



Modeling and Analysis of Customer-Product Relationship for Revenue Growth of Online Telecom Industry

Author Name: Priyanka Shukla

Assistant Professor R.I.T.M, Lucknow

Email-id: akipriya50@gmail.com

Author Name: Akanksha Shukla

Assistant Professor R.I.T.M, Lucknow

Email-id: priyaaka.shukla710@gmail.com

Abstract

Today, it has become very difficult for the telecom industries to generate revenue at the speed they thought it would be. Customer-Product relationship has always been the most important relationship for growth of business. The better this relationship better is revenue generation and better is the growth of company. This paper will focus on different data mining techniques applied to provide better understanding of customer and product relationship hence help e-commerce business to grow. The three main phases of Customer Relationship management are as follows:

- Customer Identification
- Customer Attraction
- Customer Retention

As there is better understanding of the customers and products, there is more probability of transactions. If transaction count increases, proportionally even the revenue increases which in turn increases the profit.

In designing the solution, data mining methods and algorithms play a vital role. Concepts such as classification, clustering, prediction techniques, association rule mining and network based learning are used. With all these concepts put together, the solution becomes one of many ways to generate more revenue and help e-commerce business flourish.

Introduction

We all know that web based nature of business is also referred as e-commerce business it has many advantages but only business ideas using web can survive.

1.1 Problem Statement

Different issues faced by E-commerce industries are as follows:

- Lack of understanding of customer attributes
- Lack of understanding of product attributes
- Lack of understanding of customer – product relationship

This paper work will mainly focus on above mentioned three sub problems and will provide best solutions to overcome with these problems.

1.2 Reasons Why E-commerce Business Fail

- The main problem with e-commerce is that sometimes it aims at selling wrong and unintended product to the customer. This makes customers unhappy. So this must be avoided.
- If one wants to earn higher revenue then he/she has to make sure that the business website is catering to needy customers at time of their need with the products they need.
- The e-commerce has its presence only on web. Thus one should make optimum use of this platform for marketing.
- This all can be handled by using CRM methods. These CRM methods internally use data mining techniques.

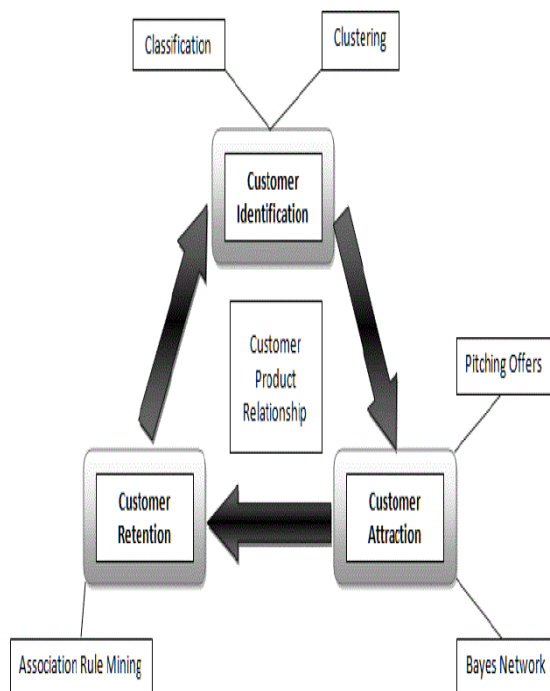
Customer Relationship Management

CRM is an approach to manage an organization's interaction with its current and future customers. In case of e-commerce, there will not be any physical or real interaction. The interaction with customers will be in form of asking the customers to visit the webpage and choose the products they want to buy. This interaction will involve many stages. All these stages are based on

using business data and information to turn it into knowledge base. This conversion of information to knowledge requires data mining techniques. Mostly used techniques are:

- Classification
- nonlinear regression
- Clustering
- Bayesian network
- Apriori algorithm

Diagram 1. CRM Process for Maintaining Customer Product Relationship



□ **Classification** Classification is a process where we assign a class label from predefined set of classes to any new object. The assignment of this label is dependent on the properties of the new object and the similarity of the same with other pre classified objects.

□ **Clustering** Clustering is a process where we group multiple objects together. This grouping is based on the similarity measure of objects. K Modes algorithm is used for this.

□ **Nonlinear regression** Regression is a technique which helps to understand the statistical relationship between variables. Once this relationship is established it can be used for prediction also.

□ **Apriori Algorithm** Apriori technique is useful for finding out association rules based

on pre-decided support and confidence thresholds.

□ **Bayesian network** if businessman has to predict with what probability a customer will buy a product, Bayes network comes handy.

Data Mining Applications in Telecommunication

Call detail record analysis:

Telecommunication companies accumulate detailed call records. By identifying customer segments with similar use patterns, the companies can develop attractive pricing and feature promotions.

Customer loyalty: Some customers repeatedly switch providers, or “churn”, to take advantage of attractive incentives by competing companies. The companies can use DM to identify the characteristics of customers who are likely to remain loyal once they switch, thus enabling the companies to target their spending on customers who will produce the most profit. This paper describes the most valuable CRM data mining applications in telecommunications. Data mining project for effective CRM consists of several phases:

1. **Defining the problem to be solved.** Each CRM application will have its own business objectives and requirements. Data mining model have to be defined according to these objectives.

2. **Preparing List of questions:** It is advisable to make a list of interesting questions. This step can sometimes be skipped, in case a data warehouse is used as the single source of data needed for analysis purposes. This is because the data has to be **cleaned, integrated and transformed** before entering into a data warehouse. Of course, data can be accessed from a relational database, a flat file, a spreadsheet, or from some another sources as well. In this case preparation steps usually take a lot of time and effort, especially when the data needed resides in multiple data repositories. Selecting the summary variables on which the model will be built is a critical step within the data mining process.

3. **Modeling:** In this phase the data is



presented to a data mining software program. Sometimes the variables chosen are not the appropriate ones, and in this case the analyst has to go back and make some changes to the data he is using.

4. **Interpreting the results.** The results should be brought together into a coherent presentation and presented to the business people.

5. **Applying the results** –The gathered information should be used to enhance business and customer relationship behaviors.

REASONS FOR APPLYING DATA MINING TECHNIQUES FOR CRM IN TELECOMMUNICATIONS

According to the International Engineering Consortium (2005) telecommunications companies can accept one of the two basic strategies:

- Product strategy
- Customer strategy.

Product Strategy was very popular in the past when companies were marketing their services to the masses. But this strategy involves high marketing costs and also the customer loyalty was very low. So companies now design their product according to customer's needs.

In order to deliver relevant services to their customers most telecommunications firms accepted the second of these two strategies. Today's companies are customer-centric. To create a better environment for managing customer relationships, companies use an approach called CRM. CRM is defined as a set of activities a business performs to identify, qualify, and acquire. Data mining software should be used together with campaign management software in order to apply a customer-centric business approach. There are several more reasons for applying data mining techniques for CRM in telecommunications:

- **Competitive market.** After years of being a monopoly market, the telecommunications market is now highly competitive. Customers are able to switch providers easily, because there are many of them available. For this reason telecommunications companies explore data mining solutions to achieve

competitive advantage. By understanding the demographic characteristics and customers' behavior, telecommunications companies can successfully tailor their marketing strategies to reach those most likely to use their services, to increase customer loyalty and improve customer profitability.

- **High churn rates.** Churn refers to the monthly or the annual turnover of the customer base. Competitive climate naturally results in high churn rates. Initially, growth in the telecommunications market was exponential, and since many new customers arrived, eventually, the market matured and the churn rates became high.

- **Massive data collection.** Telecommunications companies collect massive amounts of data. Since the main product of the company is the call, its customers create hundreds of thousands of transactions per day. Call detail records are stored in the database and they are a very large data source. Telecommunications firms also collect customer data, which describes their customers, and network data. All of these can be presented to some data mining tool.

THE DATA TO BE MINED

A huge amount of data generated by telecommunications companies cannot be analyzed in a traditional manner, by using manual data analysis. That is why different data mining techniques ought to be applied. As mentioned before, information about each and every call customers make is stored in the database. These are known as **call detail records**. Call detail records usually include information about originating and terminating phone numbers, the date and time of the call and its duration. But those records are often not suitable for data mining itself, so they have to be **transformed**. This is because the goal of data mining is to discover patterns that concern customers, not calls.

Data mining can build models that can explain customers' behavior and predict it, but it is only a step in a much larger process. The successfulness of data mining is determined by the business process, especially by marketing activities, because marketers are



the primary users of CRM tools. Marketers have to understand the results of data mining before they put them into action.

Since data mining extracts hidden patterns of customers' behavior, understanding the results can be a bit complicated. But it is necessary in order to improve campaign management. Data mining software should be used together with campaign management software in order to apply a customer-centric business approach. Data mining can be used for marketing campaign design, response modeling and marketing.

BUILDING DATA MINING APPLICATIONS FOR CRM

The two most valuable data mining applications for CRM in telecommunications are concerning **customer segmentation and churn prediction**. These data mining models utilize the necessary data that exists in a database to build patterns that are relevant to CRM.

Customer segmentation is one of the most important data mining methodologies used in marketing and CRM. It helps telecommunications companies to discover the characteristics of their customers. Customer segmentation is grouping similar customers together, based on many different criteria. In this way it is possible to target each and every group depending on their characteristics. A more appropriate term to use is **clustering**. Clustering is a good way to analyse large and complex set of data. Since each cluster provides a description, the analyst can understand the nature of the problem better. The data to be mined usually includes:

- Behavioral data (call detail data)
- Demographic data (customer data).

Behavioral data helps one to identify groups of customers who have similar calling behaviors. In this way it is possible to focus on what customers do rather than what they are.

Identifying customers' needs only from their demographic data does not produce much value in the market. Different clustering techniques are used. Telecommunications companies have to make efforts to recruit new

customers, but they also have to concentrate on not letting the existing ones go.

Hence the telecommunication industries Applies data mining techniques in CRM under three main sections:

- Customer Identification
- Customer Attraction
- Customer Retention

Customer Identification This phase can also be called as **customer acquisition phase**. In this phase business targets people who are most likely to become customers. To target people who are most likely to become customers, it is must that the customer data should be analyzed. After analysis there comes a step of segmentation of group forming. The analysis is done based on customer attributes and characteristics. Depending on these attributes and characteristics customers are clustered or grouped into multiple clusters or groups. For analysis purpose people use classification algorithm such as K Nearest Neighbor. This algorithm will analyses all the customer records and then will classify a new record on basis of pre classified records. After Analysis comes the segmentation part. Customer segmentation can also be termed as **clustering**. Generally in such scenario people use K Mode algorithm.

Customer Attraction Once the customer is classified and grouped with other customers, the main challenge is to attract them to transact. These transactions would fetch more revenue and the business will grow. One way to accomplish this is by direct marketing. Direct marketing involves knowing when customers buy very often. One can target this period and give away offers those will force the customer to transact. There can also be coupons for the transactions. This can be accomplished by **regression techniques**. If a customer is outlier or showing behavior that is not consistent with the cluster that will be found in this stage. One should use outlier detection techniques for the same.

Customer Retention The customer might visit the e-commerce website and perform some transaction and might come for next transaction too. However what if that does not

happen. Thus customer retention is very important stage. This is also considered as most vital phase for customer product relationship. From customers viewpoint this mainly deals with satisfaction of customer by showing the right products for him. From the business point of view, this is a long term profit generator. If the customer is happy and satisfied, he will again and again transact with e-commerce venture. That is why business should give more importance to this. This uses Apriori algorithm to calculate products

those are highly associated with already bought products. One more way to accomplish this is to have loyalty program where the customer is given additional offers for being loyal customer. Loyalty program can use decision tree like algorithms.

Diagram2. Flow Chart of model that uses data mining techniques in CRM

