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Smart Queue Management System for Banking Sector

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Abstract

The major problem faced by the banks are the long queues of customers at the peak hours and then at the off peak hours the lack of customer entry. The number of customer are so large that many a times customer waits for more than an hour to get his turn but at odd hours, the banks remain idle that there are no customers to serve . Depending on the current capacity of each branch, many alternative decisions can be made. To overcome these problems, a new way of queue management system can been introduced that is Queue Management System with SMS notification. This new system is designed with a small interface, easily accessible with smart phones for a queue management with SMS notifications.

Keywords: Arrival process, Smart queue, M/M/1, Short message system

INTRODUCTION

Even in these modern days, customers at the bank have to wait for long hours to accomplish their transactions in bank. To overcome this problem, a new way of queue management system has been introduced and called as Queue Management System with SMS notification which will issue a queue ticket to a customer and later announce the ticket number when service is available, eliminating the need to stand in line while waiting. In this way, queue management systems help to provide comfort as well as fairness to customers, by allowing them to maintain their position in the queue while they are seated comfortably or engaged in constructive activity.

M.E. El-Naggar[1] described a methodology designed to support the decision-making process by developing seaport infrastructure to meet future demand. In order to determine an optimum number of berths at a sea port using queuing theory, the optimum number of berths that minimizes the total port costs can be decided.
Vasumathi.A, Dhanavanthan P[2] formulated a suitable simulation technique which will reduce idle time of servers and waiting time of customers for any bank having ATM facility.

Dr. Ahmed S. A. AL-Jumaily, Dr. Huda K. T. AL-Jobori[3] have presented a new technique for queuing system called automatic queuing system. The proposed technique showed improvements in average waiting time.

Mrs. S.Maragatha Sundari, Dr. S.Srinivasan[4] have used the highly suitable modeling tool for MMC queueing model, the stochastic Birth-death Markov process and have eliminated the long waiting hours for customers.

Bhavin Patel, Pravin Bhathawala[5] have discussed how queueing theory can be applied to a busy bank ATM and how the service should be improved so that the banks do not loose their customers. This research can help bank ATM to increase its QoS (Quality of Service), by anticipating, if there are many customers in the queue.

S. K. Dhar, Tanzina Rahman[6] have discussed the application of queuing theory to the Bank ATM. This research can help bank ATM to increase its QoS (Quality of Service), by anticipating, if there are many customers in the queue. Because the bank can now estimate the number of customers waits in the queue and the number of customers going away each day.
S. Vijay Prasad and V. H. Badshah[7] recommends changing the present queuing system to alternate queuing system where the passengers do not need to wait so long. It was proved that this model of the queuing system is feasible and the results are effective and practical.

Md. Manjurul Ahsan, Md. Raisul Islam , Md. Ashikul Alam[8] have proposed by shifting a server from day to night. From the performance measurement of the proposed model the waiting time decreased expectedly at night shift than day shift. So this model can be used as an improvement technique for the service of the restaurant.

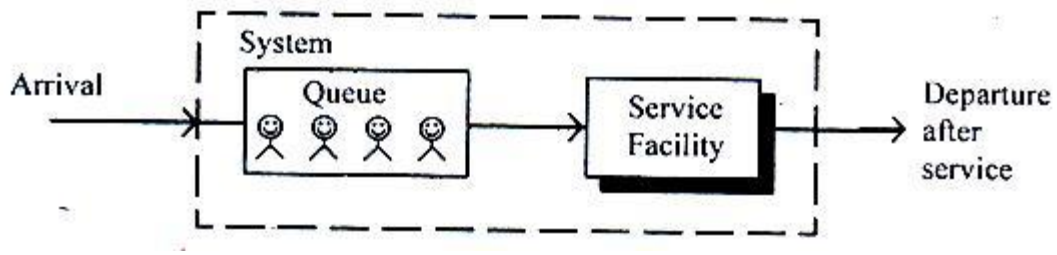
Nityangini Jhala, Pravin Bhathawala[9] have described a methodology designed to support the decision-making process by the banks to meet the demand. In order to determine an optimum number of servers, queuing theory is applied. The Waiting and service Costs were determined with a view to determining the optimal service level.

METHODOLOGY

We will make the following assumptions for queuing system in accordance with queuing theory.

1. Arrivals follow a Poisson probability distribution at an average rate of λ customers per unit of time.
2. The queue discipline is First-Come, First-Served (FCFS) basis by any of the servers. There is no priority classification for any arrival.
3. Service times are distributed exponentially, with an average of μ customers per unit of time.
4. There is no limit to the number of the queue (infinite).
5. The service providers are working at their full capacity.
6. The average arrival rate is greater than average service rate.
7. Servers here represent only employees of the bank.
8. Service rate is independent of line length; service providers do not go faster because the line is longer.

M/M/1 queuing model:



M/M/1 queuing model means that the arrival and service time are exponentially distributed (Poisson process). For the analysis of the cash transaction counter M/M/1 queuing model, the following variables will be investigated:

λ: The mean customers arrival rate

μ: The mean service rate

$\rho = \frac{\lambda}{\mu}$: utilization factor

Probability of zero customers in the bank:
$P_0 = 1 - \rho$

The probability of having n customers in the bank:
$P_n = P_0 \rho^n$

The average number of customers in the bank:
$L_s = \frac{\rho}{1-\rho} = \frac{\lambda}{\mu-\lambda}$

The average number of customers in the queue:

$L_q = L \times \rho = \frac{\rho^2}{1-\rho} = \frac{\rho\lambda}{\mu-\lambda}$

W_q: The average waiting time in the queue:

$W_q = \frac{L_q}{\lambda} = \frac{\rho}{\mu-\lambda}$

W_s: The average time spent in the bank, including the waiting time

$W_s = \frac{L}{\lambda} = \frac{1}{\mu-\lambda}$

ANALYSIS OF DATA

Present Scenario:

It was observed in an XYZ bank that the arrival rate was λ=40 customers per hour and the service rate was μ=42 customers per hour.

The performance measures are:

Utilization factor $\rho = 0.9523$

Probability of zero customers in the bank:

$P_0 = 0.0476$

The average number of customers in the bank: $L_s = 20$

The average number of customers in the queue: $L_q = 19.046$

The average waiting time in the queue: $W_q = 0.47615$ hr or 28 min

The average time spent in the bank, including the waiting time $W_s = 0.5$hr or 30 min

Proposing Model:

To use the SMS 'Q' service, customers simply need to text "Q" to the number tagged to the branch they want to visit. The mobile number of different branches are easily available. Customers will subsequently receive an SMS menu where they can select the service they require. Once they have made their selection, they will receive their queue number as well as the number of customers that are being served ahead of them. If there is a longer wait time, customers will also receive a reminder SMS when their turn is nearing. Once their turn is up, customers can proceed directly to their assigned counter. If they miss their turn, they will receive an SMS with the option to rejoin the queue.

For those customers who are not having mobile phones and for those who are not comfortable to use SMS facility, branch staff are at hand to assist them to provide them with appointment time through telephonic facility. There is no difference in queue priority if customers opt for either the SMS or telephonic facility to get appointment.

PERFORMANCE MEASURES FOR THE PROPOSING MODEL

The customers will arrive according to their appointment with the new arrival rate λ = 30/hour and the service rate will be the same as μ=42/hour.

The performance measures are:

Utilization factor $\rho = 0.7142$
Probability of zero customers in the bank:
$P_0 = 0.2858$
The average number of customers in the bank: $L_s = 2.5$
The average number of customers in the queue: $L_q = 1.7855$
The average waiting time in the queue: $W_q = 0.05951$hr or 3.57min
The average time spent in the bank, including the waiting time $W_s = 0.0833$hr or 5min

DISCUSSION AND CONCLUSION

This proposing model is a small step towards easing out the life from the long queues in banking sector. The problem of waiting for ones turn to come in a long queue could be easily overcome by this project. It reduces queue length and actual waiting times, thus improving customer satisfaction. It enhances the productivity and motivation of the staff providing excellent customer service. It upholds the image of the banking firm as the queue system ensures discipline at the premises.

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