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THE WORLDWIDE MODEL FOR IMPROVEMENT IN THE TRAIN RESERVATION SYSTEM

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INTRODUCTION

In everyday life, it is seen that a number of people arrive at a cinema ticket window; if the people arrive too frequently they will have to wait for getting tickets or sometimes do without it. Such problems arise in railways, airlines, etc.. Under such circumstances the only alternative is to form a queue called the waiting line in order to get the service more effectively. If we have too many counters for service then expenditure may be high. On the other hand, if we have only few counters then the queue may become longer resulting in the dissatisfaction or less of customers. Queueing models are aids to determine the optimal number of counters so as to satisfy the customers keeping the total cost minimum. Here the arriving people are called customers and the person issuing the tickets is called a server.

Servers may be in parallel or in series. When in parallel, the arriving customers may form a single queue or several queues as is common in big post offices. Service time may be single or in batches.

QUEUEING SYSTEM

A Queueing system can be completely described by,

a) The input (or arrival pattern)
b) The service mechanism (or service pattern)
c) The queue discipline
d) Customer's behavior

a) The Input (or Arrival Pattern)

The input describes the way in which the customers arrive and join the system. Generally, the customers arrive in more or less random fashion which is not worth making the prediction. Thus the arrival pattern can be described in terms of probabilities and consequently the probability distribution for

inter arrival times shall be defined. We deal with the Queueing system in which the customers arrive in Poisson fashion.Mean arrival rate is denoted by λ.

b) The Service Pattern Mechanism (or Service Pattern)

The Service Pattern is specified when it is known how many customers can be served at a time, what is the statistical distribution of the service time and when the service is available. Service time may be a constant or random variable.Distribution of the service time which is important in practice is the negative exponential distribution. The Mean Service rate is denoted by μ.

c) The Queue Discipline

The Queue discipline is the rule determining the information of the queue, the manner of the customer's behavior while waiting, and the manner in which they are chosen for service. The simplest discipline is "First come, First served", according to which the customers are served in order to their arrival. Such type of queue discipline is observed at railway reservation centre, ration shop, etc..if the order is reserved ,we have "Last come, first served" discipline, as in the case a big godown the items which come last one taken out first.

FIFO- first in, first out or FCFS

LIFO- last in, first out or LCFS

SIRO-Service in random order

d) Customer Behavior

The customer generally behaves in 4 ways.

i. Balking: A customer may leave the queue, if there is no waiting space.
ii. Reneging: This occurs when the waiting customer leaves the queue due to impatience.
iii. Priorities:In certain applications some customers are served before others regardless of their order of arrival.
iv. Jockeying: Customers may jump from one waiting line to another.

KENDAL'S NOTATION FOR REPRESENTING QUEUEING MODELS

Generally, Queueing model may be completely specified in the following symbol form (a|b|c) : (d|e) where,

a = Probability law for the arrival

b=Probability law according to which customers are served

c=Number of channels (or service stations)

d= Capacity of the system

e= Queue discipline

RAILWAY TICKET RESERVATION CENTRE

There is Only One Service Station at Railway Ticket ReservationCentre ,. This centre follows (M/M/1):(∞/FCFS) Queueing model. The Service time starts from 8.00 am to 6.00 pm.(ie.,10 hrs per day).The Average time taken by the server to render service is 2.5 minutes following the exponential distribution. The customers arrive in a Poisson fashion.

The Number of customers who had approached the ticket reservation centre during the period of August 2013 – July 2014 has been taken into study.

Year	Month	No of customersarrived
2013	Aug	5820
2013	Sep	6521
2013	Oct	6381
2013	Nov	6532
2013	Dec	6321
2014	Jan	6646
2014	Feb	5050
2014	Mar	6561
2014	April	6931
2014	May	7025
2014	June	7489
2014	July	6691

Source: Railway Ticket Reservation center,

The Queueing Model that exist in the current systemis (M/M/1):(∞/FCFS)
Average number of customer arriving each day=215.255
Arrival rate of customer in every 1 hr=215/10 (Since Service time is 10 hrs per day) =21.5
= 22 (approximately)

Arrival rate of customers is 11 in every 30 minutes following the Poisson process.

Here the mean arrival rate $\lambda = \frac{11}{30}$ per minute

Mean service rate $\mu = \frac{1}{2.5}$ per minute

Our aim is to find the Expected time spent by the customer in the system.

Traffic Intensity = $\frac{\lambda}{\mu}$

$= \frac{(11/30)}{(1/2.5)}$ =0.917

Expected waiting time of the customer $= \frac{1}{\mu - \lambda}$ minutes

$= \frac{1}{1/2.5 - 11/30}$

$= \frac{1}{1/30}$ = 30 minutes.

Average Expected number of units in the system

$Ls = \frac{\rho}{1-\rho}$

$= \frac{0.917}{1-0.917}$ =11

Average length of the Queue $L_q = L_s - \frac{\lambda}{\mu}$ = 11 - $\frac{11/30}{1/2.5}$ = 10.131

Lq= 10 (approximately)

Waiting time of a customer in this model (30 minutes) is too high and the service station is 91.7 % busy and the length of the queue (10 numbers) is long in the current model. To sophisticate the customers, let us suggest the model (M/M/S) : (∞ / FCFS).

Here S denotes the number of service stations.

Suppose the number of service stations is increased by 2 , let us calculate the Expected waiting time.

Expected waiting time of the customers $= \frac{1}{S\mu - \lambda} = \frac{1}{2(1/2.5) - 11/30}$ = 2.308 minutes.

The Fraction of time , the service is busy = $\frac{\lambda}{S\mu}$

$= \frac{11}{24}$ = 0.4583

Fraction of time the service remains idle = 1 - $\frac{11}{24} = \frac{13}{24}$ = 0.5417

If the number of service counters is increased by 3, then

Expected waiting time of the customers $= \frac{1}{S\mu - \lambda}$

$= \frac{1}{3(1/2.5) - 11/30}$ =1.2 minutes.

The Fraction of time , the service is busy = $\frac{\lambda}{S\mu}$ = 0.306

Fraction of time the service remains idle = 1 – 0.306 = 0.694

Though the expected waiting time of the customers in 3 service counter Queueing system is less than the expected waiting time of the customers in 2 service counter Queueing system, the amount of time, the service station remains idle in 3 service counter Queueing system(69.4%) is more than the amount of time, the service station remains idle in 2 service counter Queueing system (54%).So as to decrease the expenditure it is better to opt the model (M/M/2) : (∞ / FCFS).

CONCLUSION

Expected waiting time of the customer in the current model (M/M/1) : (∞ / FCFS) is 30 minutes.

Expected waiting time of the customer in the model (M/M/2) : (∞ / FCFS) is 2.308 minutes.

Thus, the waiting time of the customer in the model (M/M/2) : (∞ / FCFS) is 13 times less than the waiting time of the customer in the current model (M/M/1) : (∞ / FCFS).

Therefore ,(M/M/2) : (∞ / FCFS) would be an appropriate model for the ticket reservation center, .

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