



## Study on the Relationship between Customer Satisfaction and 3PL Costs

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### Abstract

The relationship between customer satisfaction and logistic costs was mainly analyzed in the article, and the grey correlation analysis method was used to study the relationship between customer satisfaction and various activity centers, and the research result could offer decision-making references to save costs and enhance customer satisfaction for 3PL (Third Party Logistic) enterprises.

**Keywords:** 3PL (Third Party Logistic), Customer satisfaction, Cost, Grey correlation

With the increasingly drastic competition in the 3PL market, the logistic service enterprises all take improving the service of the enterprise as the important measure to enhance consumer satisfaction and form higher consumer loyalty. However, the enhancement of the service quality level always goes with the large rise of the logistics costs, and it is worthy to study whether the paid costs will obtain good returns. At present, there are many researches about customer satisfaction by foreign and domestic scholars, and they primarily used various models to analyze the influencing factors of satisfaction, and for the cost research about 3PL enterprise, their researches mainly centralized in the cost analysis and cost saving, and the researches about the relationship between 3PL service cost and customer satisfaction were still rare.

### 1. Customer satisfaction and its evaluation

#### 1.1 Customer satisfaction

Marketing scientist Philip Kotler pointed out that the satisfaction meant one person's joviality sense or disappointment sense by comparing his perceptive effect to the product or service with his expectation. So the customer satisfaction is decided by customer expectation and actual perception, and both factors are reversely proportional, and the customer satisfaction is positively proportional with the actual perception. The computation formula of the concept can be described as (Gong, 2000, P.78)

$$D = \frac{u(X)}{U}$$

Where,  $D$  is the customer satisfaction,  $u(X)$  is the customers' actual perception which shows positive correlation with the service level of the enterprise and is influenced by the enterprise drumbeating and the client perceptive ability,  $U$  is the customer expectation which is decided by the promise of the enterprise and customer's historical experience accepting service, and when  $D = 1$ , the customer's expectation goes all the way with his actual perception, and when  $D \geq 1$ , the customer obtains the satisfaction exceeding his expectation, and when  $D \leq 1$ , the customer's experience and perceptive quality are lower than his psychological expectation.

The researches about customer satisfaction begun earlier in foreign countries, and some customer satisfaction mode identified by many scholars have been formed, and the representative model is the American customer satisfaction index evaluation model (seen in Figure 1).

From Figure 1, customer satisfaction is mainly decided by two factors including customer expectation and perceptive factor, and both factors act each other to make customer feel satisfactory or not. Based on that, many domestic and foreign scholars put forward the strategies about how to enhance customer satisfaction, and in these strategies, one common problem can be concluded, i.e. to enhance the service ability and service level of the enterprise.

### 1.2 Evaluation of 3PL enterprise customer satisfaction

The competition in the 3PL market is more and more drastic, and facing the severe situation, many professional logistics companies all put improving service quality and enhancing service level on the primacy to maintain the market status and enhance the market share. It is an urgent problem to improve the service quality and enhance the service level for professional logistics companies. In the summer of 2006, after interviewing 64 production enterprises with logistics outsourcing operation in Tianjin City, the problems concerned by these enterprises could mainly include safety, being in time, veracity, the ability and level to dispose international logistics, communication ability and the reasonability of price.

The safety includes the safety of the transportation on the road, the safety of the storage and the safety of information, and about 84.4% of inquired enterprises emphasized the demand of the safety. The being in time includes picking up the goods in time, delivering goods in time, transporting in time and so on, and about 78% of inquired enterprises emphasized the character of being in time. The veracity includes the accomplishment veracity of orders, the nicety of the repertory, the nicety of the information and the nicety of the charge accounting, and about 76.6% of inquired enterprises emphasized the character of veracity. The ability and level to dispose international logistics (most production enterprises in Tianjin have the outsourcing operations) include the customs applying ability of professional logistics companies, sheet processing ability and the transportation ability of international goods, and about 59.7% of inquired enterprises emphasized the ability and the level to dispose international logistics. The communication ability includes the business communication ability with clients, and the ability processing clients' complaints, and about 59.4% of inquired enterprises emphasized the communication ability of professional logistics service companies.

## 2. Costs of 3PL enterprises

According to the logistic iceberg theory proposed by Professor Seiichi of Japan Waseda University (Shuai, 2005, P.156), the logistics costs include not only the material charges such as direct transportation and distribution charges above the water, but the invisible immaterial charges which happen below the water in the interior of the enterprise. For 3PL enterprises, the logistics is their prime business, and the logistics costs analysis is the important measure of the logistics management, and the quantification of the logistic economic benefit index, and it can more obviously reflect the 3PL economic benefits.

Because different services offered by 3PL enterprises for customers will produce different costs, so according to the logistics function classification (Gao, 2006, P.67), the logistics cost generally can be divided as material circulation charge, information circulation charge and logistic management charge. The material circulation charge includes the packaging charge, the transportation charge, the storage charge, the loading and unloading charge, the circulation machining charge and the distribution charge. The information circulation charge includes the information charges about the storage management, the order management and the customer service. The logistic management charge generally includes the charges in the logistic computation, adjustment and control.

According to the activity-based costing method, the whole operation flow of the logistic service enterprise can be divided into many different activity centers, and the cost accounting can be implemented by different activity centers. Table 1 is the cost accounting according to the activity-based costing method, and the cost accounting period is from Jan 2006 to Dec 2006.

From Table 1, the maximum proportions of the cost in Company A are the distribution charge and the storage charge, and to effectively cut the costs of 3PL enterprises, both charges should be noticed.

## 3. Relationship between customer satisfaction and logistics cost

The relationship between customer satisfaction and logistics cost is influenced by many factors, so following hypotheses are needed. First, the management level of all logistic enterprises has achieved their optimal level. Second, the market is in the state with sufficient competition. Third, when other influencing factors don't change, the logistic service level decides customer's satisfaction degree.

### 3.1 Relationship between customer satisfaction and total logistics cost

Customer satisfaction is not directly correlative with logistics cost, and there is the service quality between them to maintain their relationship. Generally, higher payment of service cost can bring higher service quality and obtain customer's higher satisfaction, and on the contrary, lower payment of service cost will induce lower service quality and reduce customer's satisfaction. So generally speaking, customer's satisfaction is positive proportional with the service cost paid by the enterprise. In the survey of logistic enterprises, the degressive relation of the marginal benefit exists between customer satisfaction and costs paid by the professional logistic companies. In the initial stage, the super-addition of service cost can largely enhance customer satisfaction, but with the continual increase of service cost, the enhancement of customer satisfaction brought by the added unit cost will continually decrease.

In Figure 2,  $OC_1 = C_1C_2 = C_2C_3$ , and  $OQ_1 \geq Q_1Q_2 \geq Q_2Q_3$ , and with the continual addition of unit cost, the

enhancement of customer satisfaction is decreasing continually.

In the actual production and management, to survive and develop, 3PL enterprises all emphasize the relationship between service cost and customer satisfaction. The ideal change relationship between both sides can be presented in Figure 3 (Xu, 2001, P.6).

In Figure 3,  $S_1$  and  $S_2$  are the relationship curves between customer satisfaction and logistics cost, and the service cost is kept in  $C_1$ , and the customer satisfaction rises from  $Q_1$  to  $Q_2$ , and the customer satisfaction is enhanced when the service cost doesn't change.

In Figure 4,  $S_1$  and  $S_2$  are the relationship curves between customer satisfaction and logistics cost, and the service cost decreases from  $C_1$  to  $C_2$ , but the customer satisfaction rises from  $Q_1$  to  $Q_2$ , i.e. when the service cost decreases, the customer satisfaction is enhanced.

### 3.2 Analysis of relationships between customer satisfaction and various logistics costs

According to the activity-based costing method, the services offered by the 3PL enterprises can be divided into different activity centers, and the costs expended by different activity centers and their contributions to customer satisfaction are different, so the influences on customer satisfaction can be analyzed according to different activity centers. Six enterprises with logistic service outsourcing business were selected to respectively evaluate influences of many factors including distributing, goods processing, order processing, storage service, information processing and problem disposal on the satisfaction. Supposed that the values of various indexes are in the range from 1 to 10, and higher values means higher importance degree, and the scores and reference sequences of various enterprises are seen in Table 2.

The influences of various activity centers on customer satisfaction are taken as the research objectives, and the grey association analysis method (Deng, 1987) is adopted to study the problem.

Above values are nondimensionalized and the result is in Table 3.

Perform the grey correlation analysis for above data in Table 3.

$$\eta(k) = \frac{\min \min |\hat{X}_{(0)}(k) - X_{(0)}(k)| + \rho \max \max |\hat{X}_{(0)}(k) - X_{(0)}(k)|}{|\hat{X}_{(0)}(k) - X_{(0)}(k)| + \rho \max \max |\hat{X}_{(0)}(k) - X_{(0)}(k)|} \quad (1)$$

Where,  $|\hat{X}_{(0)}(k) - X_{(0)}(k)|$  is the absolute error between the k'th factor  $\hat{X}_{(0)}(k)$  and  $X_{(0)}(k)$ ,  $\min \min |\hat{X}_{(0)}(k) - X_{(0)}(k)|$  is the minimum difference between two classes,  $\rho$  ( $0 < \rho < 1$ ) is the distinguished rate, and generally  $\rho = 0.5$ .

After compute the correlation coefficient between sequence  $X_{(0)}(k)$  and sequence  $\hat{X}_{(0)}(k)$ , and compute the average value of various correlative coefficients.

$$r = \frac{1}{n} \sum_{k=1}^n \eta(k) \quad (2)$$

The correlations of 6 influencing factors to customer satisfaction and their rankings are seen in Table 4.

Table 4 indicates the ranking of the importance of logistic activity center influencing customer satisfaction is from distributing, storage service, information processing, goods processing, and problem disposal to order processing in turn.

## 4. Conclusions and advices

In the costs of logistic enterprise, the proportions of distributing and storage service are bigger than others', and for the total control cost, the controls about these two aspects will produce effective effects. However, they are the most important factors influencing customer satisfaction, so the relationship should be disposed carefully.

To solve the problem about the logistic costs, the customer satisfaction should be enhanced based on controlling the costs from following aspects.

(1) The all-personnel service concept should be established. First, employees' master consciousness should be established, and the enterprise should make them realize that their thoughts and actions are closely linked with the survival and development of the enterprise. Second, the communication between the enterprise and interior employees should be strengthened, and the enterprise should let employees deeply understand the development objective and task of the enterprise. Third, the education of service consciousness should be strengthened, and the consciousness servicing for clients should be sunk deep into the hearts of the people. Fourth, the employee training should be strengthened and

the ability servicing service should be enhanced.

(2) The communication between the enterprise and the clients should be strengthened. The communication is the important measure to increase understandings and release conflicts and complaints between the enterprise and customers. Good communication can make the enterprise really know customers' real demands and establish target-oriented strategies and methods to fulfill these demands, which can not only effectively enhance customers' satisfactions, but effectively reduce the service cost for the enterprise and fundamentally reduce the cost waste induced by the inefficient services. Regular client communication, complaint mail box and visiting customers regularly are goods measures to communicate with customers.

(3) Different service combinations should be offered to different clients according to the market segmenting results. Aiming at the similar demands in the interiors of various sub-markets, the enterprise should offer consistent service product combination for various enterprises in the sub-market, and aiming at the different demands among different sub-markets, the enterprise should offer different service product combination among various sub-markets. On the one hand, the standardized service aiming at similar demands could largely reduce the production and service cost, and on the other hand, aiming at different demands, the individual service product combination could effectively enhance customers' satisfaction.

(4) The professional operation of the enterprise should be emphasized and the core operation of the enterprise should be cultivated as soon as possible. Michael Porter thought that the difference was one important approach to enhance the competitive force of the enterprise, and professional logistic enterprises should emphasize the cultivation of their core business and establish the image of difference. Quite part Chinese logistic enterprises are from original transportation enterprise and storage enterprises, and they should fully utilize their traditional resources to offer professional services for clients.

(5) The utilization of high-new technologies could also effectively enhance the efficiency of the logistic service and reduce the cost for the enterprises.

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Table 1. Cost accounting table of Company A (unit: Yuan)

Activity center	Money amount of costs	Proportion
Distributing	1024108	40.24%
Goods processing	301582.5	11.85%
Orders processing	31558	1.24%
Storage service	904747.5	35.55%
Information processing	268752	10.56%
Problem disposal	14252	0.56%
Total	2545000	100%

Table 2. Customer satisfaction influencing values of various activity centers

	Distributing	Goods processing	Orders processing	Storage service	Information processing	Problem disposal
Enterprise 1	8	2	4	8	6	5
Enterprise 2	9	5	5	9	8	8
Enterprise 3	8	6	7	10	8	6
Enterprise 4	8	3	5	9	7	6
Enterprise 5	9	5	5	9	6	7
Enterprise 6	8	6	5	8	6	6
Reference $x_0'$	9	6	7	10	8	8

Table 3. Dimensionless data table

	Distributing	Goods processing	Orders processing	Storage service	Information processing	Problem disposal
Enterprise 1	0.89	0.33	0.57	0.8	0.75	0.625
Enterprise 2	1	0.83	0.71	0.9	1	1
Enterprise 3	0.89	1	1	1	1	0.75
Enterprise 4	0.89	0.5	0.71	0.9	0.875	0.75
Enterprise 5	1	0.83	0.71	0.9	0.75	0.875
Enterprise 6	0.89	1	0.71	0.8	0.75	0.75
$x_0$	1	1	1	1	1	1

Table 4. Correlations and ranking of influencing factors

Influencing factor index $x_i$	$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	$x_6$
Correlation degree $r_i$	0.833	0.675	0.6	0.762	0.74	0.652
Ranking	1	4	6	2	3	5

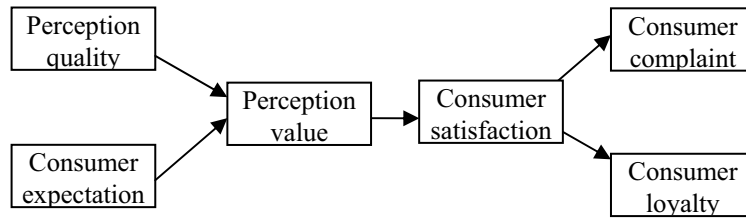


Figure 1. US Customer Satisfaction Index Evaluation Model

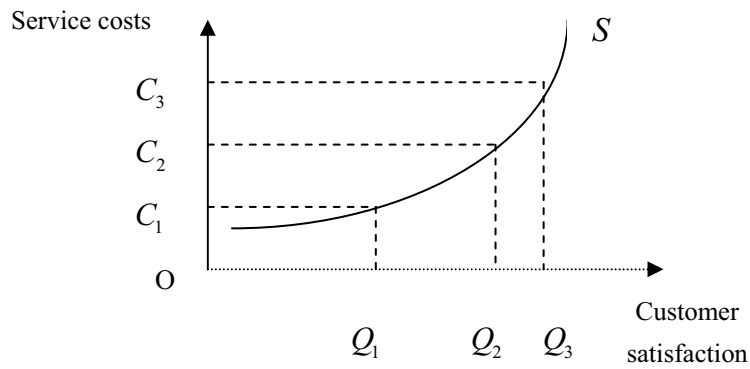


Figure 2. Sketch Map of the Relationship between Logistics Cost and Customer Satisfaction

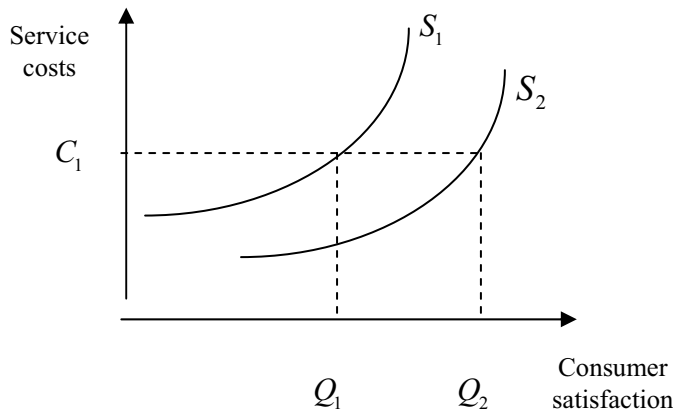


Figure 3. Relationship 1 between Service Cost Change and Customer Satisfaction Change

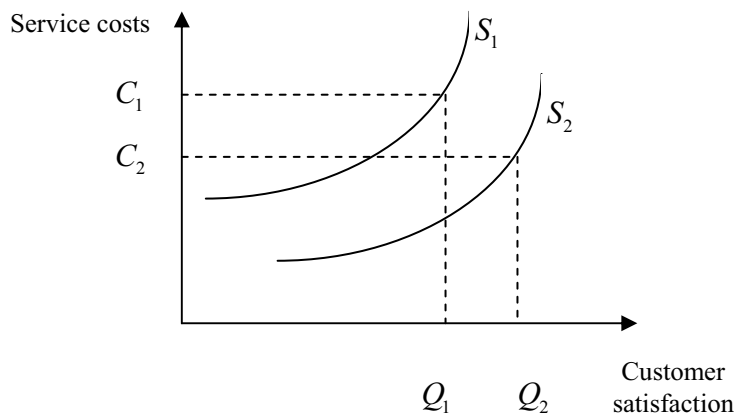


Figure 4. Relationship 2 between Service Cost Change and Customer Satisfaction Change