BANKING QUEUE SYSTEM IN NIGERIA

[1] * J.C. Odirichukwu
Department of Computer Science
Federal University of Technology
Owerri, Imo State
chiomajaco@yahoo.com

Tonye Lekara
Department of Computer Science
Federal University of Technology
Owerri, Imo State
Tonye4u2001@yahoo.com

J.N. Odii
Department of Computer Science
Federal University of Technology
Owerri, Imo State
jnodii@yahoo.com

* Correspondence Author

ABSTRACT
Queuing in Nigerian bank is an approach that involves lining up of customers in bank hall in order to be served by bank personnel at each terminal (server). At any point in service time, customers usually move to the desk for one enquiries or the other. This and other obstructions result to much delay in customers waiting time. It now becomes one of the challenges for banks, to be able to manage the time spent by customers in the banking hall to remain competitive. The aim of this research is to minimize waiting time in queue by proper queue management and thereby maximizing throughput. We developed a web based application that assigns each customer queue number on arrival based on touching the screen and the queue number are stored electronically. First in First out Queue Method is implemented in the design to achieve an orderly service delivery, also customer who have successful gotten the queue number are attended to first based on FIFO-Queue Model already programmed, After a successfully daily operation in the bank, performance measure can be display. The proposed system when implemented will minimize the problems of congestion, and better service will be achieved. This research uncovered the applicability and extent of usage of queuing models in achieving customer satisfaction at the lowest cost.

Keyword: Queue, Fifo, Bank, Customer, Operation

1. INTRODUCTION TO QUEUE SYSTEM

Every relationship is a game and banker-customer relationship is not an exception. The corporate objective of any bank which is maximization of shareholders' wealth can only be achieved if customers are retained and satisfied. This is in line with Philip Kotler's (1999) perception that the key to successful marketing of financial services is identification and packaging of customers' needs to their satisfaction. The competition in Nigerian banking sector is getting more intense, partly due to regulatory imperatives of universal banking and also due to customers' awareness of their rights. Bank customers have become increasingly demanding, as they require high quality, low priced and immediate service delivery. They want additional improvement of value from their chosen banks (Olaniyi, 2004).

Service delivery in banks is personal, customers are either served immediately or join a queue (waiting line) if the system is busy. A queue occurs where facilities are limited and cannot satisfy demand made against them at a particular period. However, most customers are not comfortable with waiting or queuing (Olaniyi, 2004). The danger of keeping customers in a queue is that their waiting time may amount to or could become a cost to them (i.e. bank customers). According to Elegalam (1978), customers are prepared not to spend more cost of waiting / queuing. The time wasted on the queue would have been judiciously utilized elsewhere (the opportunity cost of time spent in queuing). This researcher has then gone ahead to design a solution which when implemented will minimize the problems of congestion. This work covers the FIFO-Queue method to optimization queues in bank.

1.1 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 (1978) 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. NEED FOR A PROPOSED QUEUEING SYSTEM

Against all the drawbacks observed in banking queue, it is pertinent that the new Queue System will be able to eliminate the shortcomings. The new system will be designed in such a way that it will among others:

> Increase efficiency and reliability of stored information.
> Produce accurate data and information for report generation.
> Produce neater work and achieve controlled & restricted access to the central database.
> Production of performance measure
> effective timing and orderliness in queue traffic based on FIFO

In this new proposed system, when a customer comes into the banking hall, a queue Number is given to the customer base on touching the screen and the queue number are stored electronically,, also Customer who have successful gotten the queue number are attended to first based on FIFO-Queue Model already programmed, After a successfully daily operation in the bank, performance measure can be display.

2.1 Overview of the New System

For a clearer view of what the database looks like, there will be a display that will contain records of customers queue entering.

This system holds the solution to all the problems encountered in the present system:

> Data will be more secure, since you must process the administrator password before you can use the program.
> Efficiency and reliability of the data is increased and data redundancy is reduced.

2.2 Algorithm for Proposed Queue System

In the course of investigation and data collection, the modus operand of Queue records was learnt. In designing the new system, easy interactive users interface was design to make it easy for users to access. The designing of the new system was arranged as follows.

SAVINGS WEB FORM:
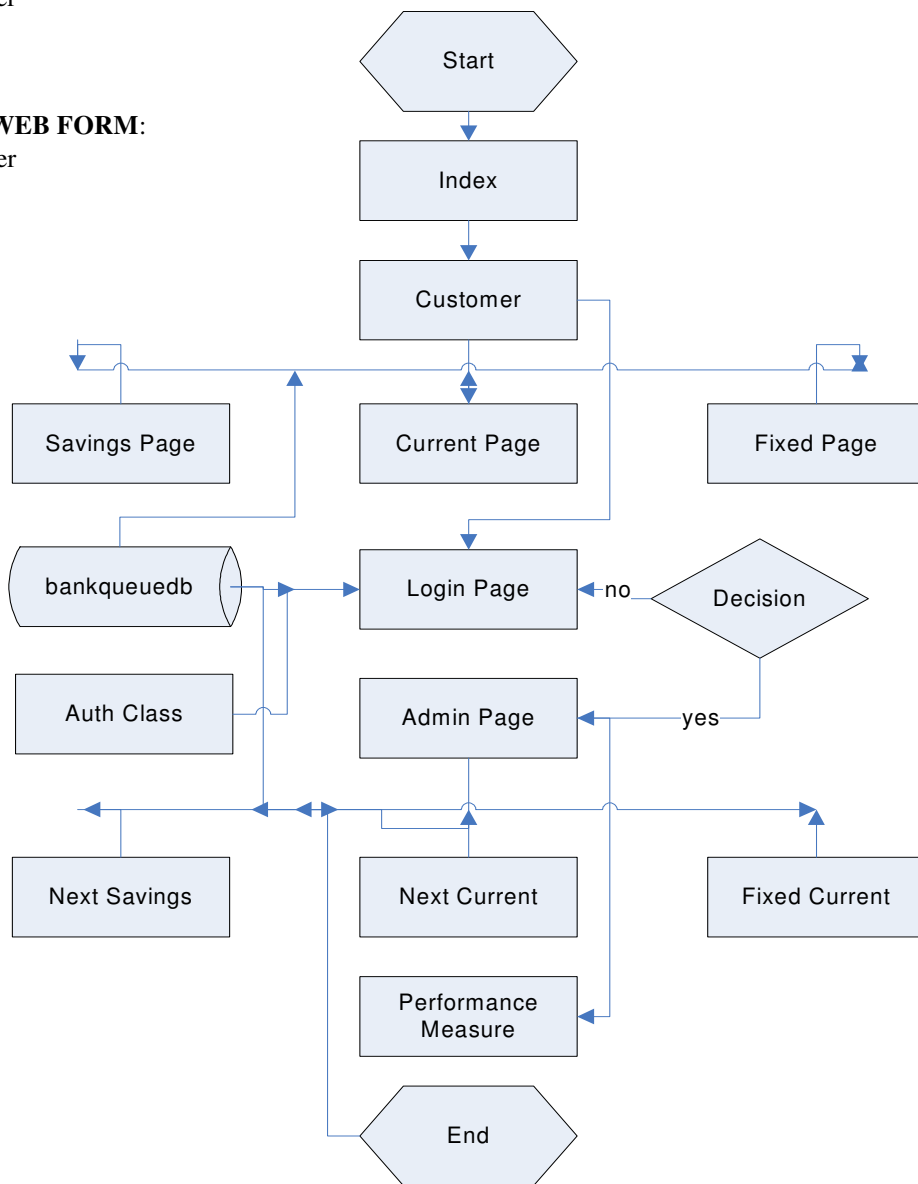- Queue Number
- Date In
- Time In
- Process

CURRENT WEB FORM:
- Queue Number
- Date In
- Time In
- Process

FIXED DEPOSITE WEB FORM:
- Queue Number
- Date In
- Time In
- Process

2.3 Flowchart for the Proposed System

3. DISCUSSION/ANALYSIS

Research service management experts believe that customer service is one of the most important issues. Customer is characterized by random arrival, and called for an immediate access to services, if the customer arrives, all the service capabilities are already being used, then the customer need to wait patiently in queues.

Customers waiting in line to receive services in any one service system are inevitable. Bank Queue management has been facing a huge challenge. Nature cannot be avoided because of the queue for a long time on the queue has been a lot of theoretical research, and the result of domestic banks queuing problem is very serious, this research on the commercial banks is aim in improving customer satisfaction research in commercial banking services analysis and management.

3.1 Queuing Theory

Queuing theory which is a branch of operations research, also known as stochastic service system theory or wait for the line theory, is use to study the object of a service request generated by the randomness of customer arrivals and services rate. There are several performance metrics of queuing theory put together for these research purpose such as,

- The average queue length L_q of customers in the system,
- The average waiting time W_q of customers in the system,
- The average length of stay W_s in system,
- The average number of customers L.

And other several commonly used quantitative indicators such as:

- Average arrival rate;
- The average service rate;
- The average service time;

X / Y / Z / A / B / C. X refers to the distribution of interval between successive arrival; Y refers to the distribution of service time; Z refers to the number of help desk; A refers to system capacity limitations; B refers to the number of clients source; C means the service rules.

Banking customer service system is arranged in parallel multi-server system, but is now common practice for banks to use the window because of automatic calling system; all the same service needs of customers came in to the same queue. In order to facilitate analysis of issues, can be multi-server as a whole. Then the queuing system is suitable for single-queue queue model. Below is individual sub-system as regards to customers queuing for service.

Arrival process:
- How customers arrive
- How the arrivals are distributed in time

Service mechanism:
- A description of the resources needed for service to begin
- How long the service will take (the service time distribution)
- The number of servers available
- Whether the servers are in series (each server has a separate queue) or not

Changing the queue discipline (the rule by which we select the next customer to be served) can often reduce congestion. Often the queues discipline "choose the customer who comes first.

3.2   Queuing System Characteristics

Queuing system characteristics are summarized in the tables 3.1 below:

Tables 3.1

CHARACTERISTIC	SUB-TYPE	DESCRIPTION
Population	Finite	Arrivals are unrestricted and can exceed system capacity at any time
Servers	Finite	Banking staff numbers are limited some times less than service capacity
Arrival Pattern	Number	Poisson Distribution
Service Pattern	Time/Rate	Average time for attending to a customer
Queue Discipline	FIFO	First Come First Served

3.3 Queuing System Notations

As queuing theory is a mathematical theory there are several mathematical notations used in it. Few of the basic notations used in this research queuing model calculations are enumerated in the table 3.2 below.

Table 3.2

NOTATION	DESCRIPTION
λ	Arrival Rate
μ	Service Rate
Lq	Average number of customers waiting for service
L	Average number of customers in the system (waiting or being served)
Wq	Average time customers wait in queue
Ws	Average time customers spend in the system
ρ	System Utilization

In this research we choose 3 servers as bank attendant who will serve customer on arrival in the banking hall. From analysis of this research it is shown that on an average, every ½ minutes a new customer approaches the desk (counter) on busy hour between 9:30am to 10:45am and based on 8 hours banking working hour. Suppose we use a Poisson arrival distribution at a mean rate of lambda = 0.5 customer per minute (i.e. on average one customer appear every 1 / lambda = 1/0.5 = 2 minute) and service time distribution, with a mean service rate of 4 customer per minute. Using Simple M/M Queue System for a single server the following were obtained.
Inputs:

Service rate: μ = 4 customers / minute

Arrival rate: λ = 0.5 customers /minute

Number of server = 1
Using the M/M/1 model, we get the following results:

Average Server Utilization (ρ) = $\dfrac{\lambda}{\mu}$ = $\dfrac{0.5}{4}$ = **0.125**   **(1)**

Average Number in the Queue (**Lq**) $\dfrac{\rho 2}{(1-\rho)}$ = $\dfrac{0.016}{0.875}$ = **0.0182**   **(2)**

Average Number in the System (L) $\dfrac{\rho}{(1-\rho)}$ = $\dfrac{0.125}{0.875}$ = **0.143**   **(3)**

Average Time in the Queue (**Wq**) $\dfrac{\rho}{\mu(1-\rho)}$ = $\dfrac{0.125}{4*0.875}$ = **0.0357 = 60*0.0357 = 2.142 min**   **(4)**

Average Time in the System (Ws) = $\dfrac{L}{\lambda}$ = $\dfrac{0.143}{0.5}$ = **0.286**   **(5)**

For more than one Server, Average Server Utilization (ρ) = $\dfrac{\lambda}{n\mu}$ *Where n (1, 2, 3…n (servers))* **(6)**

Table 3.3 below is the summary of the above solution

Table 3.3

S/N	DESCRIPTION	RESULT VALUE	TIME(PER MIN)
1	Average Server Utilization	0.125	-
2	Average Number in the Queue	0.0182	-
3	Average Number in the System	0.143	-
4	Average Time in the Queue	0.0357	2.142
5	Average Time in the System (Ws)	0.286	17.16

4. INTERPRETATION OF RESULTS

The results shows that the capacity utilization is 12.5%, average number of people waiting in queue is 0.0182, average number of people in the system at a point in time is 0.143, average waiting time in queue is 2.42 minutes and average time in system is 1 hour and the arrival pattern has been Poisson distribution. This shows that the queue and waiting times are less and would probably result in gain of business, increase satisfaction of the customer and reduction of employee workload.

4.1 Limitations of Queuing Models
Queuing models have several limitations and are used in conjunction with the other decision analysis methods like simulation and regression. Most of these limitations are the basic assumptions for application of queuing models. Some of the limitations of queuing models are enumerated below:
  ➢ Takes average of all variables rather than the real numbers itself
  ➢ Assumes steady state
  ➢ Based on assumption that service time is known
  ➢ Service times are independent from one another
  ➢ Service rate is known
  ➢ Service rate is greater than arrival rate
  ➢ Arrivals are served on first come first serve basis
  ➢ Service times are described by the negative exponential probability distribution

4.2 Process Description For New System
Against the entire drawback observed in the manual process of recording of customers queue in the bank, it is pertinent that the new system will be able to eliminate the shortcomings. The new system has been designed in such a way that it will among others:
  ➢ Increase efficiency and reliability of store information.
  ➢ Produce accurate data and information for report generation.
  ➢ Produce neater work and to achieve reliable access to resource.

4.3   Input Design

Input data information resources have been put together into the new system as a web application forms, processing inputs will take the user to click/ touch a button he/she needs, various Forms has been organized and line together for easy access around different resources, input design has been made in such away that response from user on any button will process the request and give an instant result displaying them in the same web form. . Below are inputs considered during system analysis:

➢ Queue Number
➢ Date In
➢ Time In
➢ Process

4.4   Output Design

This is the resultant respond from the user, which display the result required by the user organized in a predefined format in order not to confuse users, but to provide the user with good and reliable result requested. Several resources have been saved and organized in the new system for easy retrieval. These resources are as follows

➢ Performance Measures
➢ Automatic Graph Plotter
➢

4.5 Overall System Implementation of Queue System

Queuing system is a complete easy menu driven application, such that the user is required to select any menu of choice to get along with the application
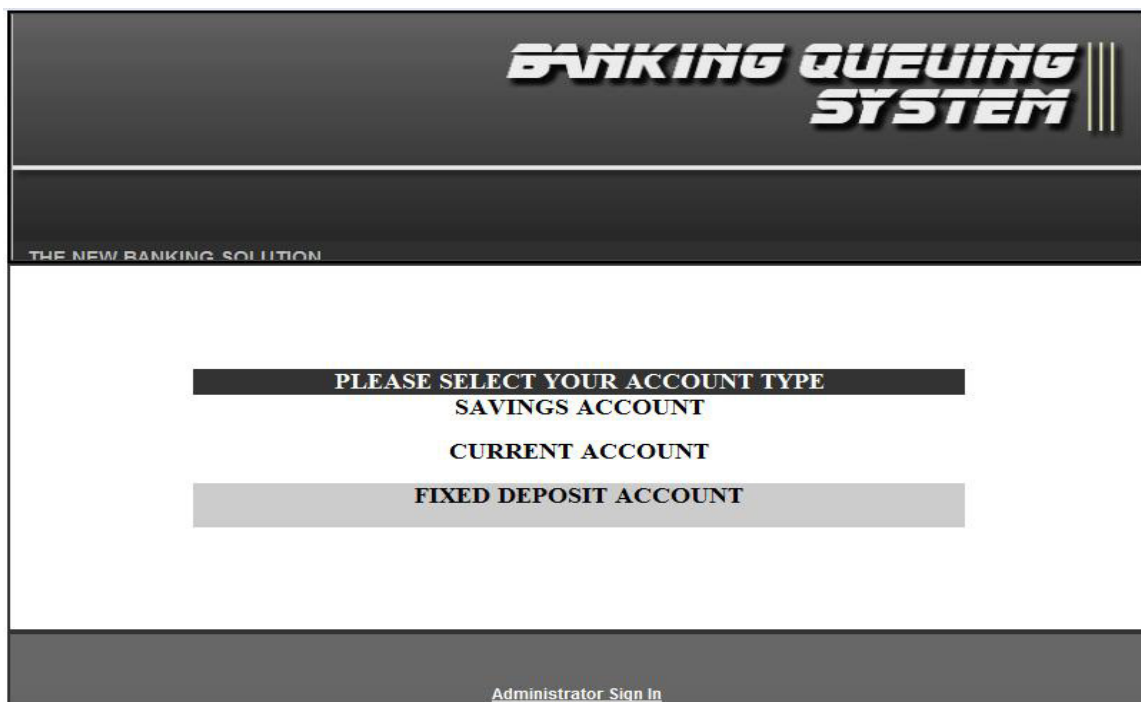

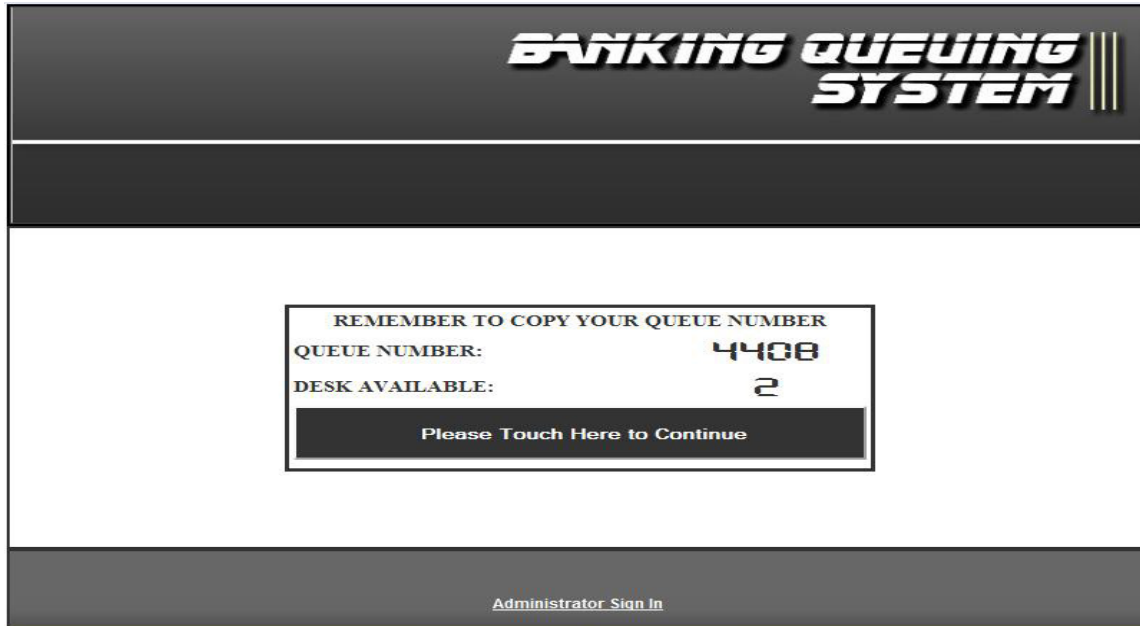**Figure 4.1 below shows how the main interface of Queuing system is been implemented**

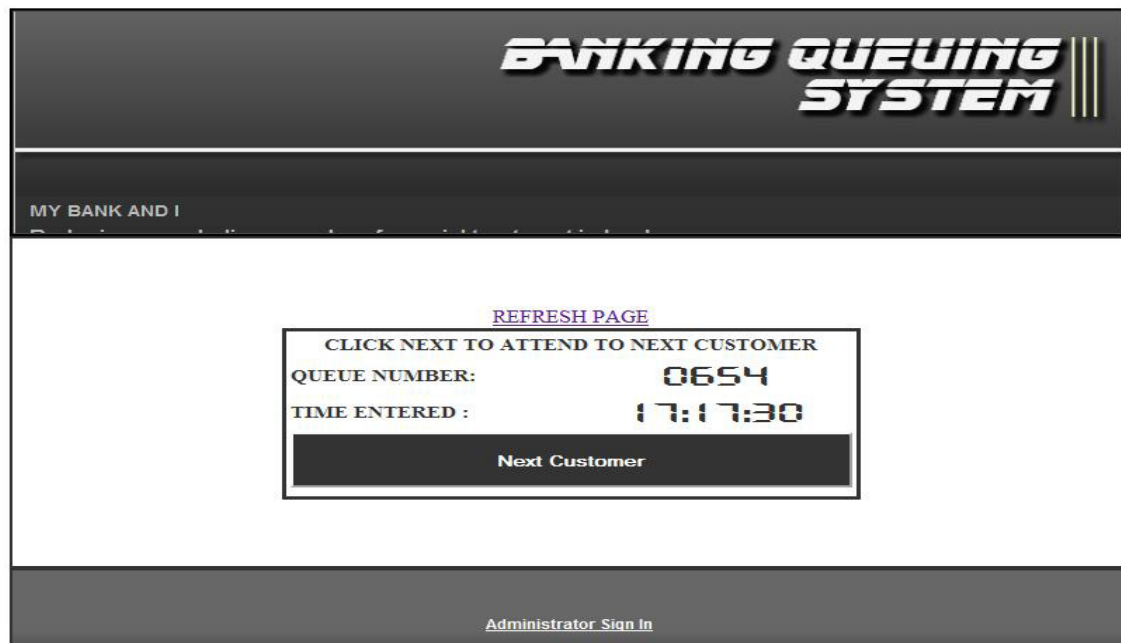**Figure 4.2 shows the implementation of Queue Number collection Form**

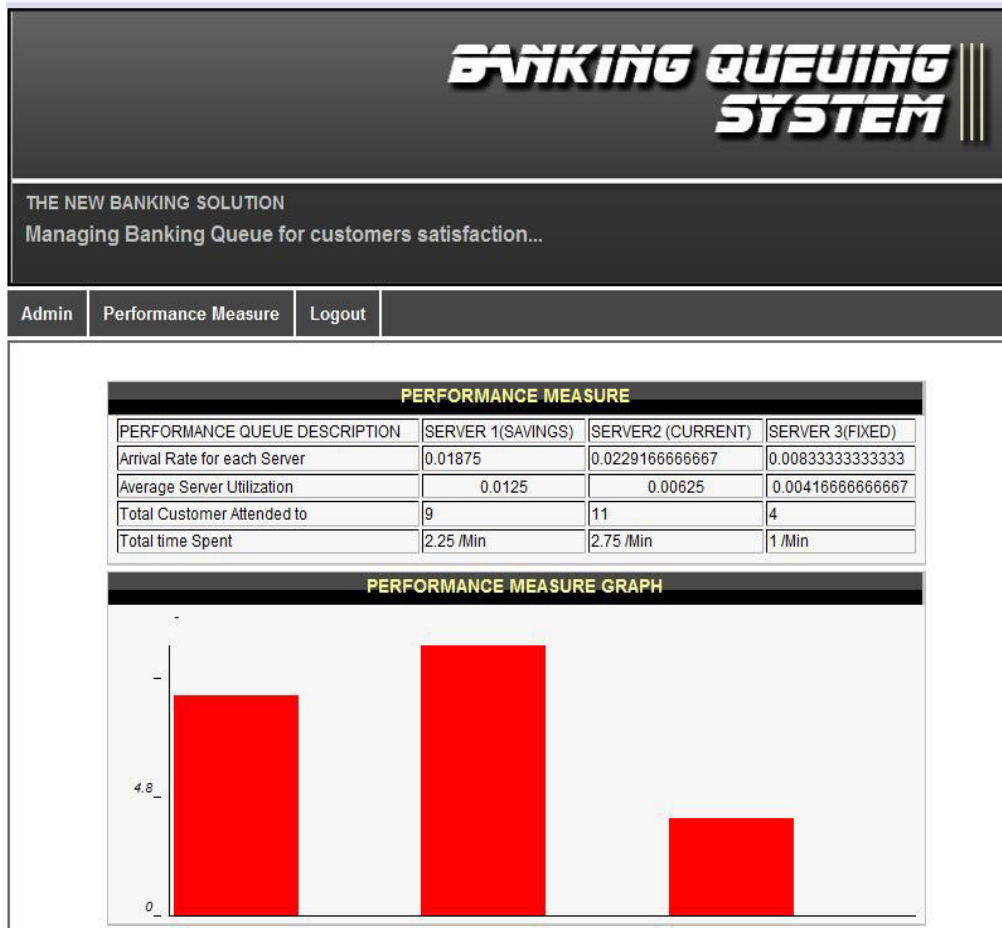**Figure 4.3 shows the implementation of Staff Attending to customers**

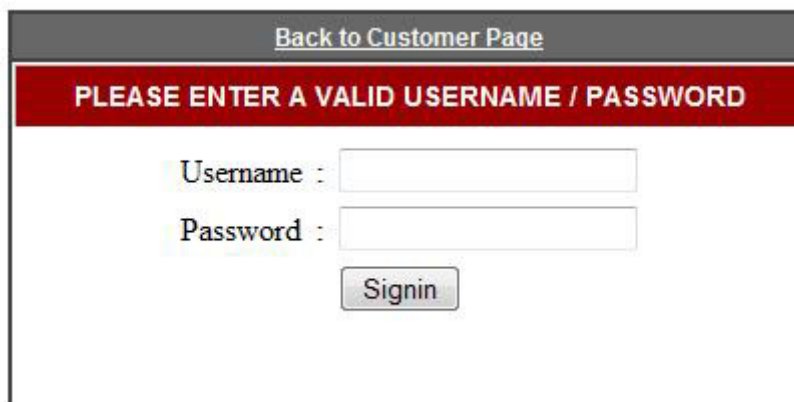**Figure 4.4 shows the implementation of Performance measure**

Figure 4.5 shows the implementation of login Form

Figure 4.6 shows the implementation of the Admin Form

5. CONCLUSION

This research uncovered the applicability and extent of usage of queuing models in achieving customer satisfaction at the lowest cost. Customers are unhappy due to delay in service delivery while in bank. A single server is not effective when arrival rate exceeds service rate. The use of three server system and attending to only customers with queue number eliminates waiting.

5.1 Recommendations

The following recommendations are suggested for efficiency improvement and quality of service to customers' banks:

➢ Adoption of three-server model to reduce total expected costs.

➢ The management should educate their operation managers and other staff on the application of queuing models to operational problems.

➢ It should trust its employees, empower them, enrich their jobs by making them multi-skilled through continuous training to enable them eliminate unnecessary counter-check handoffs while allowing them to complete many processes in the front line.

➢ The queue characteristics should be viewed from the stand point of customers as to whether the waiting time is reasonable and acceptable by making queue discipline fair and varying the number of service channels according to queue circumstances.

➢ Reengineering the banking operations through IT solutions e.g. voicemail and online withdrawal system to complement queuing model.

➢ Making customers comfortable and unaware of the waiting time by providing electronic notice boards or TV in the waiting room as well as comfortable seats, cooling and toilet facilities and;

➢ Improvement of staff-customers relationship and provision of unlabelled paper bags for carrying customers' money.

REFERENCE

[1] Ashley, D.W. (2000) "*Introduction to waiting lime models*" 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 The Business Administration Department, Unilorin.

[3] Cooper, R.B. (1972) *Introduction to Queuing Theory*, New York, Macmillan.

[4] Elegalam (1978) "*Customer retention versus cost reduction technique*" a paper presented at the Bankers forum held at Lagos, pg.9-10.

[5] Jay, H, Barry, R. (1988) *Production and operation management strategies and tactics*. Business and economic Rich Wolt.

[6] Juwah (!986) "Operational problems and customers' dissatisfaction" *CBN Bullion*, pg. 14-17.

[7] Michael, K. (2001) "Service on call" in *Banking Technology News Service Network* http:/www.fineos.com / documentation / features / bank teach.itm.

[8] Nelson, R.T. (1959) "An empirical study of arrival, service time and waiting time distribution of job shop production process", Report No. 60 *Management Research Project*, University of California, L.A.

[9] Obayemi, F.E. (1992) 'A queuing model analysis of a retail organization' – a case study of Mr. Biggs, Lagos.

[10] Olaniyi, A. (2004) "Relationship between arrival rates of customers and bank's service rate's", seminar paper series, University of Ife.

[11] Philip, K. (1999) *Marketing Management*, the New Millenium Edition.

[12] Robert, B.T. (1997) "Customer service for the new millennium" *Career Press 800:239-6681* www.innovastioresource.com.

[13] Safe Associate Ltd. (2002), Unpublished lecture notes for professional Accountants, pg.68.

[14] Yechiali, U. (1992) "Elevator polling with globally gated Regime" Google (ttp:/www.com)

[15] Yechiali, U., Altmand, E., and Kofma, D., (1995) "Discrete Time queues with delayed information" Vol. 19:361-376.

[16] Olaniyi T.A. (2002) An appraisal of Techniques for minimizing cost of customers waiting in first bank of Nigeria Plc Ilorin (An M.Sc. Seminars presentation to the Department of Accounting & Finance Unilorin).