

# Customer segmentation and strategy development based on customer lifetime value: A case study

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## Abstract

The more a marketing paradigm evolves, the more long-term relationship with customers gains its importance. CRM, a recent marketing paradigm, pursues long-term relationship with profitable customers. It can be a starting point of relationship management to understand and measure the true value of customers since marketing management as a whole is to be deployed toward the targeted customers and profitable customers, to foster customers' full profit potential. Corporate success depends on an organization's ability to build and maintain loyal and valued customer relationships. Therefore, it is essential to build refined strategies for customers based on their value.

In this paper, we propose a framework for analyzing customer value and segmenting customers based on their value. After segmenting customers based on their value, strategies building according to customer segment will be illustrated through a case study on a wireless telecommunication company.

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## 1. Introduction

Customer Relationship Management (CRM) has become a leading business strategy in highly competitive business environment. CRM can be viewed as 'Managerial efforts to manage business interactions with customers by combining business processes and technologies that seek to understand a company's customers' (Kim, Suh, & Hwang, 2003). Companies are becoming increasingly aware of the many potential benefits provided by CRM. Some potential benefits of CRM are as follows: (1) Increased customer retention and loyalty, (2) Higher customer profitability, (3) Creation value for the customer, (4) Customization of products and services, (5) Lower process, higher quality products and services (Jutla, Craig, & Bodorik, 2001; Stone, Woodcock, & Wilson, 1996). When evaluating customer profitability, marketers are often reminded of the 80/20 rule (80% of the profits are produced by

top 20% of profitable customers and 80% of the costs are produced by top 20% of unprofitable customers) (Duboff, 1992; Gloy, Akridge, & Preckel, 1997).

The core parts of CRM activities are understanding customers' profitability and retain profitable customers (Hawkes, 2000). To cultivate the full profit potentials of customers, many companies already try to measure and use customer value in their management activities (Gloy, Akridge, & Preckel, 1997; Rosset, Neumann, Eick, Vatnik, & Idan, 2002; Verhoef, & Donkers, 2001). Therefore, many firms are needed to assess their customers' value and build strategies to retain profitable customers.

This paper aims at suggesting a new LifeTime Value (LTV) model and customer segmentation considering customer defection and cross-selling opportunity. We will also propose marketing strategies after segmenting customer base. This paper is organized as follows. Section 2 reviews the previous studies related to segmentation of customers based on their value. Section 3 presents a conceptual framework. Section 4 proposes a calculation model for measuring customer value applicable to a wireless telecommunication company. Next, we apply the real data of a wireless company to the model and perform customer segmentation with the result of customer value derived. Section 5 develops marketing strategies based upon the result of customer analysis. Finally, Section 6

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concludes this paper with the remark on future research directions.

**2. Related works**

*2.1. Customer segmentation based on customer value*

Customer value has been studied under the name of LTV (Life Time Value), CLV (Customer Lifetime Value), CE (Customer Equity) and Customer Profitability. The previous researches define LTV as the sum of the revenues gained from company’s customers over the lifetime of transactions after the deduction of the total cost of attracting, selling, and servicing customers, taking into account the time value of money (Dwyer, 1997; Hoekstra & Huizingh, 1999; Jain & Singh, 2002).

Customer segmentation methods using LTV can be classified into three categories: (1) segmentation by using only LTV values, (2) segmentation by using LTV components and (3) segmentation by considering both LTV values and other information.

In the first method, the list of customers’ LTV is sorted in descending order. The list is divided by its percentile. In this case, we segment customer list by only LTV, however, other information like socio-demographic information or transaction analysis may be used together for a better marketing practice. For instance, after segmenting a highly profitable customer group, a firm may recommend popular products to the targeted group at a discounted price. Fig. 1 briefly depicts the concept of segmentation using only LTV.

The second method performs segmentation by considering components used in LTV calculation. Hwang, Jung, and Suh (2004) considered three factors: current value, potential value, and customer loyalty to calculate LTV and present the method to segment the three factors for customer segmentation. Fig. 2 shows segmentation using factors in calculating LTV.

The last method is to segment the customer list with LTV value and other managerial information. In this case, LTV is an axis of the segment in *n*-dimensional segment space and other information, such as socio-demographic information and transaction history become another axis. This approach is more meaningful for segmenting the customer list than the first method. Fig. 3 shows a segmented customer list with LTV value and other managerial information.

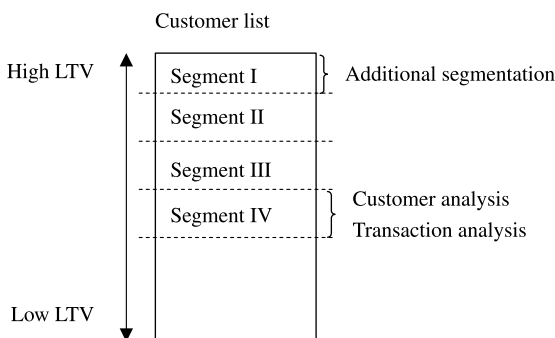


Fig. 1. Customer segmentation using LTV.

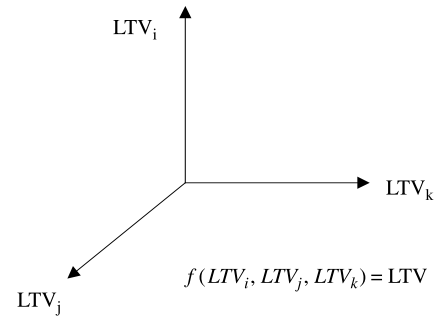


Fig. 2. Customer segmentation using LTV components.

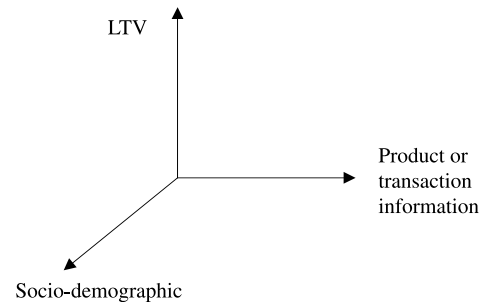


Fig. 3. Customer segmentation based on LTV and other information.

Most discussions on the marketing literature and textbooks describe behavioral segmentation in terms of usage volume such as heavy users, medium users, and light users (Kotler, 1997) or brand-buying behavior such as brand loyal, other brand loyal, and brand switchers (Rossiter & Percy, 1997). Customer profitability can serve as another important basis for behavioral segmentation because of the central importance of profits (Mulhern, 1999).

Several segments may be formed by using customer profitability. For instance, the most profitable segment consisting of the highest-profit customers should be retained through loyalty and retention program. Another possible segment is the most unprofitable customer group who generate more costs than profit. This segment is arguable since unprofitable customers seem to have no worthy of marketing efforts.

Verhoef and Donkers (2001) used two dimensions, current value and potential value, to segment the customers of an insurance company. In this study, we use three dimension, current value, potential value and customer loyalty, to consider the customer defection. The current value becomes a measure of customers’ past profitability, potential value becomes a measure of the possibilities of additional sales and the customer loyalty can be a measure of customer retention. After calculating three customer values, we perform customer segmentation by using the values.

**3. A Framework for building managerial strategies based on customer value**

A framework for building managerial strategies based on customer value is organized into three phases. Phase I explains the preparation steps to be conducted before defining

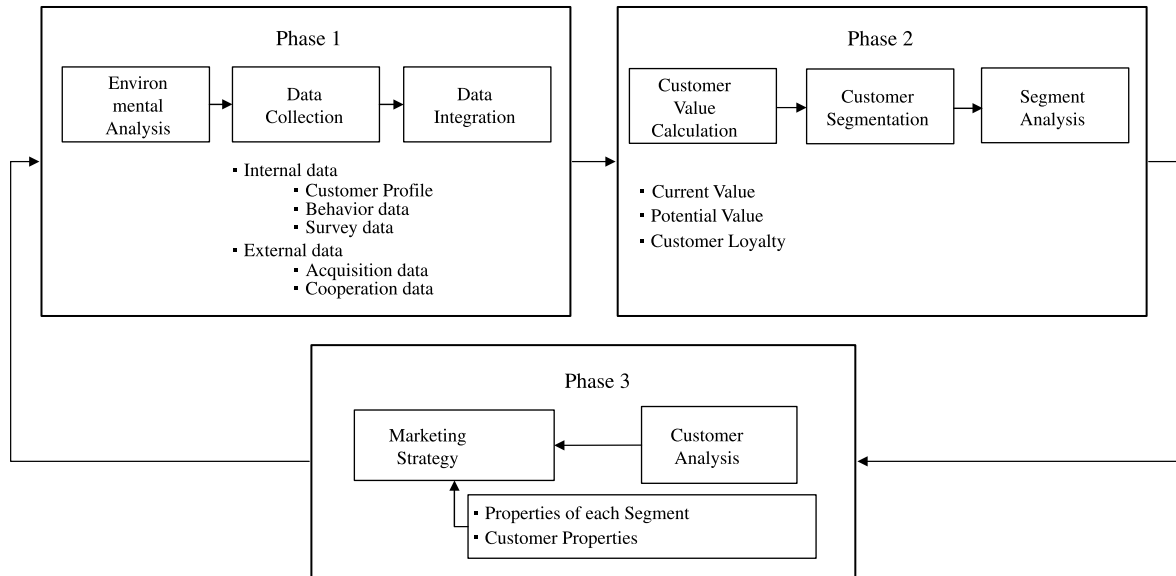


Fig. 4. Framework for customer segmentation based on LTV.

the customer value and setting up marketing strategies. In phase II, we evaluate the customer value from three viewpoints—current value, potential value and customer loyalty. After segmenting the customer base with three viewpoints, a segment analysis is performed according to the segmentation results. Phase III analyzes the characteristics of each segment according to current value, the potential value, and the customer loyalty and this part presents the procedure of building strategies based on these three customer values.

Fig. 4 shows a conceptual framework of this study. We will explain this research according to the framework.

#### 4. Phase II—segmentation based on customer value

##### 4.1. Data description

The raw data of this study consists of 6-month service data of a wireless communication company in Korea. The data can be categorized roughly into two types, socio-demographic information and usage information of wireless service. This dataset is composed of 200 data fields and 16,384 records of customers. 101 data fields were left to work with after unessential data fields were eliminated. The mean value for continuous values and the mode value for class variables substituted for missing values. In addition, we divided the entire dataset at the ratio of 70-to-30, training set and validation set, respectively. We used the same method of calculating customer values—current value, potential value, and customer loyalty—suggested by the previous study (Hwang, Jung, & Suh, 2004).

##### 4.2. Calculating current value

In this paper, we calculate the current value as the average amount of service charge asked to pay for a customer, minus the average charge in arrears for a customer, regarding 6

months for calculation.

$$\text{Current Value} = (\text{Average amount asked to pay for a customer} - \text{Cumulative amount in arrears for the customer/total period of use})$$

##### 4.3. Calculating potential value

As mentioned before, it is important to consider cross-selling and up-selling as well to calculate customer value (Kim & Kim, 1999). We define here potential value of customers as expected profits that can be obtained from a certain customer when a customer uses the additional services of a wireless communication company. The following is the equation to evaluate potential values.

$$\text{Potential value}_i = \sum_{j=1}^n \text{prob}_{ij} \times \text{profit}_{ij}$$

$\text{Prob}_{ij}$  is the probability that customer  $i$  will use the service  $j$  among  $n$ -optional services.  $\text{Profit}_{ij}$  means the profit that a company can receive from the customer  $i$  who uses the optional service  $j$ . In other words, the equation above means expected profits from a particular customer who uses optional services provided by a wireless communication company. The expected profits will become potential value we need to evaluate.

$\text{Profit}_{ij}$  means the expected value when a company provides a customer with a certain optional service. We calculated it by subtracting the cost of each optional service from the charge of each optional service. The charge and cost of each optional service is given by the telecommunication company. Potential values can represent a measure of additional sales opportunity. It can be used to recommend optional services to customers.

4.4. Customer loyalty

Customer loyalty can be defined as the index that customers would like to remain as customers of a company.

$$\text{Customer Loyalty} = 1 - \text{Churn rate}$$

Churn describes the number or percentage of regular customers who abandon a relationship with a service provider. Customer loyalty can be a measure of customer retention. The previous studies on customer value have not treated the churn rate yet, limiting themselves to predict the future profit change of customers with the past profit history. The effective evaluation of customer value, however, should comprehend the leaving probability of each customer. Fig. 5 shows the procedure of calculating an individual churn rate.

Therefore, this paper measures the leaving probability for each customer to calculate the churn rate, using data mining techniques. Like the process to calculate the  $\text{Prob}_{ij}$ , we take several models (decision tree, neural network and logistic regression) and then select an optimal model among them based on the result of a comparative test with the misclassification rate or the lift chart method.

4.5. Customer segmentation and segment analysis

We have discussed the calculation method on customer value by dividing the value into current value, potential value and customer loyalty. We can display the entire customers in three-dimensional space to see the distribution of customers. Each axis denotes Current Value, Potential Value, and Customer Loyalty respectively. Fig. 6 shows the result of customer segmentation.

Originally the units of three axes are different from each other. Therefore, we convert the scale into a real number between 0 and 1. As shown in Fig. 6, many customers are located in upper area of the cube, which means many customers have high customer loyalty. Nearly 30% of customers are scattered in the cube and have lower customer loyalty ( $<0.5$ ). We can conclude that customer base can be segmented into two categories based on their customer loyalty. Customers whose loyalty is greater than 0.5 represent extreme high customer loyalty but the others are located sporadically in the cube. We can also conclude that more sophisticated data

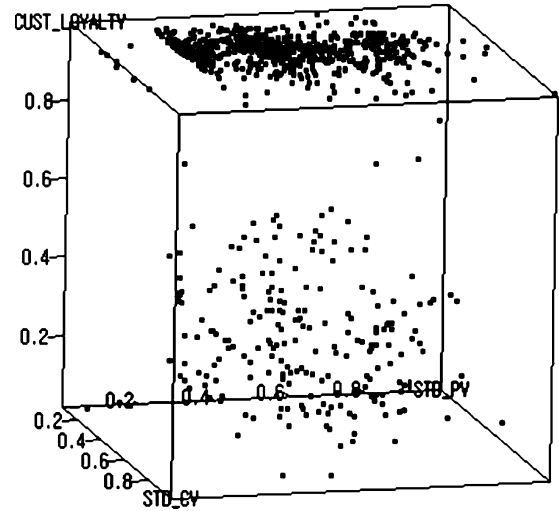


Fig. 6. Result of customer segmentation.

mining is required to analyze the high customer loyalty segment precisely.

5. Phase III—customer analysis for marketing

As explained on the previous page, a wireless telecommunication company can set up more efficient marketing strategies through customer segmentation. But this customer segmentation is not enough for a company to plan a practical marketing strategy balanced with characteristics of customers. It only shows a glimpse of the entire picture. Thus it helps to plan practical marketing strategies to define and analyze the characteristics of customers belonging to each segment. This section presents the procedure of developing market strategies based on customer values.

5.1. Method for analysis

In this page, Decision Tree is used for mining the characteristics of customers. Decision Tree makes it possible to analyze the outcome drawn from the target variable of binary in classification problem and makes it easy to classify customers, which is appropriate for analyzing them.

Since, it is difficult to find which one out of three customer value actually causes that customer to have these favorable characteristics, we do not choose a specific segment but analyzes this segment based on each three customer-value classification. After analyzing the characteristics of the each customer who earns a high score in potential value, the current value, and a low score in customer loyalty, it will explain what improvements in the marketing strategy should be taken to transform customers in each segment to more valuable customers. For this analysis, the customers in each segment should be divided into two categories; one is for customers who have a low score and the other is for ones who have a high score in the category. Before understanding the characteristics of high score customers, this analysis needs a criteria of how to measure the score whether a customer possesses high or low

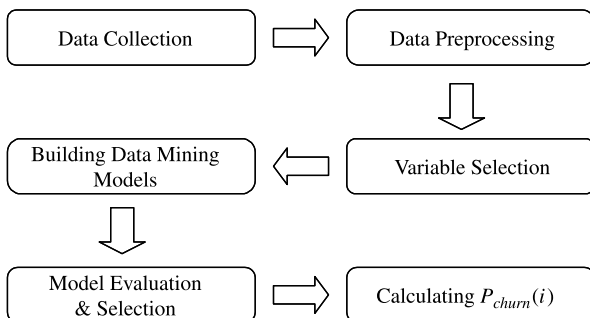


Fig. 5. Procedure of predicting churn rate.

value. For setting up this criterion, this paper defines what is  $3\sigma$  higher than the average of each axis (customer value) as high value and what is  $3\sigma$  lower than average of each axis (customer value) as a low value. When it is difficult to find a dividing point whether it is high or low, the appropriate dividing point is obtained by seeing the distribution of data. Through this work, we compute each criterion's score and customer's number corresponding to the each criterion's score.

All 2000 customer's data is divided into a training set and a test set. Each set has 1000 data and is analyzed by the SAS e-miner. The depth of Decision Tree is set at five and the number of Branches is limited at two for appropriate interpretation. Analysis had done to the current value, the potential value, and customer loyalty.

5.2. Results and analysis

The result of Decision Tree is the nodes remaining until the final one. But cases with too small population or insignificant classification were excluded.

5.2.1. Characteristics of customers in the low customer loyalty

The characteristics of customers in the low Customer Loyalty are shown in Table 1. Customers, who had no charge of membership fee, mandatory usage month less than 18 months, and non-loyal payment plan, show a low customer loyalty. Also, customers with no charge of membership fee, mandatory usage month more than 18 months, and use special phone devices (SCH, HHP, etc.), belong to low customer loyalty. The most important criteria in classifying the customer loyalty is whether a customer pays the entrance charge. Ninety percent of customers in the low customer loyalty segment are classified by this criterion. Even though they pay a membership fee, customers who work as a company employee or run their own businesses also represent low customer loyalty. The Mandatory usage month is usable criteria. But this cannot be a significant criterion, because customers are obliged to use a service during the mandatory usage months.

Based on the customer loyalty analysis, it is a better marketing strategy that a company charges a certain portion of membership fee in a way of divided payments and compensates for amount in alternative ways such as discounts on a phone bill or other services than the strategy where a company charges no membership fee and recovers this expenditure from phone usage cost of customers.

5.2.2. Characteristics of customers in the high current value

The characteristics of customers in the high current value are shown in Table 2. In this analysis, the standard deviation of the average phone usage cost is a significant criterion. And

Table 2  
Characteristics of customers in the high current value

**USAGE\_SD:** > =20862.1 & **SUSP\_M:** < =7.75 & **CHG\_PLAN:** < =1  
**USAGE\_SD:** < =20862.1 & **USAGE\_SD:** > =9614.919 & **INB\_CALL:** 0

the larger the standard deviation data, the higher the current value it shows. Also, the frequency of changing a price plan, the term when a service was disconnected, and the frequency of asking for better phone reception are other significant criteria.

First, customers who have the standard deviation of average phone usage cost more than 20862.1, the term stopping service more 7.75 days, and the frequency of changing price plan less than one represent a high Current Value. Also customers with the standard deviation of average phone usage cost more than 9614.919 and meet both criteria that are zero frequency in asking better receptions and standard deviation of average phone usage cost less than 20862.1 represent a high current value.

The standard deviation of average phone usage cost means the deviation of phone usage cost charged every month. Considering that the average charge of mobile phone amounts to about 20,000 Korean won, we infer that the average mobile users pay having those standard deviations a relatively high charge.

We expect that customers who do not change charge plans frequently have not chosen an appropriate charge plan suitable for their usage characteristics and do not take advantage of cost saving from alternative plans.

5.2.3. The characteristics of customers in high potential value

The characteristics of customers in high potential value are shown in Table 3. In the Potential Value analysis, age of customers and types of phone devices came out as the most important criteria. This result seems to be natural as considering the premise that the potential value is defined as the value gained later by providing optional services to customers. The 'RES\_INIT' variable is code representing local address of customers. When it set the 'In-Cheun at the numerical value of 100', the 'RES\_INIT' should have a higher value as customers have further local address from the 'In-Cheun'. According to the outcome above, the result comes out that the customers who is younger than 27.5 and who have the 'RES\_INT' code less than 226 (Seoul and Incheon area) represent high potential value. The customers who are older than 27.5, have a special type of phone device and short term of mandatory usage month have high potential value. And so are the customers who have a long-term mandatory usage month and a higher standard deviation of phone usage cost than 7071 Korean Won. The data shows that the type of phone along with the age are the factors strongly affecting the outcome of

Table 1  
Characteristics of customers in the low customer loyalty

**FEE\_METH:** B & **MUST\_MGP:** > =18 months & **Price\_1:** ~A  
**FEE\_METH:** B & **MUST\_MGP:** < =18 months & **NDL\_MBR1:** SCH, HHP etc.  
**FEE\_METH**—~B & **OCCU\_GP:** C, E

Table 3  
Characteristics of customers in the high potential loyalty

**AGE:** < 27.5 & **RES\_INIT:** < =226  
**AGE:** > =27.5 & **MDL\_NBR1:** > =HGC etc. & **MUST\_MON:** 0  
**AGE:** > =27.5 & **MDL\_NBR1:** > =HGC etc. & **MUST\_MON:** > =12 months & **BILL\_SD:** > =7071

potential value, in consequence of the fact that the types of phone device determine what kind of optional service plan customers are provided. Customers can be provided with upgraded services with the latest phone device, but customers with old devices cannot use upgraded services. We can infer that this fact results in the outcome explained above.

### 5.3. Marketing strategies

The outcome of the Decision Tree, as explained previously, can benefit a company to plan marketing strategy, set up marketing strategy for each segment, and provide beneficial information in terms of grasping a whole picture of future marketing strategy. Also by using the outcome of the Decision Tree, a company can recognize and classify an important or less important potential customer to set up proper marketing plan for those particular customers. A company can plan these five possible marketing strategies.

#### 5.3.1. Strategy to charge membership fee

A customer without paying membership fee shows low customer loyalty. This means charging membership fee is actually good way to keep customers to use a current service provider. The marketing strategy of charging no membership fee and compensating this cost on later services causes a customer to consider switching a current service eventually. So it is better marketing strategy for company to charge the membership fee in some way and provide better and more services later such as discount on phone bill and other various customer-beneficial services. Especially for young generations and the capital-area customers, it turns out to be efficient strategy that a company encourages important customers to use its service by charging membership fee and cost of phone devices.

#### 5.3.2. Strategy to upgrade a phone device

In the potential value Analysis, a type of a phone device is an important criterion. The customers with new phone devices are easily accessible to extra services plan, which can be encouraged by a phone device exchanges service and free upgrade. For a customer who earns high value in the potential value and low value in the current value, a new strategy is needed that a customer is allowed to use his/her accumulated point or score during the service term to exchange the old device for a new one.

Also, a phone-exchanging service is needed for customers who have high current value and low customer loyalty. From this outcome, a type of phone device is the factor affecting the customer loyalty, because customers can switch to other service providers as they change a phone device. So for customers who have high current value and high possibility to switch to other providers, a company should provide the service of credit-rebating sale or free upgrade to keep customers who have high current value.

#### 5.3.3. Strategy to attract customers belonged to particular ages and occupations

Optional service plan is frequently used among young people and people in the Capital area. This fact had been verified through the analysis of the potential value. So a company needs a strategy to attract these kinds of people by providing optional service plans. Through an additional analysis, a company can develop more attractive service plan and sell extra service plans for targeted customers.

#### 5.3.4. Strategy to provide better services for loyal customers

As the wireless telecommunication market become highly competitive, it is more important to keep current customers and attract customers of other service providers than to develop new customers. Losing current customers will be painful situation for a Wireless telecommunication company, because it is expected that a company make a profit not only from a basic service but also from various kinds of service plan through loyal customers. Also it is required to improve benefits for loyal customers as customers are expected to switch to other service providers in consequence of new policy unifying all wireless phone numbers next year. Providing free extra services and discount on phone bill can impress loyal customers on the belief that it will be beneficial for them to keep the current relationship with a current service provider. If a company attracts and brings customers of other companies back by providing special events like the free basic service offer, a company will be able to achieve stabilized profit flow even after the number unifying policy.

#### 5.3.5. Strategy to strengthen a brand image

The brand image is important as much as a service itself. Especially young generations tend to choose a particular service provider due to the innovative and sensuous image of that company. So a company needs to develop the brand image to attract more customers and this marketing strategy should be conducted to improve image of the company itself and the image of a service this company provides. Depending on the segments of customers, a company develops a different service package for each segment and plans separate brand image marketing for each service package. Because this type of marketing strategy can separate the image of a company from the image of its service, a company can practice a new marketing strategy without changing the image of a company.

## 6. Conclusion

Since the increased importance is placed on customer satisfaction in today's business environment, many firms are focusing on the notion of customer loyalty and profitability to increasing market share and customer satisfaction. CRM, the core business concept to enhance customer relationship, is emerging as core competence of a firm. Building successful CRM of a firm starts from identifying customers' true value and loyalty since customer value can provide basic information to deploy more targeted and personalized marketing.

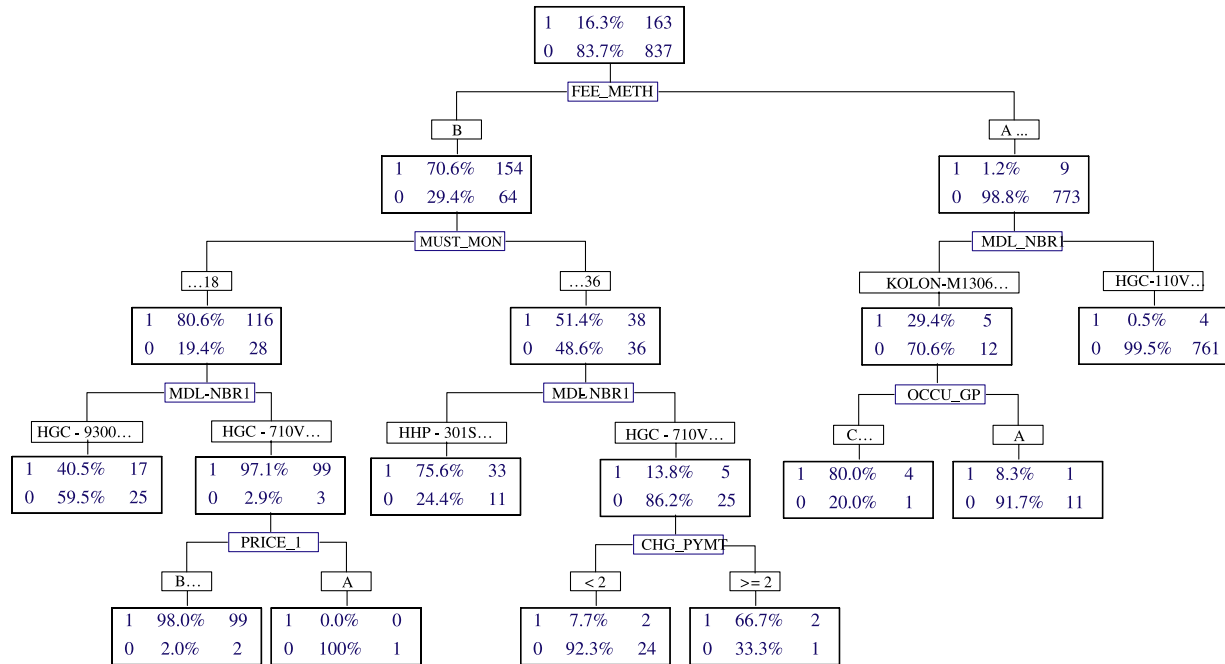


Fig. A1. The result of decision tree analyzing low-customer-loyalty segment.

In this paper we suggested an LTV model considering the past contribution, potential value and churn probability at the same time. The model can also be used for customer base segmentation. Three perspectives on Customer Value (current value, potential value, and customer loyalty) assist marketing managers in identifying customer segmentation with more balanced viewpoints. Current value provides financial viewpoint and potential value indicates cross-selling opportunity. Customer loyalty estimates durability of the previous two values. By analyzing the characteristics of segmented customer groups, we can develop refined strategies for each segment.

In the future, we expect that this study will spur further extensions of verifying the feasibility of the LTV model and the developed strategies by assessing the result of deploying the strategies.

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**Appendix A. An example of decision tree analysis**

Fig. A1

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