Optimal service using Matlab - simulink controlled Queuing system at call centers

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Abstract. This paper presents graphical integrated model based academic research on telephone call centres. This paper introduces an important feature of impatient customers and abandonments in the queue system. However the modern call centre is a complex socio-technical system. Queuing theory has now become a suitable application in the telecom industry to provide better online services. Through this Matlab-simulink multi queuing structured models provide better solutions in complex situations at call centres. Service performance measures analyzed at optimal level through Simulink queuing model.

1. Introduction
Call center is a third party customer desk, which handles customer calls and complaints, but also tries to build a comprehensive customer relationship management (CRM). CRM is the process of sales, marketing, service and support within an organization with the customer as the focal point system for the products and services a particular company markets like Banks, Manufacturing companies, credit cards, cellphone servies, Restaurants and etc.. Call centre is a booming industry and thousands of people are performing jobs 24/7 hours per day. In call centers we can do shift basis by adjusting our duties time according to schedule.

The role of call center is Staffing, training how to handle the customer, recording the voice calls, tracking the customer requirements with using data base. Normally Call center operational metrics is measured largely through queue times and customer abandonment rates, and thus managers have an acute need to understand how these model affect the service improvement. To overcome this problem we have to develop the simulation alternatively to erlang c. Most call centres also support Interactive voice response system (IVRS) i.e., a caller first hears the IVR greeting and then asked to choose from a series of prompts (e.g. “Press 1 for Sales, 2 for Support…”). The caller is then routed to the most appropriate team member or waiting queue based on their selection

2. Automatic call distributor (ACD)-skill based routing
ACDs perform many essential functions with latest software and are therefore considered the backbone of a call center. They are a telephony system that routes incoming calls to the most appropriate agent within a call center. ACDs also records usage data such as call volume, calls
handled, call duration, wait time, etc. They also allow for managers to engage in call monitoring, call conferencing, call barging and whisper coaching. Thus, ACDs are essential for any call center.

![Simulation multi-server model](image)

**Fig 1 - Simulation multi-server model**

How do I want to prioritize customers waiting time? after how much time in queue does their abandonment rate start. Increase in abandonment rate what percentage satisfaction customers have whether we have not employed 80/20 and focused or not and meeting a higher service level.

ACD characteristic Auto e-mail, IVR, web self-service, text chat, assisted response e-mail, telephone, web collaboration using Mainframe computers and database with automatic number identification tool.

Agents must become well versed in the company’s proprietary programs as well as any mainstream applications used by the call center. Properly written call center training material should allow trainees sample time to work through the various systems in realistic scenarios. A pre-test and post-test must be administered to ensure proper training. Agents must be able to perform pre-determined activity checklist to show complete competence. **Skills-based routing** is essential for all call center that would like to optimize the service they provide their callers. Call center managers assign tags to their agents based on their department, good skill-set, area of expertise, language, demographics, location or other meaningful information.

Based on the information collected from the call centers data. The average arrival rate and service rate considered for the following calculation analytically. The entity is connected to entity servers with queue and entity generator. But service is 230 calls per hour per server. We can find the difference between 4 entity queues, how they can perform potentially with using analytically and Matlab simulation. We can analyze the the difference between four channels with respect to Lq, Ls, Ws, Wq.

| Status queue | C=1 | C=2 | C=3 | C=4 |
|--------------|-----|-----|-----|-----|
| Arrival calls | 220 CUSTOMERS/hr | 220 CUSTOMERS/hr | 220 CUSTOMERS/hr | 220 CUSTOMERS/hr |
| Service calls | 230 CUSTOMERS/hr | 230 CUSTOMERS/hr | 230 CUSTOMERS/hr | 230 CUSTOMERS/hr |
| \( \rho \) | 0.9565 | 0.4783 | 0.3188 | 0.2391 |
| Lq | 12.2 customers | 0.25 customers | 0.109 customers | 0.00459 customers |
Table 1: Difference table shows between 4 channel in analysis of Ls, Lq, Ws, Wq

|   | Ls                  |      | Ls                  |      | Ls                  |      | Ls                  |      |
|---|---------------------|------|---------------------|------|---------------------|------|---------------------|------|
| Ws| 13.18 customers     | 1.18 | customers           | 1.039| customers           | 0.93408| customers           | 0.93408|
| Wq| 33.42 min           | 0.69 | min                 | 0.299| min                 | 0.00021| min                 | 0.00021|
| Ws| 35.95 min           | 3.23 | min                 | 2.834| min                 | 0.04246| min                 | 0.04246|
| P  | 0.007               | 0.365|                    | 0.39133|                     | 0.37458|                    | 0.37458|

1.3 Queuing theory simulation

Queues are waiting lines very common in everyday life whereby certain business situations require customers to wait in line for a service, namely: telephone exchange, at a bank, in public transportation or in a traffic jam, students waiting to pay school fees, in a supermarket, at a petrol station, at computer systems, waiting to use an ATM machine, and paying for groceries at the supermarket. The ultimate objective of the analysis of queuing systems is to understand the behaviour of their underlying processes. So that informed and intelligent decisions can be made in their management system using database system.

The queue discipline specifies the order in which waiting customers are selected from the queue for service. Selecting or constructing a queuing model that is rich enough to reflect the complexity of the real system, queuing theory has now become a practical application to whole telecommunications industry and BPO industry. Those who study this theory strive to obtain as a model as possible to real world systems in order to predict their behaviour and consequently improve their performance.

I need to check the difference between random customer enter into the queue of call centers and the how much time a customer spend in the queue. To give the best services by increasing the number of service channels C = 1, 2, 3, and 4. Based on the collected data from the various call centers, assigned

as average number of calls 220 per hour. But 4 service channels required to give better services without waiting much time in the queue and system. For to sort-out this Problem with 2017b Matlab simulink programming software used to reduce the waiting time in the call center. These models used because they are so tractable, less expensive, simulation through visualized display.

1.4 Customer Behaviour in the call center

This multi server model is good attempt to better understand the dynamics of the relationship that exists between satisfaction and service quality in the entity queue. Customer satisfaction has become a primary point of differentiation in any service and business industry. Customer calls and disputes will lead to extreme point that agent and customer to file a case on the company. Where the emotional values play a vital role in communicating to each other.

Ar: Average arrival rate
Lq: Average number of students in the waiting line (queue)
Ls: Average number of students in the system
P: System intensity (utilization)

Po: Steady-state Probability of all idle servers in the system / Probability that here is no customer in the system
Sr: Average service rate
Wq: Average amount of time a student spends in queue
Ws: Average amount of time a student spends in the system
Arrival rate: 220/Hr
Service Rate: Random order C=4

Figure 2. Entity Arrival pattern

Arrival /Service Rate: Random Order

Figure 3. Entity Arrival randomized exponential

Figure 4. service-Waiting time

Figure 5. service-Waiting time

Figure 6. Terminator Out-After service

Figure 7. Terminator Out-After service

Conclusion:
Queueing simulation in MatlabM2017b give the best service solution for entities of arrival process. In one part of figures 3,5,7 give the solutions based on 220 calls for hour with the random service pattern obtained the simulation results and represented graphically. The other part of figures like 4,6,8
obtained the solutions with the randomized service process. With Matlab simulation, the difference of the services based on different arrival process and increased method channel service distribution. With this software easily can identify the various channel services using scope and Entity terminator. Through this results, utilization of service channel efficiency can be identified. Decision to reduce the abundant ratio from the queue service.

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