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An Analysis of CRM through Data Mining Methods

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Abstract: *Nowadays Customer Relationship Management (CRM) has become very important factor in defining the enterprise growth because of economic globalization and rapid development in e-commerce. Data mining is important in creating a great experience at e-business. Data mining is the systematic way of extracting information from data. Many of the companies are developing an online internet presence to sell or promote their products and services. Most of the internet users are aware of on-line shopping concepts and techniques to own a product. The e-commerce landscape is the relation between customer relationship management (sales, marketing & support), internet and suppliers.*

Keywords: *CRM, Data mining techniques, e-commerce, online internet, suppliers.*

I. INTRODUCTION

A new business culture is developing today. Within it, the economics of customer relationships are changing in fundamental ways, and companies are facing the need to implement new solutions and strategies that address these changes. The concepts of mass production and mass marketing, first created during the Industrial Revolution, are being supplanted by new ideas in which customer relationships are the central business issue. Firms today are concerned with increasing customer value through analysis of the customer lifecycle. The tools and technologies of data warehousing, data mining, and other customer relationship management (CRM) techniques afford new opportunities for businesses to act on the concepts of relationship marketing. The old model of “design build- sell”(a product-oriented view) is being replaced by “sell-build redesign”(a customer-oriented view).

The traditional process of mass marketing is being challenged by the new approach of one-to-one marketing. In the traditional process, the marketing goal is to reach more customers and expand the customer base. But given the high cost of acquiring new customers, it makes better sense to conduct business with current customers. In so doing, the marketing focus shifts away from the breadth of customer base to the depth of each customer’s needs. Consumers make choices about where to shop based on their preferences for a shopping environment and experience as well as the selection of products at a particular store and distance to travel. They select a store that gives them the best combination of prices, convenience, variety and service, and time and distance to travel to the store, subject to their time and money constraints. The performance metric changes from market share to so called “wallet share”. Businesses do not just deal with customers in order to make transactions; they turn the opportunity to sell products into a service experience and endeavour to establish a Long-term relationship with each customer. The advent of the Internet has undoubtedly contributed to the shift of marketing focus. As on-line information become more accessible and abundant, consumers become more informed and sophisticated. They are aware of all that is being offered, and they demand the best. To cope with this condition, businesses have to distinguish their products or services in a way that avoids the undesired result of becoming mere commodities. One effective way to distinguish themselves is with systems that can interact precisely and consistently with customers. Collecting customer demographics and behavior data makes precision targeting possible. This kind of targeting also helps when devising an effective promotion plan to meet tough competition or identifying prospective customers when new products appear. Interacting with customers consistently means businesses must

store transaction records and responses in an online system that is available to knowledgeable staff members who know how to interact with it. The importance of establishing close customer relationships is recognized, and CRM is called for. It may seem that CRM is applicable only for managing relationships between businesses and consumers. A closer examination reveals that it is even more crucial for business customers. In business-to business environments, a tremendous amount of information is exchanged on a regular basis.

For example, transactions are more numerous, custom contracts are more diverse, and pricing schemes are more complicated. CRM helps smooth the process when various representatives of seller and buyer companies communicate and collaborate. Customized catalogues, personalized business portals, and targeted product offers can simplify the procurement process and improve efficiencies for both companies. E-mail alerts and new product information tailored to different roles in the buyer company can help increase the effectiveness of the sales pitch. Trust and authority are enhanced if targeted academic reports or industry news are delivered to the relevant individuals. All of these can be considered among the benefits of CRM.

Activities a business performs to identify, qualify, acquire, develop and retain increasingly loyal and profitable customers by delivering the right product or service, to the right customer, through the right channel, at the right time and the right cost. CRM is, essentially, a business strategy that aims to help companies maximize customer profitability from streamlined, integrated customer facing processes. The motivation for companies to manage their customer relationships is to increase profitability from concentrating on the economically valuable customers, increasing revenue (“share of wallet”) from them, while possibly “demarketing” and discontinuing the business relationship with invaluable customers.

II. LITERATURE REVIEW

E.W.T. Ngai et al [1] in their paper indicates that the research area of customer retention received most research attention. Of these, most are related to one-to-one marketing and loyalty programs respectively. On the other hand, classification and association models are the two commonly used models for data mining in CRM.

Yong Wang et al[2] expounds the composition and major function of the bank’s CRM, and constructs decision tree to analyze the kind of the bank’s customers by applying the ID3 algorithm. This will attain the intellectual need in the CRM interactive process, help the bank understand the behaviour of the customers to a fuller extent, and improve the service level of the bank.

Joseph Vella et al [3] in their article identifies perceived usefulness and perceived ease of use as key elements that are critical in encouraging service providers’ intention to use CRM systems.

Babita Chopra et al[4] throw light on the underlying technology and the perspective applications of data mining in CRM. She suggests as organization cannot extract valuable information from huge data bases solution lies in the use of Data Mining tools for customer segmentation and profitability, marketing and customer relationship management.

Arun Kumar Agariya et al[5] provides a conceptually validated CRM scale catering to Indian banking sector, which can help the managers in implementing the CRM in an effective manner and also can be used as a tool to identify the major areas requiring attention.

Vivek Bhambri [9] suggests Data Mining techniques can be of immense help to the banks and financial institutions for better targeting and acquiring new customers, fraud detection in real time, providing segment based products for better targeting the customers, analysis of the customers’ purchase patterns over time for better retention and relationship, detection of emerging trends to take proactive approach in a highly competitive market adding a lot more value to existing products and services and launching of new product and service bundles.

V. THANUJA et al [11] referred data mining as analytical intelligence. He suggested that in building CRM application, Data Modelling is a small yet critical part of the final solution.

Chris Rygielski et al [12] look closer at two data mining techniques: Chi-square Automatic Interaction Detection (CHAID) and Neural Networks. Based on those case studies, CHAID and neural Networks are compared and contrasted on the basis of their strengths and weaknesses. He also suggested that Businesses also have a duty to execute their privacy policy so as to establish and maintain good customer relationships.

I Kirshna Murthy [13] concluded that for successful knowledge discovery we need the coordination among the disciplines statistics-data mining, computer science and domain knowledge, if this coordination comes into reality then definitely we see wider applications of data mining in almost all the areas of research.

XindongWu et al [16] pointed out that k-means can be paired with another algorithm to describe non-convex clusters. He also suggested that the algorithm is quite simple and easy to implement

ZHEXUE HUANG [17] derived that Although K-Means has large efficiency in clustering large data sets it only works on numeric data and thus limits its use in many data mining applications because of the involvement of categorical data.

K.Saravana Kumar et. al [21] concluded that the conventional algorithm of association rules discovery proceeds in two steps. All frequent item sets are found in the first step and the association rules with the confidence at least minimum confident are generated in the second step.

III. CUSTOMER RELATIONSHIP MANAGEMENT (CRM)

The emergence of Information Technology and use of computer in every field of activities has created a new buzz in the field of marketing and that is the concept of Consumer Relationship Management (CRM). The concept of CRM defined as *“the process of acquiring, retaining and growing profitable customer which requires a clear focus on service attributes that represent value to the customer and creates loyalty”*. The CRM is a term applied to processes implemented by company to handle their contact with their customers. CRM software is used to support these processes, storing information about prospective customers.

CRM includes many-aspects which relate directly to one another:

- Front office operations: Direct interaction with customer, e.g. face to face, email, online services, phone calls etc.
- Back office operations: Operations that ultimately affect the activities of the front office e.g. billing, maintenance, marketing, planning, finance, manufacturing, advertising, etc.
- Business Relationship: Interaction with other companies and partners, such as suppliers/vendors and retail outlets, distributors, industry networks. This external network supports front and back office activities.
- Analysis: Key CRM data can be analyzed in order to plan target-marking campaigns, conceive business strategies, and judge the success of CRM activities e.g. market share, number and type of customers, revenue, profitability, etc.

IV. DATA MINING

Data mining is the process for finding knowledge and knowledge is represented through certain patterns or trends through large amount of data. For simplicity Data mining is the process of extracting interesting pattern (previously unknown) and correlation from huge data. It is also called as Knowledge Discovery in Databases (KDD) which discovers useful patterns or relationships in a group of data. Finally Data mining is the *“mining knowledge from large volume of data”*. The process of hidden knowledge extraction from stored data or database information is the essential components for business and marketing organization because it helps for analyzing the business to generate the hypothesis only. Data mining and KDD process consists of five interactive sequence methods those are:

Selection: Selected relevant data for analysis from database.

Pre-processing: Removal of noise and inconsistent data, combining multiple data sources. Transformation: Transformation of data into appropriate form for performing data mining. Data mining: Selection of appropriate data mining algorithm to extract the pattern. Interpretation/Evaluation: Translating the useful patterns into human understandable form through interpreting and removal of irrelevant redundant pattern. Several data mining techniques developed and used in various data mining projects.

V. DATA MINING IN CRM

We are able to use data mining techniques to analyze customer information but clustering and association rules mining are most popular in this field. The main idea of data mining for CRM is that data from the past can contains information that will be useful in the future. It works because customer behaviours captured in corporate data are not random, but reflect the differing needs, preferences, propensities, and treatments of customers. The goal of data mining is to extract patterns in historical data. The task is not easy, because the patterns are not always strong, and the signals sent by customers are noisy and confusing. Separating signal from noise is an important and difficult role of data mining. For example, data mining can help to show distinct customer segments, facilitating the development of customized new products and product offerings which better address the specific priorities of the customers. Data mining can provide customer insight, which is vital to make an effective CRM strategy. It can help to personalized interactions with customers and hence increased satisfaction and profitable customer relationships through data analysis. It can support an optimized customer management throughout all the phases of the customer lifecycle, from the acquisition and establishment of a strong relationship to the prevention of attrition and the winning back of lost customers. In simple words, they are responsible for getting, developing, and keeping the customers. Data mining models can help in all these tasks, as shown in Table I.

Task	Techniques	Example of Application
Association	Apriority FP-Growth	Market Basket Analysis
Sequence Mining	Apriority, FP-Growth	Web Usage Analysis
Clustering	K-means, Hierarchical Models,	Segmentation
Classification	Decision Trees, Neural Networks, Regression, SVM,..	Prediction

Marketers use direct marketing campaigns to communicate a message to their customers through mail, the Internet, e-mail, phone, and other direct channels.

VI. DATA MINING CHALLENGES AND OPPORTUNITIES IN CRM

Following are the key data mining challenges and opportunities for better customer relationship management:

- *Non-trivial results almost always need a combination of DM techniques:* Chaining/composition of DM, and more generally data analysis, operations is important. In order to analyze CRM data, one needs to explore the data from different angles and look at its different aspects.
- *There is a strong requirement for data integration before data mining:* In both cases, data comes from multiple sources. For example in CRM, data needed may come from different departments of an organization.
- *Diverse data types are often encountered, which requires the integrated mining of diverse and heterogeneous data:* In CRM, while dealing with this issue is not critical, it is nonetheless important. Customer data comes in the form of structured records of different data types (e.g., demographic data), temporal data (e.g., weblogs), text (e.g., emails, consumer reviews, blogs and chat-room data), (sometimes) audio (e.g., recorded phone conversations of service reps with customers).

• *Highly and unavoidably noisy data must be dealt with:* In CRM, weblog data has a lot of “noise” (due to crawlers, missed hits because of the caching problem, etc.). Other data pertaining to customer “touch-points” has the usual cleaning problems seen in any business-related data.

• *Real-world validation of results is essential for acceptance:* In CRM, as in many DM applications, discovered patterns are often treated as hypotheses that need to be tested on new data using rigorous statistical tests for the actual acceptance of the results.

• *Developing deeper models of customer behavior:* One of the key issues in CRM is how to understand customers. Current models of customers mainly built based on their purchase patterns and click patterns at web sites. Such models are very shallow and do not have a deep

understanding of customers and their individual circumstances. Thus, many predictions and actions about customers are wrong. It is suggested that information from all customer touch-points be considered in building customer models.

• *Acquiring data for deeper understanding in a nonintrusive, low-cost, high accuracy manner:* In many industrial settings, collecting data for CRM is still a problem. Some methods are intrusive and costly. Datasets collected are very noisy and in different formats and reside in different departments of an organization. Solving these pre-requisite problems is essential for data mining applications.

• *Managing the “cold start/bootstrap” problem:* At the beginning of the customer life cycle little is known, but the list of customers and the amount of information known for each customer increases over time.

VII. CONCLUSION

As per various reviews, in today’s global competition Data mining is a growing discipline which originated outside statistics in the database management community, mainly for commercial concerns. Data mining can be considered as the branch of exploratory statistics where one tries to find new and useful patterns, through the extensive use of classic and new algorithms. Application of customer relationship management tool in business gives a new dimension. It proved beneficial but applying data mining in customer relationship management was further more beneficial. Although the data mining tools market is relatively small, at the same time the data mining application solution market is growing exponentially. Our main focus was on customer retention techniques to enhance our customer relationships via Data Mining. Data Mining would fasten up the process of searching large databases so as to extract customer buying patterns, to classify customers into groups which also make databases to be handled efficiently.

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