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Streamlining Railway Ticketing with Queueing Theory: A Model for Efficient Booking

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ABSTRACT:

Queuing Theory has been used in railway reservation counter for booking train tickets. Generally peoples stand in queue for getting the train ticket or they wait for their token number to be announced.If a server stand in Queue or wait for the token number to be announced ,he or she wastes the time.Now a days waiting for anything has become a boaring job.People do not want to wait for hours. The purpose of this paper is to present a way of saving the customer time optimizing the use of railway resources. Long waiting time in any outlet is considered as an indicator of poor quality and needs improvement. We present a technique for optimizing the passenger time in order to maintain an acceptable delay probability at a sufficiently low level.

Keywords: Service; FIFO; M/M/s; Poisson distribution; Queue; Service time; Utilization factor; Waiting time, optimization.

Introduction

In almost every field in daily life ,Queues are observed. If queues can be managed with a proper technique,then time can be saved. The ultimate goal is to achieve a time balance between the sources of service and the time associated with the waiting for that service. Queuing theory is the study of waiting in all these various guises. Forming a Queue being a social phenomenon, it is essential to the society if it can be managed so that both the unit that waits and the one which serves get the most benefit.

Review of literature:

In this journal I tried to save the time of the customer in the railwayreservation system which provides the train timing details,reservation, billing and cancellation on various types of reservation namely, Confirm Reservation for confirm Seat.

Behavior of the Arrival : Most queuing models assume that an arriving passenger is a patient traveller .Patient customer is people or machines that wait in the queue until they are served and do not switch between lines or they leave the line. Unfortunately, life and quantitative analysis are complicated by the fact that people have been known to balk or renege .Balking refers to passengers who refuse to join the

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waiting lines because it is to suit their needs or interests. Reneging passengers are those who enter the queue but then become impatient and leave the need for queuing theory and waiting line analysis. How many times have you seen a shopper with a basket full of groceries, including perishables such as milk, frozen food, or meats, simply abandon the shopping cart before checking out because the line was too long? This expensive occurrence for the store makes managers acutely aware of the importance of service-level decisions.

Waiting Line Characteristics: The waiting line itself is the second component of a queuing system. The length of a line can be either limited or unlimited. A queue is limited when it cannot, by law of physical restrictions, increase to an infinite length. Analytic queuing models are treated in this article under an assumption of unlimited queue length. A queue is unlimited when its size is unrestricted, as in the case of the tollbooth serving arriving automobiles. A second waiting line characteristic deals with queue discipline. This refers to the rule by which passengers in the line are to receive service. Most systems use a queue discipline known as the first-in, first-out rule (FIFO).This is obviously not appropriate in all service systems, especially those dealing with emergencies. In most large companies, when computer-produced messages are due out on a specific time, the server program has highest priority over other runs.

Service Facility Characteristics: The third part of any queuing system is the service facility. It is important to examine two basic properties :(1)the configuration of the service system and (2)the pattern of service times. Basic Queuing System Configurations : Service systems are usually classified in terms of their number of channels, or number of servers, and number of phases, or number of service stops, that must be made.

Analysis of Time Management Model:

The Queuing model is commonly labeled as M/M/c/K, where first M represents Markovian exponential distribution of inter-arrival times, second M represents Markovian exponential distribution of service times, c (a positive integer) represents the number of servers, and K is the specified number of customers in a queuing.

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

λ: The mean customers arrival rate

μ: The mean service rate

ρ = λ / : utilization factor

Probability of zero customers in the counter:

$P_0 = 1 - \rho$

The probability of having n customers in the counter:

$$P_n = P_0 \rho^n$$

The average number of customers in the counter:

$L_s = \frac{\rho}{1-\rho} = \frac{\lambda}{1-\lambda}$ L

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The average number of customers in the queue:

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

Wq: The average waiting time in the queue:

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

Ws : The average time spent in the counter, including the waiting time

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

Now, we discuss the same for M/M/s Model

All customers arriving in the queuing system will be served approximately equally distributed service time and being served in an order of first come first serve,and customer need not to wait , or choose or switch to the shortest length queue. There is no limit defined for number of customers in a queue or in a system.

Method

The methods employed during data collection were direct observation and personal interview and questionnaire administering by the researcher. Data were collected for (4) weeks. The following assumptions were made for queuing system which is in accordance with the queue theory. They are:

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 for obtaining the token.
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 customers.
8. Service rate is independent of line length; service providers will send the message to the customers at least one hour before issuing of ticket.

Discussion Of Result :The results show that optimal server level is achieved when the service provider read their messages as well as time allotted to them for collecting their tickets from the counter.

Conclusion

The queuing characteristics at the XYZ reservation counter were analyzed using a Multi-server queuing Model and the Waiting and service times were determined with a view to determining the optimal service level. The results of the analysis showed that average queue length, waiting time of customers as well as total time could be reduced when both the service provider send the messages and customers must see the same.. The operation managers can recognize the trade-off that must take place between the cost of

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providing good service and the customers waiting time. Service time increases as a firm attempts to raise its level of service. As service improves, the cost of time spent waiting on the line decreases. This could be done by expanding the service facilities or using models that consider time optimization.

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