

Enterprise Customer Life-Cycle Value Model and Applied Research

Yang Wang¹, Shengguo Gao¹ & Xiaoqi Sheng¹

¹ School of Management, Shanghai University of Engineering Science, Shanghai 201620, China

Correspondence: Yang Wang, School of Management, Shanghai University of Engineering Science, Shanghai 201620, China. E-mail: smilewy1314@126.com

Received: September 2, 2014

Accepted: September 27, 2014

Online Published: October 1, 2014

doi:10.5430/jbar.v3n2p68

URL: <http://dx.doi.org/10.5430/jbar.v3n2p68>

Abstract

Customer relationship management (CRM) more and more the concern of all enterprises, enterprises have become the new era of killer competition winning. Customer lifetime value (CLV) is a customer relationship management (CRM) in a core concept, is an important part of CRM research. In this paper, research scholars combined with the development of domestic enterprises and analyzed the theory of customer relationship management, customer life cycle theory and customer value theory. Then, the existing quantitative calculation of the value of customer life cycle approach to refine and improve, from the customer profitability parameters, dynamic customer retention and customer life cycle to study three aspects of time, and after the proposed expansion of the customer life cycle value model. Finally, the value of customer life cycle model applied analysis, in order to better guide our enterprise customer relationship management practices.

Keywords: Customer relationship management, Enterprise customer life-cycle enterprise customer life-cycle value, Value model

1. Background and significance

1.1 Background of study

In today's society, the customer as an important resource of enterprises has become the focus of the enterprise, and customer centered business model requires more enterprise to regard customer resources as the key to win in the fierce competition, customer resources has become one of the most important strategic resource of enterprises. How to identify customer needs and maintain long-term cooperative relations in the competition of the market has become an urgent problem. It's no doubt that this requires new management ideas and new methods to help enterprises to enhance the ability to handle customer relationship.

Customer Relationship Management (CRM) caters to the change and development of market economy environment, the theory and method that CRM advocates are generally recognized by the enterprise, and become the focus of enterprise management decision and management information system. The analysis on the value of life cycle of customers is the infrastructure and security strategy to complete effectively the customer relationship management (CRM).

1.2 Significance of study

The research on the Customer Lifetime Value (CLV) is the premise of enterprise to correctly identify customer needs and allocate enterprise resources effectively and reasonably, the infrastructure and security strategy to complete effectively the customer relationship management (CRM), and the guarantee to win the benefit and return. The enterprises assess the customer lifetime value, and maintain long-term relationships with customers by using scientific methods, in order to obtain the customer life cycle value and bring the competitive advantage for the long-term development of enterprises.

In this paper, by researching domestic development situation, regarding the customer relationship management (CRM) as the prerequisite, and basing on customer life cycle management, carrying on the discussion about the latest progress in the study of customer lifetime value field, it aims to promote the research of enterprise customer relationship management strategy and improvement of CRM system.

First, this paper analyzes the related theory of customer lifetime value, then analyzes the calculation method of customer lifetime value and proposes a new model about the customer lifetime value. At last, in order to guide the practice of customer relationship management in Chinese enterprises, we analysis the customer lifetime value model

application .

2. The related theory of the customer lifetime value

2.1 The theory of customer relationship management

Customer relationship management means that enterprises use information technology and Internet technology to coordinate between businesses and consumers in the sales, marketing and service interaction, so as to enhance their management, provide innovative personalized customer interaction and the service to the customer. Customer relationship management is a kind of business management concept and strategy.

2.1.1 The core idea of customer relationship management

- (1) Customer delivered value is the foundation of high quality customer relationship
- (2) Paying more attention to the individual characteristics of customers, and achieving one to one marketing
- (3) Customer care throughout the whole process of marketing
- (4) Improving customer satisfaction, retaining old customers and attracting new customers

2.1.2 Relationship management operation process includes:

Environment analysis - the construction of idea and goal - strategy making- business process recombination - system establishment - information analysis - knowledge management

2.1.3 Marketing argument of CRM

- The 80/20 rule, 80% enterprise's profit is obtained from 20% of the customers.
- The integration of marketing information
- The idea of one to one marketing
- The input of acquiring a new customer is N times than keeping an old customer.
- A satisfied customer propagandizes benefits of the enterprise to N people when an unhappy customer will be unable to hold his suffering experience to N+M people.
- Customer life cycle theory

2.2 Customer life cycle theory

As an important resource of the enterprise, the customer has value and life cycle. The theory of customer life cycle refers to the process of the enterprise from the establishment of business relations to the whole process completely ended the relationship with clients, is the development of customer relationship level changing over time, and it dynamically describes the different feature in different stages of the life cycle of customer relationship.

The life cycle of customer relationship development is divided into stages, and the stages of customer relationship are based on customer life cycle. At present, there are many researches on customer life cycle, and lots of kinds of division. Some people put forward the five stages model of the development of the business relationship, also some people proposed the customer life cycle is divided into four stages. The widely recognized are the following two kinds of classification:

2.2.1 The four stages of the life cycle can be divided into:

- (1) Probationary period, is the incubation period of customer relationship;
- (2) Formation period, is the rapid development stage of customer relationship;
- (3) Stable period, is the mature period and ideal stage of customer relationship;
- (4) Degradation period, is the reversal stages of customer relationship level.

2.2.2 The five stages of the life cycle can be divided into:

- (1) Customer acquisition, discovery and access to potential customers;
- (2) Customers improve, make customers become high value customers by stimulating combination product or service demand;
- (3) Customer maturity, enable customers to use new products, and cultivate customer loyalty;
- (4) Customer recession, establish an early warning system for the high-risk customers, prolong the life cycle of the customer;

(5) Customer churn, the mainly work is winning back customers.

2.3 The customer value theory

Customer value is the value that customer can bring for the enterprise, its size is equal to the D-value of the enterprise past, present and future returns from customers and attract, development, maintaining the customer costs. Here the benefits include monetary and non monetary income; Attract cost refers to the enterprise invest in order to win customer satisfaction expenditure, including marketing, advertising and promotion, etc; Development cost refers to the enterprise to strengthen or maintain existing customer relationship, including research and development, production, etc; Maintain cost refers to the need expenditure that enterprise to extend the customer relationship duration, reduce customer dissatisfaction, or win back customers.

Generally speaking, the customer value should include two aspects of value: one is the value of customers for suppliers, the other is the value created by suppliers for customer. The former refers to from the perspective of suppliers, analyze the value that customer can create for enterprise according to the customer's consumption behavior and consumption characteristic; it is an important standard for customer segmentation. The latter refers to considering from the customer perspective, customers according to their value evaluation criteria identify the value of products and service; this value in marketing is often referred to as the value delivered value or customer identification value. Of course, these two aspects are related, only when the value provided for the customer continuously improves, customer value for enterprises can be sustained implementation; only customer's growth can bring long-term development of enterprises. In this article, we will research the customer value that customer can bring for enterprise.

When evaluating the value of a customer, the enterprise should not only consider the customer current value, the predict judgment according to the customer future potential value is more important. Customer long-term potential value is related to the enterprise's long-term profits and long-term development, and it is an important factor that whether the enterprise continues to invest in the customer or not.

3. Study on the life cycle of enterprise customer value model

3.1 The current research status of enterprise customer lifetime value.

Customers as an important resource of enterprise like product have value and life cycle. CRM emphasizes customer lifetime value as the optimum objective, so as to achieve effective management of the lifetime value customer. In order to obtain valuable customers, enterprises need to use some methods to calculate the effective value of customers objectively and accurately, and conduct differential input and differential management for different types of customers, quantitative research on customer value can make CRM realize dynamic management of customer value.

With the development of information technology, enterprise owned complete customer data has made in-depth excavation and analysis of the customer consumption behavior possible. In recent years, the researches on CLV and related areas are mainly concentrated in the following 3 aspects: (1) by calculating the customer revenue stream and customer acquisition and retention cost and other related costs to establish CLV model. (2) Put forward different methods to analyze existing customer information, to predict the future customer trading probability value, and to determine the customer base that enterprise should be to acquire and retain, as well as the relations between the long-term value and enterprise profit through experiments. (3) Analysis of CLV decision support for enterprise management.

Although great progress has been made in research on CLV, the quantitative study of CLV model is still not deep enough, of which the representative is the research work on PAUL D Berger and NADA I Nasr. It was aimed at typical customer base to study CLV, and overcame the flaw that definition of simple CLV model cannot be achieved in practical application. The study introduced customer retention in CLV model parameters, constructed a more complete model, and made the application value of CLV model in the practical life realized.

3.2 Parameter structure of customer lifetime value model

According to the research results of PAUL D Berger and NADA I Nasr, we can express the general form of CLV model as:

$$CLV = \sum_{t=0}^n P(t) \times r \times \left[\frac{1}{(1+d)^t} \right] \quad (1)$$

P (t) for the customer net profit function; r for customer retention rate; t for customer life cycle time; d is the discount

rate, so CLV model parameters formed by customer profit, customer retention and customer life cycle time

4. The development of customer lifetime value model

4.1 Model expansion demand

Literature study found that: customer's profit parameters have been studied widely, but the research on customer retention rate and customer life cycle time remains to need further scientific studies. In the above models, assuming that the customer retention rate is unchanged, which makes that the model calculation results and the actual situation appear a gap, and it cannot meet the needs of enterprises for higher CLV application. The customer life cycle time also affects the results of CLV model. Therefore, in order to enhance the maneuverability and practicability of CLV model, improving and extending the CLV model is necessary.

4.2 Determination of model parameters

As we can see from the general CLV model, the error of model parameter estimation will cause the prediction deviation when calculating the same amount level of CLV, and reducing the difference between model parameter and the actual value can improve the accuracy of CLV calculation.

4.2.1 Determination of customer profit parameters

Customer profit means that the customer produces the net margin or net cash flow value added in the period of life cycle. Set up that a customer brings to the enterprise's profits for the $P(t)$ at the time t , we can obtain:
 $P(t) = GC_t - M_t$

GC_t is that customer brings the enterprise profit and the customer relationship maintenance and development costs at the t time. $P(t)$ can be similar to the difference between the income and the cost. According to the customer life cycle varies with time, scholars from both domestic and foreign put forward a customer profit curve inverted "U" shaped.

According to the three paragraph of fitting function of inverted "U" shaped of customer profit curve, customer profit can be expressed as:

$$\begin{aligned} P(t) &= P_1(t) = h_1 t^2 + v, 0 \leq t \leq t_1 \\ P(t) &= P_2(t) = h_1(t_1) + [N(1 - e^{-t/t_1})], t_1 < t \leq t_2 \\ P(t) &= P_3(t) = P_2(t_2) - h_2(t - t_2)^2, t_2 < t \leq T \end{aligned} \quad (2)$$

The h_1, h_2, t_1, t_2, N is the parameter of customer profit curve; v means that customer bring the profits to the enterprises by the first purchase; h_1, h_2 reflect the acceleration of customer profit growth and decline; N is the ultimate profit of the total growth after the t_1 point.

4.2.2 Determination of enterprise dynamic customer retention rate parameters

(1) The distribution function of dynamic customer retention rate

Customer retention is customer (relationship) life distribution, Weibull distribution can effectively represent the actual dynamic change of customer churn rate, and keep a great convenience for evaluating the customer on the different time of the customer life cycle. Assuming that the customer retention rate obeys Weibull distribution, cumulative customer retention variable can be expressed as:

$$r(t) = e^{-(\alpha t)^\beta}, \quad (3)$$

$r(t)$ is the accumulation of time t customer retention; $\alpha > 0$ for the scale parameter of the Weibull distribution (with the same t), and it can determine the scope of function value; $\beta > 0$ as the shape parameter of the Weibull distribution (dimensionless constants), and determining the distribution shape. Thanks to the dynamic customer retention rate, companies will focus on extending the customer retention time, so that acquiring higher CLV customer lifetime value.

(2) Enterprise dynamic customer retention rate and parameters calculation

In the function of Weibull distribution, the α and β parameters are the factors of the application. The determination of α and β is the key to establish customer retention rate function. This is an exponential distribution function, which can be converted to a simple form, the simplification process is

$$r(t) = e^{-(\alpha t)^\beta} \rightarrow \ln[1/r(t)] = (\alpha t)^\beta, \ln \ln[1/r(t)] = \beta \ln \alpha + \beta \ln t$$

In the formula to make

$$y = \ln \ln [1/r(t)], \gamma = \beta \ln \alpha, x = \ln t$$

It can be expressed as $y = \gamma + \beta x$

4.2.3 Determine customer life cycle time parameter

As mentioned before, the customer retention rate can reduce the errors between the calculated value and actual value about the customer relationship of time, and solving equations by Dynamic customer retention curve: $r(t)=0.5$ and $e^{-(\alpha t)\beta}=0.5$ can get customer life cycle time:

$$T = \exp \{ [\ln(-\ln 0.5)] / \beta \} / \alpha \quad (4)$$

The α and β respectively act as the scale and shape parameters. The time of customer life cycle is determined in the process that we can solve the equation $P_1(t) = P_2(t)$ to get t_1 , and we can solve the equation $P_2(t) = P_3(t)$ to get t_2 by type (2).

4.3 The extended model of customer life cycle value

We can establish the extended CLV model in the CLV model (1) by determining the customer profit parameters, dynamic customer retention and customer life cycle time. The extended CLV model includes 3 parts: developing stage, steady stage and decay stage of customer value corresponding to the customer life cycle, as shown below:

$$CLV = \sum_{t=0}^{t_1} P_1(t) \times r(t) \times d^t + \sum_{t=t_1}^{t_2} P_2(t) \times r(t) \times d^t + \sum_{t=t_2}^T P_3(t) \times r(t) \times d^t \quad (5)$$

$P_1(t)$, $P_2(t)$, $P_3(t)$ is the customer profit function, and based on the analysis of the historical profits to the customer by using the fitting function. $d = 1/(1+d)$, d is the discount rate.

$R(t)$ obeys dynamic customer retention rate of Weibull distribution. $r(t, t+1)$ represents conditional customer retention rate in $[t, t+1]$ time periods. In this article $r(t)$ is the cumulative customer retention rate at t time. $r(t = e^{-(\alpha t)\beta})$ is the customer retention rate by dynamic variable determined. When the higher rate of major customers keep customer profit, the greater the CLV. At the same time, customer retention rate and the maintenance time are connected, when the enterprise reduce customer churn rate, average customer retention time prolonged, CLV increased. Customer life cycle time T is the solution of the equation (4), a larger T indicates customer life cycle is longer, the higher the CLV.

5. The enterprise CLV model applied to the customer segmentation

From the above analysis: the customers bring maximum profits in the stable phase of the enterprise, thus the goal of customer retention is to enable customers to stay in the stable phase. During the whole life cycle management, management of customer value is the basic idea of CRM. CLV segments customer value, mainly from the customer current value and customer potential value.

5.1 Customer current value

Customer current value is actually generated net cash flow in the evaluation stage of customer. The prediction

formula is as follows: $CCV = \sum_{t=0}^{T_0} P(t)$

CCV is the customer current value, T_0 is the life cycle time, $P(t)$ is the historical customer profit in evaluation phase.

5.2 The customer potential value

Customer potential value is expected to increase the total for the enterprises in the future customer profit discount value in customer life cycle. Customer potential value (long-term value) is that the surplus value in the customer life cycle value minus the customer before the current time in net cash flow, that is the net present value of customer transactions in the future period. The key of predicting the customer's potential value is to measure the long term value.

Customer long-term value refers to the customer generating the total net cash flows in the interval from the current to the relationship termination. Assuming that the current customer life cycle time is T_0 , obviously the $T_0 \leq T$, its

long-term value depends on the relationship between T_0 and t_1, t_2 .

When $0 < T_0 < t_1$, customers is in the development stage of relationship, its long-term value can be shown as :

$$CPV = \sum_{t=T_0}^{t_1} P_1(t) \times r(t - T_0) \times d^{(t-T_0)} + \sum_{t=t_1}^{t_2} P_2(t) \times r(t - T_0) \times d^{(t-T_0)} + \sum_{t=t_2}^T P_3(t) \times r(t - T_0) \times d^{(t-T_0)} \quad (6)$$

When $t_1 < T_0 < t_2$, customers is in the stable phase of relationship, its long-term value can be shown as :

$$CPV = \sum_{t=t_0}^{t_2} P_2(t) \times r(t - T_0) \times d^{(t-T_0)} + \sum_{t=t_2}^T P_3(t) \times r(t - T_0) \times d^{(t-T_0)}, \quad (7)$$

When $t_1 < T_0 < T$, customers is in the recession of relationship, its long-term value can be shown as :

$$CPV = \sum_{t=t_0}^T P_3(t) \times r(t - T_0) \times d^{(t-T_0)} \quad (8)$$

5.3 Example verification

We use an enterprise customer profit history data to get profit function by regression analysis. Solve the dynamic distribution of customer retention, then get the customer life cycle time of customer segment for 5.5 years. Assuming the customer's duration is 2 years in the N-tf phase, the discount rate $d=0.2$, the customer who has been researched is in the stable stage (1~3.7years), the calculation of long-term value can be carried out by formula(7):

$$CPV = \sum_{t=2}^{3.7} P_2(t) \times r(t - 2) \times d^{(t-2)} + \sum_{t=3.7}^{5.5} P_3(t) \times r(t - 2) \times d^{(t-2)} = 256.37 + 90.29 = 346.66 \approx 347$$

That is the long-term value of the segmentation customer is 347 currency units.

By the above shows, we can simply get customer potential value prediction with the expansion of the CLV model. Enterprise can allocate their average cost in the segment customer according to customer's long-term value, and assist enterprises to make the correct customer retention and development decisions, and also can adopt the corresponding strategies to make customer value to maximize long-term value potential on the basis of customer's value expression.

References

- Chen Mingliang. (2014). The empirical study of customer lifetime profit trends. *Statistical Research*, 2014,6:40-50.
- PAUL D Berger, NADA I Nasr. (1998). Customer lifetime value: marketing models and applications. *Journal of Interactive Marketing*, 1998,12(1):17-30.
[http://dx.doi.org/10.1002/\(SICI\)1520-6653\(199824\)12:1<17::AID-DIR3>3.0.CO;2-K](http://dx.doi.org/10.1002/(SICI)1520-6653(199824)12:1<17::AID-DIR3>3.0.CO;2-K)
- PETER Verhoef, BAS Bonkers. (2001). Predicting customer potential Value an application in the insurance industry. *Decision Support Systems*, 2001,32(2):189-199. [http://dx.doi.org/10.1016/S0167-9236\(01\)00110-5](http://dx.doi.org/10.1016/S0167-9236(01)00110-5)
- Qian Ying, Wang Shoujin. (2013). Customer lifetime value enhancement strategy based on system dynamics. *Systems Engineering*, 2013,22(5):720-727.
- REICHHELD F F. (2000). The loyalty effect-the relationship between cycle and profits. *European Business Journal*, 2000,12(3),173-179.
- Wang Weiyan. (2012). The role of customer lifetime value in CRM performance management. *Business Studies*, 2012,16:20-23.
- Yang Lin. (2013). *Research on customer intelligence system based on customer knowledge*. Tongji University, 2013(01).