

# A CLV (Customer Lifetime Value) model in the wireless telecommunication industry

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## Abstract

Since the early 1980s, the concept of relationship management in marketing area has gained its importance. Acquiring and retaining the most profitable customers are serious concerns of a company to perform more targeted marketing campaigns. For effective CRM (Customer Relationship Management), it is important to gather information on customer value. Many researches have been performed to calculate customer value based on CLV (Customer Lifetime Value). It, however, has some limitations. It is difficult to consider the churn of customers, because the previous prediction models have focused mainly on expected future cash flow derived from customers' past profit contribution.

In this paper we suggest a CLV model considering past profit contribution, potential benefit, and churn probability of a customer. We also cover a framework for analyzing customer value and segmenting customers based on their value. Customer value is classified into three categories: current value, potential value and customer loyalty. Customers are segmented according to the three categories of customer value. A case study on calculating customer value of a wireless communication company will be illustrated.

## 1. Introduction

CRM has become one of the leading business strategies in the new millennium. CRM can be described as '*Managerial efforts to manage business interactions with customers by combining business processes and technologies that seek to understand a company's customers*' [11]. That is, structuring and managing the relationships with customers, CRM covers all the processes related to customer acquisition, customer cultivation and customer retention. Though we put aside the existing studies that assert that it is more costly to acquire new customers than to retain existing customers, it is easy to assume that customer cultivation and retention is more important than customer acquisition because the lack of information on new customers makes it difficult to select target customers thereby results in inefficient marketing efforts.

This paper aims at suggesting a new CLV model considering customer churn and cross-selling opportunity.

## 2. Related works

### 2.1 The definition of CLV

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 contain several definitions of CLV. The differences between the definitions are small. Table 1 shows the definitions of CLV.

<Table 1> Definitions of CLV

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The present value of all future profits generated from a customer [7]
The net profit or loss to the firm from a customer over the entire life of transactions [2]

Expected profits from customers, exclusive of costs related to customer management [4]

The total discounted net profit that a customer generates during her life on the house list [3]

The net present value of the stream of contributions to profit that result from customer transactions and contacts with the company [13]

The net present value of a future stream of contributions to overheads and profit expected from the customer [10]

The net present value of all future contributions to overhead and profit [14]

The net present value of all future contributions to profit and overhead expected from the customer [6]

### 2.2 Models of CLV Calculation

There are a lot of researches on calculating customer value. The basic concept of these researches, however, focused on NPV (Net Present Value) obtained from customers over the lifetime of transactions [1][2][7][14]. Dwyer tried to calculate CLV through modeling the retention and migration behavior of customers [6]. Focused on making decision of marketing invest, Hansotia & Rukstales suggested incremental value modeling using tree and regression based approach [8]. Hoekstra & Huizingh also suggested a conceptual CLV model and categorized input data of the model into two types, source of interaction data and time frame [9]. Most CLV models stem from the basic equation, although we have many other CLV calculation models having various realistic problems. The basic model form based upon the proposed definition is as follows.

$$CLV = \sum_{i=1}^n \frac{(R_i - C_i)}{(1+d)^{i-0.5}} \wedge \wedge \wedge (Eq. 1)$$

$R$  and  $C$  denote revenue and cost at time  $i$  respectively and  $d$  means a discount factor.

## 3. New CLV model

### 3.1 Research scope

The previous researches can be classified into

three directions as shown in table 2. The shaded parts in the table represent the coverage of the suggested model.

<Table 2> Research scope

Focus	Category	Model
Calculative	Calculation unit	Individual
		Segment
	Prediction data	Retrospective
		Prospective
	Transaction	Contractual
		Non-Contractual
	Purchase cycle	Discrete
		Continuous
Qualitative	Ex) Relationship between duration and cost	
Analytic	Ex) Resource allocation	

### 3.2 Conceptual Framework and CLV model

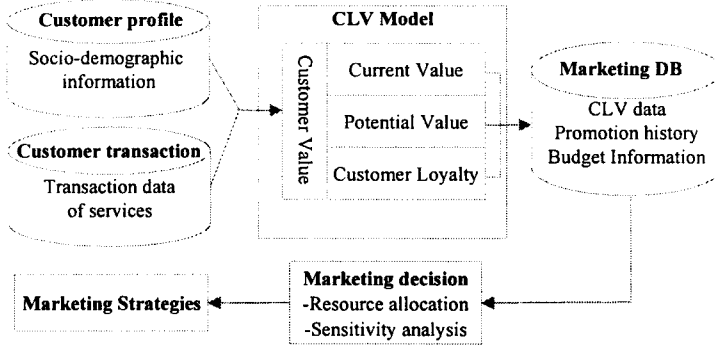
In this paper we evaluate individual customer value with three viewpoints - current value, potential value and customer loyalty. The potential value represents a measure of cross-selling possibility while the customer loyalty denotes a measure of customer retention.

CLV model should consider:

- customer retention or customer loyalty, since it is directly connected to customer profitability
- individual CLV rather than segment (customer base) CLV to support direct marketing or one-to-one marketing
- marketing potential to identify sales opportunities by predicting cross-selling/up-selling probability of each customer

Customer churn is the hottest issue of highly competitive industries. Churn problem is also a critical issue of CLV model because it affects the length of service period and the future profit generation. Though a customer contributes much

money, he may have low CLV due to his high churn probability.



<Figure 1> Conceptual Framework

We, therefore, suggest a new CLV model of individual customer considering churn rate of a customer. The modified CLV model is shown in Eq. 2.

$$CLV_i = \frac{W(N_i)}{N_i} \times \sum_{t_i=0}^{N_i} \frac{\pi_p(t_i)}{(1+d)^{t_i-N_i}} + \sum_{t_i=N_i+1}^{N_i+E(i)+1} \frac{\pi_f(t_i) + B(t_i)}{(1+d)^{t_i-N_i}} \quad \Lambda \quad \Lambda \quad (Eq. 2)$$

$N_i$  is the past service duration.  $W(N_i)$  is a normative factor determined by the relationship between the past service duration and future profit generation.  $W(N_i)$  is a weighting factor of the past profit generation, which decides the amount of contribution toward individual CLV. The sum of  $\pi_p(t_i) / (1+d)^{t_i-N_i}$  represent NPV (Net Present Value) of the past profit contribution, where  $\pi_p(t_i)$  and  $\pi_f(t_i)$  are the past and future profit contribution of customer  $i$  at period  $t_i$  and  $(1+d)^{t_i-N_i}$  is the discount rate factor which transforms the past profit into the present value. The future cash flow can be derived from the sum of the expected future profit and potential benefits during the expected service period of customer  $i$ ,  $E[i]$ .

The existing CLV models have focused on financial contribution estimated from past history of

profit generation, and converted the contribution to present value. The suggested model, however, focuses not only on past profit contribution, but also on future financial contribution, potential profit generation of a customer, and expected service periods.

### 3.2 The simplified CLV model in the wireless industry

To calculate CLV of wireless phone users, we formulate Eq. 3 by simplifying Eq. 2. In the wireless industry the expected service period can be derived from churn rate. The function  $\tilde{\pi}_f(t_i)$  is obtained from regression of past profit data and  $\tilde{B}(i)$  is a fixed value obtained from expected optional service profit of customer  $i$ .

$$CLV_i = \frac{W(N_i)}{N_i} \times \sum_{t_i=0}^{N_i} \frac{\pi_p(t_i)}{(1+d)^{t_i-N_i}} + \sum_{t_i=N_i+1}^{N_i+\lceil 1/P_{churn}(i) \rceil} \frac{\tilde{\pi}_f(t_i) + \tilde{B}(i)}{(1+d)^{t_i-N_i}} \quad \Lambda \quad \Lambda \quad (Eq. 3)$$

In the simplified model, the way of calculating past profit contribution is the same as that of Eq. 2. The expected service time,  $E[i]$ , is replaced with  $\lceil 1/P_{churn}(i) \rceil$  because service time  $y$  will follow *geometric distribution*. We, therefore, can calculate the expectation of service period using the following simple statistical calculation.

$$p(n) = P\{y = n\} = P_{churn} (1 - P_{churn})^{n-1}, \quad n = 1, 2, 3, \Lambda \quad (Eq. 4)$$

therefore  $y \sim Geo(P_{churn})$ ,  $E[y] = 1/P_{churn}$

Let  $y$  and be the number of service time required until a customer stops his service and let  $P_{churn}$  be the churn probability of a customer.

Then the service period of customer  $i$  can be estimated as  $\lceil 1/P_{churn}(i) \rceil$ , the nearest integer of  $1/P_{churn}(i)$ .

#### 4. Conclusion

Many CRM researches pertain to develop a comprehensive model of customer profitability since the question 'Who are profitable customers?' is a starting point of CRM. Many models have been researched to calculate CLV of a customer. Most of them focused on the future cash flow derived from the past profit contribution. In some industry, however, it is inadequate to consider only expected future cash flow to calculate CLV because stiff competition results in frequent customer churn and churn affects customer profitability significantly [12].

In this paper we suggested a CLV 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.

In the future, we expect that this study will spur further extensions of developing the more general CLV models considering the characteristics of the industry and customers such as reactivation possibility, attracting/servicing cost and causes of customer churn.

#### REFERENCES

- [1] Bayón, T., Gutsche J., & Bauer H. (2002). Customer Equity Marketing: Touching the Intangible. *European Management Journal*, 20(3), 213-222.
- [2] Berger, P. D., & Nasr, N. I. (1998). Customer Lifetime Value: Marketing Models and Applications. *Journal of Interactive Marketing*, 12(1), 17-30.
- [3] Bitran, G. R., & Mondschein, S. (1996). Mailing Decisions in the Catalog Sales Industry. *Management Science*. 42( 9), 1364–1381.
- [4] Blattberg, R.C., Deighton, J. (1996). *Manage Marketing by the Customer Equity Test*, Harvard Business Review, Jul-Aug, 136-144.
- [5] Courtheoux, R. (1995). *Customer Retention: How Much to Invest. Research and the Customer Lifecycle*, New York, NY: DMA.
- [6] Dwyer, F. R. (1997). Customer Lifetime Valuation to Support Marketing Decision Making. *Journal of Interactive Marketing*, 11(4), 6-13.
- [7] Gupta, S., & Lehmann, D. R. (2003). Customers as Assets. *Journal of Interactive Marketing*, 17(1), 9-24
- [8] Hansotia, B., & Rukstales, B. (2002). Incremental Value Modeling. *Journal of Interactive Marketing*, 16(3), 35-46.
- [9] Hoekstra, J. C., & Huizingh, E. K. R. E. (1999). The Lifetime Value Concept in Customer-Based Marketing. *Journal of Market Focused Management*, 3(3-4), 257-274.
- [10] Jackson, D. R. (1994). Strategic Application of Customer Lifetime Value in the Direct Marketing Environment. *Journal of Targeting Measurement and Analysis for Marketing*, 3(1), 9–17.
- [11] Kim, J., Suh, E., & Hwang, H. (2003). A Model for Evaluating the Effectiveness of CRM using the Balanced Scorecard. *Journal of Interactive Marketing*, 17(2), 5-19.
- [12] Knox, S. (1998). Loyalty-based segmentation and the customer development process. *European Management Journal*, 16(6), 729-737.
- [13] Pearson, S. (1996). *Building Brands Directly: Creating Business Value from Customer Relationships*, London: MacMillan Business.
- [14] Roberts, M. L., & Berger, P. D. (1989). *Direct Marketing Management*, Englewood Cliffs, NJ: Prentice-Hall, Inc.