

Inbound and Outbound Calls Assignment for an Efficient Call Center

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ABSTRACT

This study aims to provide the solution for call center providers to overcome the problem of optimizing the call center's efficiency, while ensuring satisfactory customer service. By formulating a simulation to represent call center model based optimization approach, helps eliminating the cost of uncertainty that might occur when the call center model is actually applied to the real life situation. The simulation model is generated via Arena12, and locates the separation of the agent's obligation into 2 types: The first type is constructed as each agent will handle only inbound or outbound calls separately, whereas the second is considered an agent needed to handle both inbound and outbound calls individually. The simulation model to discover the factor that affects the efficiency of the call center the most.

Keywords: Call center, Inbound and outbound assignment

1. INTRODOCTION

A call center is growing instantly and rapidly becoming a powerful approach of service delivery. It is an important component of the operations of many businesses in the world [Gans, Koole et al. 2003]; [Aksin, Armony et al. 2007]. It is applied as a medium of interaction between the firm and the consumers. Customer service representatives (CSR), call center agents, have obligations in handling incoming and outgoing customer calls for businesses. Occasionally, call centers may arrange and systematize their agents' duty differently. The successful call centers require a very high quality of agents and also the great quality of management systems. Every agent should have a capability to reply those questions correctly without transferring to any higher tiers. Generally, many different businesses may require the distinctive direction of their call center workflow. They may handle either only inbound or outbound calls or might deal with a combination of the two. In call centers service, the arrival rate of customer calls is normally fluctuated. [Betts, 2000] Hence, call centers has been focused on the issue of uncertainty in arrival rates. Statistical analysis of call center data in [Brown, Gans et al. 2005]; [Robbins 2007] supports the notion that arrival rates are uncertain. [Bassamboo, Harrison et al. 2005] developed a model that attempted to minimize the cost of staffing plus an imputed cost for customer abandonment for a call center with multiple customer and server types when arrival rates are variable and uncertain. The call duration is always random [Grimmett, G.R., Stirzaker, D.R., 1992], also the customer waiting time, and some of waiting calls may abandon because of the impatience of customers. A general overview of models with abandonment appears in Boxma and de Waal [1994], with a review of relevant literature. Ancker and Gafarian [1963] analyze queues with abandonment, multiple heterogeneous agents and finite capacity, through their steady state equations and they derive the waiting time density.

The call center operation is required the effective model to manage and provide the most efficiently solution to the organization. The most important impacts that affect the call center are the customer satisfaction and the cost reduction. The more customers satisfied the service, the more revenue company could generate. The call center needed to make customers satisfied so they would come back and use its service again [2000]. The proper design of staff work schedules is required in order to reduce or minimize the staffing cost. The excellent call center management use to effectively adjust and manage the staff work schedule for each individual in the organization. It needed some potential methods to organize the currently situation for the efficient manpower plan during the shift of the day. The excessive and the shortage of agents in the call center will generally affect the organization's condition. This can suddenly shorten the demand of customer and unconvinced the customer to return ever again. On the other hand, identifying the effective number of staff having in the call center at each shift of the day is an important part of the call center process. It affects the service level and also many key performance indicators which are a number of customers in the system, a queue length, customer waiting time in queue, customer waiting time in the system and the abandon rate [1984]. It compares different approximations for both types. After that, the results are verified by simulation.

This study is willing to build a model in order to company efficiency of the two different types of call center service. Moreover, the general people can perceive this model easily. In our consideration, there is a model which can construct two different types of call center management. The first one is constructed as each agent will handle only inbound or outbound calls separately, whereas the second one is considered an agent needed to handle both inbound and outbound calls individually. The objective of the study is to evaluate the efficiency in handling calls and to identify which

model is more preferable in particular conditions. Furthermore, many factors in the model can be varied and adjusted in order to notice the effect of individual to the service level follows with the effective staff work schedules for the individual staff. Therefore, this study generally focuses on the capability of the call center under the sufficient service level.

2. SIMULATION AND MODEL CONDITION

In this study, the following conditions are assumed.

- A call provides the call center service to three different companies as a fast food delivery service, a credit card company and a direct sale company. There is no limitation in a number of telephone lines provided for those companies. However, the arrival rates of them are different.
- By considering the uncertainty of the arrival rate, inbound calls and outbound calls arrival rates of each company are different as random values of the Erlang distribution.
- There are two models. In each model, call center agents' assignments are different. The first model (*Model 1*), the agents are divided into two groups. One group of agents is assigned for handling inbound calls and another group of agent is assigned for taking care outbound calls. For the second model (*Model 2*), agents handle both inbound and outbound calls.
- The agents work as a shift (8 hours) and there are three shifts. The working time starts from 8.00-21.00 (13 hours) during a day as seen in Figure 1
- By assuming different relevant factors in the call center, the result from both models can show the more suitable and efficient model to each situation in order to achieve the effective staff assignment for a call center.

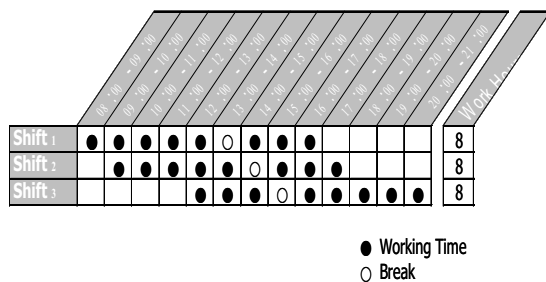


Figure 1: Agents' working time

To test efficiency in each type of model, this study set a

base case of each model. The value of relevant factors was assumed to set condition and scenario of the base case. All details of the factors are given in Table 1.

Table 1 Base case of each type in the model

Factors	Model 1	Model 2
Inbound Agent Shift 1	4 person	6 person
Inbound Agent Shift 2	4 person	6 person
Inbound Agent Shift 3	5 person	7 person
Outbound Agent Shift 1	2 person	0 person
Outbound Agent Shift 2	2 person	0 person
Outbound Agent Shift 3	2 person	0 person
Maximum Waiting Time	20 min.	20 min.
Arrival rate Company 1 Period 1	2	2
Arrival rate Company 1 Period 2	1	1
Arrival rate Company 1 Period 3	1	1
Arrival rate Company 1 Period 4	2	2
Arrival rate Company 2 Period 1	4	4
Arrival rate Company 2 Period 2	4	4
Arrival rate Company 2 Period 3	4	4
Arrival rate Company 2 Period 4	4	4
Arrival rate Company 3 Period 1	5	5
Arrival rate Company 3 Period 2	5	5
Arrival rate Company 3 Period 3	3	3
Arrival rate Company 3 Period 4	4	4
Erlang k	1	1

The models were run to see the result of effectiveness of call center service. The summary of results are generated when the program run for 30 replications.

In base case, *Model II* was found to be more efficient than *Model I* of the model. The average service level (ASL) of *Model II* was 99.98%, while that of *Model I* was about 97.6863%. Also, total abandon call of *Model II* was less than that of *Model I* which also made total call completeness of *Model II* more than that of *Model I*. These result shows that agent should handle both inbound and out bound calls to gain the most efficient from base case. All details of the result of two types of model are given in Table 2. The results shown in Table 2 are the conclusion for the based case. In the next step, three factors (maximum waiting time, different assignment and different arrival rates) are assumed to be varied to see the results.

3.1 Waiting Time

In waiting time case, the models were set to vary the maximum waiting time that customer will wait to receive service from agents to see the effect on service level. All other factors remained unchanged. The impact of changing maximum waiting time to the service level is given in Figure 2.

Table 2 Simulation Result for *Model I* and *Model II*

Results	Model I	Model II
Company 1 Abandon	10.8333	0.1000
Company 1 Complete	550.73	571.07
Company 1 Number In	572.23	575.73
Company 1 SLA	98.0278	99.98
Company 2 Abandon	5.1667	0.0333
Company 2 Complete	188.37	196.70
Company 2 Number In	199.33	199.63
Company 2 SLA	97.2384	99.98
Company 3 Abandon	5.4000	0.0333
Company 3 Complete	182.80	193.03
Company 3 Number In	193.10	195.80
Company 3 SLA	97.1160	99.98
Service Level	97.6863	99.98
Total Abandon	21.4000	0.1667
Total Call Complete	1402.67	1525.77
Total Inbound Complete	921.90	960.80
Total Outbound Complete	480.77	564.97

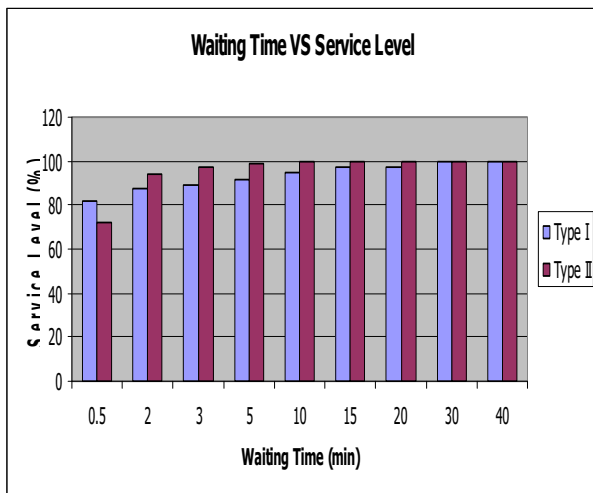


Figure 2 Result of changing waiting time

When waiting time could be varied between 1 to 30 minutes, *Model II* was found to be more efficient than *Model I* in term of service level. However, *Model I* was found to be more efficient than *Model II* when the maximum waiting was setting less than 1 minute. The service level is almost same when waiting time is set to be more than 30 minutes.

3.2 Job Assignment

In job assignment case, the models were assigned number of agent in each shift differently for each case without increasing or decreasing the number of agents in system to see the effect on service level on each model. Result on the service level in form of job assignment case is given in Figure 3. Similar to the base case, the service level of *Model II* was found to be more efficient than *Model I*. Thus agents should handle both inbound and out bound calls to gain the most efficient in this condition.

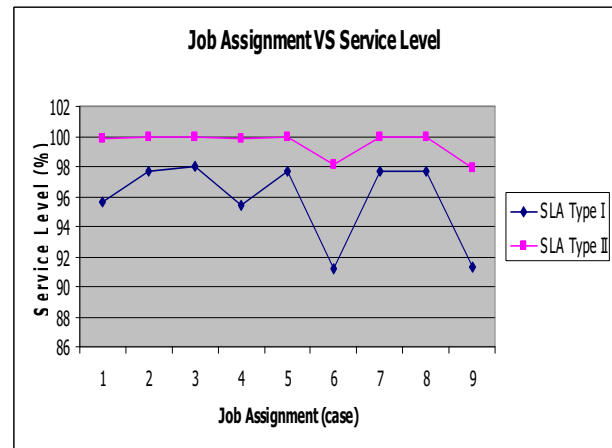


Figure 3 Result of changing job assignment

4.5 Arrival rate

In arrival rate case, the model was set to vary arrival rate of customers in each company's period to see the effect on service level in both model. Result on the service level in form of arrival rate case is given in Figure 4. In this case, the service level of *Model I* was found to be more efficient than *Model II* when the arrival rates were less in each period. However, there is no different in service level when arrival rate increase.

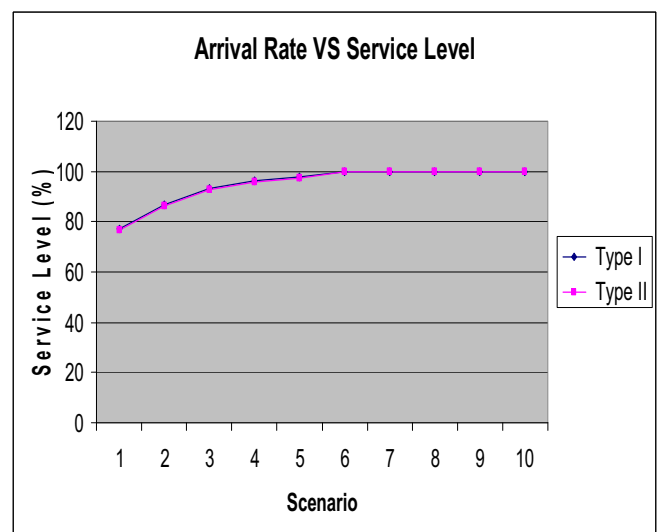


Figure 4 Result of changing arrival rates

3. CONCLUSION

Call centers provide an important role in service industry since they act as the representatives of a company in providing the service to the customers. Poor call center management can result in poor service to the customers finally. One of the major concerns of the company is how to assign the tasks to the call center agents to provide the effective service to their customers. In this study, the assignment of inbound and outbound call was studied and the effectiveness of the call center

was measured via the service level, total abandon call and total call completeness. It was found that most of the time, the call center which assigns both inbound and outbound calls to agents (Model I) can gain more service effectiveness than the call center which assigns different agents to handle inbound and outbound calls separately (Model II). However, in case of small maximum waiting time (less than 1 minute) or less customer arrival rate, assigning inbound and outbound calls separately for separate group of agents gain more advantage in term of service level.

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