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Analysis of M/M/1/3 as a Means of Decision Making In Banking Industry

Olawepo G.T

Dept. Of Business Administration Ajayi Crowther University Oyo State ,Nigeria

tejuolawepo@yahoo.com

Abstract: This research Analysis of M/M/1/3 as a Means of Decision Making in Banking Industry . UBA bank in Katsina state were used as a case study. This study is limited to queuing system of the customers data in the arrivals and service, operate for the period of 8.00am to 4.00pm on a daily basis for the interval of 60minutes for 10days in the UBA bank. For this study direct observation was used to obtain the number of customers arrived and numbers of customers serviced within the stipulated time interval.. The result shows that at any point in time there will be at least 2 customers in the system that is in M/M/1/3 . At least there will be only one customer in the queue in the system. At any point in time, a customer spent one 1 minute and 7seconds on the queue for M/M/1/3 . The expected time required by a customer to spent on the system is 11minutes and 18 seconds before leaving the bank in M/M/1/3. Since the utilization factor $\rho k \leq 0.5$,for the system, there is a building up of customers and as a result there are few people in the system. That is the system is in control. Therefore M/M/1/3 is more effectives in terms of time spent in the system. We thereby recommended that The pattern at which queue component arrived and service should be thoroughly studied, the operating characteristics should be computed to determine the type of queue formed

Keywords: Queuing, customers, arrival, service, utilization factors

I. INTRODUCTION

As the word turns to a global village characterized by intense and ever increasing competition, operation bank managers continue to experience rapid changes, which they must keep up with for relevance. Bank customers have also become increasingly demanding. Today, they require high quality, low price and immediate service delivery and tomorrow, they want additional components of value from their chosen banker. Since service delivery in banks is personal, customers are either served immediately or join a queue (waiting line) if the system is busy. Waiting line is what we encounter everywhere we go, while shopping, checking into hotels, at hospitals and clinics e.t.c. In a traditional non-queuing environment, customers can be left confused as to what line to stand in, what counter to go to when called and distracted by noisy crowded environment [2].In situations where facilities are limited and cannot satisfy the demand made upon them, bottlenecks occur which manifest as queue but customers are not interested in waiting in queues[4]. When customers wait in queue, there is the danger that waiting time will become excessive leading to the loss of some customers to competitors[1]. But allowing them to serve themselves so easily is a key factor in both keeping and attracting customers[5]. At one point or the other, people or individual wait on a line expecting one form of service or the other, some of those waiting lines can be seeing in banks, registration centers, fuelling stations, phone boots, airports motor parks, restaurants stadia and so on where people have to wait for one form of service or queue.

In a brief term, a queue can be defined as an aggregation of items waiting for service function. A queue emerges when the numbers of waiting for the service outweigh the channels, that is responsible for the service, when the arrival pattern is higher than the service pattern. A queue does not only involve people, it also involves machines and other materials due for service or repairs goods or units, individual machine and so on requires service and has to wait because the service is not forthcoming, then a queue is said to exist[3].

When limited service facilities fail to meet the demand for the services that are made upon them, problems occur which produce queues or waiting lines. A queue is characterized by the arrival of unit which require at one or more services facilities.

The units that are demanding for one or more service are called customers .Because of the rampant occurrences of queue in most of our services, the concept of queue with special attention on airport using international airport authority, Ilorin as a case study for the course of this project the queue process consist of customers arriving at the service facility then waiting in a line(if all services are busy) eventually receiving service and finally departing from the system facility, this is described as the birth dead process with a population consisting of customers either waiting for the service or currently in service. A birth occurs when a new customers arrive at service facility, a death occurs when a customer departs from the facility[6].

Nigerian Banking Industry most bedeviled with customer, waiting problems is studied here for a period of two weeks in GTB and UBA Plc; through observation. The variables measured include arrival rate (λ) and service rate (μ).

II. QUEUE STRUCTURE

This is the nature of the queuing system in terms of input, queue and service mechanism. This is illustrated below:

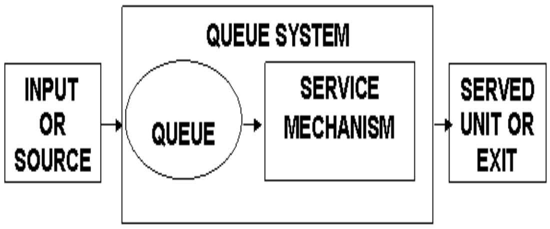


Figure: 1

III. ASSUMPTIONS OF QUEUE THEORY

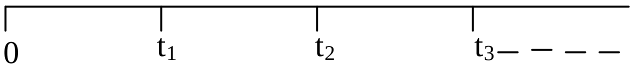
The following assumptions hold for any queue problem

a) Arrival follows a process

i. The number of the customers that comes to the queue check out servers during the time period.

ii. (t,t+s) only depends on the length of the time period "s" but not related with start time (t).

iii. If "s" is small enough; there will be at most one customer arrives in a queue of a serve during the time period (t,t+s).



b) Inter-arrival times of a poison process are exponentially distributed

c) Service time are also exponentially distributed

d) Identically service facilities

e) No customer leave the queues without being serviced.

f) Infinite number of customers in quenching system

g) First in first out (FIFO) hold.

IV. QUEUE THEORY SYMBOLS

The following symbols are associated with problems concerning queue or waiting line.

λ = mean rate of arrival

μ = mean rate of service

ρ = service stations or channels

ρ k = traffic intensity or utilization factor for multiple service

1/λ = inter-arrival rate

1/ μ = inter-service rate

V. METHODOLOGY OF THE STUDY

a. P(n≥k) = probability that a customer has to wait
$$P(n \geq k) = \mu\left(\frac{\lambda}{\mu}\right)^n \frac{\rho_0}{(n-1)!(k\mu-\lambda)}$$

b. P (μ ≤λ) = probability that a customer will not want idle. $P(n \leq k) = \left(\frac{\lambda}{\mu}\right)^n \frac{\rho_0}{n!}$

c. Average number of customers in the system
$$\mathrm{E}(n) = \mu k\lambda\left(\frac{\lambda}{\mu}\right)^n \frac{\rho_0}{(n-1)!(k\mu-\lambda)^2} + \frac{\lambda}{\mu}$$

d. Average number of customers in the queue (queue length). $\mathrm{E}(q) = \lambda k\mu\left(\frac{\lambda}{\mu}\right)^n \frac{\rho_0}{(n-1)!(k\mu-\lambda)^2}$

e. Average time a customer spent in the system
$$\mathrm{E}(ts) = \frac{\mathrm{E}(n)}{\lambda}$$

f. Expected time spent by customers in the queue
$$\mathrm{E}(ts) = \frac{\mathrm{E}(q)}{\lambda}$$

g. Probability of arrival of customers in the system
$$p_o = \left[\sum_{n=0}^{k-1} \frac{1}{n!}\left(\frac{\lambda}{\mu}\right)^{k-1} + \frac{1}{k!}\left(\frac{\lambda}{\mu}\right)^n \frac{k\mu}{k\mu-\lambda}\right]^{-1}$$

VI. SUMMARY OF DATA COLLECTED IN UBA

Table: 1

Day & date	**Total no of arrival**	**Total no of service**
Day 1	423	357
Day 2	459	371
Day 3	463	397
Day 4	409	322
Day 5	455	373
Day 6	442	371
Day 7	429	355
Day 8	464	394
Day 9	423	353
Day 10	448	387
TOTAL	4,415	3,680

Data Analysis

VII. SUMMARY OF FINDING

Table: 2

S/N		M/M/1/3 FOR UBA
1	The mean rate of arrival	55.19/hr
2	The mean rate of service	46/hr
3	The inter arrival rate	1 minute 9 seconds
4	The inter service rate	1 minute 30 seconds
5	The utilization factor (Pk)	0.3999
6	The probability that there is no customers in the system (Po)	0.2942
7	The probability that a customers arrival has to wait	0.1411
8	The probability that a customers will not idle	0.0847
9	The expected number of customers in the system E(n)	2
10	The expected number of customers on the queue	1
11	The expected time a customers spent on the queue	2minutes 45seconds
12	The expected time a passenger spent in the system	13minutes 5seconds

The result shows that at any point in time there will be at least (2) customers in the system that is M/M/1/3 At least there will be only one customer in the queue in the system. At any point in time, a customer spent one 1 minute and 7seconds on the queue for M/M/1/3 . The expected time required by a customer to spent on the system is 11minutes and 18 seconds before leaving the bank in M/M/1/3

VIII. CONCLUSION

Since the utilization factor $\rho k \leq 0.5$,for the system, there is a building up of customers and as a result there are few people in the system. That is system is in control. Also for the two systems it is 93% assure that there will be no queue hence M/M/1/3 is appropriate system for UBA bank.

IX. RECOMMENDATION

People have waited in line to purchase fuel clear money, or cheques at the bank, buy tickets in the airport, line up to registered as a students and many other place as waiting line are so prevalent in our present society, it is therefore a matter of imperative base on the foregoing it is therefore recommendation that : The pattern at which queue component arrived should be thoroughly studied ,the pattern at which services takes place should also be studied, the operating characteristics should be computed to determine the type of queue formed and reasonable conclusion and decision to should be taken to make services more effective

X. REFERENCES

[1]. Ashley D.W. (2002) "Introduction to Waiting Line Models" available at Google, http/www.com.

[2]. Bale, A.F. (2002) "Managerial Applications of Queuing Models in the Service Industry: A Case Study of Afribank Nigeria Plc., Ilorin Main Branch". A Research Paper submitted to Business Administration Department, University of Ilorin, Ilorin.

[3]. Elegalam,(1978)."Customer Retention Versus Cost Reduction Technique", A Paper presented at the Bankers forum held at Lagos.

[4]. Jay, H.and Barry, R. (1993) Production and Operation Management Strategies and Tactics, Business and Economic Rich Wolf, Allyn and Bacon.

[5]. Juwah (2006) "Operational Problems and Customers' Dissatisfaction" CBN Bullion.

[6]. Michael, K. (2001) "Service on Call" in Banking Technology News Service Network. http / www.fineos.com/documentation/ features/ bankreach. com.

