



A novel decision rules approach for customer relationship management of the airline market

James J.H. Liou *

Department of Air Transportation, Kainan University, No. 1, Kainan Road, Luchu, Taoyuan 338, Taiwan

ARTICLE INFO

Keywords:

Dominance
Rough set
Customer relationship management
Data mining
Factor analysis

ABSTRACT

Customer churn means the loss of existing customers to a competitor. Accurately predicting customer behavior may help firms to minimize this loss by proactively building a lasting relationship with their customers. In this paper, the application of the factor analysis and the Variable Consistency Dominance-based Rough Set Approach (VC-DRSA) in the customer relationship management (CRM) of the airline market is introduced. A set of “if...then...” decision rules are used as the preference model to classify customers by a set of criteria and regular attributes. The proposed method can determine the competitive position of an airline by understanding the behavior of its customers based on their perception of choice, and so develop the appropriate marketing strategies. A large sample of customers from an international airline is used to derive a set of rules and to evaluate its prediction ability.

© 2008 Elsevier Ltd. All rights reserved.

1. Introduction

Customer relationship management (CRM) is crucial in today's airline business because of globalization, increasing competition, market saturation and rapid advances in technology. The aim of CRM is to understand the profitability of their customers and to retain the profitable ones. Therefore, many firms need to be able to determine the value of their customers in order to retain or even cultivate the potential profit of customers (Hawkes, 2000). CRM is a dynamic process of managing a customer–company relationship such that customers elect to continue mutually beneficial commercial exchanges and at the same time are dissuaded from participating in exchanges that are unprofitable to the company (Bergeron, 2002). CRM is a key business strategy in which a firm needs to stay focused on the needs of its customers and must integrate a customer-oriented approach throughout the organization.

The trend of increasing competition and decreasing customer loyalty have led to the emergence of concepts that push from a product orientation to a customer orientation and that define their market strategy from the outside-in and not from the inside-out. The focus here is on customer needs rather than on product features (Ozgener & Iraz, 2006). This shift in organizational culture challenges airlines to revise their organizational system and processes, identify customer-related metrics, and identify areas of strategic advantage. To address this customer focus, discussion on data management, availability, data warehousing, and data mining are occurring at various levels within the airline compa-

nies, from booking, check-in, cabin service, customer complaint handling to frequent flyer incentives. An important driver of this change is the advent of CRM, which is underpinned by the information and communication technologies (Ryals & Knox, 2001). Thus, a clear shift toward data-based decision making, using so-called data mining or knowledge discovering techniques is evident.

Data mining – the extraction of hidden predictive information from a large database – is a useful tool for airlines that can identify valuable customers, predict future behaviors, and enables firms to make proactive, knowledge-driven decisions. The Variable Consistency Dominance-based Rough Set Approach (VC-DRSA) originally developed by Greco, Matarazzo, and Slowinski (1998, 2000) and extended by Blaszczynski, Greco, and Slowinski (2007) is a relatively new approach in data mining, and is very useful for data reduction in both quantitative and qualitative analysis. The decision rule preference model resulting from the VC-DRSA can even represent inconsistent preferences (Blaszczynski et al., 2007). Unlike conventional data analysis, which uses a statistical inferential technique, the rough set approach is based on data mining techniques for discovering knowledge (Goh & Law, 2003). According to Zhu, Premkumar, Zhang, and Chu (2001), the rough set method does not require additional information about the data; it can work with imprecise values or uncertain data, and is able to discover important facts hidden in that data and express them in natural language. The rough set theory has been successfully applied in a variety of fields, including: evaluation of bankruptcy risk (Slowinski & Zopounidis, 1995), business failure prediction (Beynon & Peel, 2001), travel demand analysis (Goh & Law, 2003), mining stock prices (Wang, 2003), insurance market (Shyng, Wang, Tzeng, & Wu, 2007), accident prevention (Wong & Chung, 2007), customers'

* Tel.: +886 3 3412500x6064; fax: +886 3 3416912.

E-mail address: jhliou@mail.knu.edu.tw

classification of telecommunication services (Blaszczynski et al., 2007) etc.

The objective of this research was to apply the VC-DRSA data mining technique to investigate the behaviors of customers in the airline market, and to develop an appropriate CRM strategy for personalized marketing that could contribute to the enhancement of the long-term relationships with exiting customers. The rest of this paper is structured as follows: In Section 2, some of the important previous researches regarding CRM are summarized, and in Section 3, the basic concept of the VC-DRSA is introduced. In Section 4, an empirical example is illustrated for use in the validation of the proposed model. The results and discussions of the empirical study are presented in Section 5. Finally, in Section 6 some conclusions are drawn.

2. A brief review of CRM

With the ever-increasing competition for marketing dominance, many firms have utilized the CRM system for improved business intelligence, better decision making, enhanced customer relations, and increased quality of services and product offerings. The underpinning of the customer-oriented management concept is that identification and satisfaction of customers must lead to improved customer retention, which is based on corporate profitability (Roh, Ahn, & Han, 2005). There are various definitions of CRM in the literature. Among the most representative, Day and Van den Bulte (2002) define CRM as a cross-functional process for achieving a continuing dialogue with customers, across all their contact and access points, with personalized treatment of the most valuable customers, to increase customer retention and the effectiveness of marketing initiatives. Another one is that CRM is an active, participatory and interactive relationship between business and customer (Ozgener & Iraz, 2006).

Although CRM escalated into a topic of major importance a decade ago, its origins which involve building relationships of mutual value between companies and customers have been in existence since the start of commerce (Gronroos, 1996). CRM takes a wide view and is an attitude towards customers and to the organization itself, which dynamically integrates sales, marketing and the customer care service in order to create and add value for the company and its customers (Chalmeta, 2006). Several recent trends have impacted the ability of organizations to build more enduring relationships, especially for those businesses with a large customer base. Amongst the most important ones are: the increasing power of personal computers; the availability of increasingly sophisticated tools to undertake data mining and data analysis; the rise of e-commerce and the ability to be able to target customers via the Internet at a much lower cost; and an increased recognition of the importance of customer retention and customer lifetime value (Payne & Frow, 2004).

Many studies in marketing suggest that using data mining tools in CRM can enhance a firm's performance. By means of the data mining technology large databases can be explored to find previously unknown relationships and trends that can provide support for complex decisions (Ozgener & Iraz, 2006). Gustafsson, Johnson, and Roos (2005) studied telecommunication services to examine the effects of customer satisfaction and behavior on customer retention. Results indicated a need for CRM managers to more accurately determine customer satisfaction in order to reduce customer churn. Mithas, Krishnan, and Fornell (2005) studied the effects of CRM initiatives showing that CRM efforts improved a firm's knowledge of their customers and in turn, improved customer satisfaction. They also determined that sharing CRM information with suppliers created gains in customer knowledge. Kim, Jung, Suh, and Hwang (2006) proposed a framework for analyzing customer

value and segmenting customers based on their value. After segmenting customers based on their value, strategy building based on the mined information can be carried out by the company.

Despite its apparent value, the literature on data mining and its application to CRM in the airline market is virtually silent. In this emerging research area, the present study can provide insight for research and theory development. In the next section, the concept of the VC-DRSA theory will be introduced.

3. The basic concept of VC-DRSA

The rough set theory, first introduced by Pawlak (1982), is a valuable mathematical tool to deal with vagueness and uncertainty (Pawlak, 1997). For a long time, however, the use of the rough set approach and the use of data mining techniques in general were restricted to classification problems where the preference order of evaluations was not considered. This was due to the fact that the classical rough set approach cannot handle inconsistencies (i.e., preferences not satisfying the Pareto-dominance principle) as a result of the violation of the dominance principle (Greco, Matarazzo, & Slowinski, 2001). In order to deal with this particular kind of inconsistency a number of methodological changes to the original rough sets theory were necessary. Greco et al. (1998) proposed an extension of the rough set theory based on the dominance principle, which permits it to deal with inconsistencies. This method is mainly based on substituting the indiscernibility relation by a dominance relation in the rough approximation of decision classes. However, the decision rules induced from the lower approximations of the Dominance-based Rough Set Approach (DSRA) are sometimes weak in that only a few objects support them. For this reason, a variant of DSRA, called VC-DRSA, has been proposed (Blaszczynski et al., 2007). It allows some inconsistency in the lower approximations of sets by a parameter called consistency level. It is more general than the classic functional or relational model and is more understandable for users because of its natural syntax and because it considers the inconsistency of real-life. The basic concepts of the VC-DRSA are described as follows (Blaszczynski et al., 2007; Greco et al., 1998, 2000, 2001, Greco, Matarazzo, & Slowinski, 2002).

3.1. Data table

For algorithmic reasons, the information regarding the objects is supplied in the form of a data table, in which the separate rows refer to distinct objects (actions), and where the columns refer to the different attributes or criteria (attributes with preference-ordered domains) that are considered. Each cell of this table indicates an evaluation (quantitative or qualitative) of the object placed in that row by means of the attribute/criterion in the corresponding column.

Formally, a data table is the 4-tuple information system $IS = (U, Q, V, f)$, where U is a finite set of objects (universe), $Q = \{q_1, q_2, \dots, q_m\}$ is a finite set of attributes/criteria, V_q is the domain of attribute/criterion q , $V = \cup_{q \in Q} V_q$ and $f: U \times Q \rightarrow V$ is a total function such that $f(x, q) \in V_q$ for each $q \in Q$, $x \in U$, called information function. The set Q is usually divided into set C of condition attributes and set D of decision attributes.

3.2. Rough approximation by means of the dominance relationship

Let \succeq_q be an outranking relation to U with reference to criterion $q \in Q$, such that $x \succeq_q y$ means that "x is at least as good as y with respect to criterion q". Suppose that \succeq_q is a complete preorder, i.e., a strongly complete (which means that for each $x, y \in U$, at least one of $x \succeq_q y$ and $y \succeq_q x$ is verified, and thus x and y are always comparable with respect to criterion q) and transitive binary rela-

متن کامل مقاله

دریافت فوری ←

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