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Analysis of Expected, Actual Waiting Time and Service Delivery: Evidence from Nigeria Banking Industry

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Abstract:
Queues are common sight in bank these days especially on Mondays and on Fridays. Hence queuing theory which is the mathematical study of waiting lines or queue is suitable to be applied in the banking sector since it is associated with queue and waiting line where customers who cannot be served immediately have to queue(wait) for service. The aim of this paper is to determine the expected time a customer likely to spend in bank, the actual waiting time and service delivery time. The primary data were collected from First Bank of Nigeria plc, Osogbo, And Osun State South West Nigeria. The data were collected based on the arrival pattern and service pattern of customers. Data were collected using personal observation and the recording was taken from Monday to Friday mostly during the peak period. Poison Distribution approach was used for data analysis.

Keywords: *Queue, waiting time, actual time, service delivery time and customer*

1. Introduction

Waiting in lines or queues seems to be an general phenomenon in our day to day life. Think about the many times you had to wait in line in the last month or year and the time and frustration that was associated with those waits. Whether we are in line at bank, grocery store checkout, the barbershop, the stoplight, hospital or in the pharmacy, ―waiting our turn‖ is part of our everyday life

Bank, like other service oriented industries, functions in an increasingly competitive environment. Speed of service has been shown to provide businesses a competitive advantage in the marketplace. In addition; the literature reveals several studies documenting customer's dissatisfaction with long waiting times and indicates that this is a pervasive problem in banking practice and a common source of anxiety and dissatisfaction among customers and, in many cases, banks staffs.

The common experience in Nigeria is that most banks do not have the facilities and capacities to service the number of customers without much delay on the part of the customers. The problem in this regard had been that though bank customers for instance, have always been desirous of spending the least possible time in banking transactions, this age-long desire is yet to be met by the banks. Banks on the other hand, want to attract, retain customers and at the same time optimize profit. Profit making in banks is a function of management ability to provide efficient services to customers at little or no time wastage (Agbadudu, 1995).

One major recurring problem in Nigerian Banks is the overcrowding banking halls, this had led to the movement of customers from one bank to the other, where they can obtain banking services without much delay. The modem day computerization, (such as Online Real Time, Automated Teller Machine (ATM) etc) by banks in attempt to minimize waiting line problem have not yielded the much desired result due to frequent breakdown of such computerization and networking arrangements. Hence, long queue persisted in all Nigerian banks. More time and money for one thing, means less time and money for other things. The time available to any economic agent has alternative uses, for leisure or for work (Ashley, 2006).

The number of hours devoted to work determines the individual's wage. Apart from situation of work or leisure, economic agents sometime commit considerable amounts of their time when they come into service stations for service. Typical of Nigeria, customers wait for hours to get service without the service providers feeling that there is an opportunity cost for the wasted time. Maybe, the lack of economic growth in the country is traceable to this economic waste and the economy will begin to grow if this waste can be minimized.

1.1. General Review of Queue System

Queuing theory is the mathematical study of waiting lines or queue. The theory enables mathematical analysis of several related processes, including the arrival at the (back of the) queue, waiting in the queue (essentially a storage process) and being served at the front of the queue. The queue permits the derivation and calculation of several performance measures including the average waiting time in the queue or the system, the expected number waiting or receiving service and the probability of encountering the system in certain states such as empty, full, having an available server or having to wait a certain time to be served. Queuing theory has become one of the most important, valuable and arguable

one of the most universally used tool by an operational researcher. It has applications in diverse fields including telecommunications, traffic engineering, computing and design of factories, shops, offices, banks and hospitals. A queuing model of a system is an abstract representation whose purpose is to

Isolate those factors that relate to the system's ability to meet service demands whose occurrences and durations are random. (Janos, 2010). The study of queue deals with quantifying the phenomenon of waiting in lines using representative measures of performance, such as average queue length, average waiting time in queue and average facility utilization (Eze & Odunukwe, 2012). Some of the analysis that can be derived using queuing theory include the expected waiting time in the queue, the average waiting time in the system, the expected queue length, the expected number of customers served at one time, the probability of balking customers, as well as the probability of the system to be in certain states, such as empty or full (Olasore, 2013). Queuing models are used to represent the various types of queuing systems that arise in practice, the models enable in finding an appropriate balance between the cost of service and the amount of waiting (Wagner, 2007). Queuing models provide the analyst with a powerful tool for designing and evaluating the performance of queuing systems (Banks, 2001). Any system in which arrivals place demands upon a finite capacity resource maybe termed as queuing systems, if the arrival times of these demands are unpredictable, or if the size of these demands is unpredictable, then conflicts for the use of the resource will arise and queues of waiting customers will form and the length of these queue depend on two aspects of the flow pattern: First, they depend on the average rate. Secondly, they depend on the statistical fluctuations of this rate (Klenrock, 1975)

1.2. Review of Queue in Nigeria

In Nigeria, a study conducted by Olaniyi (2004) revealed a positive correlation between arrival rates of customers and bank's service rates. He concluded that the potential utilization of the banks service facility was 3.18% efficient and idle 68.2% of the time. However, Ashley (2000) asserted that even if service system can provide service at a faster rate than customers arrival rate, waiting lines can still form if the arrival and service processes are random.

One week survey conducted by Elegalam (2006) revealed that 59.2% of the 390 persons making withdrawals from their accounts spent between 30 to 60 minutes while 7% spent between 90 and 120 minutes. Baale (1996) while paraphrasing Alamatu and Ariyo (1983) observed that the mean time spent was 53 minutes but customers prefer to spend a maximum of 20 minutes. Their study revealed worse service delays in urban centres (average of 64.32 minutes) compared to (average of 22.2 minutes) in rural areas. To buttress these observations, Juwah (1986) found out that customers spend between 55.27 to 64.56 minutes making withdrawal from their accounts. Efforts in this study are directed towards application of queuing models in capacity planning to reduce customer waiting time and total operating costs.

2. Characteristics of a Queuing System

We take a look at the three parts of queuing system (1) the arrival or inputs to the system (sometimes referred to as the calling population), (2) the queue# or the waiting line itself, and (3) the service facility. These three components have certain characteristics that must be examined before mathematical queuing models can be developed.

Arrival Characteristics, the input source that generates arrivals or customers for the service system ahs three major characteristics. It is important to consider the size of the calling population, the pattern of arrivals at the queuing system, and the behavior of the arrivals.

Size of the Calling Population: Population sizes are considered to be either unlimited (essential infinite) or limited (finite). When the number of or arrivals on hand at any customers given moment is just a small portion of potential arrivals, the calling population is considered unlimited. For practical purpose, in our examples the limited customers arriving at the bank for deposit cash. Most queuing models assume such an infinite calling

3. Statement of the Problem

The obvious cost implications of customers waiting range from idle time spent when queue builds up, which results in man-hour loss, to loss of goodwill, which may occur when customers are dissatisfied with a system. However number of customers goes to bank hoping to complete the transaction within a particular period of time and busy with something else but eventually spend unimaginable long time waiting to be served. Therefore, this study attempts to look at the determine the period a particular customer is to spend in the bank using the queue model. This will help the customer to have a pre-knowledge of how long he/she is likely to wait and be served in Nigeria banking system.

4. Data Collection and Analysis

The research method used in this work is a quantitative research approach. The data gathered were the daily record of queuing system over a week. The stop watch was used to record the arrival time and service time for each customer and the data gathering was conducted during peak period that is when much customers visits banks.

Monday						
	Server 1		Server 2		Server 3	
	Arrival	Service	Arrival	Service	Arrival	Service
9:00 – 10:00 am	27	22	19	21	15	16
10:00 – 11:00 am	18	25	24	24	29	27
11:00 – 12:00 pm	16	17	30	35	37	34
12:00 – 1:00 pm	25	27	22	16	18	22
1:00 – 2:00 pm	17	6	19	17	20	19
2:00 – 3:00 pm	14	20	22	25	20	19
Total	117	117	136	138	144	145

Table 1: Day One (1): Data and Queuing System Analysis of the servers

Tuesday						
	Server 1		Server 2		Server 3	
	Arrival	Service	Arrival	Service	Arrival	Service
9:00 – 10:00 am	24	17	35	39	29	31
10:00 – 11:00 am	27	31	27	29	31	27
11:00 – 12:00 pm	31	29	31	28	14	16
12:00 – 1:00 pm	36	39	26	23	37	38
1:00 – 2:00 pm	21	25	18	18	26	29
2:00 – 3:00 pm	19	23	19	23	14	15
Total	158	164	156	160	151	156

Table 2: Day Two (2): Data and Queuing System Analysis of the servers

Wednesday						
	Server 1		Server 2		Server 3	
	Arrival	Service	Arrival	Service	Arrival	Service
9:00 – 10:00 am	23	25	12	17	29	31
10:00 – 11:00 am	37	39	27	30	21	23
11:00 – 12:00 pm	21	23	26	21	35	35
12:00 – 1:00 pm	16	18	8	8	16	14
1:00 – 2:00 pm	17	21	32	32	22	21
2:00 – 3:00 pm	8	8	30	31	17	19
Total	122	134	135	139	140	143

Table 3: Day Three (3): Data and Queuing System Analysis of the servers

Thursday						
	Server 1		Server 2		Server 3	
	Arrival	Service	Arrival	Service	Arrival	Service
9:00 – 10:00 am	22	23	28	29	14	21
10:00 – 11:00 am	18	19	29	31	35	36
11:00 – 12:00 pm	8	10	35	35	26	27
12:00 – 1:00 pm	21	23	18	16	21	23
1:00 – 2:00 pm	35	35	27	29	18	19
2:00 – 3:00 pm	16	17	15	19	15	18
Total	120	127	152	159	129	144

Table 4: Day Four (4): Data and Queuing System Analysis of the servers

Friday						
	Server 1		Server 2		Server 3	
	Arrival	Service	Arrival	Service	Arrival	Service
9:00 – 10:00 am	20	27	35	39	14	16
10:00 – 11:00 am	11	10	28	31	35	35
11:00 – 12:00 pm	23	23	21	19	22	21
12:00 – 1:00 pm	35	39	16	20	17	19
1:00 – 2:00 pm	16	20	14	17	18	23
2:00 – 3:00 pm	18	11	35	33	15	14
Total	123	130	149	159	121	128

Table 5: Day Five (Five): Data and Queuing System Analysis of the servers

	Arrival And Services Summary						
		Server 1		Server 2		Server3	
		Arrival	Service	Arrival	Service	Arrival	Service
DAY1		113	117	136	138	144	145
DAY2	Total arrival &service	158	164	156	160	151	156
DAY3		122	134	135	139	140	143
DAY4		120	127	152	159	129	144
DAY5		123	130	149	159	121	128

Table 6: Summary and Data and Queuing System Analysis of the servers

4.1.Results

The table below shows the average arrival and service rate for the three servers. The average service rate is calculated for he five days for which data was collected. Here the total arrival and service rate was divided by the number of data taken which thus give us the average

		Server 1		Server 2		Server 3	
		Arrival	Service	Arrival	Service	Arrival	Service
DAY1	AVERAGE	18.83	19.50	22.66	23.00	24.00	24.16
DAY2	AVERAGE	26.33	27.33	26.00	26.66	25.16	26.00
DAY3	AVERAGE	20.33	22.33	22.50	23.16	23.33	23.83
DAY4	AVERAGE	20.00	21.16	25.33	26.50	21.50	24.00
Day5	AVERAGE	20.5	21.66	24.83	26.5	20.16	21.33
	TOTAL	105.99	111.98	121.32	125.82	114.15	119.32

Table 7: Average of summary of Data and Queuing System
Analysis of the servers based on number of hours for data collection (6 hrs)

The intensity is calculated for each of the server to determine the time a customer waits before been server.

$$\text{Intensity} = \frac{\text{Average arrival rate}}{\text{Average service rate}}$$

SERVER1	SERVER2	SERVER3
0.946	0.964	0.956

The table below also shows the time each server spends to attend to a customer and it is thus calculated as below.

Server1	Server2	Server3
0.165hours	0.220	0.190
= 9.9minutes	13,2minutes	11,4minutes

Average time spent in the system
= 1/1-e*i/n
Average total unit spent in the system by the 3 servers

$$= \frac{9.9+13.2+11.4}{3} \qquad = \frac{34.5}{3} = 11.5\text{minutes}$$

Therefore the total expected time a customer is likely to spend on the system (queue time + service time) in Nigeria contexc yt = 11.5 minutes
Total work hour = 6hours
Average arrival rate = total arrival/ total work hour
Average service rate = total service rate/ total work hour

5. Summary and Conclusion

Based on our study, we found that the in Nigeria context bank customers should prepare their mind no to spend less than 11.5 minutes anytime they are going to make transaction in bank. Waiting time is something that needs to be managed seriously, especially in banking sector. We highlighted several studies that stress the importance of managing customers' perceptions of waiting time and several ways how banks can do that.

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