DATA MINING AND ITS APPLICATIONS IN CRM

PRIMJENA RUDARENJA PODATAKA U SVRHU CRM-A

MILETIC, Danijel

Abstract: *Group of techic and business processes is called customer relationship management, and CRM is a strategy for establishing customer relationship. CRM is a newer concept created at the time of significant growth of interest in direct contact with customers and impressions of ICT equipment that allows such a thing and supports. Data mining is an example of one new technology, which can help to discover hidden knowledge from an organization's databases with a view to making better business decision. This article aims to investigate how data mining techniques can be applied in customer relationship management (CRM).*

Key words: *customer relationship management, CRM, data mining*

Sažetak: *Skup metoda i poslovnih procesa naziva se upravljanjem odnosima s klijentima, a CRM (Customer Relationship Management) je strategija uspostavljanja odnosa s klijentima. CRM je noviji pojam stvoren u vrijeme značajnog porasta zanimanja za neposredno kontaktiranje s kupcima te pojavljivanja informatičke i komunikacijske opreme koja tako nešto omogućuje i podupire. Rudarenje podataka je primjer nove tehnologije koja omogućuje otkrivanje novih informacija iz poslovnih podatkovnih baza s ciljem donošenja boljih poslovnih odluka. Ovaj članak ima za cilj istražiti kako se tehnike rudarenja podataka mogu primijeniti u svrhu upravljanja odnosa s klijentima.*

Key words: *upravljanje odnosa s klijentima, CRM, rudarenje podataka*

Authors data: Danijel **Miletic**, President of the management board, FIMA Global Invest Ltd., Varaždin, danijel.miletic@gmail.com

1. Introduction

Data mining, or knowledge discovery from databases (KDD), is the search for valuable information within large volumes of data [1], which can then be used to predict, model or identify interrelationships within the data. By utilizing data mining techniques, organizations can gain the ability to predict future trends in both the markets and customer behaviors. By providing detailed analyses of current markets and customers, data mining gives organizations the opportunity to better meet the needs of its customers. Some of the business areas with an early adoption of data mining into their processes are banking, insurance, retail and telecom. More recently it has been adopted in pharmaceutics, health, government and all sorts of e-businesses. The most well-known business applications of data mining technology are in marketing, customer relationship management and fraud detection. CRM is arguably a progression from data warehousing. One of the principle functions of CRM systems is indeed to collect as much data about each customer as is possible. This information is then stored to be used at a later stage to give guests as much of a personalized service as possible when they return. Data that companies have compiled over the years about their customers, would need to be used intelligently in order to be enable predictions about consumer behavior as well as the anticipation of needs or even problems.

2. Data mining methods

Data mining methods can generally be grouped into four categories: classification, clustering, association rules and information visualization. The following subsections will describe these in further detail.

2.1. Classification

Databases are full of hidden information that can help to make important business decisions. Classification involves using an algorithm to find a model that describes a data class or concept [2]. By identifying a series of predefined labels, items can be categorized into classes according to its attributes (e.g., age or income).
Popular classification techniques include Decision Trees and Bayesian Networks.

2.2. Clustering

Where classification is thought of as a supervised learning technique because it uses a set of predefined class labels, clustering is an unsupervised learning technique. Because no assumptions are made about the structure of the data, clustering can uncover previously hidden and unexpected trends or patterns. Clustering involves grouping items into “natural” clusters based on their similarities. Each item in a cluster is similar to those within its cluster, but dissimilar to those items in other clusters. In this way, clustering is commonly used to identify customer affinity groups with the aim of targeting with specialized marketing promotions. Common clustering techniques include K-means and Kohonen Networks.

2.3. Association rules

Association rules are mainly used to find relationships between two or more items in a database. Association rules are in a set of transactions, this means that those containing the items X, tend to contain the items Y. Such an association rule is usually measured by *support* and *confidence*, where the *support* is the percentage of both X and Y contained in all transactions and the *confidence* is calculated by dividing the number of transactions supporting the rule by the number of transactions supporting the rule body [3]. For example, this technique is commonly used to identify which items are regularly purchased together or to identify the navigational paths of users through an online store. The discovery of such relationships can help in many business decisions, such as customer shopping behavior analysis, recommendations, and catalog design [2].

2.4. Information visualization

Information visualization is based on an assumption that human beings are very good at perceiving structure in visual forms. The basic idea is to present the data with some graphics, for example, 2D graphics and 3D graphics, allowing the human to gain insight from the data, draw conclusions, and directly interact with the data [4]. Since the user is directly involved in the exploration process, shifting and adjusting the exploration goals is automatically done if necessary. This approach is especially useful when little is known about the data and the exploration goals are vague, for example, analyzing the path of customers through an online store.

3. Applying Data Mining in CRM

In order to build good models for CRM system, there are a number of steps to follow. The basic steps of data mining for effective CRM are:

1. Define business problem,
2. Build marketing database,
3. Explore data,
4. Prepare data for modeling,
5. Build model,
6. Evaluate model,
7. Deploy model and results [5].

3.1. Defining business problem

Every single CRM application has one or more business issues for which appropriate model is built, depending on specific goal, such as "increasing the response rate". An effective statement of the problem includes a way of measuring the results of the CRM project.

3.2. Building marketing database

These steps constitute the core of the data preparation, and they take more time and effort than all the other steps together. Operational databases and corporate data warehouse often doesn't contain the date in the form we need, so we have to build

"marketing database". After building marketing database, we have to clean it up (integrate, consolidate data into a single marketing database).

3.3. Exploring the data

We must understand our data, before we can start building good predictive models. First steps are making descriptive statistic such as averages, standard deviations and looking at the distribution of the data. Visualization and graphing tools are very useful aid in data preparation.

3.4. Preparing data for modeling

This is the final data preparation step before building models and it's consisting of four main parts. First is selection the variables on which to build the model. The next step is to construct new predictors derived from the raw data. After that step, we have to select a sample of our data on which to build models. Last step is transforming variables in accordance with the requirements of the algorithm we choose for building the model.

3.5. Data mining model building

This step is an iterative process and we will need to explore alternative models to find the one that is most useful in solving our business problem. Most CRM applications are based on a protocol called supervised learning.

3.6. Results evaluation

Accuracy is perhaps the most overrated metric for evaluating results. Another measure that is frequently used is lift, and it measures the improvement achieved by a predictive model.

3.7. Incorporating data mining in CRM solution

Data mining is often a small part of the final CRM application. The way data mining is built into the application depends of the customer interaction (inbound or outbound).

Outbound interactions are contacts such as in a direct mail campaign or an advertising campaign. On the other hand, contacts such as telephone order, and internet order, or a customer service call are include in inbound interactions. In both case, the key issue in applying a model to new data is the transformations we used in building the model. For example: if the input data contains age, income and gender fields, but the model requires the age-to-income ratio and gender has been changed into two binary variables, we must transform our input data accordingly.

4. Strength and weaknesses of data mining methods

Strength and weaknesses of this methodology is often distorted interpreted as the solution of business problems or solutions to all problems of modern business. Main strengths are saving time, multidisciplinary applicability, segmentation, data safety

improvement, better database utilization, etc. On the other hand, the main weaknesses are closely connected with private policy (costumer personal data), security problems, incorrect information interpretation and fraud.

5. Conclusion

In summary, data mining can be used to discover novel and interesting relationships from large business databases. These can then be used to enhance an organization's productivity by supporting their CRM functions. This paper provides a background to data mining and has given some examples of how data mining supports CRM, especially focusing customer analysis and marketing strategies. By exploiting the full potential of data mining techniques, organizations can meet their customers' needs in the best possible way.

6. References

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