Application of Activity Based Costing in
Customer Evaluation and Management

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Abstract: As plant develops many industries´ automatic level is very high leading to the increasing of indirect cost. Traditional costing methods which use single standard of distributing indirect cost cannot calculate customer cost accurately and satisfy managers any more. This paper is aimed on solving the aforesaid problem. In this paper we propose the thought of evaluating customer cost by using activity based costing(ABC) and the traditional model of customer lifetime value(CLV) to improve the CLV model then analyze the difference of using both models through an empirical study. As a result ABC can account customer cost more accurately so that the CLV can help managers evaluate customer more effectively.

Key words: customer lifetime value; activity based costing; customer cost

1   Introduction

In the wake of the increasingly intense market competition customers have got more choice. Meanwhile the market changes from supply-oriented to customer-oriented so customers become the source of existence and development of enterprises. The management philosophy of "customer-oriented" demands that enterprises create value for customers and pay attention to the cost variance among different customers so that enterprises can achieve the goal of maximization of profit. The traditional marketing strategies of production-oriented aim at selling more production and expand the market share.

New customers are regarded as valuable as long-term loyal customers. However the long-term customers buy frequently and are easy to be served so the cost of service is less than new customers. Besides new customers bring about searching cost and buy small quantity of productions but spend the same transaction cost as buying large quantity of productions [1]. The traditional accounting method cannot distinguish the difference of cost among different customers and simply allocate indirect expenses according to single standard leading to information loss of the difference of cost then result in the inaccuracy of the assess of the profitability of customers.

The analysis of customer value has great effect on the profit of enterprises so there were many researches on this issue at home and abroad. Most customers value evaluation research concentrate on increasing customer life-time value (CLV) or increase customer capital to enhance customer loyalty through marketing method [2,3]. However these marketing activities have to make sure the increasing of sales revenue exceeds the increasing of related cost brought by increasing

CLV so that achieve the goal of increasing selling profit [4]. Yet marketing research overlooked cost issue and when researchers calculated CLV they made assumptions for cost specially or simply used direct product cost [5]. Considering customer demands differ a lot there are different indirect costs in customer costs. Using direct production cost cannot reflect customer value factually. Most empirical researches neglected indirect customer cost including customer-interactive cost and customer-buying behavior cost. Researches concentrated on reducing customer-obtaining and customer-retaining cost or reducing direct cost to improve enterprise benefits [6][7].

Civil researchers' studies of customer value begin later. Through document analysis most researches are after 2000 especially about 90% of researches are after 2004. Civil researchers were based on absorbing and referring foreign studies and combined civil modal carrying out applied researches of specific businesses such as manufacturing business [8] electric system [9] commercial bank [10] natural gas system [11] and so on. Although these studies fairly analyzed influence factors of customer life-time value in specific industries they rarely came down to indirect customer cost but just simply use product cost. What's more some qualitative factors were determined by people subjectively so quantitative models based on those factors were not exactly accurate.

According to the aforesaid documents analysis there were no researches ever studying customer value using activity based costing which can account customers' cost more accurately. This paper attempt to introduce ABC to identify customer activities in the customer life-time analyses activity cost drivers and builds customer value model based on the model of traditional customer life-time value to mend the traditional model so as to improve the accuracy of customer value evaluation.

2 Theoretical fundamentals

2.1 Activity-based costing

The basic idea of activity based costing was first introduced by American account scholar Eric Kohler in the 1930s. Its basic thought is "activities consume resources products consume activities" in other words ABC is a costing model that identifies the cost pools or activity centers in a firm and assigns costs to products and services based on the number of events or transactions involved in the process of providing a product or service.

The general procedure of ABC is in the following:

　　1) analyze activities to verify main activities then divide activity centers;

　　2) allocate expenses to activity centers which are cost pools;

　　3) allocate cost in the cost pools to products and services.

There are several concepts in ABC:

　　1) resource: the total of cost and expenses;

　　2) activity: the series of works that enterprises do throughout the life of products and services from producing to selling;

　　3) cost driver: consist of resource driver which is the standard of allocating resources to activities reflecting activities consume resources and activity driver which is the standard of allocating activities cost to objects reflecting objects consume activities;

　　4) cost driver ratio: activities consumed by each product and service the formula is as follows:

$$\varepsilon_i = \frac{C_i}{M_i} \qquad (1)$$

Where ε_i is the cost driver ratio of activity i; C_i is the total cost of activity i; M_i is the quantity of activity i.

2.2 Customer life-cycle

Customer life-cycle is the track that customer relations level changes reflecting the feature of customer relations move from one state to another state. According to the life cycle theory the development of customer relations can be divided into several stages and in the

different stages customer behaviors bring different cus-tomer activities.

There are four stages in the customer life-cycle:

1）stage of investigation: search and test rela-tions，both sides acknowledge each other and consider build long-term relation to obtain right and obligation，customers may have some tentative orders in this stage;

2）stage of formation: relations develop quickly，both sides have more trust and dependence on each other，transaction increases;

3）stage of stable: the stratosphere，the long-term cooperative relationship is established，both sides make tangible and intangible investments along with large transactions;

4）stage of vestigial: one side or both sides be-come dissatisfactory or find better partnership，trans-actions decrease，relations end along with search new partner.

2. 3　Model of CLV

Customer lifetime value means the present value of the total profits enterprises make for customers in the whole process of the relationship.

The traditional model of computing CLV is

$$\text{CLV} = \sum \frac{A_m}{(1 + I)^m} = \sum \frac{R_m - C_m}{(1 + I)^m} \quad (2)$$

Where m is the number of year; A_m is the profits of the year of m; I is discount factor; R_m is the general in-come of the year of m; C_m is the general cost of the year of m.

From the formula，in the condition of the same dis-count factor，CLV depends on R_m，C_m and m. The key of the accuracy of evaluation is effective cost ac-counting，in other words，make sure the accuracy of C_m. Traditional customer cost accounting just consider product cost ignoring indirect customer cost brought by customer behavior，so traditional model of CLV cannot reflect customer value accurately. It is neces-sary to mend the traditional model.

3　Research method

3. 1　Customer activity analysis

According to the life-cycle of customer，customer be-haviors include order processing，product producing，product selling，after-sale service and customer man-agement.

To further explain it:

1）order processing contains order obtaining，or-der conformation，customer files building，stock que-ry and order assign;

2）product producing contains technical prepara-tion，basic production，supplementary production and production service;

3）product selling is closely related to the or-ders;

4）after-sale service mainly means technical ad-vice and repair of products in problem;

5）customer management means managing infor-mation of customers.

3. 2　Activity cost driver analysis

ABC divides activities into the following four types:

1）unit-level activities represent the work per-formed for every unit of product or service produced;

2）batch-level activities represent resources re-quired to perform a batch-level activity. The expenses of this resource are fixed;

3）product-sustaining activities represent the work performed to enable the production of individual products to occur;

4）customer-sustaining activities represent the work that enables the firm to sell to individual custom-ers. For each activity，there is an activity cost driver that links to different activities.

Use ABC to analyze the five customer activities as shown in Table 1.

Table 1   Activity cost driver analysis

Types	Activities	Activity drivers
Batch–level	Order processing	Order quantity
Unit–level	Product producing	Product quantity
Batch–level	Product selling	Selling batches
Product–sustaining	After–sale service	After–sale service times
Customer–sustaining	Customer management	Manage time

3. 3 **Modified model**

Assuming there are three customers   through customer cost analysis as shown in Table 2   the formula of cus– tomer cost is in the following.

$$C_i = \sum_{j=1}^{5} \varepsilon_i M_{ij} \quad i = 1 \ 2 \ 3 \qquad (3)$$

Table 2   Quantity of customer activities

Activity	Customer A	Customer B	Customer C
a_1	M_{11}	M_{21}	M_{31}
a_2	M_{12}	M_{22}	M_{32}
a_3	M_{13}	M_{23}	M_{33}
a_4	M_{14}	M_{24}	M_{34}
a_5	M_{15}	M_{25}	M_{35}

The modified model of CLV can be calculated by

$$\text{CLV} = \sum_{m} \frac{R_m - C_i}{(1 + I)^{m}}$$

$$i = 1 \ 2 \ 3 \qquad (4)$$

4 **Empirical study**

The empirical study is based on a varistor enterprise that supplies electronics manufacturing enterprises A B and C with electric resistance products. After a full investigation   we get the operation data of the enter– prise during June   2012 as shown in Table 3.

Table 3   Sales and cost details

Customer	Order	Sales	Sales value ¥ /Yuan	Total cost ¥ /Yuan
A	200	500	2 000 000	1 500 000
B	1 000	800	3 200 000	2 400 000
C	800	400	1 600 000	1 200 000

The overhead cost of sales department is 189 600 Yuan which is composed of commissions (60 000 Yuan) use cost of computer (9 600 Yuan) and office expenses (120 000 Yuan). There are four activity centers include order handling center sales center after-sales service center and customer management center. The salary for every employee is 3 000 Yuan per month; Use cost of computer is 2 Yuan per hour; Office expense is 25 Yuan per hour.

According to *ABC* every activity center will extract resources. Then the cost will be gathered into the corresponding activity center. Table 4 shows that the total consumption of resources is 189 600 Yuan which remains to be allocated to the four activity centers. Based on *ABC* the cost of resources of order handling center is 28 440 Yuan sales center 75 840 Yuan after-sales service center 75 840 Yuan and customer management center 9 480 Yuan.

Table 4   Cost allocation of activity center

Activity center	Resource driver			Resource cost ¥/Yuan
	Employee quantity	Computer time/h	Labor time/h	
Order processing	3	720	720	28 440
Product selling	8	1 920	1 920	75 840
After-sales service	8	1 920	1 920	75 840
Customer management	1	240	240	9 480
Total	20	4 800	4 800	189 600

The allocated cost will be re-allocated to every customer according to the activities it consumes. We can get resource driver ratio with the allocated cost and the total activity amount based on Equation (1). Then we can figure out the client cost with activity amount that it consumes based on Equation(3).

Table 5   Cost allocation of client

Customer	Cost driver				C_i
	Order times	Order batches	Service times	Management time/h	
A	200	50	10	20	46 055
B	1 000	40	8	100	52 770.4
C	800	80	20	80	90 774.6*
Total	2 000	170	38	200	189 600
ε_i	14.22	446.1	1 995.8	47.4	–

* Cost of client C is the result of total cost minus cost of A and B to adjust the error from ε_i accuracy.

Finally we use the general CLV model and *ABC* improved CLV model to calculate the client value respectively. Client value segmentation is the primary task for enterprises to implement customer management effectively. To say it briefly based on the study method analysis above the general CLV model sees client direct cost（product cost）as the calculation standards of client value while *ABC* improved model is based on client cost obtained from *ABC*. Difference between the two lies in the calculation of client indirect cost as client direct cost calculation standard is the same. The general CLV model doesn´t cover any cost that clients exhaust beyond the product cost. However client cost obtained from *ABC* is more accurate as it involves all client related activities and resources. We can see the differences in Table 6.

Table 6　Comparison of client value under two models

Items	Client *A*	Client *B*	Client *C*
Sales value ￥/Yuan	2 000 000	3 200 000	1 600 000
Direct client cost ￥/Yuan	1 500 000	2 400 000	1 200 000
general CLV model	500 000	800 000	400 000
Indirect client cost ￥/Yuan	46 000	53 000	91 000
Modified CLV model	45. 4	74. 7	30. 9
Change percent/%	9. 2	6. 7	22. 8

We adopt profit for the term directly and ignored time value when calculating client value as we only collect data of a month. Given stable clients of the enterprise we suppose that the life cycle of these three clients are the same and ignore discount ratio. Thus we can see from the comparison that all client value decreases under the improved CLV model among which client *C´* value decrease the most（22. 8%） while client *A* and *B* drop within 10%. The comparative client value doesn´t change anyway but client *B´s* value is the biggest following by client *A* and client *C* is the least. It is clear that the smaller client´s value has been overstated largely.

As the three client value is considerably large we didn´t get any negative client value under the improved CLV model. In fact the general CLV model isn´t able to investigate client cost fully or allocate cost effectively thus some client indirect cost is underestimated while others overestimated leading to the inaccurate evaluation of client value. We can say that negative client may exist. Some problems may arise as to the segmentation of clients and customer management. Moreover negative value clients may remain leading to losses or negative influence on the realization of profit maximization.

5　Conclusions

To apply *ABC* to client value analysis and decision making is to extend value chain of enterprise to clients. In this way clients´ behavior not only involves direct cost of product that clients buy（i. e. product cost） but also cost relative to activity cost because of some clients´behavior. The client cost we discuss in this paper combine time value and the traditional concept of cost which is more scientific and impartial as to the evaluation of client cost. So it is helpful to the choosing of clients and is practical. Meanwhile with the development and application of customer relationship management the message of clients will be more

comprehensive which makes it possible to apply *ABC* in more and more enterprises. So *ABC* has extensive application foreground as to client value evaluation.

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