

# Mining the text information to optimizing the customer relationship management

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## Abstract

Customer data warehouse and mining are able to provide the structure of recording of the whole customers' information, the flow of detecting the important customers systematically, the change of identifying the individual and valuable customers in the whole name list of customers or discovering the royal customers. Generally speaking, it is no doubt that "customer relationship" is one of the most important factors to construct the core of competitiveness, especial in service industries for running business forever. Therefore, the objective of this research is to apply the data warehouse and data mining technologies to analyze the customers' behavior in order to form the right of customers' profile and its growth model under Internet and e-commerce environment. This could provide the best service model owing to the enounced of customer-orientation and making more effective marketing strategy. Consequently, a case study will be presented to verify the feasibility and effectiveness of the approach proposed in this research.

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## 1. Introduction

Linoff and Berry (2002) indicate that when managing hundreds of thousands of customers, businesses will have difficulty sustaining the rising costs created by interactions among people. However, if all customer data is inputted into a database, the resulting records will provide a detailed profile of these customers and their interactions with one another, and will be an important resource for businesses that wish to probe customer data, customer needs, and customer satisfaction levels (Aha, Kibler, Albert, & Albert, 1991). Data mining uses transaction data to gain a better understanding of customers and effectively discover hidden knowledge through the insertion of business intelligence into the process of customer relationship management. More precisely speaking, it replaces artificial intelligence,

and for this reason the technology has become popular in recent years. Data warehousing, then, is a useful and accurate tool for assembling a business's dispersed heterogeneous data and providing unified convenient information access technique, because it can process large amounts of information with the support of its unique data storage structure and network architecture. In the business world, once the foundation of a data warehousing system is laid, data mining technology can be used to transform hidden knowledge into manifest knowledge. The results improve the independent decision-making abilities of employees and help businesses attain Gates's model: Digital activity as the kernel for building business processes and providing timely information to appropriate decision-making units (Gates, 1999).

Popularizing information automation has resulted in heavy utilization of information technologies, such as the internet and automated telephone answering systems, construction of dynamic websites, and implementation of ERP and operational CRM systems; their emphases are on process optimization and efficient, highly precise account

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management. With the increased popularity of personalization management, the integrated CRM aim to seek quality service and high levels of customer satisfaction. An integrated CRM system is extremely flexible – It can adjust customer needs throughout a product's life cycle, and it has the ability to analyze and actively monitor customer preferences. Therefore, one of the best competitive strategies is the successful utilization of information technology to swiftly and effectively integrate business knowledge and provide the business with timely quality decision support.

Today, businesses face the challenges of using the past to predict the future and using past experiences to communicate effectively with the customer. The most common forms of customer interaction are as follows: (1) Face-to-face interaction with retail personnel; (2) Calls to customer service centers and conversations with customer service representatives; (3) Comments on company websites; and (4) Opinions expressed through e-mail. Customer data harvested through these methods is usually unstructured; however, most data mining technologies can only handle structured data, which means that the data warehouse must have explicit field structures. Therefore, during customary data warehousing processes, unstructured data is not taken into account and much valuable customer information is lost.

This study uses content analysis to transform unstructured textual content into structured data; the systematic application of the coding principles of content analysis can produce derived variables and objectively quantify unstructured textual content. These construct a more complete customer data platform for data mining analysis and the extraction of hidden individualized knowledge for optimizing marketing strategies.

## 2. Literature review

Content analysis is chiefly the process of establishing a framework and selecting the units of analysis based on the goal of the study. It uses the principles of “measurable” and “quantifiable” to design categories that can partition the analyzed units' data content into a series, selects representative data samples, and uses the categories to quantify (recording coding decisions and performing reliability analyses) and analyze the samples. Krippendorff (1980) praised content analysis because it is unobtrusive, accepts unstructured samples, is context-sensitive, and can handle large amounts of data, etc. McMillan (2000) considered that the ability to handle massive amounts of data is the biggest advantage of applying content analysis to web content. Empirical studies in traditional communication fields often use content analysis on various style of advertisement; in computer-mediated communications, content analysis has been used to analyze discussions in newsgroups and on electronic bulletin boards.

Linoff and Berry (2002) defined data mining as the usage of classification, association rules, machine self-learning,

sequential analysis, cluster analysis, and other statistical methods to seek out implicit, unknown, yet extremely useful information from massive and diverse databases. In other words, data mining extracts accurate, previously unknown, yet significant information from large databases and uses this information to make important decisions. Romero and Ventura (2007) surveyed the application of data mining to traditional educational systems, particular web-based courses, well-known learning content management systems, and adaptive and intelligent web-based educational systems. Chau and Yeh (2004) developed concept-based cross-lingual text retrieval to discover the multilingual concept–term relationships from linguistically diverse textual data relevant to a domain. Yang and Lee (2005) developed automatic hypertext construction method is necessary for content providers to efficiently produce adequate information that can be used by web surfers. Köhler, Philippi, Specht, and Rüegg (2006) developed fully automated methods for mapping equivalent concepts of imported RDF ontologies to allow the seamless integration of domain specific ontologies for concept based information retrieval in different domains.

Among customer relationship management studies, decision trees are frequently used when studying customer portfolio management. An important function of decision trees is the construction of a branching structure by classifying known examples. The resulting decision tree has rules that can be expressed via text or data, and the decision tree model can be used in predictions beyond the existing sample. The decision tree is a figurative tree and similar to the data structure tree in that it has nodes and leaves, and an appropriate test is placed at each node. The test determines which sub-tree or condition of the node the data will be applied to for further decision-making. The goal or target of the analyzed question is arrived at through the tests at these nodes. The tree is established when all the data is distributed to appropriate tags and the results are displayed in tree form.

## 3. Methodology

The information flow from data collection to useable knowledge is shown in Fig. 1. According to Fig. 1, the first steps are to apply pre-established selection rules in the integration of primitive data, to decide whether to keep or discard data, and to decide the subset to which the data belongs. The next steps are to clean up and reorganize the data by discarding unnecessary or redundant information, to establish record-keeping formats and contents, and to ensure the integrity and consistency of the data in order to construct a data platform. Thereafter, the organized data is grouped into related subjects through data transformation and data mining processing methods are used to determine data models and to further define relationships among various data for reference in storage and query computation. After analysis and interpretation, the result-

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