Winter 12-5-2004

Working Mechanism and Structure of Customer Services Support System

Qingguo Wang

Shuqin Cai

Yuhua Zhou

Kaichun Liang

Working Mechanism and Structure of Customer Services Support System

Qingguo Wang, Shuqin Cai, Yuhua Zhou, Kaichun Liang

School of Management, Huazhong Univ. of Sci. & Tech., Wuhan 430074, China
wqg1997@163.com

ABSTRACT

On the basis of analyzing customer services of manufacturing enterprises and these supporting requires, using the method of discrete system simulating, the paper provides the classifications of customer services suitable information technology supporting, brings forward the working mechanisms suitable to the supporting system of different kinds of customer services and the relevant system structure.

Keywords: customer service (CS), customer service support system (CSSS), working mechanism, system structure

1. INTRODUCTION

To manufacturing company, with the fierceness of the market competition, customer service of enterprise faces all kinds of presses such as the increase of working load, serve standard raising, resource limited and fund shortage,[1] and customer service bears dynamics, complexity, timeliness and outburst of time and space, so enterprise requires customer service supported by information technology which can be realized with low cost, effective resource allocation and fast and automatic reactivity. The domestic and international relevant scholars have studied in regarding customer service and its supporting technologies with information technology [2-9], the typical applications include mainly: customer care, dispute disposing, order following, field service, and database of problem and solution, etc. Many kinds of new methods of customer service such as Web, VoIP, Email, Live Chat, Virtual Reps have appeared. But the applications of the technology are mainly the support to the concrete business of customer service and have supported the development of enterprise's customer service to a certain extent, but set foot in little in decision of enterprises service resource scheduling. The problems such as rational arrangement and managing enterprises service resources, integrating the numerous service methods and formulation of the service tactics are that enterprises are badly in need of solution at present. Though customer service has many kinds of different classification already, [10,11] it can't totally respond to the request of customer service supporting with information technology yet. So it is very necessary to study the classification of customer service in more pertinence, which can help to provide different and more effective disposing mechanisms for all kinds of customer services.

Customer service supporting system is a part of customer relationship management system backstage supporter their system, supports and restricts whole customer relationship construction and service support operation, and plays a key role in the system, so its working mechanism and system structure become hotspot in theory and practice to study. Systematic simulation has already been applied to numerous systems such as economic system, business system, and logistics management system extensively. By the look of resource competition, customer service is a kind of question of lining up, and dispersed incident systematic simulation is a kind of auxiliary administrative skill and can preferably solve this problem [12,13]. Because of the characteristics of customer services, the study of customer service not only focuses on simulating experiences and suitable service strategies, also includes the customer service support system that integrates the testing study and practicing support.

Taking manufacturing enterprise as the background, this paper provides a kind of new customer service classification based on discussing influence factors of customer service, designs system model of event-driven customer service using systematic simulation technology, provides system structure and the corresponding systematic module to provide guidance for development of enterprise's customer service, distribute the service resources of enterprises rationally in the course of implementing and improve the customer satisfaction of enterprises.

2. CUSTOMER SERVICE CLASSIFICATION SUITABLE TO CSSS

The customer service is a very extensive concept, does not confine to narrowly-defined ranges such as traditional selling service and after-sale service and should include these activities, such as advertisement, free trial, presentation and investigation, solicitude and support to customers which get in touch with enterprise, involving the whole cycle of selling products. So the customer service is not only the service request responding the customer passively briefly, should also offer customer service voluntarily.

2.1 Influencing Factors of Customer Service

The service time variable not only points the implementation time of the customer service but also includes the makeup-time and latency time of service. As latency time correlates with the customer service tactics of enterprises and customer service resource and

does not have direct relation with customer service, only implementation time and makeup-time of the customer service are considered here. In the customer services that enterprises offer, some are finished once, otherwise, some are implemented many times stage by stage, where the service time of this kind of customer service is made up of implementation time of a lot of customer services. So service time T can be described as following:

$$T = f_1(n), \tag{1}$$

where n denotes stage degree of service. When n is equal to one, T is short, and T is long when n is bigger than one.

Service costs include only labour cost l, material cost m and opportunity cost. Labour cost depends on the service provider and shows significant degree of customer attendants in enterprises. The material cost is the value of the corresponding material while offering this kind of customer service by enterprises, if maintaining the three guarantees products, enterprises should offer the corresponding spare part to replace the trouble one. When a certain customer service needs to consume material cost, not only raise the service costs of enterprises, may take more makeup-time for planning the material. The opportunity cost means possible losses caused by that enterprises appoints competent technology and management attendants to implement one requiring the low customer service to engineering level. Because the attendants with competent technology are limited in quantity, so this kind of chance loss may cause another customer service expected much to engineering level not to get prompt treatment. So service costs can be described as the following:

$$C = f_2(l, m), \tag{2}$$

where l is low without m, C is low, and C is high when l is high or there is m.

Different customers have different customers' value to enterprises. If enterprises do not distinguish the customer according to these value, it will cause that some customers' actual contribution to enterprise are still not enough to remedy the input of enterprises for them, otherwise, some customers are influenced as investment to them is insufficient. According to customer value, all the customers can be classified into important customers and ordinary customers shown by G. There are present customers in the important customers, and there are potential customers too. The important customer enjoys enterprise's customized customer service, and enterprises offer ordinary customer service for ordinary customer.

2.2 Classification of Customer services

Considering above-mentioned influence factors synthetically, customer service classification Y can be defined as follows:

$$Y = f_3(T,\ C,\ G). \tag{3}$$

The customer services of manufacturing enterprises can be divided into event type, activity type and process type three kinds, according to T, C, G, and the requires, feasibility and simplicity realized of information supporting technologies to customer services, showing as table 1.

Table 1 Value of Customer Service Classification

Y	T	C	G
Event Type	Short	Low	Ordinary
Activity Type	-	High	Ordinary
Activity Type	Long	Low	Ordinary
Process Type	-	-	Important

Event type customer service is a kind of customer service that possesses of short service time, low service cost and ordinary customer, which is one stage service. The realization of event type customer service can be regarded as the array of event serials made up of beginning event and ending event.

Activity type customer service is a kind of customer service that possesses of long service time or high service cost and ordinary customer, which is multi-stages service, and the beginning of subsequent service decides by the foregoing service. Activity type customer service accords with the definition of activity in activity scan simulation method, so it can be disposed as an activity.

Process type customer service has nothing with two factors of service time and service cost, only decided by customer types, whose customer is important customer. It is not a certain concrete customer service, but a kind of customer service tactics of enterprises, it covers the customer's whole life cycle and is a service package including lots of services for the important customers. Each service package is different from others as each of them faces a certain important customer. So process type customer service is made up of event type customer services and activity type customer services disposed as event and activity respectively. A process type customer service including these events and activities is disposed as a process.

Three kinds of customer services have different service costs, among them the incident type has the lowest customer service, the course type is the highest, the differentiation of this kind of service cost contributes to controlling enterprise's service cost, and the enterprise can provide different customer services to different customers discriminatively. The serving objects of three kinds of customer services are different, those of the event type customer service and activity type customer service are ordinary customers, those of process type

customer service is important customers, which contributes to guaranteeing enterprise's main profit source and satisfies the service of the important customer. From the point of information technical support, above-mentioned categorized methods can help enterprises to implement customer's service support system based on information technology better.

3. WORKING MECHANUSMS OF CSSS

Systematic simulation is a course of solving the dynamic system model with number value method, which understands and predicts systematic behavior through the experiment of a realistic system or the system model that plans to be set up. Event step method in dispersed incident systematic simulation is often used to simulate enterprise management system, which is divided into three kinds of different simulation working mechanism: event-driven method, activity-scanned method and process-switched method.

3.1 Working Mechanisms of CSSS used by Event-driven Method

Event-driven method is described in Ref. 12 as: Operations of system are made up by a series of emergence of events according to time, courses that take place inside are regarded one array of events and future event list (FEL) is adopted to confirm the order of events according to each time that events happen. The incident of time take place first is chosen from FEL, each time the most necessitous event is disposed, simulation clock is advanced to here incident time at the same time, then the corresponding event subprogram is carried out, the corresponding systematic state of changes, and any condition is tested and happened in the incident subprogram. After an event is dealt with, it retreats from FEL. The operation of the event-driven simulation method includes two stages: (1) Time scanning, to carry out two operations: scanning future incident form FEL to confirm next time that event happens, and moving e forward clock to present time. (2) Event execution, to transfer the corresponding event subprogram. Carry out two these repeatedly, until the fact that fixed simulation end conditions are satisfied.

In three kinds of customer services, the event type customer service is made up of service beginning event and service ending event, and the emergence course of it also composes of the array of these two events above. The activity type customer service can be regarded as a lot of associations of event type customer services, it also composes of service beginning event and service ending event too, but a different one is that the end of anterior events can touch off the beginning of the next stage. The process type customer service is the service package made up of event type customer services and activity type customer services. So Event-driven method can be adopted to support tactics and simulation implement of the three kinds of customer service above.

3.2 Working Mechanisms of CSSS used by Activity-Scanned Method

Activity-scanned method is the simulating method based on activity scanning. Beginning events and ending events of are initialized by terms that the activity stipulate, and not prearranged by the model. In three customer services, event type customer service does not adapt to activity-scanned method because it is one stage service. Activity type customer service is made up of lots of stages where subsequent service is decided by anterior service, so it is suitable to activity-scanned method. Process type customer service includes activity type customer services, so it can be disposed using activity-scanned method.

3.3 Working Mechanisms of CSSS used by Process-switched Method

Process-switched method is the simulating method based on processes that compose of the array of events and some activities. Event type customer services and activity type customer services are unsuitable to process-switched method because of their characteristics. Process type customer service is made up of event type customer services and activity type customer services, so it can be disposed using activity-scanned method.

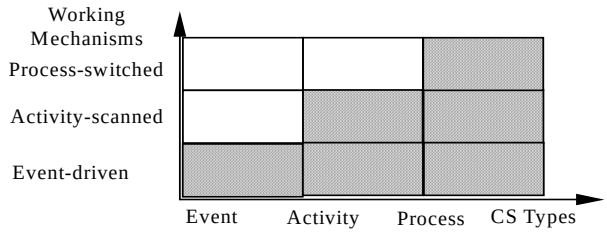

Fig. 1 Working Mechanisms suitable to each kind of CS

Fig.1 shows the different working mechanisms supporting the three kinds of customer services in customer service support system.

4. STRUCTURE AND REALIZATIONS OF CSSS

4.1 Main Data Structures of CSSS

The static information of system consists of customer information, customer service information, the detail of activity type customer service, the detail of process type customer service, distant time weight, distance weight, balanceable guideline weight, service attendants' information and city geographical information. Here, customer information is the relative information to customer weight, and not customer dossier in customer relationship management. Customer service information records all the services developed by the enterprise. The detail of activity type customer service records the information of each stage services in activity type customer service. The detail of process type customer

service records all the service items of important customers served in process type customer service, which includes the following word sections: customer number, product number, service number and prospective service time, where prospective service time denotes prospective time of each service item. Distant time weight records every weight that increases after certain time interval to count. Distance weight records every weight that increases after certain distance interval to count. Balanceable guideline weight records the weight in total PRI of each index. Service attendants' information records the personal information and technology level information of all the attendants. City geographical information records the longitude and latitude of all over the national cities, and the grain size reaches the county.

The dynamic information of system consists of the information in the following tables: present event list, future event list and customer latency time list. Present event list records present customer services serving, future event list records waiting customer record having been in service queue, and customer latency time list records the latency time taking in each serving.

Service tactics storehouse mainly records service tactics used by the enterprise and their purposes. In system, service tactics represents as variation of all the weights, and their purposes are mainly evaluated by the average of latency time. In service tactics storehouse, there are three kinds of average of latency time: the average of latency time of important customers, the average of latency time of ordinary customers and the average of latency time of all the customers, which are used to judge the influence of service tactics on the important customers, ordinary customers and the whole customer cluster of the enterprise. These information in service tactics storehouse not only are an evaluation to former service tactics, also use for reference to drawing new service tactics.

There are three kinds of events: happening event of new service need, service ending event and latest approaching clock event, to vary the systematic state. Happening event of new service need denotes the new service need being from customers or new customer service practiced by the enterprise, whose direct influence is to add new record in FEL. Service ending event denotes that the serving customer service has completed, whose direct influence is this record of customer service will be deleted from FEL. Because not all the waiting service records need to be served immediately, the latest approaching clock event is set to dispose them. When latest approaching clock event is touched off, system transfers directly the calculating rules of entering FEL, inserts suitable record into FEL and make it be served.

4.2 Function and Structure of Event-driven CSSS

Customer service support system is one of the back platform subsystems of customer relationship management system. It supports customer service and the practice of customer service, makes it be the profits center by distributing customer service resources and decreasing costs. Because of the concrete difference in business treatment of customer service, as an event-driven customer service system in common use, it does not participate in the actual treatment of enterprise's customer's service items, but regarded as a middle bridge between customer identifying system and enterprise's customer service process system. The event-driven customer service system receives service needs of customers issued by the intellectual agent's system of the customer service, optimizes these needs, distributes the service resources of enterprise in reason, and submits them to enterprise's customer's service item process system. So its main function is the support to decision-making and practices. Fig. 2 shows the information flows of customer service support system, and Fig. 3 describes the structure of the system.

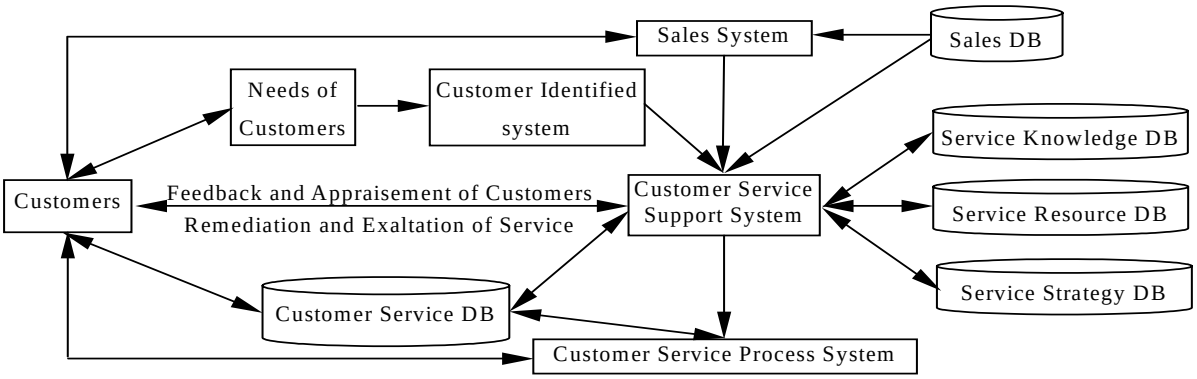

Fig. 2 Information Flows of Customer Service Support System

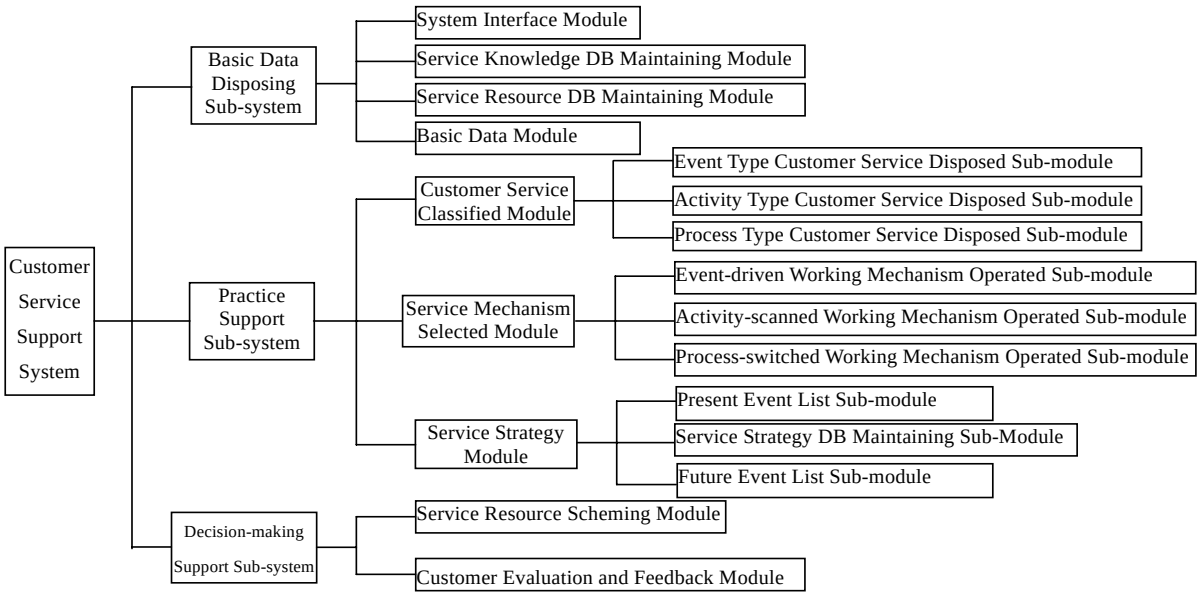

Fig. 3 Structure of Customer Service Support system

4.3 Realization of Event-driven Working Mechanism

Event-customer service is not a concrete customer service, it is a kind of customer service with the same working mechanism, though the service content of each kind of customer service has very great differences, they possess the characteristics of event-customer service such as the short service time, low service costs and general customers, so their way of taking up enterprises service resources is the same. The event type customer services accords with the so-called a M / G / 1 system [14] [15] [16], namely a queuing model where the flows of customer reaching are the simplest flows, service time is at random and it possess one information desk. So the realization course of customer service A can be simulated using M / G / 1 system.

The simulative models of event-driven method include defining entity and entity set, defining activity and event, and describing event disposal. Here, the entities compose of a lot of customers and an information desk, the entity set is customer queue, the activities include waiting, being served and falling out the queue, the events compose of reaching information desk named event 1 and going away from information desk named event 2. The disposing procedures of event 1 and event 2 can refer the relative reference. Fig.4 describes the disposing procedure of event-driven working mechanism for event-customer service.

The simulating model of activity-customer service is similar with that of event type customer service except that the customer is served by service B_1 and service B_2 in turn in activity type customer service. We can suppose that customers arrive at $t_1, t_2, \cdots, t_n, \cdots, t_{n+m}, \cdots$, where we can think that a customer is served by service B_1 at t_n and by service B_2 at t_{n+m}, the service times are independent and the twice arrives of a customer are thought as the arrives of two customers. The flows of customers reaching are the simplest flows, so activity type customer services can also be simulated using M / G / 1 system. There are three kinds of events: reaching information desk named event 1, producing condition after service B_1 named event 2 and going away from information desk named event 3, where the disposing procedure of event 1 and event 3 is similar with those of event-customer service, and other disposing procedures are omitted limit to space.

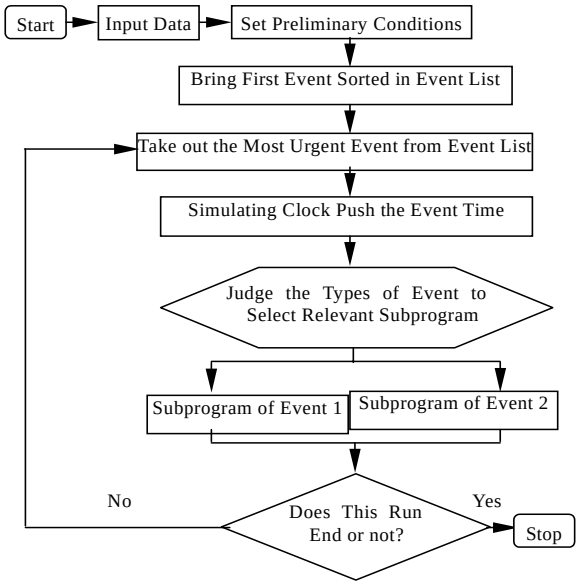

Fig. 4 Procedure of Event-driven Working Mechanism for Event-customer Service

Because the process-customer service is a service package made up of event type customer services A and activity-customer services B, we can adopt the procedures of event type customer service and activity-customer service in simulation of process-customer service, whose simulating model and

events are made up of the models and events of event type customer services and activity type customer services. The relative models and disposing procedures are also omitted.

5. CONCLUSION

According to the three variables: service time, service cost and customer type, this paper provides the three types of customer services: event type customer service, activity type customer service and process type customer service. Simulating the procedures of these customer services using event-driven method and establishing the system structure of customer service support system, which help enterprises to optimize the procedure of customer service, raise the efficiency, lower costs, reduce service accident, and this customer service support system model has oneself ability of appraising and adjustment.

Of course, this paper has laid particular emphasis on studying event-driven working mechanism, and there is the research to activity-scanned working mechanism and process-switched working mechanism remaining to continue carrying on deeply. At the same time because different working mechanism have different influence on way and result in which the customer service is implemented, it is necessary to compare the result of adopting different working mechanism of three kinds of customer services, find out the most suitable working mechanism of each kind of customer service, then set up system in common use. As regards technological aspect, information technology adopted in different working mechanism need to study further. At aspect that system implement, customer service support system and other data of system share also await to study and discuss.

ACKNOWLEDGEMENT

This work was supported by national nature foundation of China 70271030 and research foundation of graduate school of Huazhong Univ. of Sci. & Tech 2002.

REFERENCES

[1]Greg Gianforte, “The Future of Customer Service: The Road to Top-Line Impact”, http://www. rightnow.com, 2003

[2]Berkley B J, Gupta A, “Improving Service Quality with Information Technology”,International Journal of Information Management, Vol. 14, No. 2, pp 109-121, 1994.

[3]Domegan C T, “The Adoption of Information Technology in Customer Service”, Journal of Marketing, Vol. 60, No. 6, pp 52-69, 1996.

[4]Wang Chunxiao, Wen Biyan, “Internet- A New Era of Customer Service”, Science Technology and Management, No. 1, pp12-15, 2001.

[5]Zhang Ning, Ye Xiaojun et al, “Design and Implementation of the Design-support System in a Customer Service Management System”, Computer Engineering and Application, Vol. 37, No. 16, pp107-109, 2001.

[6]Lu Jianfeng, Zhang Hao et al, “The Construction of A Tele-customers Engineering Support System and Its Integration with PDM System CESS”, Manufacturing Technology and Machine, No. 2, pp12-14, 2002.

[7]Jiang Xianxin, Zou Hua, Wang Bo, “A Net Meeting-Based Integration of Call Center and Web Scheme”, Journal of Beijing University Posts and Telecommunications, Vol. 23, No. 1,pp92-95, 2001.

[8]Guo Xiurong, Liu Jidong, “Design and Application of Data & Voice Information Support System for Shandong Electric Power Customer Service Center”, Electric Power, Vol. 29, No. 2, pp 63-66, 2002.

[9]Luo Cheng, Chen Xuerong, Zhang Shaojun, “Application Study on VoIP Technology in 185 Customer Service Center”, Study on Posts, Vol. 18, No. 2, pp27-28,2002.

[10]Wang Qingguo, Cai Shuqin, “Study on the Classification of Customer Service”, Management Review, Vol. 16, No. 3, pp19-24, 2004.

[11]Cai Shuqin, Wang Qingguo, Tang Yunfei, “Summary of Customer Relationship Management and Customer Services”, Forecast, Vol. 23, No. 5, pp55-60, 2004.

[12]Huang Wei-wei, “Method and Application of Management System Simulation”, Beijing, Renmin University of China Press, 1991.

[13]Shi Qing, “Stochastic System of Management”, Beijing, China Machine Press, 1994.

[14]B Krishna Kumar, A Vijayakumar, D Arivudainambi, “An M/G/1 Retrial Queuing System with Two-phase Service and Preemptive Resume”, Annals of Operations Research, Vol. 113, No. 1, pp61-79, 2002.

[15]Kailash C. Madan, “An M/G/1 queue with second optional service”, Queueing Systems, Vol. 34, No. 4, pp37-46, 2000.

[16]Onno J. Boxma, Tetsuya Takine, “The M/G/1 FIFO Queue with Several Customer Classes”, Queueing Systems, Vol. 45,No. 3, pp185-190, 2003.