Expert Systems with Applications 37 (2010) 7489–7496

Contents lists available at ScienceDirect

Expert Systems with Applications

journal homepage: www.elsevier.com/locate/eswa

Integration of data mining technologies to analyze customer value for the automotive maintenance industry

Yi-Hui Liang *

Department of Information Management, I-SHUO University, 1, Section 1, Hsueh-Cheng Rd., Ta-Hsu Hsiang, Kaohsiung 840, Taiwan, ROC

ARTICLE INFO

Keywords:
Customer value
Customer relationship management
Data mining
The automotive maintenance industry

ABSTRACT

Customer value refers to the potential contribution of customers to an enterprise during specific periods. When enterprises understand the value of customers, enterprises that understand customer value can provide customized service to different customers and thus achieve effective customer relationship management. This study focuses on the current automotive maintenance industry in Taiwan and systematically integrates numerous data mining technologies to analyze customer value and thus promote customer value. This investigation first applies the *K*-means and SOM methods to establish a customer value analysis model for analyzing customer value. By the results of the two methods, the customers are divided into high, middle and low value groups. Moreover, further analysis is conducted for clustering variables using the LSD and Turkey HSD tests. Subsequently, decision tree theory is utilized to mine the characteristics of each customer segment. Third, this study develops different strategies for customers with different values and thus promoted customer value. The analytical results in this study can provide a valuable reference with regard to customer relationship management for managers in the automotive maintenance industry.

© 2010 Elsevier Ltd. All rights reserved.

1. Introduction

Customer relationship management (CRM) denotes that managerial efforts to business processes and technologies that designed to understand the customers of a firm (Kim, Suh, & Hwang, 2003). Successful CRM requires enterprises to interact flexibly with their customers (Edelstein, 2000). Enterprises that succeed in correctly assessing customer value can offer customized services to diverse customers, perform effective customer relationship management and, simultaneously, also increase enterprise revenues (Berson, Smith, Smith, & Thearling, 2000).

Customer value indicates the potential contribution of customers to an enterprise during specific periods. The core of CRM activities primarily involves understanding customer profitability and retaining profitable customers (Hawkes, 2000). Numerous enterprises start to measure customer value and utilize this information in management to retain customers and maximize their profit potential (Hawkes, 2000; Kim, Jung, Suh, & Hwang, 2006; Verhoef & Donkers, 2001).

Enterprises utilize market segmentation to identify customer segments that are most interested particular goods and services, and to concentrate their resources on the most efficient and effective ways (Jang, Morrison, & O'Leary, 2002). Restated, enterprises can help homogenous smaller customer cluster with similar customer value via market segmentation and thus efficiently focus their efforts, identify opportunities and develop products and services strategies in a tailor-made manner (Jang et al., 2002). Therefore, enterprises are required to evaluate the value of their customers, segment customers based on customer value and develop strategies for every customer segment to acquire and retain profitable customers.

Data mining technology can be employed to excavate out hidden information behind the data and identify useful patterns and associations. Many data mining technologies including *K*-means and Self-Organizing Map (SOM) methods can supply enterprises with better methods of segmenting their customers and developing marketing strategies tailored to specific segments and individuals (McCarty & Hastak, 2007). Otherwise, decision trees theory can produce meaningful rules governing the underlying relationships of a dataset and can be used for classification and prediction. This study utilized the decision tree theory to mine the characteristics of each customer segment.

Many studies have employed data mining to analyze customer data until now, but few studies have tried to systematically integrate numerous data mining technologies within the same field.

Therefore, this study analyzes customer data for Taiwanese automotive maintenance industry by systematically integrating data mining approaches to analyze customer value. First, the *K*-means and SOM methods are adopted to perform customer value

---

* Tel.: +886 7 6577711x6572; fax: +886 7 6577056.
E-mail address: german@isu.edu.tw

0957-4174/$ - see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.eswa.2010.04.097

analysis and segment customers based on customer value. Secondly, decision tree is used to mine the characteristics of each customer segment. Third, different strategies are developed for differently valued customer segments and customer value is thus promoted. Results of this study can provide useful CRM information for the automotive maintenance industry.

2. Literature overview

2.1. The automotive maintenance industry

The Executive Yuan of the Republic of China (Taiwan) defines the business scope of the automotive maintenance industry as including cleaning, lubrication, checking, adjusting, maintaining, and changing parts of automobiles. Maintenance includes automobile wheel making position and the automobile electrical machinery business, but doe not include cleaning cars without other maintenance activity.

The Commercial Trade Council of the Automotive Maintenance Industry in Taipei estimated the number of the domestic automotive maintenance factories in April 2007 as nearly 9180, of which 300 were registered as the first class, 700 were registered the second class, while nearly 8000 were smaller ones. However, many factories have not registered according to the law, and the estimated number of factories is three times the number registered according to regulation.

The handout issued by the Bureau of Employment and Vocational Training in Taiwan states that the automobile maintenance industry has three characteristics:

1. It is service-driven.
2. It highly emphasizes customer satisfaction.

It must constantly strengthen customer management.

2.2. Customer value

Kotler (2000) defined customer value as the difference between the benefits which enterprises obtained from customer of enterprises and the costs incurred in attracting and serving customers. Customer value is fundamental to customer relationship management. It can be a starting point of customer relationship management to understand and measure the true value of a customer (Kim et al., 2006). As enterprises successfully improve the lifetime value of customers, they will improve their investment returns, enhance customer loyalty, increase the profits from the existing customers, and improve the value of their database, and so on.

The generation of superior customer value is on the base of a company's competitive advantage (Guenzi & Gabriele, 2007). Furthermore, superior customer value creates a comparative advantage if the company can financially benefit from the exchange in the long term, namely, to create such value more efficiently and effectively than its competitors (Slater & Narver, 2000).

Kahan (1998) supposed that RFM rule is easy to use and implemented quickly. Moreover, Marcus (1998) noted that decisions and managers of enterprises can understand RFM rule. RFM rule is generally acknowledged as the most popular customer value analytical method at present. However, the disadvantage of RFM rule may pay much attention on transaction information and ignore individual difference (McCarty & Hastak, 2007). McCarty and Hastak (2007) suggested that RFM rule is an acceptable procedure in any circumstances, except for low response rate to a mailing and mailing relatively small portion of database in direct marketing.

RFM rule is used to analyze customer value by enterprises with three dimensions. The three dimensions are *R* (recency; the time recently), *M* (money; the total amount of money) and *F* (frequency; the frequency). Enterprises can get the customer value specifically through the above three kinds of analysis indexes. Help enterprises to confirm the characteristics of potential customers and existing customers which are the most capable and willing, and planned to buy most.

R variable means the difference between the time that customer purchased the last time and the time that analyze now. Generally speaking, the smaller the time that customer purchased recently is or customer finishes buying the last time, the more possible customer is considered to buy once again. The value which the above customers to enterprises are higher compared with other customers.

M variable means the total amount of money of enterprise product which customers bought during certain time. Generally speaking, the more the amount of money which customer bought is, the higher its relative importance to enterprise is. On the contrary, the fewer the amount of money which customer bought is, the lower its relative importance or the value to enterprises is.

F variable means the frequency of the products customer bought during certain time (in one month, one season or one year). The higher the frequency is, then the more relatively higher the loyalty of customer to the products of enterprises is. This above customer is also relatively important to enterprises. Therefore, the value of the customers to enterprises is higher than others.

2.2.1. Customer segmentation based on customer value and data mining technology

Market segmentation subdivides the customers into distinct subsets of customers, where any subsets may conceivably be chosen as a target market to be reached with a distinct marketing mix (Kotler, 1999).

Data mining is gradually more and more important for businesses. Enterprises can quickly and effectively find complex customer data from large quantities of data by data mining to help understand and interact with them by suitable marketing tactics, increase the value to the customer, and improve their competitive advantages of enterprises (Cerny, 2001). Cheng, Chang, and Liu (2005) supposed that data mining technology could help business in customer relationship management as listed in the following:

1. Improve business efficiency in the least budget.
2. Utilize database marketing to maintain customer relationship.
3. Increase customer loyalty and customer value contribution, decrease customer loss rate.
4. Learn customer need to develop strategy.
5. Evaluate the effectiveness of advertisement and promotion.
6. Control competitive advantages and improve brand orientation.
7. Respond to the expectation of customer and strengthen service quality.

The main function of data mining technology usually dived into five kinds. The five kinds are classification, estimate, clustering, association rule and prediction (Cheng et al., 2005).

Clustering is generally utilized for market segmentation. Smith (1956) proposed the concept of market segmentation and indicated that market segmentation involves viewing a heterogeneous market as many smaller homogenous markets, in response of differing preferences, attributable to the desires of customers for more accurate satisfactions of their varying wants. Kotler (2000) supposed that market segmentation can be used to identify and profile distinct groups of buyers who might prefer or require varying products and marketing mixes and next these enterprises decides which segments present the greatest opportunity. Until now, above concept still play a crucial role.

دریافت فوری ← متن کامل مقاله

ISIArticles
مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات