Category role aided market segmentation approach to convenience store chain category management

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ABSTRACT

Category management (CM) plays an increasingly important role in retailing management, as it aids retailers to increase their core competitiveness, maximise profits and ensure a good long-term customer relationship. This technique has been successfully applied to diverse large manufacturers and wholesale retailers. However, it remains a challenging task to directly employ the CM technique in convenience store (CVS) chain(s). This is because CVS chains are often distributed in a variety of areas, each store has impulsive consumers, and the traditional market segmentation attributes (e.g. consumer age, salary, and background) are difficult to collect under such circumstances. This makes it impractical to apply one general CM solution to all CVS chains. Hence, it is crucial to segment a market region and then apply customised CM solutions to the corresponding segments. This paper presents an innovative market segmentation model which is driven by category-role (CR), for the first time, to support CM in CVS chains. A new similarity measure (named $HCsim()$) and an improved weighted fuzzy K-means clustering algorithm ($WFKM$) are developed in an effort to cluster the CVSs. The usefulness and applicability of this study is illustrated by means of an empirical study to provide marketing strategy decision support. The derived results are also discussed and compared with existing methods.

1. Introduction

Convenience store (CVS) refers to a small store that stocks everyday items such as groceries, beverages and snacks. Convenience is its distinguished strength that attracts consumers. Modern CVSs normally utilise store chain management methods and represent one of the fastest growing segments in the retail market. Such rapid growth brings increasing competition amongst CVS retailers. In recent years, category management (CM) [3,21,38] has gradually gained popularity in these companies to increase their core competitiveness, maximise profits and ensure long-term healthy customer relationship.

CM is a business fundamental that uncovers untapped potential to be explored. It aims to analyse consumer purchasing behaviour and stock the products that consumers are most likely to buy. The basic idea of CM is managing product categories as business unit and customising them to satisfy customers' needs [18]. More specifically, the defined categories can be used to target the consumer groups and to gain a better understanding of their needs. From early 1990s, CM can be divided into two types: product-centric CM [6,51] and consumer-centric CM [1,14,31]. Product-centric CM uses historical transaction data to gain insights into product movements, so as to identify and employ product attributes to determine a product category. This widely used approach straightforwardly reflects the movement of

products, and historical transaction data is relatively easy and cheap to collect. However, this approach reflects the overall movement of products, and it is hard to further identify customers' future needs, if no detailed consumer data is available. In consumer-centric CM, the demographics, attitudes, interests, shopping occasions and historical purchase records of consumers are taken into account to segmenting and targeting consumers who share similar purchase patterns. Subsequently, a marketing plan for each distinct consumer group is developed. This approach is driven by the understanding that consumer behaviour can change the design of a product category. A distinct advantage of this approach is that product category is designed by considering diverse customer groups, so that the derived category structure is transparent and interpretable. Also, marketing plans based on this approach can be more efficient and accurate. However, this in turn naturally requires the presence of consumer data, and if such data is not available, it is quite costly to collect.

Although CM attracts increasing attentions and some initial results have been obtained [11,14,26,43], applying conventional CM methods to CVS chain management remains a challenging task due to its distinguished features. First, CVSs are often distributed in a variety of areas and each store has impulsive consumers. For example, petrol station CVSs can be located at a city centre, the outskirts of a city or on a motorway. Within the same category, different CVSs may have to provide different products to meet the diverse requirements of their consumers. Second, due to the mobility of CVSs' consumers, especially for the CVSs located at the outskirts of a city or on a motorway, it is difficult to collect

consumer related data (e.g., the demographics, interests, and shopping occasions) by employing the royalty membership programme. Hence, the conventional consumer-centric CM approaches become less appropriate to analyse and group consumers of CVS chains. Third, CVSs are often small and have very limited storage space, such that it cannot provide a large number of product categories. This leads suppliers to invest most of their time and effort on their large retailers, rather than on CVS chains. This is evident in [1] that ACNielsen mainly provides CM support to wholesalers and supermarket chains, i.e. General Mills, Big Y, SUPERVALU, etc.

To overcome the above difficulties, this paper proposes an innovative market segmentation model which employs category roles (CRs), for the first time, to support CM in CVS chains. Due to the mobility of CVSs' consumers, the consumer related data (e.g., the demographics, interests, and shopping occasions) are difficult to collect. The proposed method is still a product-centric approach, but it is equipped with some new features: a) it is a value-centric approach that recognises the values of a category to retailers, consumers and the marketplace; b) it provides a dynamic view, since the growing potential of a category is considered rather than just focusing on a static view.

This new method takes three CR dimensions (importance to retailers, consumers, and the marketplace) into account to segment the market. Distinct market segments can receive a customised CM and marketing strategy. Additionally, the retailer can perceive the market with fine granularity, and better analyse different behaviour patterns. Initially, the historical transaction data provides a full view of the market. Such data are then used to derive a global category index (*CIX*) for each store. CVSs that share similar *CIX*s are clustered into the same group by using a new similarity measure, named *HCsim*() and an improved weighted fuzzy *K*-means clustering algorithm (WEKM). Based on the obtained clustering results, the retailer can design varied CM and marketing strategies for different CVS clusters.

The remainder of this paper is organised as follows: Section 2 reviews the existing approaches in CM and market segmentation. In Section 3, a novel method, the CR-based market segmentation model, is proposed to cluster CVSs. In addition, an improved clustering algorithm which employs *HCsim*() is also introduced in this section. The applicability and utility of the proposed method is demonstrated in Section 4 via an empirical study. The derived results are analysed and discussed in Section 5. The final section concludes this paper and points out future work directions.

2. Background

2.1. Category management

CM was introduced in 1990 as an organised process to enable retailers to effectively reach consumers, while maximising profits. It aims to find appropriate products and prices for the target customers, so that the customers are satisfied and remain loyal to retailers. Many retailers today have adopted the fundamental eight-step process [3] to conduct CM, including *Define category*, *Assign a category role*, *Assess a category*, *Set performance and scorecard*, *Create market strategy*, *Choose tactics*, *Implement the plan and Review*.

The biggest change over the years in CM is moving from product-centric [11,23,51] to consumer-centric [1,10,24]. A few researchers [10,11,31,40] have posited that different category characteristics can reflect different consumer needs. They believe that a key tenet of CM is that the retailer should decide the role each category plays in the retailer's overall portfolio. One popular classification schema to assign CR is cross-category quantitative analysis [14,26] which considers the importance to consumers, retailers and the marketplace. The typical four CRs are:

- Destination category: make the store the primary category provider. When consumers would like to purchase products in a certain category, the store is their main choice. This category plays a key role in retailing and distinguishes the store from other competitors. It involves 5%–10% of categories in the store.
- Routine category: make the store one of the preferred category providers. The price of daily necessities is not sensitive and reasonably stable. This category generates solid profits for retailers, while meeting customers' various daily needs. It involves 50%–70% of categories in the store.
- Occasional/seasonal category: make the store a major category provider when consumers would like to buy a given occasional/seasonal product. The demands for such a category are not stable and are normally short-term. It involves 10%–15% of categories in the store.
- Convenience category: this category helps the store to provide convenience to consumers, so that consumers can buy all they need from a store in one stop. It involves 10%–15% of categories in the store.

CRs are essential to maintain a consistent strategic and tactic plan that provides cohesive market approaches regarding price, promotion and assortment. It is pointed out that the same category may act as a different CR in different stores [43], so that customised category strategies should be implemented in different market segments.

2.2. Market segmentation

Market segmentation was initially defined by Smith in 1956 [42]. It has been well recognised that a mass market strategy has little chance of success in a highly competitive market. The objective of market segmentation is to divide a heterogeneous market into a number of smaller homogeneous markets in which consumers share sufficiently similar characteristics. This helps the retailer to identify the consumer groups, and use resources more effectively to match consumers' needs.

In general, existing market segmentation methods can be categorised into two main approaches [17,47,48]: the first is the priori approach [16,17]. It segments the market according to prior knowledge or speculated factors that are associated with consumers, services or products (such as demographic characteristics, purchase amounts and geographic areas). The second is a widely used approach called post-hoc segmentation. Different from the priori approach, it segments the market by analysing market data. More and more segmentation techniques are becoming available for the post-hoc approach [2,46], including clustering [12], classification and regression trees (CART) [15], self-organising map (SOM) [27], and multi-objective evolutionary algorithms (MOEA) [34].

The selection of segmentation variables is an essential step in building segmentation models. Many scholars generalise segmentation variables from many perspectives, ranging from demographic, geographic, purchasing behaviours to consumer values. Segmentation variables can be classified into two groups: general variables [33,48] and product-specific variables [44,47]. General variables focus on neighbourhoods' attributes (such as geographic, lifestyles and demographics) rather than on individual consumers. Product-specific variables concern consumers' preferences and their responses to products. These variables involve customer demands, intentions and purchasing behaviours.

Since 1956, market segmentation has dramatically expanded its applications to various domains, such as the online shopping market [28], the printed circuit board industry [8], and the tourist market [30]. However, the application of market segmentation is still at a relatively early stage for the retail industry [5,35], particularly when taking consumer demands into consideration. Currently, retailers normally employ unified or traditional segmentation attributes to segment the market, while ignoring underlying and potential consumer characteristics and demands. In particular, little research has been conducted in CVS segmentation. For CVSs, the concept of market segmentation can be employed and expanded to cluster stores into