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Queuing Theory and Customer Satisfaction: A Review of Performance, Trends and Application in Banking Practice (A Study of First Bank Plc Gwagwalada, Abuja Branch)

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Abstract
Queuing theory is the formal study of waiting in line and is an entire discipline in operations management. This article will give the reader a general background into queuing theory, its associated performance, and it relationship to customer satisfaction in banking sector. Queuing theory has been used in the past to assess such things as staff schedules, working environment, productivity, customer waiting time, and customer waiting environment. In banks, queuing theory in assessing a multitude of factors such as withdrawal and deposit, customers waiting time, customer time, and staffing level has been a major problem. The study uses regression analysis and model with the help of SPSS in analyzing the data collected through primary and secondary means. The study find out that most customers in banks are not satisfy base on the queue they experience before been attended to and it was base on this that the study recommended an effective and efficient application of queuing theory which can be of particular benefit in banks with high-volume out-customer workloads and/or those that provide multiple points of service. By better understanding queuing theory, service managers can make decisions that increase the satisfaction of all relevant groups-customers, employees, and management.
Keywords: Bank, Customer, satisfaction, queuing, Performance

1. Introduction

Waiting in lines or queues seems to be a general phenomenon in our day to day life.

Think about the many times you had to wait in line in the last month or year and the time and frustration that was associated with those waits. Whether we are in line at the grocery store checkout, the barbershop, the stoplight, bank waiting our turn is part of our everyday life.

Queuing theory is the formal study of waiting in line and is an entire discipline within the field of operations management. The purpose of this article is to give the reader a general background into queuing theory and queuing systems, its associated terminology, and how queuing theory relates to customer or customer satisfaction. Also, past and present applications of queuing technology and what staffs can do to manage customer or customer queues more effectively will be discussed. Finally, automated queuing technology will be described.

Queuing theory utilizes mathematical models and performance measures to assess and hopefully improve the flow of customers through a queuing system. Queuing theory has many applications and has been used extensively by the service industries. Queuing theory has been used in the past to assess such things as staff schedules, working environment, productivity, performance, customers waiting time, and customers waiting environment. In bank, queuing theory can be applied to assess a multitude of factors such as registration fill-time, customer waiting time, customer counseling time, and receptionists and technician staffing levels. The application of queuing theory may be of particular benefit in receptionists with high-volume out customer workloads and/or those that provide multiple points of service, such as those in the Department of Veterans Affairs (VA), Department of Defense (DoD), university health systems, and managed care organizations. Problematic queuing systems (ie, long lines) can lead to the customer's perceptions of excessive, unfair, or unexplained waiting time—resulting in significant detrimental effects on the customer's overall satisfaction with the service transaction.

Waiting in lines seems to be part of our everyday life. At the bank, filling station, bus stop, or in the canteen, "waiting our turn". Queues form when the demand for a service exceeds its supply (Kandemir-Cavas and Cavas, 2007). In banks, customers can wait minutes or hours before been attended to. For many customer or customers, waiting in lines or queuing is annoying (Obamiro, 2003) or negative experience (Scotland, 1991). The unpleasant experience of waiting in line can often have a negative effect on the rest of a customer's experience with a particular bank. The way in which managers address the waiting line issue is critical to the long term success of their firms (Davis *et al,* 2003)

Queuing has become a symbol of inefficiency of publicly funded bank in the world and Nigeria is not an exception. Managing the length of the line is one of the challenges facing most banks. A few of the factors that are responsible for long waiting lines or delays in providing service are: lack of passion and commitment to work on the part of the bank staff (Belson1988) overloading of available staff, bank officials attending to customers in more than one section etc. These put bank managers under stress and tension, hence tends to

dispose off a customer without attending to their needs, which often leads to customer dissatisfaction (Babes and Sarma, 1991). This paper is based on the understanding that most of these difficulties can be managed by using queuing model to determine the waiting line performance such as: average arrival rate of expectant, average service rate expectant, system utilization factor, cost of service and the probability of a specific number of customers in the system. The purpose of this study is to provide insight into the general background of queuing theory and its associated organization performance, and how queuing theory can be used to model good service delivery and organization performance of a First Bank Plc Gwagwalada Abuja, Nigeria. The resultant performance variables can be used by the policy makers to increase efficiency, improve the quality of service and performance, as well as decrease cost in bank organizations and services

1.1 Statement of the Problem

Queuing theory over the years has been the only panacea for customer satisfaction in the banks but most banks fail to properly implement this application effectively and efficiently thereby prompting the present study.

1.2 Objectives o f the Study

The main objective of this study is to examine how queuing theory has been used in offering satisfactory service to customers. Other specific objectives of the study include;

i. Examine whether application of queuing theory lead to customer satisfaction and organization performance.
ii. Examine whether bank managers attend to customer on time

1.3 Research Question

i. How does queuing theory application lead to customer satisfaction and banking performance?
ii. Do bank managers really attend to customers on time?

1.4 Hypotheses of the study

Based on the objectives of the study, the following research hypotheses were tested.

Hypothesis One (H_1) Application of queuing theory in first bank does lead to customer satisfaction and organization performance.

1.5 Significance of the Study

The study gave an insight to the various benefits that can be derived from queuing theory process in the bank. The study will be of immense important to the management of first bank for it will give the management opportunity to improve on the process and also help to increase performance. The study will also be of importance to service organizations (like stores, airport and filling stations), students for research purpose, the general public and humanity as a whole.

1.6 Scope of the Study

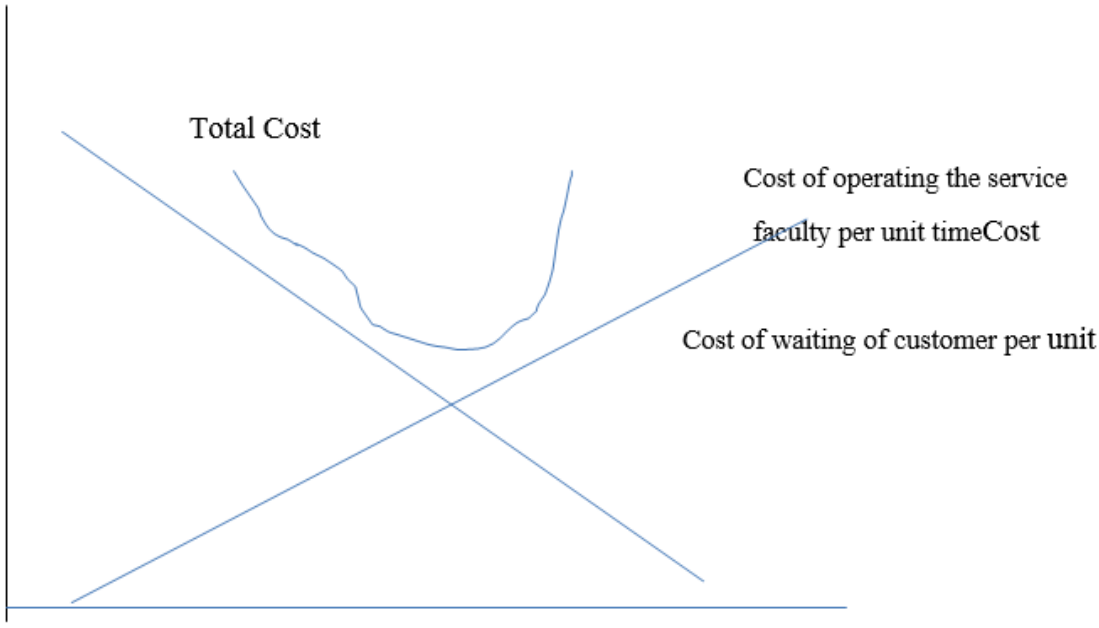
This study is limited to banking sector; therefore caution should be taken in generalizing the result of the study.

2. Literature Review

Literature on queuing indicates that waiting in line or queue causes inconvenience to economic costs to individuals and organizations. Banks, airline companies, banks, manufacturing firms etc., try to minimize the total waiting cost, and the cost of providing service to their customers. Therefore, speed of service is increasingly becoming a very important competitive parameter (Katz, et al, 1991). Davis et al (2003) assert that providing ever-faster service, with the ultimate goal of having zero customer waiting time, has recently received managerial attention for several reasons. First, in the more highly developed countries, where standards of living are high, time becomes more valuable as a commodity and consequently, customers are less willing to wait for service. Second, this is a growing realization by organizations that the way they treat their customers today significantly impact on whether or not they will remain loyal customers tomorrow. Finally, advances in technology such as computers, internet etc., have provided firms with the ability to provide faster services. For these reasons bank administrators, physicians and managers are continuously finding means to deliver faster services, believing that the waiting will affect after service evaluation negatively. Also, understanding the inefficiencies in the bank and improving them is crucial for making banking policy and budgeting decisions (Wilson and Nguyen, 2004). Cochran and Bhati (2006) also argue that higher operational efficiency of the bank is likely to help to control the cost of medical services and consequently to provide more affordable care and improve access to the public. Addressing the problems of queuing involve a trade-off between the costs of customers waiting time and the cost of providing faster service. Researchers have argued that service waits can be controlled by two techniques: operations management or perceptions management (Katz et al, 1991). The operation management aspect deals with the management of how customers (customers), queues and servers can

be coordinated towards the goal of rendering effective service at the least cost.

Customers' satisfaction has gained increasing attention over the past 20 years (Sitzia and Wood 1997). Customers' evaluation of service quality is affected not only by the actual waiting time but also by the perceived waiting time. The act of waiting has significant impact on customers' satisfaction. The amount of time customers must spend waiting can significantly influence their satisfaction (Davis and Vollman, 1990). Furthermore, research has demonstrated that customer satisfaction is affected not just by waiting time but also by customer expectations or attribution of the causes for the waiting (Taylor, 1994). Consequently, one of the issues in queue management is not only the actual amount of time the customer has to wait, but also the customer's perceptions of that wait (Davis and Heineke, 1994). Obviously, there are two approaches to increasing customer satisfaction with regard to waiting time: through decreasing actual waiting time, as well as through enhancing customer's waiting experience (Katz, Larson, and Larson, 1991; Davis and Heineke, 1994).



Customers' perception of bank service delivery has gained increasing attention over the past 20 years (Sitzia and Wood 1997). Customers' evaluation of service quality is affected not only by the actual waiting time but also by the perceived waiting time. The act of waiting has significant impact on customers' satisfaction. The amount of time customers must spend waiting can significantly influence their satisfaction (Davis and Vollman, 1990). Furthermore, research has demonstrated that customer satisfaction is affected not just by waiting time but also by customer expectations or attribution of the causes for the waiting (Taylor, 1994). Consequently, one of the issues in queue management is not only the actual amount of time the customer has to wait, but also the customer's perceptions of that wait (Davis and Heineke, 1994). Obviously, there are two approaches to increasing customer satisfaction with regard to waiting time: through decreasing actual waiting time, as well as through enhancing customer's waiting experience (Katz, Larson, and Larson, 1991; Davis and Heineke, 1994).

Queuing theory is basically a mathematical approach applied to the analysis of waiting lines within the field of operations management (Nosek and Wilson 2001). The objective of queuing analysis and its application in organizations is to "minimize costs" to the organization- both tangible and intangible and increase employee performance towards service delivery. Queuing theory uses queuing models or mathematical models and performance measures to assess and hopefully improve the flow of customers through a queuing system (Gorney, 1981; Bunday,1996;).A good customer flow means that the customer queuing is minimized while a poor customer flow means customers suffer considerable queuing delays (Hall, 1999). Queuing theory has many applications and has been used extensively by the service industries (Nosek and Wilson, 2001). A queuing system or waiting line phenomenon consists essentially of six major components: the population, the arrival, queues itself queue discipline, service mechanism, departure or exit.

The *population source* serves as where arrivals are generated. Arrivals of customers at the bank may be drawn from either a finite or an infinite population. A finite population source refers to the limited size of the customer pool. Alternatively, an infinite source is forever.

The queue discipline is the sequence in which customers or customers are processed or served. The most common discipline is first come, first served (FCFS). Other disciplines include last come, first served

(LCFS) and service in random order (SIRO). Customers may also be selected from the queue based on some order of priority (Taha, 2005).

The service mechanism describes how the customer is served. It includes the number of servers and the duration of the service time-both of which may vary greatly and in a random fashion (Nosek and Wilson, 2001). The number of lines and servers determines the choice of service facility structures. The common service facility structures are: single-channel, single – phase; single-channel, multiphase; multi-channel, single phase and multi-channel, multiphase.

The *departure* or *exit* occurs when a customer is served. The two possible exit scenarios as mentioned by Davis (2003) are: (a) the customer may return to the source population and immediately become a competing candidate for service again; (b) there may be a low probability of re-service.

2.1 Queuing Systems and Terminology

On the surface it may seem like queuing is just simply waiting in a line. To most customers, the waiting experience is all that matters. However, waiting in line is just a part of the overall queuing system. A queuing system (also known as a processing system) can be characterised by four main elements: the arrival, the queue discipline, the service mechanism, and the cost structure.

The arrival is the way in which a customer arrives and enters the system for service.

Whenever customers arrive at a rate that exceeds the processing system rate, a line or queue will form. Arrivals may come in singly or in batches; they may come in consistently spaced or in a completely random manner. A potential customer can also leave if, on arrival, he or she finds the line too long—this is called balking.

The queue discipline is the rule for determining the formation of the line or queue and the order in which jobs are processed. There may only be one line and jobs are processed first-In, first-Out or FIFO. Others may have more than one line to give certain customers priority such as express lanes in reception counter.

The service mechanism describes how the customer is served. It includes the number of servers and the duration of the service time—both of which may vary greatly and in a random fashion. The service time may be similar for each job or it could vary greatly.

The cost structure specifies the payment made by the customer and the various operating costs of the system. Other elements that impact the queue structure and performance include the number of service counters and the number and speed of servers.

2.2 The Importance of Queuing Management

Bank, like other service oriented industries, functions in an increasingly competitive environment. Speed of service has been shown to provide businesses a competitive advantage in the marketplace. In addition; the literature reveals several studies documenting customer dissatisfaction with long waiting times and indicates that this is a pervasive problem in bank practice and a common source of anxiety and dissatisfaction among customers and, in many cases, bank staffs. Speed of delivery is being emphasised increasingly and can be partly attributed to increased competition and the value a customer places on his or her time. We live in a society who has come to expect film development and eyeglasses to be ready in an hour or less. A brief story told from the customer's perspective will help to further illustrate this point:

I just arrived at my bank to get a withdrawal and to pick up a few other things. There is a line of four people at the registration counter and another six people sitting in the waiting area. By the time I get to the counter to hand the cashier/technician my pay slip, 5 minutes have passed. I ask how long the wait will be and I am told 30 to 40 minutes. I go about my shopping and return to the bank 35 minutes later. Again, there are people in line at the register and it takes me another 5 minutes to find out that my cheque is not ready. Feeling weary and somewhat frustrated, I have a seat in the waiting area. As I sit there, I watch people come and go and wonder, ―Wasn't I here before that guy? At last my name is called! I went straight to the cashier and my cheque clearing is complete. However, I don't feel good about it. Why did I have to wait so long? Did others get special priority over me? Maybe another bank will service my needs better? Am I a satisfied customer?

2.3 Application of Queuing Theory in Banking Hall Unit

The banking system ability to deliver good customer service, efficient and smooth services to the customers did not receive much attention until mid 1990's (Singh, 2006). Several key reimbursement changes, increasing critiques and cost pressure on the system and increasing demand of quality and efficacy from highly aware and educated customers due to advances in technology and telecommunications, have started putting more pressure on the bank managers to respond to these concerns (Singh, 2006).

Queuing theory manages customer flow through the system. If customer flow is good, customers flow like a river, meaning that each stage is completed with minimal delay. When the system is broken, customers accumulate like a reservoir (Hall, 1991). Banking Hall systems resemble any complex queuing network in that delay can be reduced through: (1) Synchronization of work among service stages, (ii). Scheduling of resources to

match patterns of arrival and, (iii) constant system monitoring (e.g. attending to number of customers waiting by location, diagnostic grouping) linked to immediate actions (Hall, 1991). Recently, application of stochastic methods has increased in analyzing clinical problems (Kandemir-Cavas and Cavas, 2007). Queuing theory, as the most common application of the stochastic process, examines queues or waiting lines dealing with random input and servicing processes (Wu, 1998).

3.0 Methodology

This study adopted a survey approach with a population of 300 customers of first bank plc),Gwagwalada-Abuja from different department in the bank. A sample size using Taro (Yamane's formulae) of 250 respondents were administered questionnaires, but 200 questionnaires were retrieved representing 80% of the sample size was used for analysis of the study. The sample was drawn in such a way that ensures accuracy and reliability of the data and eliminates the chance of bias in the selection process. The sampling is done in such a way that every element in the population has an equal and independent chance of being selected by allowing randomness to prevail in the selection process. The secondary data sources include journals, books, e-books. The primary instrument used for the collection of data for this study is the questionnaire. The questionnaire were designed in open and closed ended patterns and administered directly on the management of the bank. Further, in order to reduce the possibility of questionnaire missing or getting lost in transit, the questionnaire were retrieved the same manner in which they were administered. The data collected were presented in tables and analyzed using regression model statistical technique with the help of statistical package for social sciences (SPSS) in order to confirm the stated hypothesis.

The validity of an instrument refers to the extent to which it measures what was intended to measure. The validity of the scales utilized in this study was assessed for content and construct validity. After the survey had been completed the reliability of the sales was further examined by computing their p-value and Sig-value.

4.0 Result and Discussion.

The hypothesized statements were tested using regression model statistical tool with the help of SPSS as earlier stated. The tests conducted at 95% confidence interval and 0.005 level of significant. The decision rule was that if the calculated P-value is less than the critical value (0.05), we reject the Null hypothesis, if not we Accept.
The following were the result of the tested hypothesis:

REGRESSION RESULTS

Hypothesis One (H_{01}) Application of queuing theory in first bank does lead to customer satisfaction and banking performance.

Model Summary (b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.151(a)	.023	.019	.39642	1.278

a. Predictors: (Constant), Queuing Theory
b. Dependent Variable: Customer Satisfaction

Coefficients (a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.620	.080		57.406	.000
	Queuing Theory	.046	.019	.151	2.367	.019

a. Dependent Variable: Customer Satisfaction

Summary of Regression Results and other Statistics

A	**β_{pef}**	**P. value**	**R**	**r^2**	**Tα**
4.620	0.046	0.019	0.151	0.023	0.05

Source: SPSS Version 15

The regression line is (CUSTOMER SATISFACTION= 4.620+0.046) indicates that Customer Satisfaction will increase by 0.046% for every 1% increase in effective Queuing theory application. The significant value or P-value of 0.019 is less than the t-value of 0.05. We, therefore, reject Null Hypothesis and accept Alternative hypothesis that the relationship between application of queuing theory in satisfying customers and enhancing banking performance in banking sector is significant. The correlation coefficient (r) of 0.151 shows a weak relationship and the coefficient of determination (r^2) of 0.023 indicates that about only about 2.3%

of variation is explained by the role of queuing theory or the ability of the regression line to predict customer satisfaction is about 2.3%.

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENT (PPMCC) RESULTS

Correlations

		Org. Performance	Leadership Style
Queuing theory	Pearson Correlation	1	.151(*)
	Sig. (2-tailed)		.019
	N	200	200
Customer Satisfaction	Pearson Correlation	.151(*)	1
	Sig. (2-tailed)	.019	
	N	200	200

* Correlation is significant at the 0.05 level (2-tailed).

Source: SPSS Version 15

The above Pearson's result revealed a positive and significant correlation between Queuing theory application and customer satisfaction (given the coefficient and p-value of 0.151 and 0.019) respectively.

4.1 Major Findings

Having presented, analyzed and interpreted the data obtained in the course of this research work, the following are identified as major findings of this research effort:

i. That customers are highly dissatisfied with service render to them by bank managers
ii. Customers spend long time on the queue before being attended to.

5.0 Conclusion and Recommendations

Queuing theory is a powerful management tool that often gets overlooked, especially in hospital operations management. Proper application of this effective management tool can yield impressive results. There are volumes of additional material on queuing theory and in fact this paper has only touched the surface. The goal of this paper was to give the reader a general understanding of concepts, current technology, and applications of queuing theory as it relates to customer satisfaction and waiting time. Undoubtedly, there are numerous factors physical, psychological, and emotional, to name a few that affect a customer perception of the waiting experience. By better understanding queuing theory and the various measures associated with customer waiting time, service managers can make decisions that have a beneficial impact on the satisfaction of all relevant participants: customers, employees and management. There are several tools such as computer simulation, modeling, and automated queuing technology that can assist in this process improvement endeavor.

Waiting in line will always be prevalent in our society and in our banks. As the banking industry continues to evolve, staffs are under continued and growing pressure to do more and more. Wouldn't it be nice to practice banking in a setting where the worry and burden of

wait time management was eased, even eliminated keeping customers happy and decreasing the anxiety of those behind the counter trying to provide the best banking service?

This study has demonstrated that, majority of the customers were dissatisfied with services offered and the major cause of dissatisfaction was the long waiting time. There is the need for banking facilities and bank administrators to address gaps in human resources, logistics and other internal procedures aimed at reducing waiting times and thus ensuring an effective banking delivery system.

5.1 Recommendations.

1. The management of first bank should train bank managers and employees on how to relate with customers.
2. The management of first bank should employ more banking staff so that the customers will be attended to on time.
3. The management should make provision for banking facilities and bank administrators to address gaps in human resources, logistics and other internal procedures aimed at reducing waiting times and thus ensuring an effective banking delivery system which often lead to increase performance.
4. The management should train and develop its staff on the general understanding of concepts, current technology, and applications of queuing theory as it relates to customer satisfaction and waiting time.

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