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Case Report

Waiting Lines, Banks' Effective Delivery Systems and Technology Driven Services in Nigeria: A Case Study

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Abstract: This paper investigates how technology influences banks' efficient service delivery and reduces customers' average waiting time in obtaining services in a commercial bank at Obafemi Awolowo University. The Direct non-participatory observation was adopted to record time measurements and primary data. The time measurements were based on customers' arrival times to the banking hall and the service times of the customers who arrived at the bank between the hour of 12.00pm and 1.00pm which have been previously observed to be the bank's peak period. Data were fitted into the model and the results computed and analyzed. The findings of the study show that both arrival of customers and service time rate of servers follow a poisson exponential probability distribution, respectively. The results reveal that the mean service rate, the mean time spent in the queue by a customer, and aggregate service rate in the system by a customer are substantially reduced and the waiting line is short in a technology driven bank. The study concluded that only technology driven services can reduce customers' waiting time and improves efficient service delivery systems in Nigerian modern banking.

Keywords: Waiting Lines, Technology, Banks' Services, Poisson Distribution

1. Introduction

Banks' service delivery system is sometimes interrupted by rowdiness of its customers and randomness of their arrival and service time. Population explosion is one of the single largest challenges faced by Nigerian commercial banks. This scenario, in banks, makes its customers filed up in a queue system for an orderly service performance. Waiting line or queuing theory is the mathematical application of a statistical model to customers flow management. The queuing system is a day- to- day experience of human endeavor. It is a common experience in factually every economic life. There is hardly any economic activity that waiting time is not essential. Customers wait on line to get attention of the cashiers in the banks and attendants at the filling stations, barber shops, salon shops, bus-stops, supermarkets, telephone booths, toll gates, food canteens. A passenger that travels by air on both local and international routes might be asked to queue up in an orderly manner in order to be served. Queuing theory is not strange to travelers who normally wait on line at the visa department of a foreign embassy for visa; at the travel agent's office to buy ticket, at the airport to check in luggage and to get a seat assignment. Waiting is a non-value added activity. No customer likes a waiting situation. Therefore, it is always a desire of every customer to obtain an efficient and prompt service delivery from a service system.

This desire, most times, are often not met in service systems. Therefore, the need for proper management of queues for optimum service delivery is a major concern of many organizations. An efficient bank pays adequate attention to rules that govern arrivals, service times and the order in which arriving customers are served in order to boast patronage.

The objective of this paper is to evaluate how technology influences banks' efficient delivery systems, reducing waiting lines of customers and service performance of commercial banks in Nigeria.

This paper is therefore arranged as follows: following the introduction session, session 2 reviews the literature, section 3 presents the methodology of the study. Section 4 presents the analysis and discussion of the results. Section 5 concludes the study.

2. Literature Review

The focal point of waiting-line analysis is the queue or waiting-line. The waiting-line itself is not necessarily a physical string of customers like the line that forms at a theatre ticket window. The waiting line may simply be some identifiable grouping of customers whose sequence of service may or may not be designated [1] Waiting-line theory started with Erlang Agner Krarue, a Danish engineer in his research work [2]. He observed a dwindling demand in telephone traffic which provided the basis for his experiment [3] His work later extended to other areas of business applications and various service industries including telecommunication, traffic engineering, computing, banks, the design of factories, shops, offices and hospitals [4]

Single queuing nodes are visually described using Kendalls notation in the form A/S/C where A describes the time between arrivals to the queue, S the size of jobs and C the number of services at the node. Many theorems in waiting-line theory can be proved by reducing queues to mathematical systems known as Markov Chains, first described by Andrey Markov [5] Queuing theory was developed to evaluate queuing phenomena in commerce, telephone traffic, transportation business, industrial services system, variable reservoirs etc. [6]; [7]. Improving the performance of service industries where arrival and service time are random and carried out by numerous human employees is a complex decision environment. [8]; [9]. Waiting line is common in banking industry that is always characterized by customers explosion. Waiting-line model has been used as a bail out for banks from this overwhelming customers' excessive demand so as to improve the system performance. A queue system is also applicable to commercial service [10]; [11]; [12]; [13]. In their studies, they discovered that the cost of a dissatisfied customer is not negligible, and the waiting in line for customers is a primary service of dissatisfaction. They concluded that a well known queuing theory and integrating theory behind the Tagachi Loss Function, a manager can derive the costs associated with this dissatisfaction and that customer dissatisfaction is not just an issue at the upper specification limit, but rather for each moment in time beyond the targeted waiting time. Chen, [14] investigated submittal reviews process and used queuing theory to determine the major causes of long lead times. From his study, he explored the underlying causes of waiting in a process flow and found the improvement methods from the queuing perspective.

Yeung (2002) concluded research on large hospitals with the help of Laplace transform of the probability density function of customer response time in networks of queues with class-based priorities. He obtained the mean and standard deviation of total patient service time for large hospitals mainly for accident and emergency department.

Waiting line system can be of single or multiple lines. Many banks operate single line systems for its customers. In this process, customers are expected to wait for their time until a teller is free and it is the customer turn to be served. The customers' preference for a single line system, is in its fairness The single-line system promotes orderliness services for the waiting customers' turn for service and eliminate preferential treatment. With a single- line multiple- server system, banking services to customers are enhanced more than the same system with a single line, single server system.

The multiple-line systems are adopted when space consideration make a single line inconvenient [17] A waiting line is usually described by two characteristics: the length of the waiting line and the queue discipline. The length of the waiting line is measured by the number of customers on the queue and this depends on the rate of customers' arrival, the length of time taken for a customer to be served and the scope of the service facility. Queue disciplines are the various rules in place that determine customers' tune for service [18] Prominent among these rules is the first-come, first-serve discipline, when customers' selection for service is based strictly on the order of their arrival such that a customer who arrives earlier gets served and leaves the system before another customer who arrives later [19] Random discipline occurs when customers' selection is carried out without regard to the order of their arrival.

The notations used in the analysis of a queuing system are as follows:

n = number of customers in the system (waiting and in service)

P_n=Probability of n customers in the system

λ=Average (expected) customers' arrival rate or average number of arrivals per unit of time in the queuing system

μ=Average (expected) service rate or average number of customers served per unit time at the place of service.

$$\frac{\lambda}{\mu} = P = \frac{AverageServiceCompletionTime\left(\frac{1}{\mu}\right)}{AverageInter-ArrivalTime\left(\frac{1}{\lambda}\right)}$$

=Traffic intensity or server utilization factor (the expected fraction of time for which server is busy)

s=Number of service channels (service facilities or servers)

N=maximum number of customers allowed in the system

L_s=Average (expected) number of customer in the system waiting and in service)

L_q=Average (expected) number of customers in the queue (queue length)

L_b=Average (expected) length of non-empty queue

W_s=Average (expected) waiting time in the system waiting and in service

ρ_w =Probability that an arriving customer has to wait.

The general relationships between average system characteristics which are common to all queuing models are as follows:

Expected number of customers in the system is equal to the expected number of customers in queue plus in service

$L_s = L_q$ + Expected number of customers in service

$$= L_q + \frac{\lambda}{\mu} \quad (1)$$

Expected waiting time of the customer in the system is equal to the average waiting time in queue plus the expected service time.

$$W_s = W_q + \frac{1}{\mu} \quad (2)$$

Expected number of customers served per busy period is given

$$\text{by}= \frac{L_s}{P(n \geq s)} = \frac{\mu}{\mu - \lambda} \quad (3)$$

Where P(n ≥ s) = probability that the system being busy

Expected number of customers in the system is equal to the average number of arrivals per unit of time multiplied by the average time spent by the customer in the system.

$$L_s = \lambda W_s or W_s = \frac{1}{\lambda} L_s \quad (4)$$

Expected length of queue during busy period is given by

$$W_b = \frac{W_q}{P(n \geq s)} = \frac{1}{\mu - \lambda} \quad (5)$$

For applying formula (iv) and (vi) for system with finite queue, instead of using λ, its effective value $\lambda(1 - P_N)$ must be used.

Different models in queuing theory are classified by using special (or standard) notations described initially by D. G. Kendall [20] in the form (a/b/c). Later A. M. Lee [21] added the symbols d and c to the Kendall notation.

The standard format used to describe the main characteristics of parallel queues is as follows:

[(a/b/c): (d/c)]

Where

a=arrivals distribution

b=service time (or departures) distribution

c=number of service channels (servers)

d=maximum number of customers allowed in the system (in queue plus in service)

e=queue (or service) discipline certain descriptive notations are used for the arrival and service times distribution to replace notation (a and b) as follows

M=Exponential (or Markkovian) inter-arrival times or service – time distribution (or equivalently poison or Markovian arrival or departure distribution)

D=Constant or deterministic inter-arrival-time or service-time.

G=Service time (departures) distribution of general type.

GI=Inter-arrival time (arrivals) having a general probability distribution such as normal, uniform or any empirical distribution.

E_k=Erlang-k distribution of inter-arrival or service time distribution with parameter, k (i.e. if k = 1, Erlang is equivalence to exponential and if k = ∞, Erlang is equivalent to deterministic).

3. Data and Methodology

3.1. Data

The data relevant to this study are collected by observation of the bank customers during the peak period for a multi-channel branch of a commercial bank at ObafemiAwolowo University which patronizes the largest numbers of customers. Arrivals of the customers in the bank are poisson distributed, tellers/servers are represented by identical exponential service-time distribution and arrivals form a single line and are admitted into the first available service channel on a first-come, first-served basis.

3.2. Model Specification

The Single-Server Queuing Models

[(M/M/I): (∞/FcFs)] Exponential Service – Unlimited

Queue certain assumptions are made about the queuing system:

i. Exponential distribution of inter-arrival time or poisson distribution of arrivals.
ii. Single waiting line within restriction on length of queue (i.e. infinite capacity) and no balking.
iii. Queue discipline is “first-come, first-served”
iv. Single server with exponential distribution of service time.

The performance measures for the model are as follows:

(a) Expected number of customers in the system (customers in the line plus the customer being served)

$$L_s = \sum_{n=0}^{\infty} np_n = \sum_{n=0}^{\infty} n\,(1-p)p^n, 0 < P < 1$$

$$= (1-P)\sum_{n=0}^{\infty} np^n = P(1-P)\sum_{n=1}^{\infty} np^{n-1}$$

$$= P(1-P)[1 + 2P + 3P^2 + \ldots]$$

$$= (1-P)\left[\frac{P}{(1-P)^2}\right]$$

(Sum of an arithmatico-geometric series)

$$or L_s = \frac{P}{1-P} = \frac{\lambda}{\mu-\lambda}; P = \frac{\lambda}{\mu} \quad (6)$$

(b) Expected number of customers waiting in the queue (i.e. queue length)

$$L_q = \sum_{n=1}^{\infty}(n-1)\,P_n = \sum_{n=1}^{\infty} n\,P_n - \sum_{n=1}^{\infty} P_n$$

$$= \sum_{n=1}^{\infty} n\,P_n - \left[\sum_{n=1}^{\infty} P_n - P_0\right]$$

$$= L_s - (1 - P_0) = \frac{\lambda}{\lambda - \mu} - \frac{\lambda}{\mu}; 1 - P_0 = \frac{\lambda}{\mu}$$

$$\text{Or } L_q = \frac{\lambda^2}{\mu(\mu - \lambda)} \quad (7)$$

(c). Expected waiting time for a customer in the queue

$$W_q = \int_0^\infty \left[\frac{d}{dt}\emptyset w(t)\right] dt$$

$$= \int_0^\infty \lambda\,(1-P)e^{-\mu(1-P)tdt}$$

Integrating by parts $W_q = 1(1-P)\left[\frac{te^{-\mu(1-P)t}}{-\mu(1-P} - \frac{e^{-\mu(1-P)t}}{\mu^2(1-P)^2}\right]_0^\infty$

$$= \lambda\left(1-\frac{\lambda}{\mu}\right)\frac{1}{(\mu-\lambda)^2}$$

Or $W_q = \frac{\lambda}{\mu\,(\mu-\lambda)} = \frac{L_q}{\lambda}$ (8)

(d) Expected waiting time for a customer in the system (waiting and service)

W_s = Expected waiting time in queue + Expected service time

$$= W_q + \frac{1}{\mu} = \frac{\lambda}{\mu(\mu-\lambda)} + \frac{1}{\mu}$$

Or $W_s = \frac{1}{\mu-\lambda} - \frac{L_s}{\lambda}$ (9)

(e). Probability that the number of customers in the system is greater than or equal to k

$$P_{(n\geq k)} = \left(\frac{\lambda}{\mu}\right)^k;\ P_{(n>k)} = \left(\frac{\lambda}{\mu}\right)^{k+1} \quad (10)$$

(f). The variance (fluctuation) of queue length

$$Var_{(n)} = \sum_{n=1}^{\infty} n^2 P_n = \left(\sum_{n=1}^{\infty} n\,P_n\right)^2$$

$$= \sum_{n=1}^{\infty} n^2 P_n - (L_s)^2 = \sum_{n=1}^{\infty} n^2\,(1-P)P^n - \left(\frac{P}{1-P}\right)^2$$

$$= (1-P)[1.P^2 + 2^2.P^2 + 3^2.P^3 + \cdots] - \left(\frac{P}{1-P}\right)^2$$

Or $Var_{(n)} = \frac{P}{(1-P)^2} = \frac{\lambda\mu}{(\mu-\lambda)^2}$ (11)

(g). Probability that the queue is non- empty

$$P_{(n>1)} = 1 - P_0 - P_1$$

$$= 1 - \left(1-\frac{\lambda}{\mu}\right) - \left(1-\frac{\lambda}{\mu}\right)\left(\frac{\lambda}{\mu}\right) = \left(\frac{\lambda}{\mu}\right)^2 \quad (12)$$

(h). Probability of k or more customers in the system

$$P_{(n\geq k)} = \sum_{n=k}^{\infty} P_k = \sum_{n=k}^{\infty}(1-P)\,P^k$$

$$= (1-P)P^k \sum_{n=k}^{\infty} P^{n-k}$$

$$= (1-P)P^k \sum_{n=k}^{\infty} P^{n-k}$$

$$= (1-P)P^k[1 + P + P^2 + \ldots] = \frac{(1-P)P^k}{(1-P)} = P^k$$

Or $P_{(n\geq k)} = \left(\frac{\lambda}{\mu}\right)^k;\ P_{(n>k)} = \left(\frac{\lambda}{\mu}\right)^{k+1}$ (13)

(i). Expected length of non-empty queue

$$L_b = \frac{Expectedlenghtofwaitingline}{Prob_{(n>1)}}$$

$$= \frac{L_q}{P_{(n>1)}} = \frac{\frac{\lambda^2}{\mu}(\mu-\lambda)}{\left(\frac{\lambda}{\mu}\right)^2} = \frac{\mu}{\mu-\lambda} \quad (14)$$

(j). Probability of an arrival during the service time when system contains r customers.

$$P_{(n=r)} = \int_0^\infty P_r(t)_s\,(t).dt = \int_0^\infty \frac{(\lambda t)^r e^{-\lambda t}}{r!}.\mu e^{-\mu t}dt$$

$$= \frac{X^r\mu}{r!}\int_0^\infty e^{-(\lambda+\mu)t.t^r dt} = \frac{X^r\mu}{r!}\frac{r(r+1)}{(\lambda+\mu)^{r+1}}$$

$$= \left(\frac{\lambda}{\lambda+\mu}\right)^r\left(\frac{\mu}{\lambda+\mu}\right); since \int_0^\infty e^{-xt}\,t^n dt = \frac{r^{(n+1)}}{L^{n+1}} r_{(r+1)} = r! \quad (15)$$

3.3. Multi-sever Queuing Models

(M/M/s): (∞/FC/FS/) Exponential service – Unlimited Queue

This model is an extension of model 1. In this case, instead of a single channel, there are multiple servers. For this queuing system, it is assumed that customers arrive according to a poisson process at an average rate of λ customer per unit of time and are served on a first-come, first-served basis at any of the servers. These servers are identical, each serving customers according to an exponential distribution with an average of μ customers per unit of time. It is further assumed that only one queue is formed. The overall service rate of servers is obtained in two situations, when n customers are in the system.

(i) If n < s, (number of customers in the system is less than the number of servers), then there will be no queue. However, (s – n) number of servers are not busy. The combined service rate is: $\mu_n = n\mu$; n < s
(ii) If n ≥ s, (number of customers in the system is more than or equal to the number of servers) then all servers will be busy and the maximum number of customers in the queue will be (n – s). The combined service rate is: $\mu_n = s\mu$; n ≥ s.

The operating characteristics of the multiple-channel waiting line is as follows:

(a) The probability (P_0) of having no customers in the multi-channel system

$$P_0 = \left[\sum_{n=0}^{s-1} \frac{\left(\frac{m}{\lambda}\right)^n}{n!} + \frac{\left(\frac{m}{\lambda}\right)^s}{s!}\left(\frac{1}{1-\frac{m}{s\lambda}}\right)\right]^{-1}$$

$$= \left[\sum_{n=0}^{s-1} \frac{\left(\frac{m}{\lambda}\right)^n}{n!} + \frac{\left(\frac{m}{\lambda}\right)^s}{s!}\left(\frac{s\lambda}{s\lambda-m}\right)\right]^{-1} \quad (16)$$

(b) The probability that no server is free or available

$$P_n = \frac{1}{n!}\left(\frac{m}{\lambda}\right)^n P_0 \text{if n} < \text{s}$$

$$P_n = \frac{\lambda\left(\frac{m}{\lambda}\right)^s}{(s-1)!(s\lambda-m)} P_0 = \frac{s\lambda\left(\frac{m}{\lambda}\right)^s}{s!(s\lambda-m)} P_0 \text{if n} \geq \text{s} \quad (17)$$

(c) Average queue length

$$N_q = E_{(nq)} = \frac{\left(\frac{m}{\lambda}\right)^S\left(\frac{m}{s\lambda}\right)P_0}{s!\left(1-\frac{m}{s\lambda}\right)^2} = \frac{m\lambda\left(\frac{m}{\lambda}\right)^s P_0}{(s-1)!\,(s\lambda-m)^2} \quad (18)$$

(d) Average number of customers in the system

$$N = E_{(n)} = N_q + \frac{m}{\lambda}$$

$$= \frac{\left(\frac{m}{\lambda}\right)^s\left(\frac{m}{s\lambda}\right)}{s!\left(1-\frac{m}{s\lambda}\right)^2} P_0 + \frac{m}{\lambda}$$

$$= \frac{m\lambda\left(\frac{m}{\lambda}\right)^s}{(s-1)!(s\lambda-m)^2} P_0 + \frac{m}{\lambda} \quad (19)$$

(e) Average waiting time for an arrival

$$T_q = E(w_q) = \frac{\lambda\left(\frac{m}{\lambda}\right)^s}{(s-1)!(s\lambda-m)^2} = \frac{W_q}{m} \quad (20)$$

(f) Average time an arrival spends in the system

$$T = E(CT) = T_q + \frac{1}{\lambda} = \frac{\lambda\left(\frac{m}{\lambda}\right)^s}{(s-1)!(s\lambda-m)^2} P_0 + \frac{1}{\lambda} \quad (21)$$

4. Results and Discussion

The table below contains the customers' arrival and service data during the observed peak period of 12pm-1.00pm for a multi-channel branch of a commercial bank at Obafemi Awolowo University, Ile-Ife. Direct non-participatory observation was engaged to the time measurements. Measurements were taken on arrival times and service times of customers who arrived at the bank within the hour of 12pm to 1pm. The majority of the bank customers are students. The arrivals are assumed to be poisson distributed with the tellers/servers represented by identical exponential service-time distributions and arrivals for a single line areadmitted into the first available service channel on a first-come, first-served basis. The observation is limited to the first sixty customers of the bank.

Table 1. *Customer Arrival and Service Data.*

Customer Number	Teller number	Arrival Time	Service begins (pm)	Service ends (pm)
1	3	12.00pm	12.05	12.10
2	7	12.00	12.03	12.08
3	2	12.01	12.02	12.05
4	1	12.05	12.07	12.10
5	4	12.08	12.10	12.15
6	6	12.06	12.08	12.12
7	3	12.05	12.09	12.15
8	5	12.02	12.04	12.08
9	1	12.09	12.12	12.16
10	3	12.10	12.15	12.20
11	7	12.07	12.10	12.17
12	6	12.10	12.14	12.22
13	2	12.04	12.07	12.15
14	1	12.14	12.17	12.25
15	3	12.13	12.15	12.20
16	5	12.06	12.10	12.19
17	4	12.12	12.14	12.21
18	6	12.18	12.20	12.26
19	7	12.15	12.20	12.26
20	7	12.15	12.17	12.22
21	1	12.22	12.25	12.28
22	2	12.13	12.15	12.28
23	5	12.18	12.20	12.26
24	4	12.17	12.20	12.27
25	1	12.25	12.30	12.35
26	5	12.24	12.27	12.32
27	3	12.18	12.22	12.27
28	2	12.18	12.20	12.28
29	7	12.20	12.23	12.27
30	3	12.27	12.20	12.30
31	5	12.30	12.35	12.40
32	4	12.25	12.28	12.35
33.	2	12.27	12.31	12.39
34	3	12.25	12.28	12.33
35	5	12.38	12.40	12.46
36	4	12.31	12.35	12.39
37	2	12.37	12.40	12.46
38	3	12.30	12.33	12.38
39	1	12.33	12.35	12.42
40	7	12.25	12.27	12.35
41	5	12.45	12.47	12.51
42	2	12.37	12.41	12.47
43	6	12.28	12.30	12.37
44	5	12.50	12.55	12.59
45	3	12.40	12.42	12.49
46	4	12.38	12.40	12.47
47	1	12.41	12.43	12.49
48	7	12.34	12.37	12.43
49	2	12.45	12.49	12.55
50	5	12.58	1.02	1.07
51	6	12.36	12.39	12.45
52	2	12.45	12.47	12.52
53	4	12.46	12.48	12.55
54	3	12.48	12.52	12.58
55	6	12.43	12.46	12.51
56	4	12.46	12.48	12.55
57	7	12.42	12.45	12.50
58	2	12.54	12.55	12.59
59	1	12.48	12.50	12.55
60	3	12.57	12.58	1.05

The table above shows the pattern of customers' arrival and service delivery in the system. Column 1 shows the number of customers while column 2 shows the number of tellers in use, columns 3, 4 and 5 explain the arrival time, commencement of service and end of service respectively.

The mean arrival rate for the sixty (60) customers who arrived and joined the queue in the branch for the system under consideration, is 1.06 customers/minute. This implies that the bank's customers arrived at the branch to transact business at an average of 1.06 per minute. In other words, m = 1.06, represents the average number of customers that join the queue in a minute.

The mean service rate per channel or server or teller is 3.1843 minutes/customer where $\lambda = 0.2622$ customers/minute. The implication of this is that each teller serves an average of 0.2622 customer per minute. The service channels are the tellers. These were seven in number in the system. The facility is therefore adequate to meet the customers' demand for prompt service.

The aggregate service rate for the overall system is $s\lambda = 7 \times (0.2622)$ customers/minute which translates to 1.8354 customers/minute. This implies that a customer's service rate to obtain service in the bank hall cannot exceed 1.8354 minutes in the minimum.

The traffic intensity factor for the queuing system is 0.71 which shows that the customers' traffic into the banking hall is quite intense and translates to heavy workload on the tellers that will have to cope with the magnitude of customers. Also the probability that all tellers are idle equals the probability that the queuing system is empty which equals the probability that there is no customer in the queue system, is 0.0638. By implication, it means that the probability that the queuing system is empty is as low as 0.0638. This means that the inflow of customers to the queue is always predictably high in the banking hall. The probability that all tellers are simultaneously busy and every teller in the banking hall is busy and consequently an arriving customer has to wait is 0.3111 with the mean or expected number of customers in the queue system to be of customers.

The mean or expected waiting time for a customer in the queue is six (6) minutes. The mean time in the system by a customer is the average time a customer spends in the system and this is calculated to be 10 minutes. With the average waiting time of six (6) minutes and average service time of four (4) minutes, the customer spends 10 minutes on the average in the banking hall. To ensure the effective customers' service delivery, the bank has made substantial investments in its technology platform and systems, built multiple distribution channels, including an electronically linked branch network, automated telephone banking, internet banking and the introduction of "first-monie" under the mobile payment framework.

With respect to keeping a lid on operating expenses, the bank focused on right origination, cost-effective and error-free operations and effective complaint resolution. Through Firstcontact, the bank continued driving improvements in service quality encompassing all customers touch points such as branches, ATMs, internet banking, e-mail service, as well as bank-office support functions. In her pursuit of the primary objective of increasing attention to effectively serve the customers by enabling greater specialization, deeper market penetration, closer relationship management and tailored product delivery, the bank embarked on operating restructuring and ancillary alterations to incentive and performance management systems aimed at aligning staff rewards and compensations to her overall goals.

In the 2012 KPMG customer satisfaction survey, assessing 2011 performance, the bank was ranked 8th (from 10th in 2010) in its annual retail customer segment survey and 3rd (from 6th in 2013) in its corporate customer segment survey. Also, in 2011, the bank was recognized by African Bankers Magazine as the Most Innovative Bank in Africa and in 2012, the bank was named Nigeria's #1 Banking Brand by Brand Finance.

During 2012, the bank recorded a number of important achievements across market-facing Strategic Business Units (SBUs) and non-market-facing Strategic Resource Functions (SRFs) while the different non-banking businesses within the bank also made great strides. She emerged as the winner of the prestigious Sectoral Leadership Award (Financial Service – Other Financial Institutions) in the 2013 Pearl Award, in recognition of its outstanding operational and stock market performance. Also, the Best Bank Brand in Nigeria was awarded the bank three times in a row – 2011, 2012 and 2013 by the globally recognized,' The Banker Magazine of the Financial Times Group', in recognition of the Bank's feat in its steady transformation and increased brand value through the years. The bank has been the winner of the "Best Bank in Nigeria", awarded by Global Financial for the past nine consecutive years in recognition of the Bank's consistent leadership in innovative banking in Nigeria. The Asian Banker International Excellence in Retail Financial Services Award was given to her in year 2013 and was reaffirmed as the Best Retail bank in Nigeria for the second consecutive year in recognition of the Bank's Robust Portfolio and exceptional performance in Nigeria's retail market. During the year, the bank created a bespoke card product portfolio that addresses the payments needs of all customers segments with the capacity to issue a good number of cards with accompanying Pins on the spot in all the branches. The number of active cards issued by the banks grew to over 6.3 million from about 2.5 million in 2014. The bank is currently the largest issuer of Verve Cards across the industry and it is estimated that one out of every three active cards in the market is the bank's verve card. It has enhanced the internet banking platform to enable interbank transfers, and integrated her WEB and POS (Point of Sales) modules into first collect, to facilitate electronic sales collection through alternative channels on behalf of her corporate customers. She launched first Pay Link, a multi-platform internet gateway that links to the corporate customers websites to facilitates online payments with both international and domestic cards. It is the first financial institution in Nigeria to attain ISO 27001 Information Security Management System Certification which enabled the bank to offer improved and secure banking transactions to her customers. She was awarded the ISO/IEC 27001:2005 Certificate on 8 September, 2010 after attaining the global standard for information security. She is committed to availing term loans and working capital credit lines in foreign exchange and local currency to support network rollout and expansion as well as bridging working capital needs of the telecommunications industry. In 2011, she won the 2010 Best Receiving Agent Award, having paid out N233.5 billion over a short period. This award indicates the Bank's resilience and proficiency in customer service and foreign exchange, consummating the fantastic feat for a new entrant into the MoneyGram family.

The Bank promotes a business environment that provides job security, employees health and wellbeing, and capacity building through training interventions based on competence requirements, business needs and evolving business opportunities, that earned her the Award of Employer of Choice Award by Multi-Talent Heritage and Associate in recognition of her commitment to efficient and responsible business management, which cultivates a highly motivated, capable and entrepreneurial workforce. She clinched the most Innovative Bank of the Year Award in Africa by the African banker Awards in year 2012 in recognition of the creative use of technology to grant the unbanked and underbanked population in Africa, access to reliable, convenient and affordable financial services through the introduction of bio-metric technology, cash deposit ATMs and mobile financial service solutions, among other interventions to promote financial inclusion and improved customer experience not offered by her competitors. The bank was marked out in the industry as the leader in the Nigerian Banking Industry in terms of the Bank's achievement in product innovation, originality and quality, marked development, excellence in client representation and best practice in the financial and business world by World Finance Banking Awards 2011. This award also accentuates her adoption of globally acceptable standards of financial reporting to enhance shareholders value and fortify her business relationships with numerous stakeholders that require financial statements to make informed decision. The customers' time has greatly been influenced by the introduction of Information technologies in Nigerian banking operations. Information technology implies the science of applying modern technologies to information management, where various forms of information are processed, transmitted, manipulated, stored and retrieved with ease, speed, accuracy, efficiency and yet are cost effective [22]. IT can provide strategic advantages in the competition to produce new products or control distribution channels, leading to improvements in price, competitiveness, design and products quality, which developing economies find increasingly difficult to compete internationally [23]; [24]. Pepperd (2001) [25] admits that online banking and e- commerce will lead to financial stability while online trading is more cost effective because it could accelerate trade execution and expands the price information available to investors. IT diffusion involves more than acquiring Computers and micro-electronics based gadgets and related know – how. It involves the preparedness and development of technical change – generating capacities to adapt given technology to diverse new way of working through system integration [26] The pace of change in information technology is accelerating the already observable growth in the interdependence of international relations. The advancement in Information Technology, the acquisition of relevant equipment and the utilization of the equipment has opened great opportunities for the exploitation of economies of scale and scope, leading to rapid growth and conferring comparative advantage on those with access to it. Information system developments are constantly being applied to wide areas of the economy. They are responsible for increased productivity, quality and efficiency of a member of sectors. Access into the globalised world would be through the inputs (PCs, Internet, e – mails, etc), which will enhance the nation's output, thereby leading to economic growth [27]

There is a global consensus that computerization promotes efficiency, competitiveness and prompt delivery of high quality products and services. The Central Bank of Nigeria has introduced many technology devices that will help the banks moving from manual operations to automated methods such as Magnetic Laic Character Recognition (MICR) to enhance the clearing system for cheques, which takes between 3 and 4 days for local cheques and 5 and 7 days for up – country cheques. This has been in place with the commencement of the Nigerian Automated Clearing System (NACS).

Also, Banking Analysis Operating System (BANKOS) was also introduced for consolidation of different accounts by the banks. Government Security System (GSS) was also brought into use for the allocation of treasury bills (TB) to financial institutions. The bank has also implemented Satellite Wide Area Network (WAN), which facilitates transfer of data and voice between the head office and branches nation- wide, while Banking Analysis System (BAS) that provides information to the banks and the Nigerian Deposit Insurance Corporation (NDIC) to monitor the development and financial viability of banks had also been launched into the banking systems. The Banker's Committee has established the Nigerian Inter- bank Settlement System (NIBSS) while World Area Network (WAN) which was started long ago has enabled banks to link up with its branches. Information Technology is being increasingly implemented by innovative financial institutions, particularly the deposit money banks, in order to facilitate the re – engineering of their business process.

Most of the commercial banks have established Automated Teller Machines (ATM) to provide financial services to customers. Some innovative depository institutions have introduced indigenous software like Dial Serve TM for banks (telephone banks) and connect Serve TM for banks (internet banking and Trust Visual where banking business can be transacted without physical presence at the bank's premises.

5. Conclusion

This paper investigated how Technology influences the banks' effective delivery Systems and reduces waiting line of customers in Nigerian banks. Long waiting time is always detested by average bank customers. In fact no customer desires along queue before obtaining services. Sometimes, waiting lines develop when facilitates in the service systems have been stretched to their elastic limit with no efforts made to expand the systems and service capacity to accommodate demand, increases. It also arises when customers arrive at a service system in an irregular pattern or when the service times for customer transactions are different and highly unpredictable. The population considered in this study are mainly students.

Customer service times and arrival times were measured through the conduct of a direct observation at the case bank. The customers arrived at the peak period between 12pm and 1.00pm. Waiting lines are always short in the early mornings and late in the evening at the branch of the bank. The prevailing operation characteristics of the system were computed as output of the M/M/S model whereby service times and arrival times served as basic elements of inputs of the system.

The adoption of modern technologies in the bank improve to a large extent the customers' service rate and makes it possible for the customers to be served simultaneously with a steady reduction in average waiting line. The study concluded that only technology driven services can reduce the customers' waiting time and improve efficient service delivery systems in Nigerian modern banking.

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