

**QUEUE MANAGEMENT IN BANKS: THE CASE OF MOMBASA  
COUNTY**

**BY:**

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**DECLARATION**

This research project is my original work and has not been presented for examination in another University.

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This research project has been presented for examination with our permission and University Supervisors.

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## **DEDICATION**

To my dear children Alex Ndungu and Lorna Njoki

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## ABSTRACT

The aim of this research project was to study queue management of banks in Mombasa County using the Multi-channel queue model. The study population composed of all the 108 bank branches and the basic data was collected using observational timing of customer entry and service over a period of 2 hours. The number of branches successfully studied was 20 translating to 18.5% of the branch coverage. In terms of the number of institutions 15 banks out of 37 operating in the County were successfully accessed during data collection implying 41% of bank coverage. The total number of branches visited was 48 out of 108 representing 44.4% of the total population .Out of 48 branches visited the successful response of 20 represents 42% of those visited. The raw data was then analyzed using Excel template bearing the multichannel queue model equations. In general, most banks exercise multichannel queue system with 19 of 20 banks having more than one queue. The exceptional bank is unique because its core transaction is remittance of funds from Arabian Diaspora and its Forex service for those seeking opportunities there. Interestingly the service rate for this bank is commendable at 1.3 minutes per customer calling for need for congested banks to consider systematic segregation of services for instance; dedication of counters for deposit or withdrawals only so that the teller is properly tuned. The average service rates ranges from 0.3 and 1.3 customers per minute (0.8 to 3.3 minutes per customer).The mean service rate across banks is 0.8 Customers/Min (1.3min/customer) whereas the standard deviation is 0.3 Customers/minute . Banks with heavy queue formation tend to have faster service compared with those that are scanty due to less work pressure on the tellers. Bank management in less busy banks need to review need to increase customer base to utilize the less busy tellers. The mean waiting time in the system for the County is an efficient 27 minutes compared with that of earlier studies of between 55 and 64 minutes. A lot of sensitization will need to be carried out to improve response rate of study institutions in the future by involving other industry stakeholders like KBA and CBK. In a number of banks sufficient information on service offered at specific counters should be availed to customers to reduce waiting time in the banking halls. It will involve a lot of resources and cooperation of study institutions to carry out simultaneous data collection in all 108 branches in the County in order to even out the study environment.

## **ABBREVIATIONS**

ATM	Automatic Teller Machine
CBK	Central Bank Of Kenya.
Equity	Equity Bank Limited
FCFS	First Come First Served
FIFO	First In First Out
ICT	Information and Communication Technology
KBA	Kenya Bankers Association
KCB	Kenya Commercial Bank
KWFT	Kenya Women Finance Trust
LIFO	Last in First Out.
MFI	Micro Finance Institution.
NSE	Nairobi Stock Exchange
POS	Point Of Service
SME	Small and Medium Enterprise.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background

Queue management has received increased consideration in the last couple of decades, partly due to the fact that speed of service has been shown to provide a firm with a Competitive edge in the marketplace (Stalk, 1988). This is largely due to the intense competition that is related to the emergence of a single global economic village and the increased relevance of time to consumers. As the standard of living in a country increases, the value of customers' time also increases, and consequently they seek out those goods and services which will minimize the expenditure of their time (Mark andHeineke, 1994).

Globalization, regulatory, structural and technological factors are the key drivers that are significantly changing the banking environment all over the world leading to stiff competitive pressures (Grigoroudis, PolitisandSiskos, 2002). Customer satisfaction has come to be regarded as a key business strategy of every business and a yardstick against which many banks have set their standards. Sustaining existing customers for organizations is ever more important than the ability to capture new ones because customers are vital for any organization's success (Anubav, 2010). Without customers, organizations would have no resources, no profits and therefore no market niches that can enable them compete in the global arena(Mburu, Van Zyl, and Cullen, 2013).Competition and the constant revolution in technology and ways of life have changed the face of banking. These days, banks are in search of substitute ways to offer and distinguish amongst their diverse services. Customers, both corporate as well as retail, are not willing to queue in banks, or wait on the phone, for

the most essential of services. They insist on and anticipate to be able to transact their business where and when they wish to (Komal, 2012).

### **1.1.1 Queue Management**

Daintith (2013) defines queue management as characterized by the way in which customers (i.e. processes) join a queue in order to wait for service, and by the way in which customers already in the queue are selected for servicing. Queuing theory is the study of waiting lines which is a common feature in organizations providing services where customers arrive randomly to receive service at a service point. Chase and Aquilano(2006) outlined three factors used in queue system management as length of a line, number of lines and queue discipline. Most service facilities have limited line capacity whereas some have infinite potential length. In multiple lines, arrivals often shift lines/jockey. The choice of priority rule affects factors like the number of customers in line, average waiting time and efficiency of the service facility. It is usually difficult to ensure customers know and follow the adopted rule and that a system exists to enable servers to manage the lines.

Siddharthan, Jones and Johnson (1996) described a queuing system by its input or arrival process, its queue discipline, and its service mechanism. The usual description of the pattern of arrivals into a queuing system is given by the probability distribution of time between successive arrival events and the number of individuals or units that appear at each of these events. The input arrivals are usually assumed to be described by a Poisson probability distribution. The queue discipline describes the order in which costumers entering the system are eventually served. Frequently, the discipline is first come, first served. The service mechanism includes a description of time to complete a service, and the number of individuals whose requirements are satisfied at each service event. The service rate is usually

described by an exponential probability distribution. If the arrival rates, queue discipline and service rates are known, characteristics of the queue in a steady state can be calculated. They include the average waiting time experienced by the customer, the average number of customers waiting to be served in the queue and the servers.

### **1.1.2 Banking Sector in Kenya**

In 1963, banks in Kenya consisted of nine overseas owned commercial banks, dominated by Barclays Bank, Standard Chartered Bank, National Bank and Grindlays Bank (Brownbridge and Harvey, 1998). In the 1990s the government introduced a number of policy restructuring geared towards gradual liberalization of the financial markets opening the banking sector to unprecedented growth. Consequently, the banking sector grew to 33 commercial banks and 50 non-bank financial institutions (NBFIs) by 1994. Due to increased competition banks have put infrastructure in place precisely increasing delivery channels to reach and address customers needs like deposit, withdrawals, fund transfers, loan processing, account opening and call centers (Mburu, Van Zyl, and Cullen, 2013).

A key factor causing congestion in banking halls in general is that some banks changed their business approach thus predisposing other banks to move into the mass retail sector. This includes titans as well as mid ranking but aggressive banks. This decision may have been influenced by a number of factors, including high levels of competition with the traditional corporate and high net worth sector. Cracknell (2012) observed that in 1980s and 1990s Postbank customers often made many small deposit transactions through the agency network all of which attracted a transaction based service charge payable to the agent and a need for manual reconciliation at the head office. Postbank started losing customers to more dynamic and differentiated market, a case in point, Equity Bank. The study noted that Postbank in response introduced the fully computerized Bidii saving account which reduced transactions

by half, increased efficiency and reduced operating costs for customers by 60%. Today, Postbank has a branch based POS system; a system that has the capacity to handle as many as 400 transactions per day per front line staff, levels of efficiency unparalleled within the Kenyan banking sector. Processes have been streamlined and automated while delays have been eliminated. The POS system facilitates speedy service, the teller inserts the card in the POS gadget, and the customer authorizes the transaction with their PIN number. Not only does this move significantly cut the key strokes required by tellers to process transactions, but it facilitates transactions for semi-literate customers, who only have to remember to bring their card, and to recollect their PIN number (Cracknell, 2012). The study concluded that today, transaction times at Postbank have reduced from 10-15 minutes under passbook operations, to normally less than 1 minute for card based operations. Account opening is simple and easy, card issuance is among the quickest in the industry. Every branch has no less than one customer relationship officer to support those in the banking hall. Postbank is still unable to draw from the large customer base due to ineptitude in marketing and inability to lend and so banking halls are more often not frequented.

Banks have continued to take steps to shorten queues in banking halls. A countrywide survey of selected banks in Kenya show perennial congestion and long queues in banks. Central Bank of Kenya (2001) observed that among customer complaints were long queues in banking halls which persists to date. Of course banks have made a lot of efforts to increase number of ATMs, mostly for withdrawals, but customers keep on coming back to the queues and also many times the machines are out of order (Mbuvi, 2013). Some Customers want to transact beyond ATM scope and end up queuing .It is not known if bank management utilizes optimal number of servers to meet overwhelming customer demands or simply want to cut costs.

## 1.2 Research Problem

Despite all the efforts by banks, queues continue to plague bank halls (Mbuvi, 2013). The study observed that though savings account holders are not as many and are limited to a few monthly withdrawals, a bank branch might see as many as 50 a day. Coupled with those making cash deposits, cheque deposits and other banking functions, this led to queues in banks. One of the findings of the study by Mburu, Van Zyl, and Cullen (2013) in banks across Kenya, is that 34.4% of 2000 customers interviewed disagreed with the fact that waiting period is minimal and hardly noticeable; indicating a lot needs to be done to improve on waiting time. Xinhua (2012) observed that most people in major centers still find it convenient to withdraw or deposit money in banks. The result is that the long queues that characterized banking halls in Kenya before the advent of agency banking models continue to persist. Queues are usually long in the morning, at lunch hour and at 4 p.m. when the bank is about to close business. In the evening, most of those who visit banks go to deposit their days' sales, in the case of businesspersons.

A few academic research papers have been carried out in the area of queue management in banks in Kenya. Kithaka (2012) carried out a thesis to assess the extent to which queue management in financial institutions is applied in Kenya. He observed that those institutions which have an enhanced queue management system remain competitive in customer service initiative. This is more so in banks which have superior branch networking as well as training of employees and improvement in devolution of decision-making. Those organizations which have not improved queue management are rated poorly by clientele who feel not satisfied with the current method of service delivery. Thus, it is imperative for those institutions to train employees on the current method of service delivery taking into consideration the theory of queuing. Kithaka (2012) conveniently sampled three institutions operating in the Nairobi

central business district. A total of twelve branches (four branches from each institution) were used for the purpose of this study. So there is a gap in the coverage of the rest of the banks.

This study sought to make use of the various theoretical models to empirically investigate the performance of banks in queue management. The multi-channel approach will be compared with other models applicable in analyzing queuing in banks such as simulation and single queue approach. In another setting, Olaniyi (2004) observed that there was a preference to use multi-channel queue system as compared to single queue in banks due to cost and customer satisfaction implications. Kenyan bank management need to demonstrate sound queue management for efficient operations to realize customer satisfaction and higher returns on investment.

In a census survey of all 43 banks in Kenya, Kamau (2012) noted a majority of Kenyan customers are not satisfied with the management of waiting lines; - one reason being insufficient information in waiting areas causing congestion. The study recommended that bank management should inform customers of the expected waiting time. The study also observed that customers are satisfied with queue discipline. Banks are challenged with poor customer service management. No study regarding queue management and application of queuing models in banks has been identified leading to the research question; - To what extent do banks apply queuing principles for queue management and if the multi-channel queuing model is the best suited for queue management in banks in Mombasa County?

### **1.2.1 Research Objectives**

The intentions of carrying out this study were to;-

- a) Establish queue management practices in banks.



- b) Determine how well multi-channel queuing model is suited for the banking industry compared to other models, using branches in Mombasa County.

### **1.2.2 Value of the Study**

There is growing interest in Kenyan banking sector by regional and global banking brands that will boost competition especially through product diversification (Central Bank of Kenya, 2012).Based on the findings, the study will be used by bank management to improve queue management and service delivery to customers in the forecasted future. With sound queue management banks gain more opportunities after retaining and attracting new customers thus nurturing the bottom-line. Where it is inevitable to have long waits, the management can be appropriately advised to apply the principles of queuing psychology as postulated by Larson and Schaak(1989).Banks will also use the findings to determine the optimal service capacity versus cost levels(Chase andAquiliano,1973) . Banks can also utilize the findings to formulate customer arrival control mechanisms (Sherman, 2010). Queue management is a practical operation management technique commonly used to determine staffing, scheduling, and inventory levels in businesses. The research findings will be used by management scientists as reference to validate queuing theory and literature as applied by banks. The findings will also be useful to the regulatory body and other authorities to update policies geared towards efficient and hassle free banking services in queues. The County government, CBK and national government will use the information in fiscal planning and management more so as relates to financial services.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This section outlined the previous research works done on this topical issue of queue management in banks. It covered queuing models that were more often than not used in analysis and solving queuing problems in banks. The fundamental aspects that were considered include customer arrival from a population, service by tellers to individual customers one at a time and the queue formations with time. This chapter also gave historical empirical data to be used to compare with that obtained from this research.

### **2.2 Queuing and Banking**

Olaniyi (2004), in a case study of the First bank of Nigeria, explored the applicability and extent of usage of queuing models in achieving customer satisfaction at the lowest cost. The study determined that a single server is not effective when arrival rate exceeds service rate, while the existing two-server system was not optimally utilized. The use of a four server system, although eliminated waiting but at a higher cost which is not optimal too. The study therefore recommended a three server system for the bank for optimal costs, training of staff on application of queue models, multi-skilling, leveraging use of IT in banking, improving service environment and improvement of staff- customer relationship.

According to Osman et al. (2010), despite increased use of internet banking in the world some customers fear that they would lose their money to swindlers and are particularly careful about the high risk expectation during money transfer between accounts. Other risks include financial risk, loss of confidentiality, time risk, performance risk, and psychological risk. The study carried out in Turkey also showed that there is a significant relationship between risk perception and level of income. High income customers have high social, time

and security risk perceptions. However with increased use of internet banking time risk perception reduces.

### **2.3 Queuing Theory**

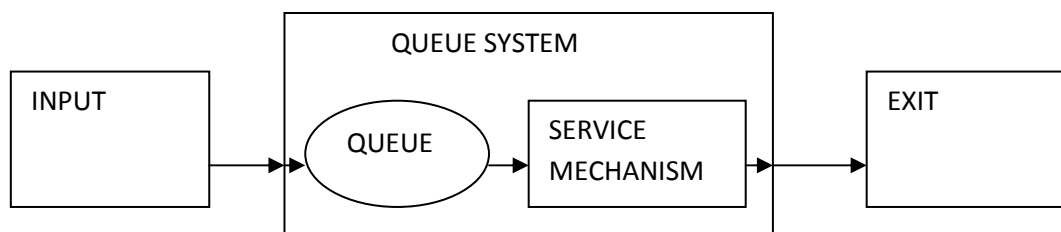
Erlang, a Danish Engineer who worked in Copenhagen wrote the first paper on queue theory in the field of telephony in 1909. The study identified that the number of telephone conversations and telephone holding time fit into Poisson distribution and are exponentially distributed. Most of the results of the study are in use to date and apply to many seemingly unrelated situations from serving customers at service counters to managing traffic congestion in a cosmopolitan city and from designing switching equipment for telecommunications to understanding internet behaviour. The load in circuit switching system is measured in Erlang. Vazsonyi (1979) observed that queuing theory provides a good conceptual model of waiting line conditions because it gives one a general understanding of the influence of such factors as arrival distribution, service distribution and number of servers on queue conditions. Waiting in line is a day to day phenomenon experienced by customers waiting to be served in banking halls, hospitals, post offices, railway stations, supermarkets, and sports stadia for football matches and other public places. Queuing can also be traced back to the days of food rationing during the World wars when queuing meant the difference between an empty and a full stomach (Debrett, 1982). The article noted that the drive to queue is determined by need of the customer and there being alternative modes of getting the service. For instance, it is more likely for a bank customer to queue for a loan than to withdraw cash because advent of ICT, banks now offer ATMs for cash withdrawal more than to deposit.

According to Moran (2005), just after World War II, with the proliferation of rationing and shortages, the waiting line was exploited for its political capital by conservative leaders like Winston Churchill, who equated queuing with promoting socialism. As queuing ceased to be an explicitly political matter in the 1950s and 1960s, it began to be linked utterly with the issue of national 'decline', which dominated political discussion and social observations from the late 1950s onwards. The queues in banks and post offices, in particular, were seen as an indication of the 'British disease' of badly trained, poorly motivated employees and mediocre management. In the 1970s and 1980s, the 'dole queue' also became part of a politicized tradition of decline, although much of its imagery was borrowed from the 1930s. In the Thatcher era, queuing was increasingly transformed by queue management theories and technologies. Being principally market-led, this queuing revolution was an uneven phenomenon. In low-status public spaces, such as bus stops, people were still left to make do with their own queue discipline; and organizations like banks used queueless services to focus on valued clients. The changing nature of the queue thus reveals much about the relationship between quotidian routine, politics, and the market in the post-war era (Moran, 2005).

Safe associate (2002) reinforced the three main characteristics that determine suitability of a queue model as the arrival to the system, queue discipline and the service facility. The size, pattern of arrival and service time distribution give rise to the arrival characteristics. The source population may be infinite while the arrivals are a small portion of the potential arrivals or limited when the source population size is known. When arrivals are independent of one another and unpredictable, then the pattern is random. Poisson probability distribution is used to estimate the number of arrivals per unit time in queuing problems. A negative exponential probability distribution is assumed for both random arrival and service rates.

Queue discipline refers to the priority rules to be used to serve customers. Jay and Barry (1993) determined two main categories as preemptive and Non-preemptive priority. Preemptive priority is the scenario that allows customers that arrive at any time to replace customers that are being served as seen in emergency situations. In Non-preemptive priority, the customer with the highest priority in the system is served first and there is no displacement of the customer in the service. These methods include FIFO( First in first out), LIFO( last in last out).Queue structure refers to the nature of the queuing system in terms of input, queue and service mechanism as shown below;-

**Fig 1: Theoretical structure of a Queue**



*Source: Jay and Barry, 1993*

Safe associates (2002) demonstrated a single server has Poisson distribution of arrival while the service is exponentially distributed and FIFO discipline of infinite population of potential customers with no simultaneous arrival neither balking nor renegeing. The study described a multi-channel server system as having more than one server, with no permissible lengths of queues and all servers operating at the same rate. Three models are used to carry out empirical analysis on a queue system using queuing theory as discussed below:

### 2.3.1 Little's Theorem

This Theorem describes the relationship between throughput rate (arrival and service rate), cycle time and work in process (the number of customers in the system). The expected number of customers (N) for a steady state system is given by,

$$L = \lambda T$$

Where;

$\lambda$  is average arrival rate

T is the average service time per customer

### 2.3.2 The M/M/1 Queuing Model

This queuing system has a Poissons arrival distribution, an exponential service time distribution and a single server.

Utilization factor is given by

$$\rho = \lambda/\mu$$

Where  $\mu$  is mean service rate.

Probability of having no customer in the system is given by;

$$P_0 = 1 - \rho$$

Probability of having n customers in the system is given by;

$$P_n = P_0 \rho^n = (1 - \rho) \rho^n$$

The average number of customers in the system is given by

$$L = \lambda/(\mu - \lambda)$$

The average number of customers in the queue is given by;

$$L_q = \rho \lambda/(\mu - \lambda)$$

The average waiting time in the queue is given by;

$$W_q = \rho/(\mu - \lambda)$$

The average waiting time in the system is given by;

$$W = 1/(\mu - \lambda)$$

In a case study for bank ATM queuing model, Patel and Bathawala (2012) used Little's Theorem and M/M/1 Model to show how queuing theory can be used to solve the problem of customers waiting long in a single ATM queue. The service time needs to be improved to maintain customers.

### 2.3.3 Multi-Channel Queue Model

The arrivals are served by more than one server on FCFS and can shift from one queue to the next. In banking halls the most common system comprises a single queue and multiple service stations.

Utilization factor of a multichannel queuing model is;

$$\rho = \lambda/k\mu$$

Where k is the number of service stations

Expected number of customers in the system is;

$$L_s = L_q + \lambda/\mu$$

Where  $L_q$  is the expected number of customers in the queue.

Expected waiting time in the queue  $W_q = L_q/\lambda$

Expected waiting time in the system  $W_s = W_q + 1/\mu$

Probability there will be n customers in the queue where  $n > k$ ;

(Expected in a congested banking hall)

$$P_n = P_0(\lambda/\mu)^n / (k!k^{n-k})$$

Where  $P_0$  is the probability that the system is idle.

### **2.3.4 Comparison of the Models**

Comparison between the queue models shows that a single queue with several servers performs better than each queue with dedicated server (Gross and Harris, 1998). A single large pool of servers also performs better than several small pools of servers. The queuing models discussed will be used according to number of servers in use. The measures of performance will then be compared to select the most efficient model (Appendix 1).

### **2.4 Empirical Studies of Queuing Model**

Waiting lines will continue to feature for the longest time because the service managers have to assess the cost of expanding capacity vis a vis the opportunity cost in waiting time wasted (Olaniyi, 2004). A case in question is customers queuing in the bank hall predominantly for securing loan whereas the institution runs the risk of bad debts on the one hand and stiff competition from other banks. There is a positive correlation between arrival rates of customers and bank's service rate according to a study carried out in Nigeria by Oladapo (1998). Elsewhere; Ashley (2000) confirmed that even if service system can provide service at a faster rate than arrival rate, waiting lines can still form if the arrival and service rates are random. Elegalam (1978) carried out a one week survey and noted that 59.2% of the 390 persons making withdrawals from their accounts spent 30 – 60 minutes while 7% spent between 90 and 120 minutes. According to Juwah (1986) customers spent between 55.27 and 64.56 minutes making withdrawals from their accounts. One of the findings of the study by Mburu, Van Zyl, and Cullen (2013) in banks across Kenya, is that 34.4% of 2000 customers interviewed disagree with the fact that waiting period is minimal and hardly noticeable; indicating a lot needs to be done to improve on waiting time.



Providing services in banks is personal and thus customers are either served immediately at a cost or join the waiting line in a busy system (Olaniyi, 2004). Queues form because of less service capacity than demand, variance in arrival pattern, variance in service time from service point to point and from time to time. To strike an economic balance between the cost of providing service and the cost of waiting, the queuing model seeks to find the optimum service rate and the optimal number of servers. The study reinforced that queuing systems can be broken down into individual subsystems composed of entities queuing for some activity. The arrival process in a sub-system seeks to address whether the customers arrive singly or in groups, the inter arrival time distribution and whether the customer population is finite or infinite. The Poisson's model which corresponds to arrival at random is very important because it is a reflection of what happens in real life even though queuing systems are described by average arrival rate.

Safe Associates (2002) observed that the service mechanism describes the resources required for the service to begin and analyses how long the service will take, the number of servers available, whether the servers are in series or in parallel and whether preemption is allowed. Queue characteristics seek to address queue discipline to be applied to waiting customers in an effort to reduce congestion for instance FIFO, LIFO. Chase et al. (2006) noted that customer behavior is studied for balking, reneging, jockeying and capacity finiteness. Uncertainty of inter arrival times and service times implies application of statistics and probability to analyze queuing situations is a must. Analytical models are used to analyze simple queuing situations while simulation is used for complex situations.

Social injustice is experienced by a customer who despite arriving earlier, slips and receives service after a later customer who skips queue *Ceteris Paribus* (Larson and Schaak, 1989).

Combining several short queues into one long one with several counters helps to solve this problem. A customer is also likely to join along queue rather than a short one if he believes those ahead have inside information about availability of service/product. The study further identified the factors that affect customer perception of and experience of queues as the environment, the level of information and the measure of social justice. Some customers are more averse to queuing and thus will exhibit behavior like jockeying, jumping queue and barging for those who cannot tolerate especially long queues. The most commonly used rule in queue management is first come first served (FCFS) because it ensures fairest treatment of arrivals. Conversely buildup of queues serves to send a signal to service managers of the need to be efficient and also serve to “market” the service given the popularity. Chase et al. (2006) observes that over the years ways have been devised to make queuing an else while good experience for the customer. Entrepreneurs also recognize the potential for marketing goods and services to those standing in queue in public places e.g. newspaper vendors. TV commercials and adverts are also used to reach those in bank queues by having screens in the environment.

Sarel and Marmorstein (1998) observed that more affluent customers would not tolerate delay in service delivery and were even willing to pay a premium due to the opportunity cost of waiting. Queuing is psychologically stressing to the customer especially if the customer is doing nothing. The expected waiting time is much less than the actual time in the mind of the customer .For example an idle customer waiting for 9sec may interpret it to be a spectacular 3 minutes! According to the famous philosopher Berkeley “perception is essence” i.e. how long customers believe they wait matters more than how much they actually take. The study noted that on the other hand, with increased emphasis on cost-cutting efforts, the ability of many firms to deliver timely service on a consistent basis has diminished. Available resources are

often barely sufficient to meet normal demand. The situation typically worsens during peak times leading to long service delays.

Katz, Larson and Larson (1991) developed several rules for management of psychology of queuing i.e. perception is more important than reality, unoccupied time feels longer than occupied time, pre-process waits feel longer than in process waits, uncertain or unexplained waits feel longer than known waits and unfair waits feel longer. One suggested solution is to segment the customers according to specific needs. Waiting line problem is inherently nonlinear and therefore difficult for the manager to understand solutions to queue situations according to Metters, King-Metters, Pullman and Walton (2006). The queuing model can be used for simple situations whereas simulation is used for complex situations. To customers queuing is a bad thing that is most times due to management fault. Boredom resulting from queuing is said to generate restlessness, tension and anxiety and to encourage the customer to dwell on the possible adverse consequences of being late for his or her next intended activity. Crucially, it has been claimed by Katz, Larson and Larson (1991) and Taylor (1994) that longish waits impact negatively on customer evaluations of an outlet's quality because long queues affect the customer's perceptions of the "punctuality" of a service (i.e. how promptly customer requirements are satisfied) and hence the customer's ratings of the service provider's overall efficiency and reliability.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter outlined the method used by the researcher to formulate the extraction and analysis of data from the source population. It gave the roadmap towards analysis and conclusion of true queue management scenario as it is in Mombasa County. The outcome of the research envisaged to find solutions to prevailing inefficiency in banking halls using mathematical models and statistics.

### **3.2 Research Design**

The research design was a cross sectional survey that sought to assess queue management practices in several selected banking halls in Mombasa County simultaneously. The study noted arrival rate of customers, queue lengths as well as service rates of tellers in focused banks. It was proposed to carry out the exercise simultaneously at specified day and time duration. Queue models were earmarked to be used to analyze and compare the performance of the banks using the data collected. Save for seeking authority and assistance from bank management, no interference with the environment of data collection was expected as both the customers and the tellers would be unaware of the ongoing exercise.

### **3.3 Population and Sampling**

The population was composed of the 108 banks branches present in Mombasa County (Central Bank of Kenya, 2012) making up the 36 banks in Mombasa County of which 11 are listed in the NSE (Appendix 5). The researcher planned to do a census of the 36 banks in the County.

### **3.4 Data collection**

Raw data on arrivals and service times was collected at each selected banking hall using the forms in appendix 2 and 3 respectively. The data collector recorded the instant a customer either arrived or was served in sequential order. For the service station the data collector also indicated the number of servers at any given time to guide in analysis using the queue models. The data collector was well coordinated to simultaneously start work at 9 am and end at 11 am by prior communication on a typical business day of the week to collect data. It was envisaged to rely on the accuracy to collect reliable data to represent the correct situation in banks. The researcher was armed with a digital watch to record time to the second accuracy, clip board, pen and suitably designed entry form. The data collector noted when queue models changed say from one to two server and collected data as such. The researcher secured authority of the branch manager at each branch by way of introductory letter (Appendix 5) due to sensitive nature of the study and created awareness to the staff involved without affecting the outcome of the study.

### **3.5 Data analysis**

The multi- channel queuing model was applied in general to analyze the raw data and all the established queuing characteristics computed using a suitable tool. Appendix 1 was designed to be used to show the results of key queue analysis parameters obtained. It envisaged applying the Monte Carlo simulation model to validate the results and make a representation of all branches in the county. Descriptive statistics were used to check the distribution of parameters across the banks on time intervals and displays in graphs. This information was vital to bank management and clientele to distinguish peak times and what way forward to beat queues.

## **CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION**

### **4.1 Introduction**

This chapter covered data analysis in line with the planned methodology, results and findings. The data put forward included the reaction rate, attitude of the bank managers to the exercise and the prevailing performance indicators of queue management in banks within Mombasa County. Analysis was based on the data collected by observation and timing of customer arrivals and service in the banking halls. Charts were used to analyze the findings of the research project.

### **4.2 Response rate.**

It was envisaged to carry out census of all the 108 bank branches within Mombasa County. The number of branches studied were 20 translating to 18.5% of the of branch coverage. In terms of the number of institutions 15 banks out of 37 operating in the County were successfully accessed for data collection implying 41% of bank coverage. The total number of branches visited was 48 out of 108 representing 44.4% of the total population .Out of 48 branches visited the successful response of 20 represents 42% of those visited. The researcher personally collected the data in the banking halls with a few cases of assistance from the banks and helpers. Within the duration of data collection in a given branch the researcher successfully collected data during all the 2 hour period without interruptions and interference of the environment largely due to adequate prior arrangement with bank management and strategic physical positioning. The researcher also ingeniously queued in some uncooperative congested banks, posing as a customer to successfully collect the data. Further assistance from the Kenya Bankers Sacco and Kenya Bankers Association officers reinforced granting of permission by resistant bank managers.

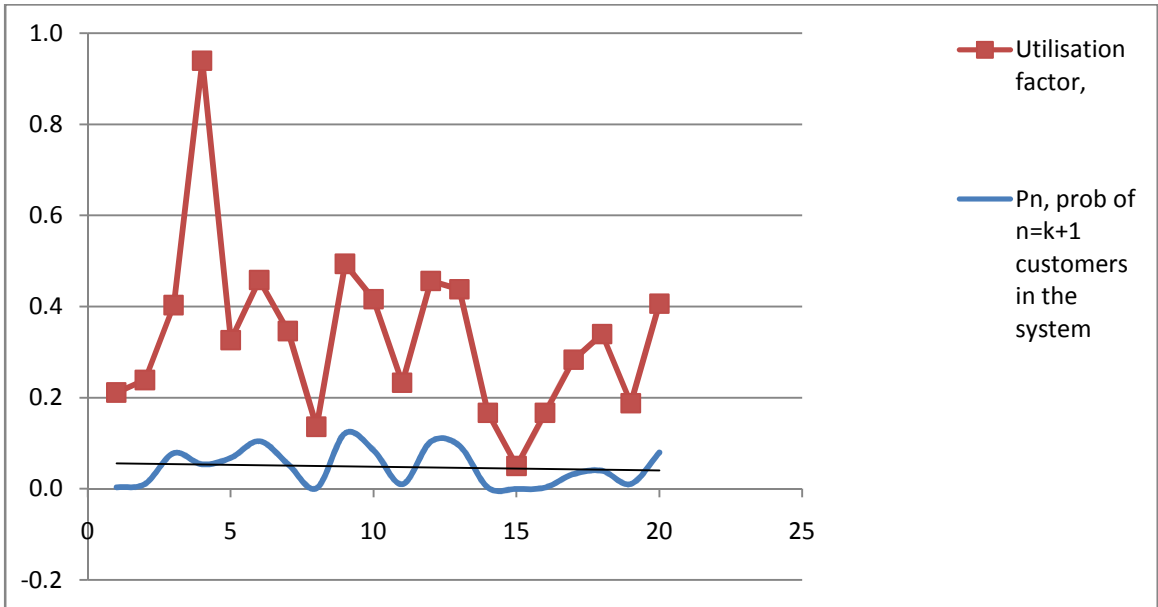
It was envisaged to collect all data on a given day. However due to varying response of institutions it became impractical. However it was possible to time the data collection timing to fall from 9am to 11 am on the appointed days. The researcher noted that banks are in stiff completion and would not want information regarding their performance shared or compared with others. Other banks quoted security concerns, others required the respondent to contact Nairobi headquarters yet others failed to give one way feedback on promised go-ahead. Branches operating near empty bank halls as common with cooperate banks presented antagonistic data collection scene as the tellers are not under pressure to serve customers faster .The reasons fronted for not getting access to unresponsive institutions are as tabulated below;

**Table 1: Fronted refusal reasons**

<b>Serial No</b>	<b>Fronted reason for refusal of permission</b>	<b>Percentage</b>
1	Wait for Manager to get clearance from Headquarters	35.7
2	Confidentiality of internal information	10.7
3	Security sensitivity	14.3
4	Cooperate Banking- No queues formed	39.3

### **4.3 Results and Discussions**

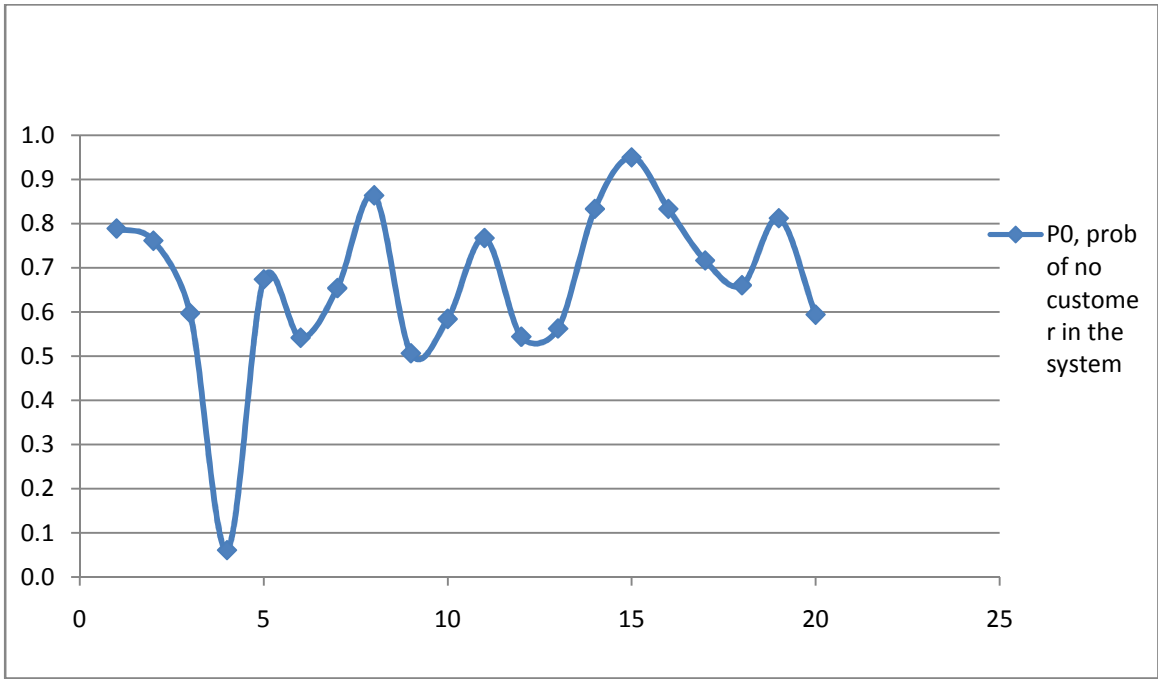
From the data collected it is deduced that five out of the twenty banks have no possibility of having queue formation indicating proper queue management and/or underutilization of capacity. The reverse is true for banks with high probability of having queue formation of  $n=k+1$  customers (See Fig 2 below).



**Fig 2: Comparing utilization factor and probability  $n=k+1$  customers in the system**

All banks showed there in a probability of having no customers and therefore the need to continuously review number of servers to suit (Fig 3 below.) The Excel template can be used instantaneously by bank management as the data sheet to review need to vary the number of servers.





**Fig 3:  $P_0$ , probability of no customer in the system**

General trend was banks with more queues are demonstrating faster service than those with less due to pressure exerted on the servers by queue length (Table 2). The researcher had intentionally removed bank names not to elicit damaging picture of studied banks in the face of prevailing stiff competition and to meet the academic objective.

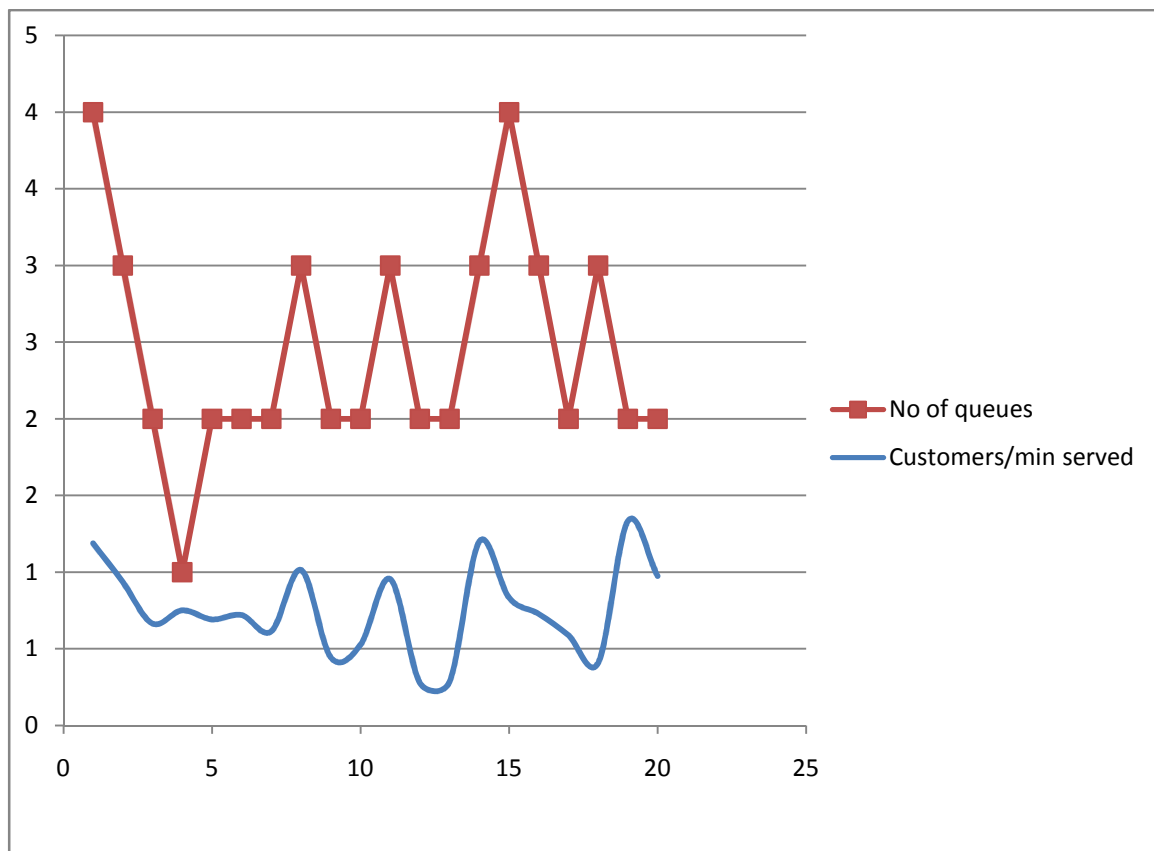
**Table 2: Tabulated Data Analysis**

<b>Tabulated Data Analysis :Queue Management in Banks: The case of Mombasa County</b>												
	<b>Parameter</b>	<b>Bank Ref</b>	1	2	3	4	5	6	7	8	9	10
1	Av service(m) customers per min		1.2	0.9	0.7	0.8	0.7	0.7	0.6	1.0	0.4	0.5
2	No of Queues(K)		4	3	2	1	2	2	2	3	2	2
3	Utilisation factor, r		0.2	0.2	0.4	0.9	0.3	0.46	0.35	0.1	0.5	0.4
4	Exp No in Queue( $L_q = r l(m-1)$ )		6.0	1.0	1.0	23.0	1.0	0.02	0.03	0.0	0.0	0.0
5	Exp No in system( $L_s = L_q + l/m$ )		6.9	1.8	1.8	24.0	1.7	0.93	0.72	0.4	1.0	0.8
6	Exp waiting time in queue $W_q = L_q/l$		6.0	1.6	1.9	32.7	2.3	0.03	0.07	0.1	0.0	0.0
7	Exp waiting time in system $W_s = W_q + 1/m$		6.9	2.6	3.4	34.0	3.7	1.42	1.69	1.1	2.3	1.9
8	Prob of no customer in system $P_0 = 1 - r$		0.8	0.8	0.6	0.1	0.7	0.54	0.65	0.9	0.5	0.6
9	Prob $n > k$ customers in system $P_n = P_0(l/m)^n / (k! k^{n-k})$		0.00	0.01	0.08	0.05	0.07	0.10	0.05	0.00	0.12	0.08
10	Trial number of customers in system $(n) > k$		5	4	3	2	3	3	3	4	3	3

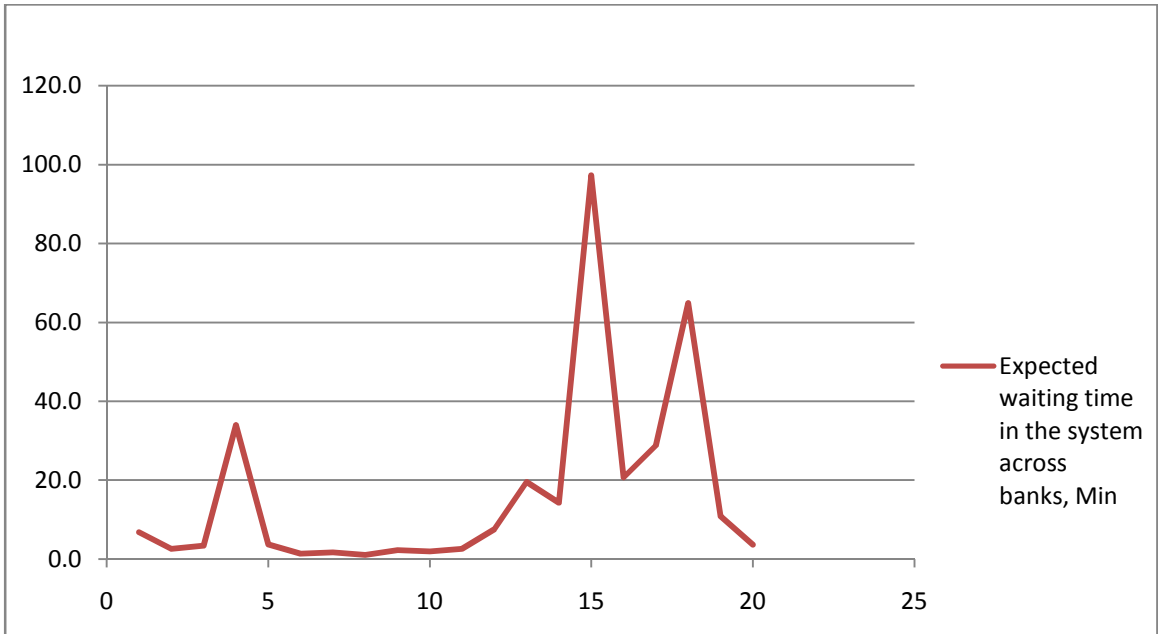
**Table 2 (Contd)**

Tabulated Data Analysis :Queue Management in Banks: The case of Mombasa County(Contd)												
	Parameter	Bank Ref	11	12	13	14	15	16	17	18	19	20
1	Av service(m) customers per min		1.0	0.3	0.3	1.2	0.8	0.7	0.6	0.4	1.3	1.0
2	No of Queues(K)		3	2	2	3	4	3	2	3	2	2
3	Utilisation factor, r		0.2	0.5	0.4	0.2	0.1	0.2	0.3	0.3	0.2	0.4
4	Exp No in Queue( $L_q = r l(m-1)$ )		1.0	1.0	4.0	8.1	16.0	7.0	9.0	26.0	5.1	2.1
5	Exp No in system( $L_s = L_q + l/m$ )		1.7	1.9	4.9	8.6	16.2	7.5	9.6	27.0	5.5	2.9
6	Exp waiting time in queue $W_q = L_q/l$		1.6	4.0	16.0	13.4	96.0	19.3	27.1	62.4	10.2	2.6
7	Exp waiting time in system $W_s = W_q + 1/m$		2.6	7.6	19.5	14.3	97.2	20.7	28.8	64.8	10.9	3.6
8	Prob of no customer in system $P_0 = 1 - r$		0.8	0.5	0.6	0.8	1.0	0.8	0.7	0.7	0.8	0.6
9	Prob $n > k$ customers in system $P_n = P_0(l/m)^n / (k! k^{n-k})$		0.010	0.103	0.09	0.00	0.00	0.00	0.03	0.04	0.01	0.08
10	Trial number of customers in system, $n > k$		4	3	3	4	5	4	3	4	3	3

The bank manager can use the real time observations to inform customers the expected waiting times in the system with due consideration of the prevailing queue length (Fig 4). One prominent commercial bank has made strides towards this by introducing computerized ticketing system whereby customers are provided with chairs to wait and the number to be served is shown above applicable teller. The researcher observed that the use of ticketing system does not however imply faster service at the counter as the average for the bank was still above 7 minutes per customer whereas the best performing bank doing a minute per customer.



**Fig 4:No of queues vs customers served /min**



**Fig 5: Expected waiting time in the system across banks, Min**

The expected waiting time in the system is dependent on bank queue length and ranges from 2.6 and 97.2 minutes which is associated with the bank with ticketing system. Clearly the use of ticketing has is not yet recipe for faster service .The mean waiting time in the system across banks in Mombasa County is 27 minute .The mean time to serve a customer and standard deviation of studied branches was as summarized in Table 3 below:

**Table 3: Mean rates and Standard Deviation,(Customer/ Min)**

Mean(Customer/Min)		Standard Deviation(Customer/ Min)	
Arrival	Service	Arrival	Service
2	0.8	1.5	0.3

The data showed more inconsistency in arrival compared to service which further reinforces need for increased queue management effort for banks across Mombasa.

#### 4.4 Monte Carlo simulation of Expected waiting time in the system, Ws

The expected waiting time in the system obtained from the twenty banks studied ranged between 1.1 and 97.2 minutes per customer giving a full range of 96.1 minutes. This range divided into quartiles of 24.025 minutes gave the discrete data classified as 1.1 to 25.125, 25.125 to 49.15, 49.15 to 73.175 and 73.175 to 97.2. From Table 2, the distribution of this data and eventual simulation for all Mombasa Bank was represented in table 3 below;

**Table 4: Monte Carlo Simulation of Ws for the entire Mombasa County**

<b>Discrete Classification of Ws, minutes per customer</b>	<b>Observed No out of 20 branches</b>	<b>Monte Carlo Simulation out of 108 branches</b>
1.1 to 25.125	16	87
25.125 to 49.15	2	11
49.15 to 73.175	1	5
73.175 to 97.2	1	5

From the table it was deduced that 87 out of total of 108 branches in the county were expected to manage waiting time in the system of less than 26 minutes per customer. Only 10 branches were expected to delay a customer in the system by more than 49 minutes compared with the best 55 minutes observed by Juwah (1986). This observation was indicative of the queue management situation in the County and can be used by prospective investors, bank authorities and statutory bodies to make decisions regarding investment in the county. The results of the study show there has been a lot of improvement in reducing the waiting time in queues in banks over the years.

## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Introduction**

This chapter sought to review the observed data apart from previous empirical studies and observations. The applicability of the multichannel and other queue model selected was also discussed for suitability in the banking context. The key performance indicators of service rate and waiting time in the system were also analyzed in relation to previous studies and across banks in the County. The researcher made deductions based on the results observed and set the case for the County. There were gaps still observed and the researcher made further recommendations for the future.

### **5.2 Summary**

In general, most banks exercise multichannel queue system, with 19 of 20 banks having more than one queue. The exceptional bank was unique because its core transaction was remittance of funds from Arabian Diaspora and its Forex service for those seeking opportunities there. Interestingly the service rate for this bank was commendable at 1.3 minutes per customer calling for need for congested banks to consider systematic segregation of services for instance dedication of counters for deposit or withdrawals only so that the teller is properly tuned. The average service rates ranges from 0.3 and 1.3 customers per minute (0.8 to 3.3 minutes per customer).The mean service rate across banks is 0.8 Customers/Min (1.3min/customer) whereas the standard deviation is 0.3 Customers/minute (See Table 3) .Post bank performance was excellent as the POS system in use was so fast at 0.5 min per customer leading to no queues for withdrawals and deposits even if there was low turn-out. The bank was in the process of marketing its new products to gain more customers. Banks with heavy queue formation tended to have faster service compared with those that were

scanty due to less work pressures on the tellers. Bank management in less busy banks needed to review need to increase customer base to utilize the less busy tellers. For banks with no queue formation it was not viable to carry out data collection as it was not representative of a typical congested banking hall.

### **5.3 Conclusion**

The mean waiting time in the system for the County was an efficient 27 minutes compared with earlier studies done elsewhere by Elegram(1978) and Juwah ( 1986) .In general banks have well adopted multichannel queue system with additional strategies including dedicated queue managers and extending working hours to beat queues. Queue discipline was orderly in all banks with rare cases of renegeing, jockeying or bulking due to up to date customer care and banks having informed customers. The Excel template based on the aforesaid queue models was useful as basis by future scholars and bank management to analyze the data queue management in banking halls in the County. The same information can also help future investors in the sector to correctly locate new branches as well as determine the required service resources. Using the information the management can have flexible control and balance of the number of tellers that are also multi-skilled for back office work. The outcome of the study was that the multichannel queue model can be used for monitoring performance of banks and to decongest the halls. The result of the study shows there has been a lot of improvement in reducing the waiting time in queues in banks over the years.

### **5.4 Recommendations.**

Not all banks are efficiently utilizing the multichannel model and more banks should adopt it to determine efficient utilization of resources. A lot of bank managers were non-committal to respond instantly to data collection. In fact one heavily congested bank claimed that the bank only carried out such surveys internally and the information held confidential making the



exercise futile. Branches of the same bank could also give varying reasons for refusal showing a great deal of disunity of command. Adequate campaign needs to be carried out by learning institutions to impress on bank authorities to relax the rules on data collection by the academia because the same information can be used to improve the way of doing business. In most cases this can be driven from the headquarters, mostly located in Nairobi. For congested retail banks it is important for bank management to consider further segregation of service to reduce distraction of the tellers and ultimately the service time. In some banks sufficient information needs to be availed to customers for instance proper signage of M-pesa/ Western Union counters apart from the withdrawal/deposit counters.

### **5.5 Limitations of the study**

The research relied on consent of bank authorities to access most banks thus leading to less than anticipated scope. Access was denied in most banks on grounds of security, confidentiality and delayed response. The researcher had no control over which service a customer received at a counter as the services are not explicitly differentiated in some banks. M-pesa withdrawals and other miscellaneous services could be transacted in same counters as deposit/withdrawals for some banks that have low turnout. A lot of resources were required to carry out simultaneous data collection in all 108 branches in addition to cooperation of bank authorities.

### **5.6 Areas of Further Studies.**

More research needs to be carried out to cover the whole population of banks in the County. A lot of resources will be required to collect data from the banks at the same time and involvement of Kenya Bankers Association (KBA) and CBK is useful to incorporate all the banks.

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## APPENDICES

### Appendix 1: Data Entry Form for Customer arrivals(2 hour period)

	Bank:Branch:					
	Arrival time	Arrival time	Arrival time	Arrival time	Arrival time	Arrival time
	(HrMinSec)	(HrMinSec)	(HrMinSec)	(HrMinSec)	(HrMinSec)	(HrMinSec)
Queue ref						
Queue length @ 9am						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

**Appendix 2: Data Entry Form for Service times(2 hour period)**

Bank:Branch:						
	Server 1	Server	Server	Server	Server	Server
	(HrMinSec)	(HrMinSec)	(HrMinSec)	(HrMinSec)	(HrMinSec)	(HrMinSec)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

### **Appendix 3: List of banks in Mombasa**

1. African Banking Corporation Ltd.
2. Bank of Africa Kenya Ltd.
3. Bank of Baroda
4. Bank of India
5. Barclays Bank of Kenya Ltd.
6. CfCStanbic Bank Ltd.
7. Chase Bank (K) Ltd.
8. Citibank N.A Kenya.
9. Commercial Bank of Africa Ltd.
10. Consolidated Bank of Kenya Ltd.
11. Co-operative Bank of Kenya Ltd.
12. Diamond Trust Bank (K) Ltd.
13. Dubai Bank Kenya Ltd.
14. Equatorial Commercial Bank Ltd.
15. Ecobank Kenya Ltd.
16. Equity Bank Ltd.
17. Family Bank Ltd.
18. Fidelity Commercial Bank Ltd.
19. Fina Bank Ltd.
20. First Community Bank Limited.
21. Giro Commercial Bank Ltd.
22. Guardian Bank Ltd.
23. Gulf African Bank Limited.

24. Habib Bank A.G Zurich.
25. Habib Bank Ltd.
26. I and M Bank Ltd.
27. Imperial Bank Ltd.
28. Kenya Commercial Bank Ltd.
29. K-Rep Bank Ltd.
30. Middle East Bank (K) Ltd.
31. National Bank of Kenya Ltd.
32. NIC Bank Ltd.
33. Prime Bank Ltd.
34. Standard Chartered Bank (K) Ltd.
35. Trans-National Bank Ltd.
36. Housing Finance Ltd.

**Source:** *CBK Mombasa Branch, July 2013*

**Note:** *The listing of banks above does not correspond to the bank references used in Table 2.*



#### Appendix 4: Mombasa banks Listed in NSE

<u>Bank</u>	<u>Share Price (12<sup>th</sup> July 2013)</u>
1. Barclays Bank Ord	17.45
2. CFC Stanbic of Kenya Holdings	66.00
3. Diamond Trust Bank	172.00
4. Equity Bank Ord	33.50
5. Housing Finance Co	25.50
6. I and M Holdigs	97.50
7. KCB	40.50
8. NBK	21.75
9. NIC Bank	53.50
10. StandardChartered	286.00
11. Co-op Bank of Kenya	15.90

**Source:** *Daily Nation*, 12<sup>th</sup> July 2013 and NSE website <https://www.nse.co.ke/listed-companies/list.html>

## Appendix 5: Introduction Letter



**UNIVERSITY OF NAIROBI**

**MOMBASA CAMPUS**

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P.O. Box 99550, 00107  
Mombasa, Kenya

12<sup>th</sup> August, 2013

**TO WHOM IT MAY CONCERN**

The bearer of this letter, **Njuguna Henry Ndungu** of Registration number **D61/73346/2009** is a Master of Business Administration (MBA) student of the University of Nairobi, Mombasa Campus.

He is required to submit as part of his coursework assessment a research project report. We would like the student to do his project on "**Queue Management in Banks: The Case of Mombasa County**". We would therefore, appreciate if you assist him by allowing him to collect data within your organization for the research.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organization on request.

Thank you.

**MR. JOB MWANYOTA**  
ASSISTANT CO-ORDINATOR, MOMBASA CAMPUS



*JM/100*