Mining Customer Knowledge for a Recommendation System in Convenience Stores

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ABSTRACT

Taiwan's rapid economic growth with increasing personal income leads increasing numbers of young unmarried people to eat out, and shopping at convenience stores for food is indispensable to the lives of these people. Thus, it is an essential issue for convenience store owners to know how to accurately market appropriate products and to choose effective endorsers for brands or products in order to attract target consumers. Data mining is a business intelligence analysis approach with great potential to help businesses focus on the most important business information contained in a database. Therefore, this study uses the Apriori algorithm as an association rules approach, and clustering analysis for data mining. The authors divide consumers into three groups by their consumer profiles and then find each group's product preference mixes, product endorsers, and product/brand line extensions for new product development. These are developed as a recommendation system for 7-11 convenience stores in Taiwan.

Keywords: Brand and Product Line Extensions, Business Intelligence, Convenience Stores, Data Mining, Endorsers, Recommendation System

INTRODUCTION

In the past decades there have been major changes in Taiwanese society: dual-earner households have become increasingly common, female employment has increased, personal income is higher, working hours are longer, and the pace of life is faster. Accordingly, the Taiwanese lifestyle and dietary habits have gradually changed from eating traditional self-cooked meals at home to eating outside. According to a survey in Global View Magazine from 2007, more than 70% of Taiwanese eat out daily, with up to 3 million eating out at least one meal and about 1.7 million eating out for all their meals. If each of them spent 10 thousand NT dollars per month, there would be an annual commercial opportunity of at least several hundred billion dollars. Therefore, many convenience store proprietors are interested in such a huge business opportunity and want to promote their personalized products. If the patterns of individual lifestyles and expenditures have been formed, these trends will become increasingly apparent to retailers.

Retail markets are now more diverse and fragmented than ever before, presenting consumers with an overload of information and alternatives. In this regard, retailers must add value, provide services, and assist in providing more product selection. Thus, product line development has become a critical strategy for retailing since it can allow segments of customers to select and purchase products with ample product alternatives, and do so through a one-stop-shopping service. On the other hand, many retail categories have witnessed the rapid growth of low-priced private label versions of products. For example, from negligible levels in the 1950s, private label brand sales represented approximately 18% of the US retail market by the mid-1990s (Liesse, 1993a,b). These private label brand products are priced lower than nationally advertised brands and frequently offer equivalent quality (Sanchez & Mahoney, 1997). The original market position of these food brands was a lower price/lower quality alternative to manufacturer brands; but they have gradually been repositioned, their quality improved and are increasingly associated with new product launches. This has been facilitated in large part by the increased willingness of retailing brand manufacturers to supply quality-equivalent private labels (Soberman & Parker, 2004). In the area of product development and private brand labels, how retailers can expand their product and brand categories using product line and brand extension has become a critical issue in retailing research (Roedder et al., 1998; Ang et al., 2000; Liao et al., 2008).

As a type of information technology aimed at supporting personalized service, recommendation systems are widely used by business practitioners and have become an important research topic in information sciences and decision support systems (Liang et al., 2008). Recommendation systems are decision aids that analyze a customer's prior online behavior and present information on products to match the customer's preferences. Through analyzing the consumer's purchase history or communicating with them, recommendation systems employ quantitative and qualitative methods to discover the products that best suit the customer. Most of the current recommendation systems recommend products that have a high probability of being purchased (Bodapati, 2008). They employ content-based filtering (CBF) (Zenebe & Norcio, 2009), collaborative filtering (CF) (Herlocker et al., 2004), recommendation based on network structure and graph theory (NSGT) (Wang et al., 2008), and hybrid recommendation (Yin & Ping, 2012) and other data mining techniques, for example, clustering (Liu & Shih, 2005), association rules (Jie et al., 2009), rough-set (Su et al., 2010), semantic approaches (Liang et al., 2008), and OLAP (Giacometti et al., 2011). Other literature focuses on the influence of recommendation systems on customer's purchase behavior (Senecal & Nantel, 2004; Bodapati, 2008). These studies argue that the recommendation decision should be based not on purchase probability, but rather on the sensitivity of purchase probability due to the recommendation action. Common wisdom regards a recommendation system as successful

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