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A Data Mining Based Approach to a Firm's Marketing Channel

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Abstract

Firms need to collect and analyze marketing data in order to have a competitive advantage in the sector. The aim of this research is to extract knowledge from an international firm's marketing channel to improve the efficiency of the marketing system. The Cross Industry Standard Process for Data Mining (CRISP-DM) is used to analyze the survey data. Data are clustered by applying a Kohonen Self Organizing Map (SOM) to reduce the attributes. Anomaly detection analysis is applied. We generate a C5.0 Decision Tree (DT) model used for predicting the marketing channel firms' complaints with very high accuracy. Decision rules are also extracted.

1. Introduction

A marketing channel, which delivers a firm's products and services to consumers, is one of the critical success factors in a marketing system to achieve marketing objectives. If a firm doesn't know its marketing channel well, it

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can't manage it. Firstly, the firm must collect data from its marketing channel. The firm needs to analyze data seriously to have a competitive advantage in the sector.

Data Mining (DM), which is the process of automatically searching large volumes of data to extract knowledge from them a in a human-understandable structure, helps analysts to recognize relationships within data.

Applying DM techniques to marketing data is extremely useful to find interesting, previously unknown, hidden patterns, which can then be better defined, in massive datasets. In this manner, DM helps to find important knowledge from the marketing channel. The achieved knowledge has a strategic importance in terms of competition and improvement of marketing and production for the firm. This is because knowledge achieved can help to improve the communication between the marketing channel and the firm by better controlling the processes, and by knowing the details about them.

One important type of knowledge that can be obtained from data mining is the decision tree (DT), which is constructed from existing data to classify future data. DTs are an effective method of classifying data set entries and can provide good decision support capabilities. DTs have several advantages over other data mining methods, including being human- interpretable, well-organized, computationally inexpensive, and capable of dealing with noisy data. Due to these merits, DTs are probably the most popular mining method [1]. There have been numerous studies in marketing which use decision trees (DTs) [2, 3, 4, 5, 6, 7, 8, 9].

Among the data mining techniques, cluster analysis helps in the classification of data. Cluster analysis seeks to maximize between-group variances and minimize within-group variances, including both hierarchical and non-hierarchical methods [10].

In the literature, Kohonen's SOM is one of the techniques used for dimension reduction. Malone et al. [11] demonstrated a trained SOM (Self-Organizing Map) which could provide initial information for extracting rules that describe cluster boundaries. Wang et al. [12] used an SOM for pattern analysis and a fuzzy inference system to capture the chaotic trend to provide short-term (hourly) and long-term (daily) Web traffic trend predictions. Fessant et al. [13] used Kohonen SOMs and they showed how the mining of network measurement data can reveal the usage patterns of ADSL customers. Maiorana [14] proposed a feature selection method based on a clustering algorithm belonging to the Kohonen SOM family. Gomez-Carracedo et al. [15] applied Kohonen SOMs to perform pattern recognition in four datasets of roadside soil samples obtained in four sampling seasons over a one year period. They used CART as an objective variable selection step before the SOM grouping. Eshghi et al. [16] compared three clustering techniques: traditional clustering methods, Kohonen maps and latent class models. Nohuddin et al. [17] introduced a technique that uses frequent pattern mining and SOM techniques to identify, group and analyze trends in sequences of time stamped social networks so as to identify interesting trends. In recent years, the Kohonen SOM method has been used in marketing [18, 19, 20, 21, 22].

In this research, we use CRISP-DM, which was developed in 1996 by analysts representing DaimlerChrysler, SPSS, and NCR. CRISP provides a nonproprietary and freely available standard process for fitting DM into the general problem-solving strategy of a business or research unit. According to CRISP-DM, which is shown in Fig. 1, a given DM project has a life cycle consisting of six phases. The phase sequence is adaptive. That is, the next phase in the sequence often depends on the outcomes associated with the preceding phase [23].