Improving Customer Relationship Management Using Data Mining

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Abstract—**Customer Relationship Management (CRM) refers to the methodologies and tools that help businesses manage customer relationships in an organized way. Data Mining is the process that uses a variety of data analysis and modeling techniques to discover patterns and relationships in data that may be used to make accurate predictions. It can help you to select the right prospects on whom to focus. The essence of the information technology revolution and, in particular, the World Wide Web is the opportunity to build better relationships with customers than has been previously possible in the offline world. For instance, as part of their CRM strategy, a business might use a database of customer information to help construct a customer satisfaction survey, or decide which new product their customers might be interested in.**

Index Terms—**CRM, LCV, Marketing, Relationship, Data Mining.**

I. INTRODUCTION

Customer Relationship Management (CRM)[1] refers to the methodologies and tools that help businesses manage customer relationships in an organized way. CRM simply means managing all customer interactions which requires using information[15] about your customers and prospects to more effectively interact with your customers in all stages of your relationship with them.

The essence of the information technology revolution and, in particular, the World Wide Web is the opportunity to build better relationships with customers than has been previously possible in the offline world. Until recently most CRM software has focused on simplifying the organization and management of customer information. Such software, called operational CRM, has focused on creating a customer database that prevents a consistent picture of customer's relationship with the company, and providing the information in specific applications. However, the sheer volumes of customer information and increasingly complex interactions with customers have propelled data mining to the forefront of making your customer relationship profitable.

Data Mining is the process that uses a variety of data analysis and modeling techniques to discover patterns and relationships in data that may be used to make accurate predictions. It can help you to select the right prospects on whom to focus, offers the right additional products to your

existing customers and identify good customers who may be about to leave. CRM applications that use data mining are called analytic CRM.

By combining the abilities to respond directly to customer requests and to provide the customer with a highly interactive, customized experience, companies have a greater ability today to establish, nurture, and sustain long-term customer relationships than ever before. The ultimate goal is to transform these relationships into greater profitability by increasing repeat purchase rates and reducing customer acquisition costs. The needs to better understand customer behavior and focus on those customers who can deliver long-term profits has changed how marketers [3] view the world.

Traditionally, marketers have been trained to acquire customers, either new ones who have not bought the product category before or those who are currently competitors' customers. This has required heavy doses of mass advertising and price-oriented promotions to customers and channel members. Today, the tone of the conversation has changed from customer acquisition to retention. A good thought experiment for an executive audience is to ask them how much they spend and/or focus on acquisition versus retention activities. While it is difficult to perfectly distinguish between the two activities although, the answer is usually that acquisition dominates retention.

II. CRM MODEL

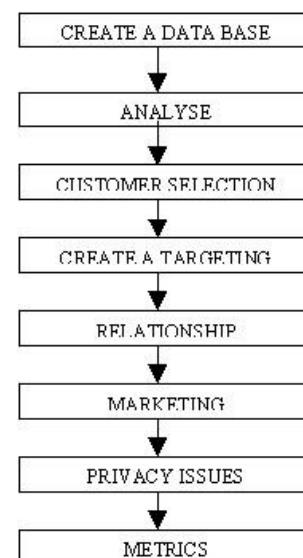A basic model of CRM contains a set of 7 basic components as shown in Fig. 1.

Fig. 1. CRM model

A. Creating a Customer Database

A necessary first step to a complete CRM solution is the construction of a customer database or an information file[4]. This serves as the basis for any CRM activity. For Web-based businesses, this should be a relatively straightforward task as the customer transactions and contact information are accumulated as a natural part of the interaction with customers. For existing companies that have not previously collected much customer information, the task will involve seeking historical customer contact data from internal sources such as accounting and customer service.

The nest pertinent question is: What should be collected for the database? Ideally, the database should contain information about the following:

• *Transactions:* This should include a complete purchase history

• *Customer contacts:* Today, there are an increasing number of customer contact points from multiple channels and contexts.

• *Descriptive information:* This is for segmentation and other data analysis purposes.

• *Response to marketing stimuli:* This part of the information file should contain whether or not the customer responded to a direct marketing initiative, a sales contact, or any other direct contact.

B. Analyzing the Data

Traditionally, customer databases have been analyzed[8] with the intent to define customer segments. A variety of multivariate statistical methods ranging such as cluster and discriminate analysis have been used to group together customers with similar behavioral patterns and descriptive data which are then used to develop different product offerings or direct marketing campaigns[5]. Direct marketers have used such techniques for many years. Their goals are to target the most profitable prospects for catalogue mailings and to tailor the catalogues suitable for different customers.

Lifetime Customer Value (LCV)[9] is a term that gives an idea that each row/customer of the database should be analyzed in terms of current and future profitability to the firm. When a profit figure can be assigned to each customer, the marketing manager can then decide which customers to target. Other kinds of data analyses besides LCV are appropriate for CRM purposes. Marketers are interested in what products are often purchased together, often referred to as market basket analysis.

C. Customer Selection[7]

After the database has been created and analyzed, the next step is to consider which customers to target? The results from the analysis could be of various types. If segmentation-type analyses are performed on purchasing or related behavior, the customers in the most desired segments (e.g., highest purchasing rates, greatest brand loyalty) would normally be selected first. Other segments could also be chosen depending upon additional factors. For example, if the customers in the heaviest purchasing segment already purchase at a rate that implies further purchasing is unlikely, a second tier with more potential would also be attractive. The descriptor variables for these segments provide information for deploying the marketing[12] tools.

If individual customer-based profitability is also available through LCV or similar analysis, it would seem to be a simple task to determine on which customers to focus. The marketing manager can use a number of criteria such as simply choosing those customers that are profitable. The goal is to use the customer profitability analysis to separate customers that will provide the most long-term profits from those that are currently hurting profits. This allows the manager to "fire" customers that are too costly to serve relative to the revenues being produced.

On what basis should these customer selection decisions be made? One approach would be to take the current profitability. An obvious problem is that by not accounting for a customer's possible growth in purchasing, this could lead to applied eliminating a potentially important customer. Therefore, the customers with high LCV could be chosen; This will allow better job incorporating potential purchases. However, these are difficult to predict and you could include a large number of unprofitable customers in the selected group. No matter what criterion is employed, de-selected customers need to be chosen with care.

D. Targeting the Customers

Mass marketing approaches such as television, radio, or print advertising are useful for generating awareness and achieving other communications objectives, but they are poorly-suited for CRM due to their impersonal nature. More conventional approaches for targeting selected customers include a portfolio of direct marketing methods such as telemarketing, direct mail, and, when the nature of the product is suitable, direct sales.

In particular, the new mantra, "1-to-1" [10] marketing [6], has come to mean using the Internet to facilitate individual relationship building with customers. An extremely popular form of Internet-based direct marketing is the use of personalized e-mails[13].

E. Relationship Programs

While customer contact through direct e-mail offerings is a useful component of CRM. It is more of a technique for implementing CRM than a program itself. Relationships are not built and sustained with direct e-mails themselves but rather through the types of programs that are available for which e-mail may be a delivery mechanism.

The overall goal of relationship programs[11] is to deliver a higher level of customer satisfaction. Managers today feel that customers match realizations and expectations of product performance, and that it is critical for them to deliver such performance at higher and higher levels as expectations increase due to intense or heightened competition, and changing customer needs. In addition, research has shown that there is a strong, positive relationship between customer satisfaction and profits[14]. Managers must constantly measure satisfaction levels and develop programs that help to deliver performance beyond targeted customer expectations. Fig. 2 shows the customer retention program which allows the managers to retains and makes good relation with customers.
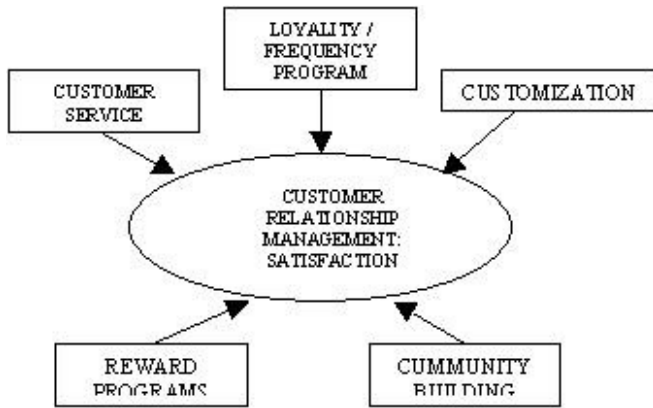
Fig. 2. Customer retention program

1) Customer Service

Because customers have more choices today and the targeted customers are most valuable to the company, customer service must receive a high priority within the Company. Programs designed to enhance customer service are normally of two types. Reactive service is where the customer has a problem (product failure, question about a bill, product return) and contacts the company to solve it. Most companies today have established infrastructures to deal with reactive service situations. Proactive service is a different matter; this is a situation where the manager has decided not to wait for customers to contact the firm but to rather be aggressive in establishing a dialogue with customers prior to complaining or other behavior sparking a reactive solution.

2) Loyalty/Frequency programs

Loyalty[2] programs (also called frequency programs) provide rewards to customers for repeat purchasing. A number of Web-based companies providing incentives for repeat visits to Web sites. Although these have not been wildly successful, it is clear that the price orientation of many Web shoppers creates the need for programs that can generate loyal behavior.

3) Customization

The notion of mass customization goes beyond 1-to-1 marketing as it implies the creation of products and services for individual customers, not simply communicating to them. Customization is termed "versioning." It is, of course, easier to do this for services and intangible information goods than for products but the examples above show that even manufacturers can take advantage of the increased information available from customers to tailor products that at least give the appearance of being customized even if they are simply variations on a common base.

4) Reward programs

Different companies used to give rewards to its customers on successive purchasing of their goods. Reward can be a gift item or cash back or like discount coupon, which can be applied on purchasing the next item from the same company.

5) Community Building

One of the major uses of the Web for both online and offline businesses is to build a network of customers for exchanging product-related information and to create relationships between the customers and the company or brand. These networks and relationships are called communities. The goal is to take a prospective relationship with a product and turn it into something more personal. In this way, the manager can build an environment that makes it more difficult for the customer to leave the "family" of other people who also purchase from the company.

6) Privacy issues

The CRM system described here depends upon a database of customer information and analysis of the data for more effective targeting of marketing communications and relationship-building activities. There is an obvious tradeoff between the ability of companies to better deliver customized products and services and the amount of information necessary to enable this delivery. Particularly with the popularity of the Internet, many consumers and advocacy groups are concerned about the amount of personal information that is contained in databases and how it is being used.

7) Metrics

The increased attention paid to CRM means that the traditional metrics used by managers to measure the success of their products and services in the marketplace have to be updated. Financial and market-based indicators like profitability, market share, and profit margins have been and will continue to be important. However, in a CRM world, increased emphasis is being placed on developing measures that are customer-centric and give the manager a better idea of how her CRM policies and programs are working.

III. APPLYING DATA MINING TO CRM

In order to build good model of CRM system, there are a number of steps that need to be followed. Following are the basic steps of data mining for effective CRM: -

- Define Business Problem
- Build Marketing Database
- Explore Data
- Prepare Data For Modeling
- Build Model
- Evaluate Model
- Deploy Model and Results

A. Define the Business Problem

Each CRM application will have one or more business objectives for which there are a need to build an appropriate model. Depending upon the goals, build a very different model.

B. Build a Marketing Database

Next step is to build a marketing database because of operational databases and corporate data warehouse. This will often not contain the data in the form it is needed. Also CRM applications may interfere with the speedy and effective execution of these systems. After this there is a need to clean and integrate the data.

C. Explore the Data

Before building a good predictive model, it is important

to understand your data. Graphing and visualization tools are a vital aid in data preparation and their importance to effective data analysis cannot be overemphasized.

D. Prepare Data for Modeling

This is the final data preparation step before building models. There are four main parts of this step:

- Select the variables on which to build the model.
- Construct new predictors derive from the raw data
- Decide to select a subset or sample of your data on which to build models
- Transform variables in accordance with the requirements of the algorithm you choose for building your model.

E. Data Mining Model Building

The most important phase in this is an iterative process. There is a need to explore alternative models to find the one that is most useful in solving your business problem. Most CRM applications are based on a protocol called supervised learning.

F. Evaluate Your Results

Perhaps the most overrated metric for evaluating your results is accuracy. Another measure that is frequently used is lift.

G. Deploy Model and Results

In building a CRM application, data mining is often a small but critical part of the final product. The way data mining is actually built into the application is determined by the nature of the customer interaction. There are two ways you interact with your customers: they contact you (inbound) or you contact them (outbound). The deployment requirements are quite different.

IV. Conclusion

CRM is essential to compete effectively in today's world. The more effectively you can use the information about your customers to meet their needs the more profitable you will be. But operational CRM needs analytical CRM with predictive data mining models. The route to a successful business requires a marketing manager that understands its customers and their requirements and implements data mining with a good different model.

V. The Future of CRM

With the increased penetration of CRM philosophies in organizations and the concomitant rise in spending on people and products to implement them, it is clear we will see improvements in how companies work to establish long-term relationships with their customers. However, there is a big difference between spending money on these people and products and making it all work: implementation of CRM practices is still far short of ideal. Everyone has his or her own stories about poor customer service and emails sent to companies without hearing a response.

We can expect that the technologies and methodologies employed to implement the steps will improve as they usually do. More companies are recognizing the importance of creating databases and getting creative at capturing customer information. Real-time analyses of customer behavior on the Web for better customer selection and targeting is already here which permits companies to anticipate what customers are likely to buy. Companies will learn how to develop better communities around their brands giving customers more incentives to identify themselves with those brands and exhibit higher levels of loyalty.

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