of Chinese cultural values. Symbolic consumption relates to products having a social value, such as the way in which a product can reflect the purchaser's ability to afford an expensive item. Health related consumption focuses on products which confer benefits such as superior nutrition, low chemical use, or other health-related benefits. Utility related consumption focuses on a product's functionality rather than on attributes such as appearance or branding. However, some authors have noted that since China has opened its doors to the western world, consumer behavior has also been

influenced by western values, labelled as 'hedonic values' (Sklair, 1994; Wei & Pan, 1999). In such a circumstance, it may be unwise to view Chinese consumers as sets of separate entities, each characterized by a particular consumption value. For example, Sun and Collins (2002) showed that for consumers purchasing imported fruit, their consumption values were mixed, but the degree of emphasis differed from group to group. As the laddering technique lacks the ability to deal with the issue of overlapping values, this research applied fuzzy set theory combined with a laddering technique to examine the importance of each identified consumption value to Chinese consumers when purchasing imported fruit, and how the different values overlapped.

2. Research methods

2.1. Research steps

The research involved four steps. The first step was to establish connection structures for each consumption value based on the data from depth interviews using the laddering technique. The connection structures were represented by favourable and unfavourable fruit attributes associated with each consumption value. The second step was a mall intercept survey conducted on a large scale ($n = 520$) using a standard questionnaire in multiple choice form. The purpose of this survey was to examine the perceptions of imported fruit buyers in a supermarket towards fruit attributes that linked to various consumption values discovered in the earlier depth interviews by laddering. The third step was to calculate the similarity of consumers' perception patterns to the connection structure of each value generated from laddering. In this process, fuzzy logic theory was applied to calculate similarity through measuring the degree of membership of each respondent to each connection structure, in other words, the degree of belonging to each consumption value. Such an approach allowed a consumer to hold multiple consumption values with different degrees of belonging to each value. Finally, in the fourth step, conventional k -means clustering was used to segment consumers based on their degree of membership of each connection structure, or consumption value. Characteristics of the membership of each segmented group revealed how consumption values overlap.

The combination of laddering and mall intercept survey was essential in this research for three reasons:

- (1) Laddering serves as a tool to discover the connection patterns for each consumption value. This is beyond the ability of a mall intercept survey, where the interviewee is normally patient for no more than 3–5 min (Malhotra, 1996). The questionnaire in multiple choice form helps to keep the intercept time short. Moreover, including questions about consumption values in the questionnaire could cause difficulty to interviewees because concepts of consumption values

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