St. Mary's University

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Contribution of Queue Management System on customers satisfaction in the case of Commercial Bank of Ethiopia Branches in Addis Ababa

By

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ACRONYMS

QMS = Queue Management System

CBE = Commercial Bank of Ethiopia

SPSS = Statistical Package for the Social Sciences

TISQ = Technology Interface Service Quality

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ABSTRACT

The main purpose of this paper is to identify the contribution of Queue Management System in customer satisfaction at Commercial Bank of Ethiopia Branches in Addis Ababa. Data was collected based on random sampling method from 10 Branches which applies Queue Management System and 65 x 10 = 650 questioners distributed for each Branch. The Data was then analyzed by using the latest version of statistical package for the social sciences (SPSS) software. The questioner administration yielded 80.31% response rates. The result shows that using Queue Management System by itself did not have big impact on customer satisfaction rather the bank should increase its product lines. In addition mathematical model is taken to measure customer waiting in the Bank by taking daily transaction data from Selassie Branch and it shows the customers wait more than 11 and half minutes in the branch whole to be served. Successful service delivery strategies can restore customer satisfaction and can be able also to influence other important aspects of the organization's outcomes including loyalty, positive and negative word of mouth behavior, and profitability. Poorly executed service delivery tends to aggravate customer dissatisfaction may result in customer total loss. One factor that affects customer's satisfaction is that their expectation and the amount of time that it took them to get the services. Every company would be wise to measure customer satisfaction regularly because one key to customer retention is customer satisfaction. Understanding what customers expect from an organization is necessary for managers, because expectations provide a standard of comparison against actual organization's performance. And, to minimize the Queue length the Bank should increase number of servers to address the large number of customers and in some branches the Branch whole is too small for expansion and the Bank should change its branches.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Banks provides financial services to individuals and organizations. Ethiopia being an essentially cash based economy, in terms of transaction payment system, left the bank with the problem of having to contend with huge volume of transaction which directly translate to long queue for services of banks. It now becomes one of the challenges for Commercial Bank of Ethiopia, to be able to manage the time spent by customers in the banking hall to remain competitive.

Commercial Bank of Ethiopia (CBE) has introduced a new technology branded Queue Manager, as a pilot project at six of its main branches in Addis Ababa as of early April 2009.Queue Manager is an automated system that facilitates queues of customers entering the branch so that they can get service sequentially with maximum attainable efficiency.

At the beginning, CBE had used the device at some of its branches to provide services. The branches include: Finfine, Arada, Megenagna, Temenja Yajh, Goffa and Addis Ketema. This pilot project is overseen by Customer Account and Transactions Service (CATS) department of the Bank. In so doing, it deploys the Information and Communication Technology (ICT) experts at each of the branches.

In its most basic form, the technology would manage queues with clear modus operandi. The machine issues a queue ticket to an arriving customer and then calls the ticket number and the counter number in the national language.

On the employee's side it promotes the performance of the staff by avoiding idle time. This new machine also encourages competition among front office employees, offering them better working conditions where they can be efficient and yet relaxed without being intimidated by a queue of onlookers waiting for service. Managers can receive information right away on wha6t is going on at the workstations and activity details of every counter. Thus, they can follow up on how many clients their staffs have served within a specific time interval.

1.2 Background of the organization

The state Bank of Ethiopia was founded in 1942 with twin objective: performing the duties of both Commercial and central banking in 1963. The commercial bank of Ethiopia (CBE) was legally established as Share Company to take over the commercial banking activities of the state Bank of Ethiopia. In the 1974 revolution CBE got its strength by merging with the privately owned Addis Ababa Bank, since then, it has been playing a significant role in the development endeavor of the country.

As at the end of the fiscal year 2012/13 the bank had around 760 branches stretched across the length and breadth of the country and more than 15,000 employees whom it regards as its key assets.

1.2.1 Mission and visions of the Bank

Vision

To become a world class commercial bank by the year 2025.

Mission

We are committed to best realizing stakeholder's needs through enhanced financial intermediation globally and supporting national development priorities, by deploying highly motivated, skilled and disciplined employees as well as state-of-the-art technology. We strongly believe that winning the public confidence is the basis of our success. is one of the oldest public Banks in Africa. It is a state owned enterprise and the leading Bank in the country. The Banks have made rapid stride of its services both in quality and quantity. However, the user at large are found dissatisfied with quality and quantity of the services made available to them. The process of technological sophistication has gained the momentum but the users are yet to get the quality and quantity of service.

1.2.2 Organizational structure of the Bank

Commercial Bank of Ethiopia process based organizational structure is started by Board of directors, the president with different department heads, Directors, and Officers, then followed by Vice presidents. In many units decision making authorities are decentralized and power is well exercised on every level of management.

1.3 Statement of the problem

Banks provides financial services to individuals and organizations. Ethiopia being an essentially cash based economy, in terms of transaction payment system, left the bank with the problem of having to contend with huge volume of transaction which directly translate to long queue for services of banks. It now becomes one of the challenges for Commercial Bank of Ethiopia, to be able to manage the time spent by customers in the banking hall to remain competitive.

It is obvious that organizations, to enhance their customer's satisfaction by maximizing the serving rates while maintaining Quality of service, all over the world have to arrange themselves in a way that could cope up with the go-ahead changes takes place both locally and globally. So, when time goose Banks should be competitive enough and competent in their overall performances. The Banking industry plays a significant role at the mental level of information and knowledge as a medium to organize globalization and by increasing the frequency, speed and efficiency of financial activity in every field.

Commercial Bank of Ethiopia changed the software SMART in the new Core Banking system with the ambition to use the current technology with educated man power there by to improve customer satisfaction and being competitive world class Bank. And provide quality Banking services in the country going ahead with the needs and expectations of its customers. Accordingly, Commercial Bank of Ethiopia has initiated new strategies to provide solutions to its customers and enhance satisfaction. However, as the public opinion and as the researchers conducted in various customer service areas; customers are dissatisfied with the serving performance of the Bank. Thus, the purpose of this study is to examine the service provision mechanism and analyzing the Queue Management System to forward recommendations so as to increase Customer Satisfaction. Therefore, the study aims at addressing the following

1.4 Basic Research Questions

- How is serving capacity of servers?
- What are the needs of the customer while waiting on the Queue?
- What is the level of Queue interruption in the Bank?
- What are the benefits of Queue Management System for controlling purpose?
- How the customers see number of servers?
- What is the contribution of Queue Management System on teller's performance?

1.5 Objective of the Study

The General objective of this study is to identify the contribution of Queue Management System on customer satisfaction. The specific objectives of the study are:

- Identify level of interruptions in the Queue
- Identify customers need while waiting on the Queue
- Measuring customers view on number of servers
- Comparing customers satisfaction before and after Queue Management System
- Measure the average customer waiting time of the Bank
- Identifying benefits of Queue manager to management of the Bank for controlling purpose

1.6 Significance of the Study

Findings of this study had benefits to different stakeholders, that is, the Commercial Bank of Ethiopia, the government, other organizations and future researchers. Employees and customers also can benefit from the study. Therefore, this study's outcomes benefit the Bank to know and improve the customers satisfaction level there by to evaluate its customer handling mechanisms, the government will know how the newly transformed company's activities being going on in line with the targeted goals and objectives of the government, other organizations also can share experience from the case company and future researchers can use this research out come as a base to investigate more about the company's status.

1.7 Scopes and Limitations of the Study

A. Scope of the study

This in one area of study would be more fruitful it is conducted widely by including other private commercial banks and service providers which are users of Queue Management System. But, due to several constraints like financial, time difficulty in organization the study is limited to only Commercial Bank of Ethiopia Branches in Addis Ababa.

B. Limitations of the study

The study had some shortages/limitations/ because of different reasons. From those reasons the major ones are: As the company is doing its business all over the country and in international level, it is good and helpful to have all the necessary information to make the research complete. However it is difficult for the researchers to cover the whole branch that needs huge amount of money and a long period of time. Therefore the study is restricted to branches in Addis Ababa. In addition the collected data will be biased and there will be negligence by respondents.

1.8 Organizations of the study

This paper is organized in five sections or chapters. The first chapter is the introduction part of the study and it includes the background of the study, statement of the problem, objective of the study, research questions of the study, scope of the study, significance of the study, limitation of the study and finally organization of the Study. The second chapter is all about review of literature, these literatures are important and bases for the research as a whole. The third chapter includes data presentation, Chapter four, analysis and interpretation section and the last chapter, Chapter five, deals with summary, conclusion and recommendation of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATUR

An Overview of Queuing Theory and Science

Queues in service operations are often the area where customers, service providers (servers, or agents) and managers establish contact, in order to jointly create the service experience. Process-wise, queues play in services much the same role as inventories in manufacturing. But in addition, “human queues" express preferences, complain, abandon and even spread around negative impressions. Thus, customers treat the queuing experience as a window to the service providing party, through which their judgment of it is shaped for better or worse. Managers can use queues as indicators (queues are the means, not the goals) for control and improvement opportunities. Indeed, queues provide unbiased quantifiable measures (these are not abundant in services), in terms of which performance is relatively easy to monitor and goals are naturally formulated (D. Fakinos, 1982).

Queuing models constitute a natural convenient nurturing ground for the development of scientifically-based design principles and tools. However, the existing supporting (Queuing) theory has been somewhat lacking .The bulk of what is called Queuing Theory consists of research papers that formulate and analyze queuing models with a realistic flavor. Most papers are knowledge-driven, where “solutions in search of a problem" are developed. Other papers are problem-driven, but most do not go far enough in the direction of a practical solution. Only some articles develop theory that is either rooted in or actually settles a real-world problem, and scarcely few carry the work as far as validating the model or the solution. In concert with this state of affairs, not much is available of what could be called Queuing Science, or perhaps the Science of Congestion, which should supplement traditional queuing theory with empirically-based models, observations and experiments. Generally service networks such “Science" is lagging behind that in Banking communications, computers, transportation and manufacturing. Key reasons for the gap seem to be the difficulty of measuring service operations, combined with the need to incorporate human factors (which are notoriously difficult to quantify).

2.1 Queuing Theory

Queues (waiting lines) are a part of everyday life. A queue occurs when potential customers arrive at a system that offers a certain facility or service that the customers wish to use. Delays and queuing problems are most common features not only in our daily-life situations such as at a bank or postal office, at supermarket checkouts, at a ticketing office, in public transportation or in a traffic jam, when Aircraft waiting to land at or depart from an Airport form queues, but also in more technical environments, such as in manufacturing, computer networking and Banking communications. They play an essential role for business process re-engineering purposes in administrative tasks. "Queuing models provide the analyst with a powerful tool for designing and evaluating the performance of queuing systems." (D.A. Bini, G. La-touche, B. Meini 2005).

Whenever customers arrive at a service facility, some of them have to wait before they receive the desired service. It means that the customer has to wait for his/her turn, may be in a line. Customers arrive at a service facility with several queues, each with one server. The customers choose a queue of a server according to some mechanism; according to Adam (2000) e.g., shortest queue or shortest workload.
Sometimes, insufficiencies in services also occur due to an undue wait in service may be because of new employee. Delays in service jobs beyond their due time may result in losing future business opportunities. Queuing theory is the study of waiting in all these various situations. It uses queuing models to represent the various types of queuing systems that arise in practice. The models enable finding an appropriate balance between the cost of service and the amount of waiting.

2.2 The Basic Queuing Process

Queue is where customers wait before being served. According to Frederick S. Hillier and Gerald J. Lieberman (2001), as indicated in the picture below, the basic process assumed by most queuing models is, Customers requiring service are generated over time by an input source (Calling Population). These customers enter the queuing system and join a queue and these Queues are called infinite or finite, according to whether this number is infinite or finite. At certain times, a member of the queue is selected for service by some rule known as the queue discipline, the order in which members of the queue are selected for service. The required service is then performed for the customer by the service mechanism, after which the customer leaves the queuing system.

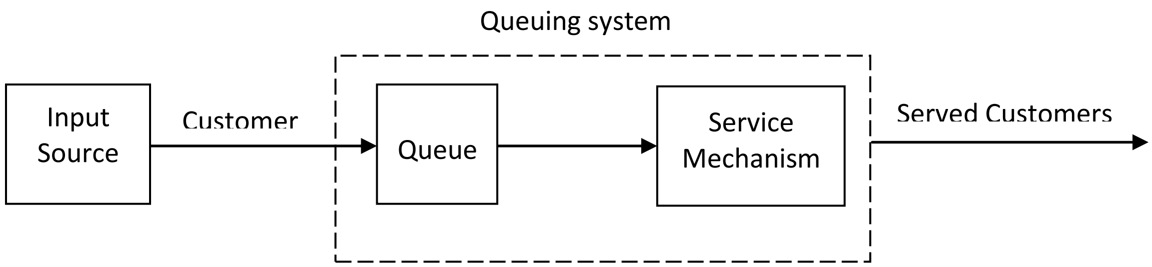


Figure2.1: The basic queuing process

The other types of queuing system are single stage queuing model with single-queue and multiple parallel servers, and single stage queuing model with multiple queues and multiple parallel servers. These two types of models are indicated in the following figures.

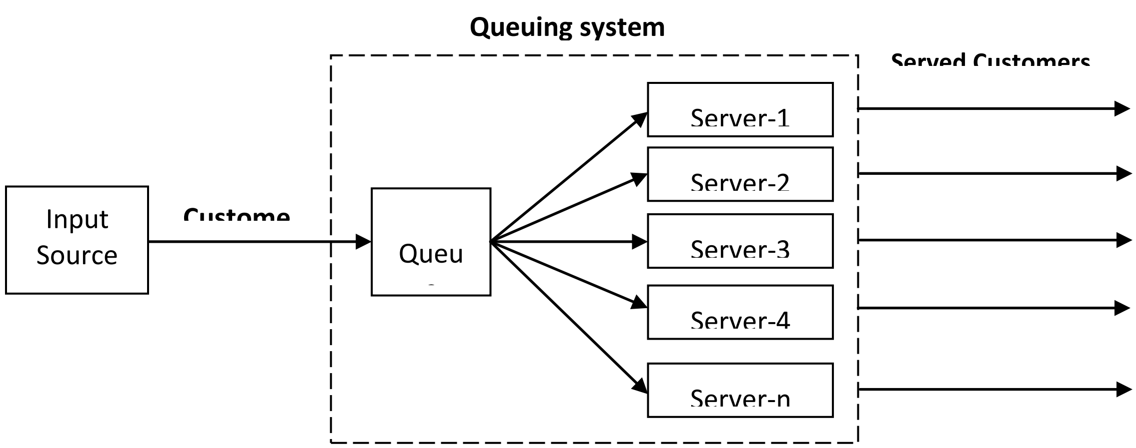


Fig. 2.2: Single Stage Queuing Model with Single-Queue and Multiple Parallel Servers

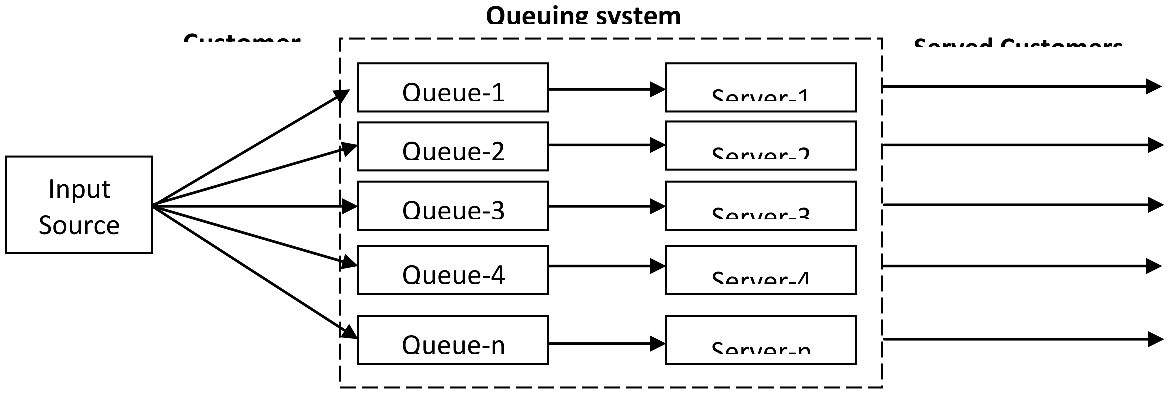


Fig.2.3: Single stage queuing model with multiple queues and multiple parallel servers

2.3 Types of queuing Model

2.3.1 Single Server Systems

Single-server queues are, perhaps, the most commonly encountered queuing situation in real life. One encounters a queue with a single server in many situations, including business (e.g. sales clerk), industry (e.g. a production line), and transport (e.g. queues that the customer can select from.) Consequently, being able to model and analyze a single server queue's behavior is a particularly useful thing to do.

2.3.2 Multi-server Systems

Multiple (identical)-servers' queue situations are frequently encountered in Banking or a customer service environment. When modeling these situations care is needed to ensure that it is a multiple servers queue, not a network of single server queues, because results may differ depending on how the queuing model behaves. One observational insight provided by comparing queuing models is that a single queue with multiple servers performs better than each server having their own queue and that a single large pool of servers performs better than two or more smaller pools, even though there are the same total number of servers in the system

2.4 Elements of the queuing System

In order to model queuing systems, we first need to be a bit more precise about what constitutes a queuing system. The three basic elements common to all queuing systems are:

Arrival Process: Any queuing system must work on something − customers, parts, patients, orders, etc. We generically term these entities. Before entities can be processed or subjected to waiting, they must first enter the system. Depending on the environment, entities can arrive smoothly or in an unpredictable fashion. They can arrive one at a time or in clumps (e.g., bus loads or batches). They can arrive independently or according to some kind of correlation.

A special arrival process, which is highly useful for modeling purposes, is the Markov arrival process. Both of these names refer to the situation where entities arrive one at a time and the times between arrivals are exponential random variables. This type of arrival process is memory less, which means that the likelihood of an arrival within the next minutes is the same no matter how long it has been since the last arrival. There are theoretical results showing that if a large population of customers makes independent decisions of when to seek service, the resulting arrival process will be Markov (Çinlar 1975). Examples where this occurs are phone calls arriving at an exchange, customers arriving at a fast food restaurant, hits on a web site, and many others. We will see below that a Markov arrival process leads to tractable models of queuing systems.

Service Process: Once entities have entered the system they must be served. The physical meaning of "service" depends on the system. Customers may go through the checkout process. Parts may go through machining. Patients may go through medical treatment. Orders may be filled. And so on. From a modeling standpoint, the operational characteristics of service matter more than the physical characteristics. Specifically, we care about whether service times are long or short, and whether they are regular or highly variable. We care about whether entities are processed in first-come-first-serve (FCFS) order or according to some kind of priority rule. We care about whether entities are serviced by a single server or by multiple servers working in parallel. These and the many other operational variations possible in service processes make queuing a very rich subject for modeling research.

Queue: The third required component of a queuing system is a queue, in which entities wait for service. The simplest case is an unlimited queue which can accommodate any number of customers. But many systems (e.g., phone exchanges, web servers, call centers), have limits on the number of entities that can be in queue at any given time. Arrivals that come when the queue is full are rejected (e.g., customers get a busy signal when trying to dial into a call center). Even if the system doesn't have a strict limit on the queue size, customers may balk at joining the queue when it is too long (e.g., cars pass up a drive through restaurant if there are too many cars already waiting). Entities may also exit the system due to impatience (e.g., customers kept waiting too long at a bank decide to leave without service) or perish ability (e.g., samples waiting for testing at a lab spoil after some time period).

2.5 Assumptions, Operating characteristics and Formulas of the Queuing Model

2.5.1 Assumptions of the queuing Model

The Assumptions of queuing model are presented below,

a) Arrivals of customers follow a Poisson process

i. The number of the customers that come to the queue of sales checkout server during time period [t, t+s) only depends on the length of the time period 's' but no relationship with the start time 't'

ii. If s is small enough, there will be at most one customer arrives in a queue of a server during time period [t, t+s)

Therefore, the number of customers that arrive in an interval [t, t+s) follows a Poisson distribution and the arrivals of them in a queue follows a Poisson process.

b) Inter arrival times of a Poisson process are exponentially distributed

Let = 1 τ the time until the next arrival from t0 to t1 i.e. (t1 - t0)

And $P(\tau_1 > t)=P_O(t)=e^{-\mu.t}$

Then $P(\tau_1 \leq t)=F_{\tau 1}(t)=1- e^{-\mu.t}$ and $f_{\tau 1}(t)=\mu e^{-\mu.t}$ for t>0

Similarly, the random variables of inter arrival times are independent of each other and each has an exponential distribution with mean 1/μ

c) Service times are exponentially distributed
d) Identical service facilities (same sales checkout service on each server)
e) No customer leaves the queue without being served
f) Infinite number of customers in queuing system of ICA (i.e. no limit for queue capacity)
g) FIFO (First In First Out) or FCFS (First Come First Serve)

Customers arriving from different flows are treated equally by placing into the queues, respecting strictly, their arriving order. Already in the queue are served in the same order they entered, this means, first customer that comes in the queue is the first one that goes out.

All customers arriving in the queuing system will be served approximately equally distributed service time and being served in an order of first come first serve, whereas customer choose a queue randomly, or choose or switch to shortest length queue. There is no limit defined for number of customers in a queue or in a system.

2.5.2 Operating characteristics of queuing Model

A general queuing system include characteristics such as

a) probability distribution of inter arrival time
b) probability distribution of service time
c) number of counters in the system
d) queue size
e) queue discipline

Efficiency indices for queuing system are

U = λ / μ = utilization rate

Wq = expected waiting time in queue

Lq = expected number of customers in queue

Where; λ = mean arrival rate and μ = mean service rate.

The time spent by the customer in the queue is of interest to the decision maker. One of the objectives of study of queuing is to find out the optimum service rate and the number of servers (counters) so that, average cost of waiting in queuing system and the cost of service are minimized.

2.5.3 Queuing Formulas for Multichannel System

M = number of channels open

λ = the arrival rate (average number of arrivals per time period)

μ = the service rate (average number served per time period) per server (channel)

The probability that there are zero people or units in the system is: $\mathrm{P}o = 1 - \frac{\lambda}{\mu}$

The average number of people or units in the system is: $\mathrm{L} = \frac{\lambda}{\mu - \lambda}$

The average time a unit spends in the waiting line and being serviced (namely, in the system) is

$$\mathrm{W} = \frac{1}{\mu - \lambda} = \mathrm{L}/\lambda$$

The average number of people or units in line waiting for service is:

$$\mathrm{Lq} = \frac{\lambda^2}{\mu(\mu - \lambda)}$$

The average time a person or unit spends in the queue waiting for service is

$$\mathrm{Wq} = \frac{\lambda}{\mu(\mu - \lambda)}$$

2.6 Effects of the Operating characteristics of queuing Model on customer Satisfaction

Customer service is the provision of service to customers before, during and after a purchase. According to Turban et al. (2002), "Customer service is a series of activities designed to enhance the level of customer satisfaction – that is, the feeling that a product or service has met the customer expectation. Service cost as a function of service level.

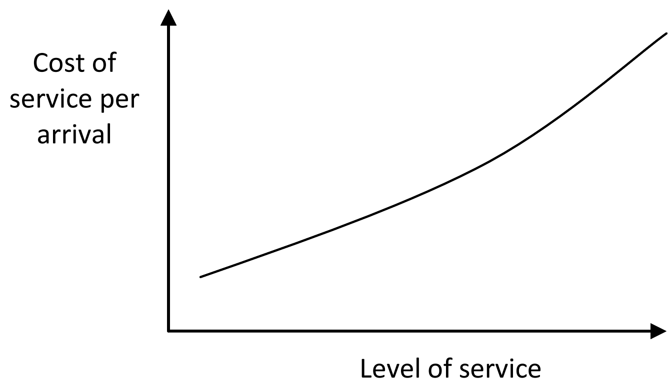


Fig: 2.4 Expected waiting time as a function of service level

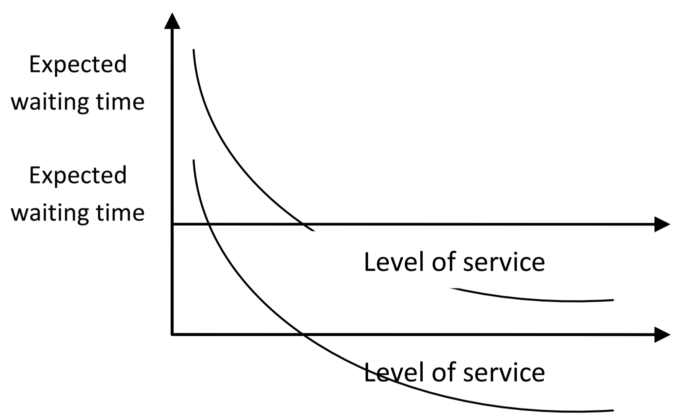
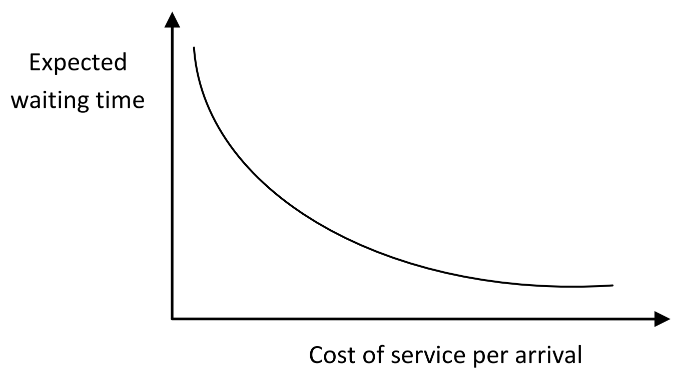


Fig: 2.5 Relationship between average delay and service cost

These two considerations create conflicting pressures on the decision maker. The objective of reducing service costs recommends a minimal level of service. On the other hand, long waiting times are undesirable, which recommends a high level of service. Therefore, it is necessary to strive for some type of compromise. To assist in finding this compromise, Figs. 2.4 and 2.5 in the above may be combined, as shown in Fig. 2.6 below. The problem is thereby reduced to selecting the point on the curve of Fig. 2.6 that gives the best balance between the average delay in being serviced and the cost of providing that service.



2.6 T*he* corresponding level of service

2.7 Effect of Queuing Analysis on Managerial Decision (Trade-Off)

The problem in every queuing situation is a trade-off decision. The manager must weigh the added cost of providing more rapid service (i.e., more checkout counters, more production staff) against the inherent cost of waiting. For example, if customers are walking away disgusted because of insufficient customer support personnel, the business could compare the cost of hiring more staff to the value of increased revenues and maintaining customer loyalty. Thus managers can use the results in probability distributions, process mapping and process improvement techniques to improve their customers' satisfaction by limiting wait time.

The relationship between service capacity and queuing cost can be expressed graphically (Figure below). Initially, the cost of waiting in line is at a maximum when the organization is at minimal service capacity. As service capacity increases, there is a reduction in the number of customers in the line and in their wait times, which decreases queuing cost. The optimal total cost is found at the intersection between the service capacity and waiting line curves.

Customer service plays an important role in an organization's ability to generate income and revenue. From that perspective, customer service should be included as part of an overall approach to systematic improvement. A customer service experience can change the entire perception a customer has of the organization and also resources utilized appropriately.

2.8 The Queuing System: Factors

The queuing system consists primarily of the waiting line(s) and the available number of servers. Here we discuss issues pertaining to waiting line characteristics and management, line structure, and service rate. Factors to consider with waiting lines include the line length, number of lines, and queue discipline.

Length In a practical sense, an infinite line is simply one that is very long in terms of the capacity of the service system. Examples of *infinite potential length* are a line of vehicles backed up for miles at a bridge crossing and customers who must form a line around the block as they wait to purchase tickets at a theater. Gas stations, loading docks, and parking lots have *limited line capacity* caused by legal restrictions or physical space characteristics. This complicates the waiting line problem not only in service system utilization and waiting line computations but also in the shape of the actual arrival distribution. The arrival denied entry into the line because of lack of space may rejoin the population for a later try or may seek service elsewhere. Either action makes an obvious difference in the finite population case.

Number of lines A single line or single file is, of course, one line only. The term multiple lines refer to the single line that form in front of two or more servers, or to single lines that cover at some central redistribution point. The disadvantage of multiple lines in a busy facility is that arrivals often shift lines if several previous services have been of short duration or if those customers currently in other lines appear to require a short service time.

2.9 Customer Satisfaction

As Solomon (2009) mentions those who buy the goods or services provided by companies are customers. In other words, a customer is a stakeholder of an organization who provides payment in exchange for the offer provided to him by the organization with aim of fulfilling a need and to maximize satisfaction. Sometimes the term customer and consumer are confusing. A customer can be a consumer, but a consumer may not necessarily be a customer. Therefore a customer is the person who does the buying of the products and the consumer is the person who ultimately consumes the product.

When a consumer/customer is contented with either the product or services it is termed satisfaction. According to kotler and Keller (2009), satisfaction can also be a person's feeling of pleasure or disappointment that results from comparing a product's perceived performance or outcome with their expectations. As a matter of fact, satisfaction could be the pleasure derived by someone from the consumption of goods or services offered by another person or group of people; or it can be the state of being happy with a situation.

Satisfaction various from person to another person because, it depends on perception. "One man's meal is another man's poison", an old age stated describing utility; thus highlighting the fact that it is sometimes very difficult to satisfy everybody or to determine satisfaction among group of individuals.

Client happiness, which is assign of customer satisfaction, is and has always been the most essential thing for any organization. Customer satisfaction is defined by an author Tse & Wilton, (1988) as the customer's response to the evaluation of the perceived discrepancy between prior expectations and the actual performance of the product or service as perceived after its consumption hence considering satisfaction as an overall post-purchase evaluation by the consumer Fornell, (1992). Customer satisfaction has also been defined by another author as the extent to which a product's perceived performance matches a buyer's expectations (Kotler et al., 2002). According to Schiffman & Karun (2004) customer satisfaction is defined as the individual's perception of the performance of the products or services in relation to his or expectations. In a nutshell, customer satisfaction could be the pleasure obtained from consuming an offer. Measuring customer satisfaction could be very difficult at times because it is an attempt to measure human feelings. The simplest way to know how customers feel, and what they want is to ask them this applied to the informal measures (Levy, 2009). According to Levy (2009) in this studies suggested three ways of measuring customer satisfaction:

1. A survey where customer feedback can be transformed into measurable quantitative data
2. Focus group or informal where discussions orchestrated by a trained moderator reveal what customers think.
3. Informal measures like reading blocs, talking directly to customers.

2.10 Characterization of Queue

A queuing system may be described as a system, where customers arrive according to an arrival process to be serviced by a service facility according to a service process. Each service facility may contain one or more servers. It is generally assumed, that each server can only service one customer at a time. If all servers are busy, the customer has to queue for service. If a server becomes free again, the next customer is picked from the queue according to the rules given by the queuing discipline. During service, the customer might run through one or more stages of service, before departing from the system. Before going into further detail, the most important aspects of queuing systems will be listed and briefly described.

• The arrival process is given by a statistical distribution and its parameters. Very often the exponential distribution is assumed resulting in the arrival pattern to be measured as the average number of arrivals per unit of time. When determining the trunk load in a PBX, the arrival pattern is often given in calls per busy hour. More general arrival processes are characterized by other pattern as well. These include batch arrivals and time dependence.

• The service process is described similar to the arrival process. Again, exponentiality is often assumed in practice due to intractability's when releasing these assumptions. In opposite to the arrival process, the service process is highly dependent on the state of the system. In case, the queuing system is empty, the service facility is idle.

• The queuing discipline refers to the way, customers are selected for service under queuing conditions. Often used and most common is the first come, first serve (FCFS) discipline. Others include last come, first serve (LCFS), random and priority service.

• The departure process is seldom used to describe a queuing system, as it can be seen as a result of queuing discipline, arrival and service process. Under certain conditions, arrival and departure process follow the same statistical distribution. This has become a very important fact in queuing network modeling.

• The system capacity introduces a natural boundary in queuing systems. In life systems, there are only limited number of resources such as trunks in a PBX, computer memory or network buffers. In queuing networks, nodes with finite system capacities may block customers from the previous node, when the node's capacity limit has been reached.

• The number of servers refers to the number of parallel nodes, which can service customers simultaneously. In telephone systems servers might describe trunks, tone detectors, tone generators and time slots.

• The number and structure of service stages, a customer might have to visit before departing the system. In a computer system, a job might have to visit the CPU twice and the I/O processor once during a single service. In practice, there exist a lot of situations, which can be modeled by complex queuing systems with service stages or simple computer networks.

2.11Queuing System Development

Waiting in line or queue causes inconvenience to customers and economic costs to individuals and organizations. Hospitals, airline companies, banks, manufacturing firms etc., try to minimize the cost involved in waiting, and the cost of providing service to their customers. Therefore, speed of service is very important and increasingly becoming a competitive parameter (Katz et al., 1991). Many studies have shown the negative effect of queues on consumers (Katz et al., 1991; Taylor, 1994; Hui and Tse, 1996). It is very common for customers to overestimate the time which they spend for waiting (Hornik, 1984; Katz et al., 1991). As the perceived time of waiting increases, customers get dissatisfaction (Katz et al., 1991).

First, in today's fast moving life time has become more precious and valuable commodity especially in developed countries where the standards of living are very high. So as a result people are less willing to wait for services. Second, this is a growing realization by organizations to make their customer satisfied and also to retain them to get business in today's competitive environment. Finally, advances in technology such as computers, internet etc., have provided firms with the ability to provide faster services. Addressing the problems of queuing involves a trade-off between the costs of customers waiting time and the cost of providing faster service. Katz et al. (1991) argued that we can control service waits by two techniques: the first one is operations management and second one is perceptions management. The operation management deals with the management of how customers (students), queues and servers can be coordinated and cooperative towards the goal of providing effective service at the least cost. Most of the firms have tried the obvious approach to the problem, which is managing the actual wait time for the services through operations management, like, modifying service delivery systems (Shostack, 1985), conducting maintenance work at offices at night, or differential pricing to shift demand, (Maister, 1985; Taylor, 1994, 1995). How-ever, the frequency of queues attests to the limits of operations management. Davis and Vollman (1990) say that the amount of time customers must spend waiting for services can significantly influence their satisfaction. Furthermore, Taylor, (1994) has demonstrated that customer satisfaction is not only affected by waiting time but also by customer expectations towards services or attribution of the causes for the waiting. As a result, one of the issues in queue management is not only the actual amount of time the customer has to wait for services, but also the perception of the customer's to wait (Davis and Heineke, 1994).

There are two ways to increase customers' satisfaction with regard to waiting time: by decreasing actual waiting time, and through enhancing customer's waiting experience. If the organizations cannot control the actual duration of the waiting, then it might consider how it manipulate the perceived wait time. As Taylor et al. (1994) have observed that the perceived waiting time is usually different from the actual waiting time. It means that understanding the factors that affect the perceptions of waiting, and their subsequent have effect on consumer behavior, provides valuable clues to strategies makers for marketing communications. Apart from operations management, that is making changes to reduce the actual waiting time, studies conducted previously on waiting and its impacts on customer satisfaction have focused on customer perceptions of the waiting and how this will be affected by the factors like, filled wait time which is providing distractions or activities (Taylor, 1994), services provider control that is can the firm be blamed for the delay (Tom and Lucey,1995; Taylor,1994; Baker and Cameron 1996), the duration to wait or queuing information which is related to the providing feedback on how long the delay is expected (Hui and Tse, 1996), the impacts of lighting, color, music and temperature (Baker and Cameron, 1996) and finally attribution of the cause of waiting for services (Baker and Cameron, 1996; Taylor, 1994).

Queuing theory is basically a mathematical approach which is applied to the analysis of waiting lines within the field of operations management (Nosek and Wilson, 2001). Any system in which arrivals of customers place demand upon a finite capacity resource may be termed as a queuing system (Singh, 2007). Gorney (1981) and Bunday (1996) argue that queuing theory uses queuing or mathematical models as well as performance measures to assess and expectedly improves the flow of customers through a queuing system .A good flow of customers means that the customers queuing is minimized while a poor customers flow means customers suffer considerable queuing delays (Hall, 2006). Queuing theory can be diversely applied and has been used mainly by the service industries (Nosek and Wilson, 2001). A queuing system or waiting lines consists of six major components: the population, the arrival, queues itself queue discipline, service mechanism and departure or exit.

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

b) The queue discipline is the sequence in which customers or students are processed or served. The most common and widely used discipline is first come, first served (FCFS). Other disciplines are last come, first served (LCFS) and service in random order (SIRO). Sometimes customers may also be selected from the queue based on some order of priority (Taha, 2005).

c) The service mechanism describes how the customer is served at source. Nosek and Wilson (2001) conclude that the number of servers and the duration of the service time- both of which may vary time to time and also in a random fashion. The choices of facility structure can be determined by the number of lines and servers. The common service facility structures are: single-channel, single – phase; single-channel, multiphase; multi-channel, single phase and multi-channel, multiphase.

d) The departure or exit occurs when a customer is served. There are two possible exit scenarios that 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.

2.12 Advancement of Technology

Over the past few decades, service organizations, including retail banks, have been driven by such key trends as advancements in technology and deregulation to focus greater attention on their distribution channel strategies. Technology, in particular, has been increasingly employed in service organizations to enhance customer service quality and delivery, reduce costs and standardize core service offerings. Its greater integration in the area of service delivery has had a dramatic effect on the nature of the core offerings and made customer participation in service delivery more widely possible.

After reviewing the literature intensively, it is observed that there currently exist many studies identifying the key service quality factors in the traditional banking environment, where the interaction between employees and customers is the main communication channel.

However, there are only a few studies that have investigated attributes of technology based service delivery channels in banking. Joseph et al (1999) investigated the role that technology plays in Australian Banking based on Hemmasi et al's Importance Performance grid and revealed six factor models comprising of convenience /accuracy, feedback/complaint management, efficiency, queue management, accessibility and customization. Madu and Madu (2002) propose 15 dimensions of e-quality for virtual operations performance, features, structure, aesthetics, reliability, storage capability, serviceability, security & systems integrity, trust, responsiveness, product/service differentiation, customer and web store policies, reputation, assurance and empathy. Santos (2003) proposed two main dimension of service quality with respect to e - commerce incubative and active each consisting of five and six sub- factors respectively. Dabholkar (1996) proposes two alternative models of service quality based on attribute versus overall affect approach in service firms offering technology based self- service options. Surjadjaja et al (2003) presented three dimensions service marketing, service design and service delivery consisting of 20 determinants essential for e- service operations. Zhu et al (2002) proposes a service quality model for IT- based service options linked to the traditional service dimension as measured by SERVQUAL. Ibrahim et al (2006) in their study of electronic service quality perception, identify six composite dimensions. Zeithaml (2002) draws attention to service delivery through electronic channels but limits the scope to internet banking. Similarly, Parasuraman (2005) confines the study to the service quality of websites. There exists a significant gap in the research carried out on the service quality of technology interfaces.

Mols (2000) argued that customer acceptance of new technology based channels of service delivery in banks may bring a dramatic change in the way retail banks build and maintain close relationships with their customers. Al - Hawari et al (2005) propose 5 dimensions of automated service quality- ATM service, telephone banking service, internet banking service, price perceptions and core service. The introduction of new technology - based channels of service delivery has made customer participation more widely possible and researchers therefore need to adopt new ways to conceptualize technology interfaces service quality, taking into consideration the attributes of all electronic delivery channels.

Ostrom et al (2010) in the study express that cross - disciplinary work is critical for effective service design. They emphasize that service design involves the orchestration of clues, places, processes and interactions that together create holistic service experiences for customers. This in today's service organizations is being brought about by the use of technology interfaces. Hence, it is important to explore the effect of the technology interfaces on the service quality as more and more customers in retail banking prefer to use technology interfaces, in combination, for interaction. A number of marketing scholars identify ATM, internet and telephone banking as the principal automated delivery channels for retail banking. However, call centers and queue systems used by the banks t o enhance the quality of service provided to the banks have been largely overlooked. Hence, this paper aims to identify various dimensions affecting the service quality across various technology interfaces and empirically test the influence of the various dimensions thereby developing a scale for measuring the Technology Interface Service Quality (TISQ) in the context of the retail banking sector.

2.13 Conceptual Framework

Structural changes within the financial sector tend to place increased pressure for improvements in communication between the service provider and the customer. In the past, the process of long- term relationship building has occurred primarily through face -to -face contact with staff. Zineldin (2000) further argued that while the need for relationship development is important it is not complete without the use of technology. Kapoulas et al. (2002) refer to this phenomenon as "technologicalship" marketing, which they regard as a symbiosis of technology and marketing which tends to enhance the relationship - building process. The technology interface service quality (TISQ) model proposed in this paper encompasses the following technological interfaces that may shape customer perceptions of service quality.

ATM

ATM, the most frequently used electronic distribution channel, allows customers to perform their main banking transactions, such as deposits and withdrawals, 24 hours a day.

Telephone banking

Telephone banking provides interactive voice response services such as account balances, instruction to issue bank cheques, account payments etc.

Internet banking

Internet banking channel can realize significant savings in the area of customer acquisition. Benchmarks suggest that the all in cost to acquire new accounts through the web can be between 15 and 45 percent lower than through the branch or call center. Moreover, internet banking is well suited to offer assistance (e.g., live online chat pop-ups when customers spend too much time on one page). These actions reduce abandonment rates for sales transactions significantly. Hence, e- commerce and the internet have been regarded as a potentially transformational force in nearly every industry and particularly in the financial services sector (Achrol and Kotler, 1999).

2.14 Communication and Call/Contact Center services

Mukherjee and Nath (2003) argue that to build and maintain a relationship with customers that lacks the physical presence of bank personnel "trust" must be central in "fostering customer loyalty". It could thus be argued that central to building and maintaining trust is communication, bi - directional communication between the customer and the service provider (bank). This is facilitated by the call center services. Moreover when self service channel is not designed properly, it is known to lead to customer frustration, decreased customer loyalty, or even defection. The contact center is the first to hear about these frustrations as customers call the service center to address their issues. With intelligent recording technologies, contact centers can record customer complaints about self service channels and provide valuable feedback and insight to other departments that are developing these avenues of service thereby enhancing service quality.

Queue Systems or "Q-matic systems"

Queue systems or "Q-matic systems" have been very helpful in bringing order to otherwise chaotic queues in the branches (Yavas et al., 1997). The banks try to explore the advanced versions of Q -matic systems to market their services where customers look at TV screens to keep track of their number in the queue while still getting information about services.

In the banking sector, customers tend to use the different service delivery channels in a complementary way. Customers use different service delivery systems depending on their assessment of each channel and how it contributes to the "overall service offering". Hence service satisfaction will not merely be based on isolated service encounters and experiences but rather on the overall feelings of satisfaction. Consequently, developing a relationship with the customer can be achieved from any one of these media and more likely, a combination of them (Lang & Colgate, 2003). Dabholkar 1996 suggests that customer evaluation of technology - based service options and their intention to use a particular option are directly affected by their perception toward the attributes associated with that option. Every electronic delivery channel has its own attributes that differ from the others, so it is important to measure the quality of e ach channel separately to get a more accurate picture of customer perceptions of technology interface service quality. The quality of every technology based delivery channel will be important to form the customers' overall perception of TISQ and each delivery channel has been considered as a factor in the proposed TISQ model.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Research design and sampling technique

The research design of this study is a descriptive research design and also a survey method was used to assess of assessing the contribution of Queue manager on customer satisfaction in Commercial Bank of Ethiopia Branches in Addis Ababa. The populations of the study are customers of the Bank which are users of Queue Management System.

3.2 Method of Data Collection and sources

3.2.1 Data sources

The data was collected from primary and secondary sources using self administered questioners, interviews, observations and analysis of earlier documents of the Bank, Internet, and published journals.

3.2.2 Data Collection

The researcher was used the survey research methods because the respondents are more than 600 individuals and this kind of research is mainly associated with descriptive and causal research situations.

The survey method, also known as the questionnaire method, was used in gathering the data. Surveys are the most common form of research method for collection of primary data. It helps for collecting large amounts of data using question and answer format.

The survey research methods are most open and asking about what respondents think and feel (Common wealth of Learning, 2000). One of its purpose is to describe, e.g., to count the frequency of some event or to assess the distribution of some variables such as proportion of the population of different age groups, sex, religion, castes and languages, knowledge, attitude and adoption of practices about particular issues, and other information of similar nature about the population(Commonwealth of Leering, 2000).

A self-administered questionnaire, or the type of questionnaire that is usually completed by respondents (Saunders et al, 2003), will be constructed to gather the needed data. This questionnaire have two sections: the first part intended to acquire the demographic profile of the respondents, and the other section comprised of a set of attitude statements.

First, pilot test on the questionnaire were conducted on 45 customers to check its reliability. Then the primary data which is relevant to the study were collected from 650 customers through questionnaire. And also side by side relevant primary data will be collected from the managements and teller.

3.3 Method of Data Analysis

After the relevant data are collected, it was analyzed using descriptive statistics and simple percentage method using tables. The collected data was analyzed with the help of SPSS.

After analyzing the data and properly interpreting them findings will be summarized. Then based on the findings, the appropriate conclusion will be drawn and the possible recommendations are rewarded.

3.4 Ethical Consideration

A policy of secrecy of the employees and managers was adhered as various confidential data might be accessed by the researcher. Moreover, a statement confirming the prohibition of including any identity details or personal reference of the respondents in the questionnaire forms were included. This was to avoid any biased response or forged data provided by the employees or managers.

Request for names and employees identification number or position was prohibited at any part of the data collection so that participants were certain that he/she cannot be traced by the managers.

This would offer them enough room to express their ideas and point out their response freely and safely.

Data gathered in process of the study was kept confidential and would not be used for any personnel interest and the whole process of the study was controlled to be within acceptable professional ethics.

CHAPTER FOUR

4.1 DATA PRESENTATION AND ANALYSIS OF FINDINGS

This chapter includes the general description of data gathered from customers of Commercial Bank of Ethiopia, which includes general description of respondents and descriptive statistics of research variables. Data was mainly collected from Ten (10) branches of the Bank namely Selassie, Aratkillo, Addis Ababa, Finfine, Megenagna, Temenjayaj, Nifasilk, Andinet, CherkosKebele, and AradaGiorgis. 65 Questioners were distributed to each branch.

This study was undertaken in Commercial Bank of Ethiopia branches in Addis Ababa in which has one or two waiting line in a form of calling to the free server. Customers are served on a first-come, first-served as a teller called them when they become free using screen display queue management system. The data has been collected from each server's report for five randomly selected days on the month of September and observation also used. Although the Bank's have counters or windows each of them have an individual teller to deal with the customers in a queue, it is possible that some of the windows are idle while the others are occupied.

4.1.1 General Information about the Respondents

As indicated in Table 4.1 below, a total of 650 questionnaires were distributed. Out of distributed questionnaires, 522 (87) were filled and returned to the researcher. The data were collected from customers and interviews were conducted with Branch Managers and Observation was used for Servers.

Table 4.1 General information about respondents

Item	Frequency	Percentage
Sex		
Male	308	59
Female	214	41
Total	522	100
Educational Status		
Certificate or Less	58	11.1
Diploma	292	55.9
Degree	131	25.1
Masters and Above	41	7.9
Total	522	100
Customer's R/ship with the Bank		
2 years and Below	73	14
2-5 years	198	37.9
Above 5 years	251	48.1
Total	522	100

Source; data from respondents, 2014

The questionnaires were distributed to customers who came to the 10 Braches those applying Queue Management System. As it can be seen in Table 4.1 item I below, out of 522 respondents 308 (59%) are Male and 214 (41%) are Female. Concerning item II, out of the respondents 58 (11.1%) are certificate and less, 292 (55.9%) are Diploma, 131(25.1%) are First Degree and the rest 41 (7.9%) are Masters and Above. Regarding item III about the duration of customers, out of 522 respondents 73 (14%) of them have less than 2 years with Bank, 198 (37.9) of respondents are within the range of 2-5 years, 251 (48.1) are above 5 years.

Table 4.1.2 Respondents View on Existence of customer waiting in Queue

	Frequency	Percent	Valid Percent	Cumulative Percent
No	10	1.9	1.9	1.9
Yes	512	98.1	98.1	100.0
Total	522	100.0	100.0	

Source; data from respondents, 2014

As it can be seen in table 4.2 regarding existence of customer on the Queue all most all 512 (981%) the respondents are believe there is a Queue when they arrived to get service.

And it shows that almost all customers are agreed that there are customer feels the Branch whole whenever they arrived for service. So, the Bank has to take measures to minimize the trend

Table 4.1.3 Respondents View on Number of customers in the Queue

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10	10	1.9	1.9	1.9
	11-20	189	36.2	36.2	38.1
	21-30	193	37.0	37.0	75.1
	31-40	72	13.8	13.8	88.9
	more than 40	58	11.1	11.1	100.0
	Total	522	100.0	100.0	

Source; data from respondents, 2014

As it can be seen in table 4.3 above respondents view on number of customers in the Queue out of the total 522 respondents 10(1.9%) are faced below 10 customers when they are entered in the Queue, 189 (36.2) respondents can see 11-20 in the Queue when they arrived in the Branch to get served, 193 (37%) of the respondents faced more in the range between 21-30 customers who are waiting their turn for service, 72 (13.8%) of the respondents waited for service by looking more than 31 customer and less than 40, the rest 58 (11.1%) are waited more than 41 customer to served.

Here, 73.2% of the respondents waited 10-30 in average for service. From the result we can conclude that the Bank should minimize customers waiting time to increase their satisfaction.

Table 4.1.4 Respondents view on Interruption of Queue

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	198	37.9	37.9	37.9
	Yes	324	62.1	62.1	100.0
	Total	522	100.0	100.0	

Source; data from respondents, 2014

As we can see from Table 4.4 from the total 522 respondents 324 (62.1%) are expresses their feeling towards Queue interruption or there are customers without waiting their turn, but 198 (37.9) customers are not experienced any Queue interruption and they believed with their own tern.

Here, the Bank should avoid Queue interruption as much as possible because at any the first customer should served first.

Table 4.1.5 Respondents View on number of servers

	Frequency	Percent	Valid Percent	Cumulative Percent
More than enough	21	4.0	4.0	4.0
Enough	186	35.6	35.6	39.7
Not enough	203	38.9	38.9	78.5
Very few	112	21.5	21.5	100.0
Total	522	100.0	100.0	

Source; data from respondents, 2014

As we can see from Tale 4.5 out of the total respondents 21 (4%) are measured the number of servers exists in the Branches are more than enough to provide service, 186 (35.6%) of the customers believes the existing servers are enough to serve the branches customer, 203 (38.9) of the respondents are measured the servers are not enough for service, 112 (21.5%) are believes the servers in those branches are very view to serve the Banks customer.

More than 60% of the respondents argued that the number of servers is not enough for provide Quality service so, the Bank based on its customers complain should increase number of servers.

Table 4.1.6 Expectation of customer while in Queue

	Frequency	Percent	Valid Percent	Cumulative Percent
Comfortable waiting environment	154	29.5	29.5	29.5
Indication of waiting time	71	13.6	13.6	43.1
Entertainment while waiting	126	24.1	24.1	67.2
Fairness of queuing system	171	32.8	32.8	100.0
Total	522	100.0	100.0	

Source; data from respondents, 2014

As we can see from Table 4.6 out of the total 522 respondents about their need while waiting on the Queue, 154 (29.5%) of the respondents wants comfortable waiting environment while waiting their turn, 71 (13.6%) of the respondents wants indication of waiting time while waiting in the Queue, 126 (24.1%) of the respondents wants to see entertaining things while waiting, 171 (32.8) of the respondents prefers to see fairness of Queuing System.

It easy to provide such needs for customers so, the Bank should fulfill the above mentioned products for its customers. The cost of providing those materials is much lower than the cost of losing the customers.

4.1.7 Respondents complain and Comparisons of service quality before and after implementation of Queue management system

Here, the researcher tries to compare and contrast the service Quality before the implementation of Queue management system and after the Bank introduces the System depending on the respondents view

4.7 Respondents comparison before and after QMS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	34	6.5	6.6	6.6
	Rarely	230	44.1	44.5	51.1
	Mostly	160	30.7	30.9	82.0
	Always	93	17.8	18.0	100.0
	Total	517	99.0	100.0	
Missing	System	5	1.0		
Total		522	100.0		

Source; respondents survey, 2014

As we can see from Table 4.7 regarding customers complain over slow service before the Bank starts to apply Queue Management System out of the total respondents 34 (6.5%) are never complained over slow service before Queue Management System, 230 (44.1%) Of the respondents are rarely complained over slow service, 160(30.1) of the respondents are complained in most of the time regarding slow service before Queue Management System, the remaining 93(17.8) of the respondents are always complained over slow service,

Table 4.8Respondents comparison before and after the System

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	70	13.4	13.4	13.4	13.4
	245	46.9	46.9	60.3	60.3
	165	31.6	31.6	92.0	92.0
	42	8.0	8.0	100.0	100.0
	522	100.0	100.0	100.0	

Source; data from respondents, 2014

As we can see from Table 4.8, regarding customer complain over slow service after Queue Management System out of the total respondents 70 (13.4%) are never complained about slow service given by the Bank, 245 (46.9%) are rarely complained regarding slow service, 165 (31.6%) of the respondents Mostly they complained over slow services, 42 (8%) of the respondents are always complaining over slow service they gained from the Bank.

When we the trends regarding customer complain it is relatively the same percent of complainers registered. So, only the system by itself can't avoid all problems the Bank had for service delivery. It shows the Bank has to work more to minimize customer complain and dissatisfactions.

Table 4.1.9, Respondents Comparison of service delivery over with and without Queue Management System

	Frequency	Percent	Valid Percent	Cumulative Percent
Very dissatisfactory	57	10.9	10.9	10.9
Dissatisfactory	186	35.6	35.6	46.6
Satisfactory	207	39.7	39.7	86.2
Very satisfactory	72	13.8	13.8	100.0
Total	522	100.0	100.0	

Source; data from respondents, 2014

As we can see from Table 4.9, regarding respondents view on the Banks service delivery using Queue Management System and without System out of the total respondents 57 (10.9%) of the respondents are very dissatisfied over the service Of the Bank using Queue Management System, 186 (35.6%) of the respondents are dissatisfied over the service with QMS, 207 (39.7%) of the respondents are satisfied and prefers to use QMS, 72 (13.8%) of the respondents are very satisfied by the Bank for the Queue Management System.

4.1.10, Respondents view over Fellow Customer Complaint Experience before Queue Management System

	Frequency	Percent	Valid Percent	Cumulative Percent
Never	40	7.7	7.7	7.7
Rarely	192	36.8	53.4	61.1
Mostly	279	53.4	36.8	97.9
Always	11	2.1	2.1	100.0
Total	522	100.0	100.0	

Source; data from respondents, 2014

As we can see from Table 4.10 regarding respondents view over fellow customer complaining out of the total 522 respondents 40 (7.7%) are never seen any customer while waiting for their turn, 192 (36.8%) of the respondents are rarely seen fellow customer complain when they waited for service, 279 (53.4) of the respondents are visualized fellow customer complain at most of the time regarding the service delivery of the Bank before Queue Management System, 11 (2.1%) of the respondents always sees fellow customer complained over the service of Bank.

Table 4.1.11, Respondents view on fellow customer complaint experience after Queue Management System

	Frequency	Percent	Valid Percent	Cumulative Percent
Never	89	17.0	17.0	17.0
Rarely	180	34.5	47.5	64.6
Mostly	248	47.5	34.5	99.0
Always	5	1.0	1.0	100.0
Total	522	100.0	100.0	

Source; data from respondents, 2014

As we can see from Table 4.11 regarding respondents view on fellow customer complain over the service of the Bank after implementation of Queue Management System out of the total respondents 89 (17%) are never listened complains regarding the service given by the Bank, 180 (34.5%) of the respondents are rarely seen fellow customer complain over the service, 248 (47.5%) of the respondents are mostly watching fellow customer complain over slow service of the Bank, 5 (1%) of the respondents are always see's fellow customer complain.

Table 4.1.12 Respondents view on Expansion of Queue Management System in other Branches.

	Frequency	Percent	Valid Percent	Cumulative Percent
No	318	60.9	60.9	60.9
Yes	204	39.1	39.1	100.0
Total	522	100.0	100.0	

Source; data from respondents, 2014

As we can see from the above table 4.12 out of the total respondents 204 (39.1) are happy to see the Queue Management System expanded in to other branches of the Bank, 318 (60.9) of the respondents are not wants to see the System in other Branch.

The respondents are happy to see the Queue Management System in other Branches but, when we the satisfaction level it is almost the same before and after implementation of the System. So has to do its cost benefit analysis before any further decision.

4.2 Waiting Time

Waiting lines results because of customers do not arrive at a constant, evenly paced rate, nor are they all served in an equal amount of time. Customers arrive at random times, and the time required to serve them individually is not the same. Thus, a waiting line is continually increasing and decreasing in length (and is sometimes empty), and it approaches an average rate of customer arrivals and an average time to serve the customer in the long run.

Table 4.1.13 Average waiting time to get services

	Frequency	Percent	Valid Percent	Cumulative Percent
less than 10 minutes	153	29.3	29.3	29.3
10-20 minutes	179	34.3	34.3	63.6
20 to 30 minutes	148	28.4	28.4	92.0
more than 30 minutes	42	8.0	8.0	100.0
Total	522	100.0	100.0	

Source; data from respondents, 2014

It is important to analyze this queuing system because excessive waiting times can make customers angry enough to close their accounts. Waiting a long time serves only to increase their dissatisfaction. As can be seen from the above table majority of the respondents; for instance 70.7% (34.3+28.4+8) said they wait more than 10 minutes to get service. This shows thus in the Bank customers are waiting too long to get the services. When we see graphically

4.3 Serving Capacity

Once customers have entered the system they must be served. The physical meaning of service depends on the system's serving capacity. Customers those who go through the Queuing process need to be served as fast as possible. The below table shows what do customers feel towards the serving capacity of the Bank.

Table 4.1.14 Respondents view on the serving capacity of the servers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very satisfactory	21	4.0	4.0	4.0
	Satisfactory	186	35.6	35.6	39.7
	Dissatisfactory	203	38.9	38.9	78.5
	Very dissatisfactory	112	21.5	21.5	100.0
	Total	522	100.0	100.0	

Source; data from respondents, 2014

Out of the total 522 respondents 203(38.9% are Dissatisfied with the number of servers in those Branches and argued that the Branches should increase the number of servers, 122(21.5%) are Very Dissatisfied with the existing number of servers. And, the rest of the respondents are responded there is number of servers and satisfied in relation with number of servers in those Branches.

4.4 Interview Question Analysis

What are the benefits of Queue management System for the Bank?

Most of the Branch managers believe that the system contributes a lot in fair distribution of customers. The other benefits are most of the customer don't want to see other customer while served in the window.

Do you think the system could expand to other Branch?

Most of the management thinks the System minimizes the concentration of customers in window that exists in front of the gate way. And the system also makes the controlling purpose because the system reports number transaction the tellers serve in a given date.

So, that the manager easily communicates with the employees about their performance with those reasons the respondents happy to see the System in other Branch.

The management also thinks the System minimizes collection of customers in single window that exists in front of the gate way, but some tellers had negligence's it happens because of customers comes for service if and only if the front maker calls the Queue number.

The management responds the Bank should differentiate its customers based on their contribution in deposit as well as Foreign currency Generating. Because such prominent customers are not willing to enter in the Queue and this will easily dissatisfy the customer

What is the contribution of Queue Management System on teller's performance?

The Queue Management System by itself contributes nothing in teller's performance but with efforts of servers it can be a base for teller's competition. And also, the system designed for proving good environment for customers no for increasing teller's performance.

4.5 Mathematical Examples

The analysis of this study is based on some assumptions and queuing model parameters with their interpretations.

Assumptions:

- Arrivals are described by Poisson process
- service times are exponentially distributed
- The experience and serving ability of the teller are assumed to be "equal"

Parameters

It is used to approximate a real queuing situation or system, so the queuing behavior can be analyzed mathematically which in turn allow a number of useful measures to be determined which are important as issues or problems caused by queuing situations are often related to customer dissatisfaction with the services or may be a root causes of economic losses in a business, such measures include:

- The average number of customers arrival rate
- The average number of service rate
- The average number people in the queue, or the system,
- The average time spent in the queue, or the system,
- The statistical distribution of those numbers or times,
- The probability the queue is full, or empty, and
- The probability of finding the system in a particular state.

In queuing theory, the multi-server queuing model describes a system where arrivals form a single queue and are governed by a Poisson process.

Further decisions about waiting lines and the management of waiting lines are based on the average values for customer arrivals and service times. Different queuing formulas for the operating characteristics of the multiple-server model were used and calculated as indicated below. Table 4.15 below illustrates the current serving capacity of the servers of Bank. Then the analysis is done for the model involving one queue and 12 parallel servers.

Table 4.1.15 Daily transaction results of arrival and service rates of the Branch

S. NO	TIME	NO.OF ARRIVALS	CAN SERVE DURING 30 MIN/SERVER	CAN SERVE DURING 30 MIN /12 SERVER 7 (TOTAL)
1	2:00	22	0	0
2	2:30	28	3.2	38.4
3	3:00	39	3.8	45.6
4	3:30	30	3	36
5	4:00	40	4.1	49.2
6	4:30	35	2.5	30
7	5:00	30	2.8	33.6
8	5:30	44	3.8	45.6
9	6:00	33	0	0
10	6:30	48	0	0
11	7:00	48	0	0
12	7:30	34	3.3	39.6
13	8:00	28	3.8	45.6
14	8:30	30	2.7	32.4
15	9:00	22	4	48
16	9:30	23	4.5	54
17	10:00	28	4.8	57.6
18	10:30	36	3.6	43.2
19	11:00	38	4.3	51.6
20	11:30	28	4.8	57.6
	12:00	664	59	708
Lambda(λ)=		service rate per hr =		service rate per hr is 84 hrs per 12 servers=
Arrival Time		Total service Time		7 x 12= 84
Total Time		Total Time		
78		7		

As shown in the above table

λ = the arrival rate (average number of arrivals per hour) i.e. mean arrival rate; is 78

μ = the service rate (average number served per hour) i.e. mean service rate; is 7

c=Number of servers =12; and that $\lambda < c\mu$ (78 < 84); this means customers are served at a faster rate than they arrive.

4.4.1 Queuing Analysis

Based on these values; we can state now the following formulas for the operating characteristics of a multi-server model or we can find the expected length of queue by using empirical data. Since decisions about waiting lines and the management of waiting lines are based on these averages for customer arrivals and service times.

Thus; with the parameters and corresponding characteristics in queuing model; the fundamental task of a queuing analysis are computed as follows:

1st given the following information as input:

- Arrival rate
- Service time

2nd Provide as output information concerning:

- Customers in system (L)
- Customers waiting in the queue (Lq)
- System time (W) and
- waiting time in the queue (Wq)

In our case study from above table, given c= number of servers = 12, λ arrival rate = 78 customers per hour; μ serving rate = 7 customers per server per hour and cμ (12) (10.83) = 84. (Service rate for 12 servers)

- The utilization of the servers is given by: $U = \lambda/c\mu = 78/84 = 0.98 = 98\%$
- The probability that there are zero people or units in the system is

$$P_0 = \frac{1}{[\sum_{n=0}^{n=c-1} 1/n!\,(\lambda/\mu)^n] + 1/c!\,(\lambda/\mu)^c.[(c\mu)/(c\mu-\lambda)]}$$

$$P_0 = \frac{1}{[1/0!(\lambda/\mu)^0{}_+1/1!(\lambda/\mu)^1+1/2!(\lambda/\mu)^2{}_+1/3!(\lambda/\mu)^3+1/4!(\lambda/\mu)^4+1/5!(\lambda/\mu)^5+1/6!(\lambda/\mu)^6+1/7!(\lambda/\mu)^7+ 1/!8(\lambda/\mu)^8+1/9!(\lambda/\mu)^9+1/10!(\lambda/\mu)^{10}+1/11!(\lambda/\mu)^{11}+1/12!(\lambda/\mu)^{12}.[(c\mu)/(c\mu-\lambda)]}$$

$$P_0 = \frac{1}{[\sum_{n=0}^{n=12-1} 1/11!(78/7)^{11}]+1/12!(78/7)^{12}.[12*7)/(12*7-74]}$$

$= \underline{0.02\ (2\%)}$ Probability that no customer is in the Branch

- The average number of people or units in the system is given by:

$$L = \frac{[\lambda.\mu\,(\lambda/\mu)^c\,p_0]}{(C-1)!\,(c\,\mu-\lambda)^2} + \lambda/\mu$$

$$L = \frac{(74)(7)\,(74/7)^{12}(0.02)}{} + 74/7$$

$(12\text{-}1)!\ 12(7) - 74)^2$

$L = \underline{14.45}$ customers on average are in the branch

- The average time a unit spends in the waiting line and being serviced (namely, in the system) is:

$W = L/\lambda$

$W = 14.45/74$

W = 0.19 hr. Average time per customer in the system to get served

w $= \underline{11.67}$ minute **,** this is average time in the branch per customer

4.4.2 Queuing Model Mathematical Results Interpretation

Efficiency indices for queuing system are: the expected waiting time in queue (Wq) and the expected number of customers in queue (Lq) with the given λ = mean arrival rate and µ = mean service rate. Thus the time spent by the customer in the queue is of interest to the decision maker. One of the objectives of study of queuing is to find out the optimum service rate and the number of servers (counters) so that, average cost of waiting in queuing system and the cost of service are minimized. The results of queuing analysis, referred to as operating characteristics, are probabilistic and those operating statistics (such as the average time a person must wait in line to be served) are used by managers of the operation containing the queue to make decisions.

It is important to analyze this queuing system because excessive waiting times can make customers angry enough to close accounts. Waiting a long time serves only to increase their impatience.

In our case study, on a day, customers arrive at an average of 78 customers per hour, and an average of 84 customers can be served per hour by tellers or by the system.

If a customer arrives and at least one server is available, then the customer is immediately dispatched to that server. It is assumed that all servers are identical; thus, if more than one server is available, it makes no difference which server is chosen for the customer. If all servers are busy, a queue begins to form. As soon as one server becomes free, a customer is dispatched from the queue using the dispatching discipline in force which is first come –first served in our case and in most cases. The performance of the branch service on a day is almost in a full capacity. We can see that the probability for servers to be busy is 0.98, i.e 98%. The average number of customers waiting in a queue is Lq = 14.45 customers per 12 server. The waiting time in a queue per server is Wq = 11.67 min which looks like long.

4.6 Effects on Managerial Decision

The multi-server queuing analysis can be used to estimate the average waiting time, queue lengths, number of servers and service rates. These queuing models approximate the performance of queuing systems with multiple queues to recognize the optimal number of required resources to be used. Operations managers thus, must recognize the trade-off that takes place between two costs: the cost of providing good service and the cost of customer or machine waiting time. Managers want queues that are short enough so that customers do not become unhappy and either leaves without making transactions or opening accounts. However, managers may be willing to allow some waiting if it is balanced by a significant savings in service costs. One means of evaluating a service facility is to look at total expected cost. Total cost is the sum of expected service costs plus expected waiting costs (see also Table 4.11 in chapter two above the optimal decision level). The objective of reducing service costs recommends a minimal level of service. On the other hand, long waiting times are undesirable, which recommends a high level of service. Therefore, it is necessary to strive for some type of compromise that is called the optimal level at which the aggregate cost is minimum.

Now, let us see the operating characteristics of our case study as they relate to management decisions:

The arrival rate of 74 customers per hour means that, on average, a customer arrives every 0.81 minutes (i.e., 1/74 x 60 minutes). This indicates that the Branch is very much busy.

Given customers' expectations, we believe that it is unacceptable for a customer to wait 11.67 minutes in the queuing system.

The management should decide on how to compute, unless it is difficult to retain its customer. From our observation the branch has space to increase its window or servers so they should identify its prominent customers and differentiate the counters or windows based on the service given.

The branch become too busy at the end of each month because of salary payment, so the management should discuss with the organizations that used the branch for salary payment and try to change the dates of payment to make the service appropriate. The Branch also should increase the serving potential of its tellers though training or by providing enough counting machine and so on.

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. SUMMARY

The purpose of this study was to measure the contribution of Queue Management System on customer satisfaction in Commercial Bank of Ethiopia Branches in Addis Ababa. And, to analyze the researcher was used the survey research methods because the respondents are more than 600 individuals and this kind of research is mainly associated with descriptive and causal research situations.

A survey of 650 questioner was distribute to customers of 10 branches which are using Queue management System in Addis Ababa out these Questioners 522 or 80% respondents properly filed and returned to the researcher. From the total respondents 308 (59%) are males and 214(41%) are females and more than 89% of the respondents has got diploma and above. 86% of the respondents are customers of the bank more than two years.

From the total respondents 98.1% or all most all respondents faces a Queue when they enter in to those Branches hall. And 62.1% of the respondents express their dissatisfactions towards Queue interruption. Here, the customers are saddened because of server's behavior towards serving customers without their turn.

Out of the total respondents 60.4% (38.9% + 21.5%) of the respondents believes number servers are not enough to serve the existing customers. Regarding, customers need while in the Queue 25.9% of the respondent's needs comfortable waiting environment, 13.6% of the respondents needs indication of waiting time, 24.1% of the respondents needs entertaining things while waiting in the Queue and 32.8% of the respondents needs fairness of Queuing System.

When we see respondents view on the serving capacity of the servers 60.4% of respondents are no satisfied on serving capacity of server's special speeds of the tellers.

Queuing model can be analyzed based on mathematically and data was taken from Selassie branch and the average waiting time of the branch is 11.67 minutes, so it is somewhat long regarding the sensitivity of the banking industry.

Finally when we see respondents view on Expansion of Queue Management System in other branches 60.9 % respondents are happy to see the system in other branch.

5.2. CONCLUSION

Waiting in lines is a part of everyday life in many aspects. Waiting in lines may be due to overfull, overfilling or due to overcrowding. Any time there is more customer demand for a service than can be provided, a waiting line forms. Waiting line models are important to a business because they directly affect customer service perception and the costs of providing service.

All most all or 98.1% of the respondents says that whenever they arrive at the Bank there is Queue in the Branches whole. That is a reason for customer's dissatisfaction on the Bank.

60.4% of the respondents believe number of servers is not enough for serving the existing large number of customers. So, as much as possible the Bank should increase number of server's to avoid concentration of customer in Branches whole.

61.4 % of the respondents are dissatisfied on server's performance and the Bank should give enough on the job and off the job training to enhance the performance of the Server.

62.3% of the respondents need fairness of Queuing system and Comfortable waiting environment. That's why most of the respondent expresses their dissatisfaction over Queue interruption. The other part of the respondents needs indication of waiting time and entertaining waiting environment in the Branches whole. So, the Bank can easily avoid such problems.

Regarding Queue interruption 62.1% of the respondents express their dissatisfaction over server's who serving customers without queue number or without their turn. And the Bank should control servers with such unprofessional manner.

The system has benefits for the Branch and the center regarding controlling purpose. All those branch managers give me the same response that the system forwards a report for the management which contains number of customers served in each server (windows).

When we see contribution of Queue Management System on teller's performance the system by itself contributes nothing, but it contributes a lot in fair distribution of customers whore entering in the Branches whole.

Long waiting time suggests a lack of concern by the organization or can be viewed as a perception of poor service quality. So, the organization should take measures to minimize the customer waiting time based on my recommendations and by looking its potentials and resources it can human resource as well as material resource.

Even though the Bank has many Branches, our findings are results of only 10 Branches. Hence it is important to cross-check whether such results most likely occur in other branches of the company or not there by to decide what has to be done.

Furthermore, we undertake the study covering a few months and small sample respondents, which may not enough for drawing companywide conclusion, as a result we further proposed that, our findings could be basis for a future studies.

5.3. RECOMMENDATION

Successful service delivery strategies can restore customer satisfaction and can be able also to influence other important aspects of the organization’s outcomes including loyalty, positive and negative word of mouth behavior, and profitability. Poorly executed service delivery tends to aggravate customer dissatisfaction may result in customer total loss. One factor that affects customer’s satisfaction is that their expectation and the amount of time that it took them to get the services. Every company would be wise to measure customer satisfaction regularly because one key to customer retention is customer satisfaction. Understanding what customers expect from an organization is necessary for managers, because expectations provide a standard of comparison against actual organization‘s performance. Through the outcomes of this findings show that customers are not satisfied with the service of the Bank and based on the survey analysis, the following recommendations can be made to improve the effectiveness of Queue Management System.

To minimize the Queue length the Bank should increase number of servers to address the large number of customers and in some branches the Branch whole is too small for expansion and the Bank should change its branches.

The Bank could provide salary payments in Customers mother Company in order to minimize the length of Queue in the Branches whole because the main reason for longing for Queue are salaries paid to customers.

Providing enough ATM machines the Bank can handle the largest number of customer out of the Branches whole and those ATM machines could be available for service when ever needed.

To increase server’s performance the Bank should give enough training for the servers because the servers are Ambassador of the Bank. And the servers could be aware of what customer mean and they should accept the principle of CUSTOMER IS A KING.

The Bank could provide conferrable waiting environment, indication of waiting time, entertainments alongside with numbers display in the screen and should protect fairness of Queue.

The Bank should not tolerate interruption of Queue it is the main reason for customers while waiting for their turn and the Bank should punish employees with luck of partiality and all customers should be equal in front of servers.

Not related with the study but network problem and shortage of cash for huge payment creates dissatisfaction on customers.

As much as possible those branches should differentiate its customers based on their contribution for the Bank. Specially, customers who has high contributions on Deposit mobilization and foreign currency earnings for the Bank.

The managers can use the results in process mapping and improvement areas to improve their customers' satisfaction by limiting waiting time. As service capacity increases, there is a reduction in the number of customers in the line and in their waiting times, which decreases queuing cost.

St. Mary's University

School of Graduate studies

Masters of Business Administration (MBA) program Questionnaire

Dear Respondents

This questionnaire is developed by the students of St. Mary's university MBA program to collect data which helps me to conduct study on queuing system of Commercial Bank of Ethiopia. The information you provide on this questionnaire is highly valuable and has permanent importance on the outcome of the research. Therefore, you are kindly requested to take few minutes of your precious time to fill this questionnaire honestly and at most care. All the information you supply through this questionnaire will be kept strictly confidential and treated with confidence and also will only be used for the purpose for which it has been collected.

Instructions: No need to write your name and please enter the appropriate response to each statement below.

Thank you in advance for your time, support and your kind responses to each question.

Contact address Email; mesche2050@gmail.com **Tel. +251922842740**

Part One: Background Information

1 **Sex** Male ☐ Female ☐

2 **Educational Background**

☐ Certificate or less ☐ Diploma ☐ First Degree

☐ Masters and above

Part Two: Questionnaire to be filled by Customers

1. How long have you been customers of Commercial Bank of Ethiopia?

☐ 2 years and below ☐ 2-5 years ☐ Above 5 years

2. Is there any other customer waiting to get a service, while you arrive at the branch?

No [ ] Yes [ ]

3. If yes, then how many?

1. 1-10 2 11-20

3 21-30 4 31-40

5 more than 40

4. If you waited to get served in the branch seating, approximately how long did you wait after arriving at the branch?

1. I did not wait [ ]
2. Less than 10 minutes [ ]
3. 10 to 20 minutes [ ]
4. 20 to 30 minutes [ ]
5. More than 30 minutes [ ]

5. What do you feel about the waiting line? I believe that the queue is:

Too long [ ] Long [ ] Normal [ ]
Short [ ] Too Short [ ]

6. Is there any other customer who come after you and served before, while you are waiting?

Yes [ ] No [ ]

7. How do you evaluate the number of servers?

More than enough	[ ]
Enough	[ ]
Not enough	[ ]
Very few	[ ]

8. What do you expect to have when you are queuing as a branch customer in Commercial Bank of Ethiopia?

a. Comfortable waiting environment
b. Indication of waiting time
c. Entertainment while waiting
d. Fairness of queuing system

9. Have you been using the banking service before the implementation of queue management system?

Yes ☐ No ☐

10.If your answer for question number 9 is yes, have you ever complained for getting slow service?

A. Always C. Rarely
B. Most of the time D. Never

11. Have you ever complained for getting slow service after the implementation of queue management system?

A. Always C. Rarely
B. Most of the time D. Never

12. Do you think that the service you receive before the implementation of queue management system was satisfactory than after the implementation?

A. Very satisfactory C. Dissatisfactory

B. Satisfactory D. Very Dissatisfactory

13. Have you ever noticed a fellow customer complaining about the service provided before the implementation of queue management system?

A. Always C. Rarely

B. Mostly D. Never

14. Have you ever noticed a fellow customer complaining about the service provided after the implementation of queue management system?

A. Always C. Rarely

B. Mostly D. Never

15. Do you know a fellow customer who left Commercial bank of Ethiopia because of slow service before the implementation of queue management system?

Yes ☐ No ☐

16. Do you know a fellow customer who left Commercial bank of Ethiopia because of slow service before the implementation of queue management system?

Yes ☐ No ☐

17. Do you think that implementation of queue management system should be expanded to other branches of the bank as well?

Yes ☐ No ☐

18. What is the biggest advantage for you with the implementation of queue management system?

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____

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THANK YOU VERY MUCH!

Interview Questions

What are the benefits of Queue management System for the Bank?

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Do you think the system could expand to other Branch?

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What are the contributions of Queue Management System on teller's performance?

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