

**USMANU DANFODIYO UNIVERSITY, SOKOTO
(POSTGRADUATE SCHOOL)**

**EFFECT OF ELECTRONIC BANKING SERVICES ON CUSTOMER
SATISFACTION IN NIGERIAN DEPOSIT MONEY BANKS: MODERATING
ROLE OF WAITING TIME**

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BY

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DEDICATION

This research work is dedicated to my late parents.

CERTIFICATION

This thesis by MUHAMMAD Sani Burodo with Adm. No. 17410905004, has met the requirements for the award of Ph.D Management Studies of the Usmanu Danfodiyo University, Sokoto and is approved for its contribution to knowledge.

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ABSTRACT

This study examines the effect of Automated Teller Machine (ATM) services and moderating role of waiting time on customer satisfaction in selected deposit money banks in Nigeria. The population of the study is infinite. This is because, Nigerian banks allow account holders to use their ATM services regardless of whether or not they have account with them. A sample size of 384 is drawn from the infinite population table. The study employs stratified sampling and purposive sampling techniques. PLS-SEM version 3 is used in testing the hypotheses of the study. The findings of the study revealed that cash withdrawal, fund transfer and balance inquiry have positive significant relationship with customer satisfaction. However, waiting time does not moderates the relationship between balance inquiries in relation to customer satisfaction. On the other hand, waiting time moderates the relationship between fund transfer and customer satisfaction. The study recommends that Deposit Money Banks (DMBs) in Sokoto metropolis should stock their ATM machines with cash at all the times to ensure that cash withdrawals by customers are not hindered or distracted. Since cash withdrawal has positive and significant effect on customer satisfaction, banks should ensure that ATM machines dispense cash at any giving time. Moreover, banks should review their maximum withdrawal limit set for ATMs in order to improve the satisfaction of the customers, the problem of debiting customers' account without dispensing cash should be addressed. The deposit money banks are strongly advised to always make all their available ATM machines functional as this will drastically reduce the time to be spent by the customers.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Nowadays, banks use modern techniques in place of conventional ones (Chumo, 2022). Electronic banking is one of these practices that is quite significant (Sisay, 2022). It is one of the most popular services provided by traditional banks, and it is aimed at providing the online banking users with services that are both quicker and more reliable (Bambore & Singla, 2017).

Electronic banking services have emerged as the primary support system for Nigerian financial institutions because of its capacity to enhance efficiency, speed, performance, effectiveness, productivity, and convenience (Chumo, 2022). The concept seems to have been fully adopted in Nigeria as a value-added service to improve customer satisfaction and save costs, although not without hitches. The provision of electronic services helps banking industry in Nigeria to reduce operational costs and gain access to the largest segment of customers (Burodo, Adeniran, & Ibrahim, 2022). Due to the low rate of human error, electronic banking services offer higher accuracy and reliability in the delivery of banking services, resulting in increased effectiveness and efficiency in the banking industry (Musenga & Phiri, 2023).

One of such electronic banking facilities is Automated Teller Machine (ATM). With ATM, banks' customers now have access to financial transaction (both physical and cashless) without the need of going into the banking hall (Biset & Bonsa, 2019). The most important tasks of a bank employee can be done by an ATM using a magnetic-stripe plastic card called an ATM card (Zenebe, 2019). This card is usually issued to the customer by the bank. The card has in it identifying information such as serial number

and an expiration date for a tighter security (Zenebe, 2019). In this way, the card is an alternative means to cheques and more. Customer's presence in person, limited banking hours, and printed documents (Ibrahim, Moh'd, Moh'd & Saharuddin, 2016). By entering a four-digit code known only to the account holder (the Personal Identification Number, or PIN), ATM users can perform a variety of financial transactions, including making deposits, withdrawing funds, checking account balances, and printing out account statements.

The current study considered the ATM services like cash withdrawal, fund transfer and balance inquiry. Customers using ATMs can instantly withdraw their money at any ATM of their choice, at any time (Dawit, 2019). This encourages users to make more frequent use of the service. In a Similar vein, Tillya (2013) states that an ATM user may withdraw cash up to a certain limit at any time of the day or night.

A funds Transfer is considered as on-line system of transaction that allows ATM users to instantly transfer money from their bank accounts to the accounts of other customers (Tillya, 2013). When using an ATM, a user can easily transfer money between accounts owned by the same or different banks at any moment (Hana, 2017). Therefore, an ATM is a device that facilitates easy transfer of cash without the need of visiting a bank branch.

Mohammad and Dada (2014) assert that having the option to check one's account balance via an automated teller machine is one of the essential aspects that significantly influence customer satisfaction. Similarly, Mohammad and Dada (2014) clarify that ATM make it easy for customers to check their account balance.

The essence of having ATM machines is to reduce the long waiting times in the banking halls. However, long queues remain persisting in the banking halls or service points. It

is common to see very long queues of customers waiting to be serviced at the Automated Teller Machines (ATMs). Although there are queues in places like; bus stops, fast food restaurants, clinics and hospitals, traffic light and supermarkets among others. But long waiting time in the banking industry is worrying, since it is one of the most vital to the public. Modern banking institutions demonstrate a considerable interest in customer-centric approaches that aim to satisfy and establish long term business relationship with profitable customers. 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. This situation could turn out to be very frustrating when customers have to wait in a queue for a long time before they are served. This often brings untold hardship and dissatisfaction to them. When it comes to the management of relationships with bank customers, one key area of concern that is shared by bank management and bank customers is the excessive amount of time that consumers are required to wait. The amount of time customers spends waiting to be served completely by the ATM system is known as waiting time.

Lahap, Azlan, Bahri, Said, Abdullah and Zain (2018) provides that customers expect not just demand high-quality products, but also demand lightning-fast service. They do not have much tolerance for waiting in line for lengthy periods of time. The way consumers feel about how long they must wait for service providers can have an impact on both their current and future relationships with those providers, therefore, managing customer waiting time is crucial. This perception indicates that when customers are content with the amount of time they spent waiting for services. It can induce loyalty behaviours and encourage them to seek for more future business with the service providers. When customers are satisfied with the amount of time they spent waiting for

services, it can also inspire them to desire more future business with such service providers.

The focus of the study is on customer satisfaction. The study intends to find out whether customers are satisfied with the ATM services such as cash withdrawal, fund transfer and balance inquiry or not. To do this, the study empirically assessing the effect of ATM services on customer satisfaction in selected Deposit Money Banks (DMBs) in Nigeria using waiting time as moderating variable.

1.2 Statement of the Research Problem

Globally, long queues of customers waiting to patronize ATM services like cash withdrawal, fund transfer and balance inquiry become an issue of concern as the customers are not satisfied or happy with long stay during the services (Ahmed, Rahman & Mizanur, 2017; Ikotun, Ademuyiwa and Famule, 2016; Bielen & Demoulin 2007; Zewude, 2016).

Customer satisfaction in Nigerian banking sector is a subject matter of concern to interested parties as a result of long waiting time. Bank customers demand short time and easy access to services. Customers that are waiting queue to receive services in some service system is inevitable, this will actually make queues management indispensable. This is due to the fact that customers who cannot be treated promptly are required to wait in the queue for service, and the amount of time spent waiting can vary anywhere from a few minute to many hours. Since time is a resource, it should be managed in an effective and efficient manner. The inefficiency with which time is managed may result in the displeasure of the clients. Customers are typically dissatisfied when they are required to wait for a service.

In addition to the customer's waiting time, sometimes customers also complain that ATM deducts money from the customers' account in respect of cash withdrawal without actually dispensing money, as in the case of fund transfer. Any delay used to occur in crediting the beneficiary's account, sometimes customers are complaining for not always receiving alert message after every transaction done on ATM.

Customers' demands must always come first for any business, which is why numerous deposit money banks (DMBs) in Nigeria rely on automated teller machine (ATM) services to ensure that their clients' needs are met around the clock and that they are happy with the products and services they receive from them. Adeleye and Samson (2015), claim that before ATMs are widely available, customers had to deal with withdrawals, queries, and transfers of money directly with a bank teller.

Dawit (2019), states that, poor customer service causes considerable damage to goodwill of the banking industry, and this eventually leads to financial losses and dwindling market share. In this regard, customers stand to enjoy the advantage of quick service delivery, reduced cash handling, reduced rate of going to banks physically, which in turn gives rise to higher revenue.

However, extant literature by Soorva & Sreelatha (2021) reveals that, studies on ATM services and waiting time are important in today's banking operations. Studies on ATM services and waiting time as a moderator are limited (Murthy, Laths & Deepthi, 2012; Yakubu & Najim, 2014). Moreover, majority of the studies either relates customer satisfaction with ATM services or customer satisfaction with waiting time. Furthermore, there is a lack of consistency in the results of studies that have analysed the association between ATM services and consumer happiness. Several studies realise that ATM services have a beneficial effect on customer satisfaction. These include Mohammed and Dada (2014); Syed and Khaliquzzaman (2016); Ameer, Usman, Muhammad, and

Nimra (2016); Chi and Phong (2015), and Kendie (2016). There is no correlation between ATM services and customer satisfaction as found in studies by Matimbwa and Ochumbo (2018); Charles, (2016a), and Kumar, Varaprasad, Sridharan, and Unnithan (2013). Inconsistencies of findings or mixed results in earlier studies may indicate the presence of a moderator, as suggested by Barron and Kenny (1986). This led the researchers to conclude that customer satisfaction with ATM services is moderated by the length of time they had to wait for their transactions.

Moreover, from the empirical studies reviewed in chapter two (Section 2.10.1), there exists methodological weaknesses as most of the studies used the same statistical tools in their analysis. For example, Lasisi and Abubakar (2014) use multiple logistic regression. In the same vein Chi and Phong, 2015), adopt explanatory factor analysis and Multiple Regression. Russel (2018), uses Factor Analysis and Regression Analysis. Safer, Sudi, Tugbay, Hande and Serpil (2015) use Factor Analysis. While Ibrahim, Moh'd and Saharuddin (2016) use Descriptive statistics and Multiple Regression. Then Elliot, Mary and Akosue (2014) apply Descriptive statistics and Chi-Square. Charles (2016b), adopts Regression analysis. Adeleye and Samson (2015) use Regression analysis and Pearson correlation. Furthermore, Matimbwa and Ochumbo (2018), Odusina (2014) considers Chi-square. However, Kibona and Mgya (2015), and Abdurahman and Premalatha (2015) used Percentage Analysis. Moreover, Singh (2011), uses Anova and Factor Analysis. Ranasinghe and Kosala (2017) adopts Regression, Anova and T- test. Study by Hana (2017) take into consideration ATM service quality which include tangible, reliability, responsiveness, assurance and empathy. Nevertheless, other significant ATM services like cash withdrawals, funds transfer and balance inquiry as well as waiting time as moderating variable were not taken into account in the study, which would have improved induce customer

satisfaction. Only descriptive statistics were used in this study, which cannot measure relationship. Furthermore, the weakness of the previous study by Magara (2018) was that, it only looked at cash withdrawal and balance inquiry, ignoring other ATM services like funds transfer that could have improved the satisfaction of customer. Additionally, the regression analysis is used, however, it ignores the effect of moderating variable such as waiting time.

Moreover, the study conducted by Burodo et al. (2022) only took reliability, responsiveness, assurance, empathy and tangibility into consideration when determining customer satisfaction. However, the study ignores other aspects of ATM services like cash withdrawals, funds transfer and balance inquiry that could have improved customer satisfaction. Similarly, age is considered as a moderating variable in the study conducted by Burodo, Shehu and Babangida (2022). However, the study did not take the effect of waiting time as moderating variable into account.

The aforementioned methods adopt by the previous authors above cannot capture intervening variables like mediator, moderator and control variables and their impact on the response variables cannot be assessed. Therefore, this study employs statistical tools that capture intervening variables such as the Partial Least Squares Structural Equation Modeling (PLS-SEM) for questionnaire data and queuing model analysis is used for observed data to fill this existing gap. However, other studies using PLS-SEM are carried out in Malaysia by Naala (2017) and Yarima (2017). Also, none of the literatures considered the three dimensions of ATM services (cash withdrawals, funds transfer and balance inquiry) simultaneously as well as waiting time as moderating variable.

In view of these identified gaps, this study investigates the effect of ATM on customer satisfaction with respect to cash withdrawals, funds transfer and balance inquiry considering waiting time as moderator in some selected Deposit Money Banks in Nigeria.

1.3 Research Questions

Based on the problem identified, the following research questions are developed: To what extent does;

- i. cash withdrawal using ATM significantly influence customer satisfaction?
- ii. funds transfer using ATM significantly influence customer satisfaction?
- iii. balance inquiry using ATM have influence on customer satisfaction?
- iv. waiting time significantly influence customer satisfaction?
- v. waiting time moderate the relationship between cash withdrawal using ATM and customer satisfaction?
- vi. waiting time moderate the relationship between funds transfer using ATM and customer satisfaction?
- vii. waiting time moderate the relationship between balance inquiry using ATM and Customer satisfaction?
- viii. waiting time from the observational data using queuing model analysis in comparative with waiting time of the questionnaire data?

1.4 Research Objectives

The broad aim of this study is to determine the effect of ATM services on customer satisfaction using waiting time as moderating variable with particular reference to selected banks in Nigeria. The specific objectives are to:

- i. Determine whether or not cash withdrawals via ATM significantly influence customer satisfaction.
- ii. Assess whether or not funds transfer using ATM has influence on customer satisfaction.
- iii. Determine whether or not balance inquiry using ATM has influence on customer satisfaction.
- iv. Determine whether or not waiting time influences customer satisfaction.
- v. Determine whether or not waiting time moderates the relationship between cash withdrawals using ATM and customer satisfaction.
- vi. Examine whether or not waiting time moderates the relationship between funds transfer using ATM and customer satisfaction.
- vii. Determine whether or not waiting time moderates the relationship between balance inquiry using ATM and customer satisfaction.
- viii. Determine whether or not waiting time from the observational data using queuing model analysis is in comparative with waiting time of the questionnaire data.

1.5 Research Hypotheses

- H₀₁: Cash withdrawals using ATM has no significant effect on customer satisfaction.
- H₀₂: ATM funds transfer has no significant effect on customer satisfaction.
- H₀₃: Balance inquiry using ATM has no significant effect on customer satisfaction.
- H₀₄: Waiting time has no significant effect on customer satisfaction.
- H₀₅: Waiting time does not moderate the relationship between cash withdrawals and customer satisfaction.
- H₀₆: Waiting time does not moderate the relationship between funds transfer and customer satisfaction.

H₀₇: Waiting time does not moderate the relationship between balance inquiry and customer satisfaction.

H₀₈: The average waiting time obtained from the respondents is incomparative with the observed queue waiting time.

1.6 Significance of the Study

This study is expected to have benefits to individuals and organizations. Practically, the study will be of great benefit to the potential and actual shareholders of banks in making strategic decisions and could guide investment decisions in banking sector. ATM users will find it interesting to know the prospects and challenges of ATM system. The study will also guide the researchers that will conduct similar research in terms of variables selection, methodologies to be adopted and other relevant information from the customers and other stakeholders. The findings of this study helps in providing information to bank managers, which will allow them to improve quality of services provided through the ATM that are contemporary and in line with the development of information and communication technology (ICT). This will assist in boosting the overall quality of their service. The effective use of ATM service will help reduce waiting time of customers when accessing banking services using the ATM. This study seeks to assess ATM use and analyses the problem militating against ATM usage and find solutions to such problems. Specifically, the findings of the study also provide recommendations to the Nigerian banking system with regards to improvement of the functionality of their ATMs machines for better services in order to enhance customer satisfaction in the banking industry. One of the significances of this study is that it reveals the major areas in which management of the banks need to improve on customer satisfaction. The study is useful to government, functionaries NGOs, private organizations, supervisory agencies, shareholders and individuals concerned with

establishing banking policies and strategies. The importance of this study to the government is, it can help towards establishing policies that will provide adequate regulatory framework, such as customer protection and security of transaction which will enhance confidence in the minds of ATM users.

Also, the findings and recommendations of this study will enable ATM users understand the importance of ATM services in terms of its convenience, safety and privacy.

Theoretically, the study will advance the application of the underpinning theory (Technology Acceptance Model). It is also necessary to conduct a study to investigate the selected waiting time perspectives that are controllable which could positively and significantly explain the customer satisfaction. The study will be indispensable reference point for future studies on the study's model which incorporate waiting time on the relationship between ATM services and customer satisfaction.

1.7 Scope and Limitations of the Study

The scope of the study is narrowed to ATM services (cash withdrawal, fund transfer and balance inquiry) and customer satisfaction with particular reference to selected deposit money banks in Nigeria (GT Bank, UBA, Zenith Bank, First Bank, Eco Bank, Access Bank, Union Bank, Ja'iz Bank, Polaris Bank and Unity Bank).

It specifically evaluates the effect of ATM services considering waiting time as moderator, on customer satisfaction. Satisfaction is defined as the pleasure or happiness derived by customers in relation to ATM services. The study covers three dimensions of ATM services such as cash withdrawals, funds transfer and balance inquiry as independent variables of the study, while the dependent variable is customer satisfaction measured by security, ease of use, speed, convenience, trust, usefulness and

accessibility. The study is however confined to assess the relationship between ATM services and customer satisfaction using waiting time as moderator. The study covers the period between 2017 and 2023. This period of seven years is considered sufficient to make an extensive and empirical analyses on the issues being focused on effectively. The area of study covers ten Deposit Money Banks (DMBs) in Sokoto metropolis, namely: GT Bank, UBA, Zenith Bank, First Bank, Eco Bank, Access Bank, Union Bank, Ja'iz Bank, Polaris Bank and Unity Bank.

The researcher faced series of challenges in the course of conducting research. These challenges financial constraints, lack of responses from the respondents during data collection, difficulties during data compilation as well as analysis. Time constraints is another big challenge and is considered during the course of the study.

1.8 Chapter Scheme

The thesis comprises of five chapters. After the general introduction that covers the background to the study, statement of the problem, research questions, research objectives, research hypotheses, significance of the study, and scope of the study. The second chapter reviews the relevant literature under investigation. The chapter is divided into two parts namely, literature review and theoretical framework. the review covers conceptual issues, an overview of the Nigeria's banking system, evolution of ATM, emergence and development of ATM in Nigeria, concept of customer satisfaction, measures of customer satisfaction, ATM services, benefits of ATM to customers, waiting time, empirical review, theoretical review and research gaps.

The third chapter covers research design, population and sample of the study, instruments of the data collection, questionnaire design, method of data analysis and

hypothesis testing, variables description and measurement. While the next chapter will analyse and discuss the empirical findings. The last chapter summarizes the study, makes recommendations, concludes and provides a suggestions for further research.

1.9 Definition of Terms

- i. **Automated Teller Machine:** This is an electronic banking facility that allows customers to perform a range of transactions such as check account balances, making deposits or withdrawals or and transferring money between accounts.
- ii. **Funds Transfer:** This refers to the on-line system of transaction that enables ATM users to instantaneously transfer money from their bank accounts to the accounts.
- iii. **Balance Inquiry:** This is a transaction that enables a cardholders to find out how much money is currently in their accounts.
- iv. **Waiting time:** This indicates the length of time customers are required to wait to receive service from the ATM.
- v. **Customer:** A customer is a person who has an account with the bank and uses the banking products or services and judge the quality of those products or services.
- vi. **Customer Satisfaction:** This is the degree to which customers are happy with the organisation's good and services.
- vii. **ATM User:** This refers to a person with a credit card or debit that can access ATM for transaction.
- viii. **ATM Customer:** Refers to any legal entity like individuals or firms which interacts with and uses the ATM's facilities.

- ix. ATM Card:** An ATM card is a dedicated payment card issued by a financial institution (i.e. a bank) which enables customers to access their financial accounts via automated teller machines (ATM).
- x. Account:** Is a record or statement of financial expenditure and receipts relating to a particular period or purpose. It is a detailed record of all the money that a business or a person receives and spends.
- xi. Banker:** Is a person who receives money, collects cheques and drafts for customers, with an obligation to honour the cheques drawn by customers.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter discusses the relevant and related literature on the effect of ATM Services and waiting time on Customer satisfaction. The chapter is sub-divided in to two main parts namely, literature review and theoretical framework. The literature review is also sub-divided in to ten sections. The first section looks at literature on the concept of customer satisfaction, the second section dealt with the measures of customer satisfaction, section third dealt with the components of ATM Services, the fourth section presents benefits of ATM to customers, section five presents evolution of Nigerian Banking industry, section six handled Evolution of ATM and the Emergence and development of ATM transactions in Nigeria, section seven dealt with waiting time as a moderator variable, the section eight dealt with the empirical review, section nine gives theoretical review and section ten takes care of research gaps.

2.2 The Concept of Customer Satisfaction

A person who is utilizing any or the entire services offered by the bank is called a bank customer (Gaur & Potnis, 2022). Generally speaking, customers often evaluate the service quality before and after their use (Abraham, 2014). Satisfaction is defined as a person's feeling of pleasure of a product's perceived outcome in comparison with his/her expectations. Consequently, if the performance outperformed the expectation, the customer is delighted. If the outcome is as expected, the customer is satisfied. But if the product's performance is below the expectation, then the customer is dissatisfied (Kotler & Keller, 2016).

Every business has been found to use customer satisfaction as a key strategy and as a criterion by which to measure itself (Burodo, Suleiman and Yusuf, 2021; Adeniran, Burodo & Suleiman, 2022a). Customer satisfaction is considered as one's feelings after comparing the performance that he or she felt compared with expectations (Kotler & Keller, 2016). In the realm of service operations, defining what constitutes satisfied customers has been handled from two different angles. Firstly, satisfaction is defined as a function of discontinuance, which, according to Nitecki and Hernon (2000), is the difference between a customer's perception and their expectation of a product or service. Secondly, according to Hana (2017), customer satisfaction is regarded as an indicator of perception, meaning that satisfaction is primarily dependent on the customer's impression of the real quality of service instead of on the disagreement that occurs between the customer's perception and their expectations. Real index of the state of satisfaction differs from individual to individual, product to product and service to service (Burodo, Aderinan & Ibrahim, 2022).

One of the most vital indicators of the prospects of the company is the extent to which its customers are satisfied with its products and services. Customers who feel their needs are met, tend to remain loyal to the brand, which helps to maintain a steady flow of revenue for the company in the years to come. In addition, pleased customers are typically characterised as being less price sensitive, and they have a preference for spending more money on things that they have already experimented with and evaluated. The concept of satisfaction is referred to as either a fleeting emotion or an attitude that is inclined to shifts brought on by a variety of factors (Burodo, Shehu & Babangida, 2022; Ahmed, Burodo & Suleiman, 2022). The key for achieving competitive advantage in the banking industry is to be customer-driven (Adeniran, Burodo & Suleiman, 2022b). Therefore, it is very imperative for banks to make use of

different approaches that vary from re-engineering of service to focusing on specific tasks in order to achieve customer satisfaction (Syed & Khaliquzzaman, 2016).

The banking industry like any other industry has intensified its efforts to satisfy consumers through the provision of quality services. Both customers and banks attach much importance to satisfaction. Serious efforts are being made by banks to offer high quality products and services to their customers. The main thing that will determine whether or not the business survives in the future is providing good customer service (Surafel, 2016).

Burodo, Shehu and Babangida (2022), contend that it is vital for current financial institutions to shift towards customer management for their satisfaction of the services provided. It is also crucial for banks to develop a system that continuously measures customer satisfaction. Olorunniwo (2006) explains the customer satisfaction as a customer's fulfillment response following the consumption experience. This response can be both evaluative and emotional-based. Chi and Phong (2015) define customer satisfaction as an affective construct rather than a cognitive one and it involves the emotional aspect.

Customer satisfaction, according to Kotler and Keller (2016), is an emotional response strongly associated with prior expectations and relates to particular transactions. Jun, Yang and Kim (2004), provide that, customer satisfaction is defined as the feelings or judgments that customers have about products or services after using them. Customers who are satisfied with the services, market the products or services which lowers the cost of advertising and improves the general reputation of the ATM services.

In this study, customer satisfaction defined as the emotional state or perception that customers have towards a product or service following its use. It is the degree to which customers are happy with the organisation's goods or services.

2.3 Measuring Customer Satisfaction

It is commonly regarded that customer satisfaction is the most important component of any business, since satisfied customers not only contribute profit to the business but also refer more of their friends and family (Adeniran et al., 2022b). Customer satisfaction is defined as the net value of services derived from a provisional source that is either negative or positive (Kotler & Armstrong, 2014). The perception of an organization's customers is one of the most crucial elements that determines the success of its products and services (Kotler & Armstrong, 2014). Providing good customer service is the major factor that will determine whether or not the business survives in the future (Surafel, 2016). However, in order to persuade customers to have a positive opinion of banking services. It is necessary to understand how they view bank-customer relations and the extent to which their demands are met (Burodo, Adeniran & Ibrahim, 2022). Banks, everywhere, are delivering almost the same products. To improve customer satisfaction and differentiate themselves from other competitors through service quality, banks need to understand what drives satisfaction. In order to deliver services that are of additional value to its consumers, financial institutions are required to learn how those customers define value. Banks also need to do everything to ensure that their profitable customers are retained. Service quality can be identified as the basic element impacting customers 'satisfaction level in the banking industry (Kotler & Armstrong, 2014).

2.3.1 Security

Security contributed positively towards customer satisfaction of ATM services. According to Dewit (2019), modern ATM are implemented with high security protection measures so as enable users to perform various ATM transactions. Most studies agree that apprehension about the safety of online and mobile banking, including ATMs, is a major barrier to the widespread use of these services. Chingang and Lukong (2010), describe security in the context of banking services, as customers' perceptions of the safety of the banking services when performing transactions. Dawit (2019), holds that Security refers to the degree to which a website is considered by users as being safe from intrusion. Banking services in respect to technology such as ATMs, Mobile banking and Internet banking facilitate customer satisfaction. Adding that, customers would expect security of money, growth and safety from these banking services.

2.3.2 Ease of Use

The extent to which ATM users believes that utilizing a system will be simple and uncomplicated is referred to as ease of use (Dawit, 2019). A user's subjective impression of how simple a computer system is to operate, is another way to describe ease of use (Dudovskiy, 2016). The literal meaning of the term ease indicates relief from difficulty or excessive effort. Zeithml (2002), report that ease of use is considered as one of the most important factors that helps ATM users to operate ATM system successfully. An application that consumers believe to be simpler to operate than others, has a higher chance of being accepted by users, if all other factors are held constant. Odusina (2014) summits that, ease of use is defined as the user's impression of the amount of effort required to utilise the system or the degree to which a user believes that utilising a specific piece of technology will be effortless. It is common knowledge that

user friendliness is a significant component in determining whether or not information technologies are accepted by users and how they are utilised (Hammouri & Abu-Shanab, 2018).

The term ease of use refers to a person's impression of how simple the innovation is to grasp and implement (Venkatesh, 2000). It should be designed in such a way that it helps in providing users to find what they need easily and quickly, as well as providing a user-friendly interface. Although users may agree that a given app has potential, they may also feel that the technology is too difficult to implement well, and that the benefits of using the app in terms of performance aren't worth the trouble (Zeithml, 2002).

One definition of ease of use is the confidence with which a customer approaches online banking (Selvanathan *et al.*, 2016). Consult (2012), made a similar observation, noting that when people talk about an innovation's "real ease of use," they mean how simple it is for them to learn about and evaluate the innovation's potential benefits. He also reaffirms that the actual simplicity of use, which is a mix of the convenience provided to those with easy internet access, high functionality of electronic banking. The availability of security and the necessity of banking services is what determines the expansion of electronic banking. With the advent of automated teller machines, customers have the freedom to withdraw funds (up to a set limit) at any time of day or night (Akrani, 2011). Unlike bank branches, where customers can only access their money during working hours.

2.3.3 Speed

The adoption of ATM banking has been of benefit to ATM use because it helps in the satisfaction of customers by significantly improving transaction speed Tasaw (2019). ATM banking provides a fast and convenient way of performing ATM transactions

such as cash withdrawals, fund transfers, balance inquiry and bill payments. It is faster than physical tellers in processing transactions (Jannat & Ahmed, 2015). ATM services improve operations and customer satisfaction in terms of time flexibility and offer value by handling large volumes of transactions quickly something that traditional services are unable to do effectively (Komal, 2009). Jannat and Ahmed, (2015), describe the factors that influence customer satisfaction such as transaction speed, security & trust, ease of use, responsiveness, convenience and cost effectiveness.

2.3.4 Convenience

Convenience addresses the issue of how close an ATM is to customers when they wish to use it (Dawit, 2019). It is defined as a capacity and capability to lower the non-monetary costs (i.e., time, energy, and effort), incurred by consumers when making purchases or utilizing goods and services. It refers to any aspect of the customer experience that reduces the amount of time and effort expended by the consumer. It is standard practice to create products, services, settings, and procedures that are geared towards making transactions and businesses easier for the consumer. According to Zenebe (2019) customers are often highly encouraged in utilizing ATM systems that reduce the amount of time and effort they invest in a task.

Jannat and Ahmed (2015), describe convenience as one of the most influential factors for customer satisfaction. Customers' pleasure with technology may be influenced by factors such as “convenience, perceived usefulness, ease of use, attitude towards conduct, intention, actual behaviour, security, privacy, and knowledge efficacy”. Olowookere and Olowookere (2014), indicate that convenience, security and privacy have positively contributed towards customer satisfaction of bank services. According to Okafor and Ezeani (2012), the ease of use, the speed with which funds may be

transferred, and the amount of time clients save all play a role in their decision to use banking services. It should be noted that the ease with which technology can be utilised favourably influences the degree to which customers are satisfied.

In this study, convenience is conceived as a critical factor in determining how customers make decisions about what to buy, what services to use, where to go, and with whom to engage. Conventional wisdom says that convenience is a factor of time and effort. The ratio of pleasure and pain in the user experience determines customer convenience, which in turn affects how customers make decisions about what products to buy, what services to use, and with what providers engage.

2.3.5 Trust

Customers' evaluation of banking products and services, which results from their trust and satisfaction in using any of the facilities they could access and afford, determines the value of those products and services (Olaleke, 2010). Additionally, the effectiveness of the services offered by the ATM system affects the level of customers' trust and satisfaction (Adeoye & Lawanson, 2012). Because of this, it is important to emphasize that trust has always been a crucial component of all business organizations, particularly in banking industry (Abdulrahman & Premalatha, 2015). Trust is considered as an essential factor in the usage of ATM services and lack of the trust hinders its acceptability and consequently retard the growth and development of ATM in Nigeria. Trust influenced the adoption of ATM technology by bank customers (Abdulrahman & Premalatha, 2015).

Customers' trust in using electronic banking is influenced by perceptions of "security, utility, and privacy. Although these factors had a greater impact on how customers perceived the organisation, its products, and services, security, privacy, intention

behaviour, attitude towards behaviour, perceived usefulness, ease of use, and actual behaviour are also likely determinants of how customers perceive their trust in using organisational products and services like ATMs (Gilaninia, Taleghani, Taheri & Mousavian, 2011).

Olaleke (2010) claims that, customers' perceptions of the quality of banking products and services are based on their trust and contentment with the products and services they use that they can access and afford. Customers' degree of trust and happiness with service delivery. According to Adeoye & Lawanson (2012), is significantly influenced by the calibre of services provided by banks that use electronic systems. According to Toth (2009), it is important to underline that trust has always been a crucial component of all commercial organisations, particularly in the banking sector.

This study defines trust as having faith in someone because you feel comfortable with them and have confidence that they will not harm or violate you. Relationships are built on trust because it allows you to be open up and vulnerable with the other person without feeling the need to defend yourself.

2.3.6 Usefulness

Usefulness in as an individual's perspective or belief that employing new technology will improve his or her performance. According to Fonchamnyo (2013), perceived utility, perceived security, perceived reliability, accessibility, cost of service, trust, age, education, and marital status all have a significant role in deciding innovation uptake. Polatoglu and Ekin (2001), concludes that the greater the perceived usefulness of adopting technology, the more likely it will be accepted. Perceived usefulness is how a user feels that the innovation is valuable, if it helps to increase productivity and produce better results. Therefore, the most important factor that determines the success of actual

system utilization is a perceived usefulness (Sindani, Muturi & Ngumi, 2019). The fact that perceived usefulness depends on the services offered by the banks such as the ability to pay bills, check balances, transfer money to abroad and apply for loans. Usefulness is important because it effects behavioural intent positively. According to Polatoglu and Ekin (2001), technology adoption is more likely to occur if people believe to be useful. Conversely, Sindani, Muturi and Ngumi (2019), argue that the perceived usefulness depends on the services offered by the banks such as the ability to pay bills, check balances, transfer money to abroad and apply for loans.

Furthermore, Sindani *et al.* (2019), recognises usefulness as a key factor in determining the connections between computing and information systems. Therefore, if the technology is useful, customers can be motivated to use the facilities and services very frequently and thereby improve their satisfaction level (Wang, Lin & Luarn, 2006).

In this study, usefulness is defined as a person's viewpoint or conviction that using new technology will enhance their performance. An invention is considered useful if it helps users feel more productive and achieve better outcomes. Therefore, usefulness is the primary determinant of the success of real system utilization.

2.3.7 Accessibility

The degree to which a user is able to access his or her bank account information and services on the website was characterized as accessibility (Tasaw, 2019). It is the level at the greatest number of people can access a service environment. The bank's ability to offer benefits such as accessibility and convenience may have an impact on customer satisfaction (Gabriel, Eugene & Daniel, 2015). Internet technology, according to Tasaw (2019), has given rise to internet banking which enables bank customers to have to banking services from anywhere as long as they have internet connectivity (Mohammad & Dada, 2014). In contrast to bank branches, ATMs are accessible every day of the

week, irrespective of the hour. Additionally, ATMs are located in places outside of banking halls and closer to people's work places and residences (Zenebe, 2019).

Furthermore, with the introduction of ATM in Nigeria, banks' users can now have access to financial transaction outside the banking hall without the need of visiting the cashier or bank teller (Mohammad & Dada, 2014).

2.4 Concept of Electronic Banking

The Nigerian banking sector is plagued by poor services and dissatisfaction due to inadequate and inefficient service delivery before the introduction of e-banking (AlHaliq & AlMuhirat, 2016). E-banking is one of the most crucial tools and methods that banks are utilising to secure client retention and happiness in the light of the recent rise in competition in the banking sector (Chumo, 2022). In the cutthroat financial industry, banks that adopt the latest technologies and payment options are more likely to be successful. Endalkachew (2013), asserts that banks' increased ability to generate business has contributed to their higher profitability.

The phrase E-banking (Electronic Banking) refers to a collection of self-service platforms (Burodo, Adeniran & Ibrahim, 2022). It refers to any payment portal, platform, or system that enables bank or financial organization customers to conduct financial transactions online or through a mobile application on different devices. (Olomofe, 2018; Parkiaei & Ardestani, 2014). It is a platform that allows users to access electronic devices without the need of going to the cashier (Kebede, 2023; Sisay, 2022; Zeleke, & Chauhan, 2022). These platforms include ATM, TV banking, PC banking, agent banking, phone banking, mobile banking, point of sale terminals and internet (online) banking (Chumo, 2022). Therefore, customers are no longer required to pay in cash for all their transactions as a result of the society is gradually becoming cashless

society. Customers can access their financial services through a collection of self-service platforms without having to actually visit a bank (Burodo, Shehu & Babangida, 2022).

Electronic banking offers a significant channel for marketing bank products and services and is seen as essential for the success of the banks. It is critical to the transformation of banks in areas such as products and services and how they are delivered to clients (Oduri, 2016; Burodo, Adeniran & Ibrahim, 2022). As a result, electronic banking is a critical tool for bank expansion, development, innovation promotion, and competitiveness enhancement (Jannatul, 2010). As further advancements and innovations are made in information technology, electronic banking will continue to grow in the banking industry (Joffe, 2018). Therefore, adopting electronic banking allows customers to manage their finances more conveniently and time savings while also providing them with easier access to financial services (Al-Smadi, 2012). Consequently, Nigerian Deposit Money Banks (DMBs) are expected to deliver quality service through innovative technology in order to maintain their competitiveness in the market.

This study defines electronic banking as the process by which banks provide their customers with information and services via various channels that can be accessed through different electronic devices, including computers, mobile phones with browser software and digital televisions. The electronic banking components are as follows:

2.4.1 Point of Sales (POS)

The Central Bank of Nigeria (CBN) introduced the use of POS terminals to undertake financial transactions in Nigeria by 2012, to promote its cash-less policy and improves the payment system. In Nigeria, bank customers are now able to conduct financial

transactions via P.O.S devices without physically visiting the banking hall. The point of sale (P.O.S), often known as the checkout or a point of purchase, is the location where a transaction takes place (Omid, Zahra, Atusa, Farshad & Mehdi, 2013).

This device is commonly used in retail shops where customers use their ATM cards to purchase goods or services, since the purchase price is deducted from the customer's card and added to the seller's account (Adeniran et al., 2022a). Moreover, POS machine are used to pay for some utility bills like electricity, airtime, and cable and decoder subscription (Mohammad, Sayyed & Mohammad, 2015).

There seems to be more points of sales (P.O.S) than ever before perhaps due to the advancements in electronic banking. As such, there is need for bank to provide its customers with more desired and enhanced electronic banking services (Omid, Zahra, Atusa, Farshad & Mehdi, 2013). The hardware and software used for checkouts are referred to as a team checkout or a Point of Sale terminal (Mohammad, Sayyed & Mohammad 2015). A P.O.S device can be used to generate and print the receipt. Customers can also use it to pay for goods and services because, the purchase price is deducted from their card and added to the seller's account (Fonchamnyo, 2013).

Moreover, the point of sale sometimes called the point of purchase (POP) checkout, is a location where a transaction takes place (Diwan, 2021). POS system refers to a point, in terms of date, time, and location (a retail shop) at which a customer uses a plastic card to pay for goods or services offered, (Business Jargons, 2021; Reddy & Megharaja, 2021). A POS terminal, or more broadly, the hardware and software used for checkouts, the equivalent of an electronic cash register is referred to as a "checkouts". Shrestha, (2019) defines point of sale terminal as a portable device that facilitates payments for goods and services at merchant locations using payment cards.

This study defines point of sales as a device that is commonly utilized at retail shops where customers use their ATM cards to make purchases of goods or services. The point of sales (POS) or point of purchase (POS) is the time and place at which a retail transaction is completed. Is a place where a customer pays for goods or services, either in person or online. Because, the purchase amount is deducted from the customer's card and added to the seller's account. Additionally, some utility bills like those for electricity, airtime, cable and decoder subscriptions are paid with POS machine.

2.4.2 Mobile Banking

One of the major innovations in the banking industry is mobile banking, which allows customers to access financial services directly from their phones (Mtui, 2020). It is a service offered by banks and other financial institutions that enables their customers to carry out financial transactions from the comfort zone of their homes or offices, using a mobile device like a smart phone or tablet (Olomofe, 2018). The application software is developed purposefully for this function. Therefore, mobile banking is usually accessible around-the-clock (Addisse, 2020).

When customers utilize mobile terminals to access different payment services, such as account balance enquiry, transference, bill payment and financial management this is known as mobile banking (Shaikh, 2013). Users are no longer constrained by time or place and may use mobile banking services from anywhere at any time. The users of mobile banking benefit greatly from this convenience (Al-Laheebi, 2022 & Faek, 2020). More conveniently, mobile banking software has the potential to boost both customer satisfaction and operational efficiencies for financial institutions (Malaquias & Hwang, 2016).

For customers banking networks using wireless application protocol (WAP) on mobile terminals such as smartphones and PDAs is known as "mobile banking" (Zhou, 2012). Thus, mobile banking offers a fast and convenient way of performing common banking transactions. After opening a mobile banking account with the banking institution, a user can conduct banking transactions from anywhere (Sagib and Zapan, 2014).

The mobile banking can be used to access the bank's website through the web browser on the mobile phone, via text messaging, or by using an application downloaded to the mobile phone. The three essential transactions are available for users to carryout via mobile banking. These transactions include funds transfer, buying airtime and bills payments (Shaikh & Karjaluoto, 2015).

Mobile banking is more convenient for bank customers as eliminates the need for them to travel to and queue at bank branches or ATM locations (Birhanu, 2021). It also helps users in terms of saving time and instantaneous information, great connectivity, convenience, and ubiquity (Jamil, 2020), all of which have the potential of increasing customer satisfaction. Similarly, Mtui (2020) contends that mobile banking channels provides chances to customers. Because, it improves customer satisfaction, reduces cost associated with providing services, and boosts operational efficiency. Therefore, it is not only attractive to customers, but also attractive to banks as well.

According to Legesse (2020), mobile banking has the ability to both increase efficiency and enhance the quality of life for its customers (Legesse, 2020). The improved service delivery and increased customer satisfaction that mobile banking brings about helps in retaining existing bank customers, attracting new ones and also enables the bank to maintain its competitive position in the market (Charles, 2018). In addition, this results in a large market share, profitability, reduced failure cost, price elasticity, lower

business expenses and a cheaper cost for the bank to acquire new customers (Mtui, 2020).

This study defines mobile banking as any banking channel that enables customers to access their bank accounts via mobile devices and carry out other related banking transactions such as money transfers, checking account buying airtime, conducting international remittances, applying personal loans among others. Put differently, mobile banking is defined as a service that allows bank users to conduct a number of financial transactions such as transferring funds, selling stocks, checking account status and making payments, without physically being present at the banking premises. Customers can interact with a bank using a portable device thanks to this innovative communicative channel. Mobile banking, which has several advantages for banks and their customers, is one of the most recent technological advancements in the banking sector.

2.4.3 Internet Banking

Internet is a global network of computers. It consists of a network computers, millions of users, and computer systems that all have similar way of communicating with one another and exchange information. (Ekwueme & Egbunike, 2012). The term internet is the acronym for global communication network (Ekwueme, & Egbunike, 2012). With the introduction of internet banking services, banks have increased their competitiveness beyond only traditional banking services (Surafel, 2016). Banks are using internet banking in an effort to retain their customers and to prevent them from changing to other banks, as well as to reassure them that they will be able to be able to continue providing a good level of service (Karungu, 2014). According to Sindani, Muturi and Ngumi (2019), providing internet banking is now seen as a requirement for survival rather than a competitive advantage. Parkiaei and Ardestani (2014), state that

efficient services are provided by internet banking, which involves the supply of banking services improves financial performance, lowers operating and fixed costs, and maintaining strong customers relationships. According to research, customers benefit from internet banking in terms of ease of use, reduced in transaction charges and enhanced control (John & Rotimi, 2014).

The emergence of internet has transformed the business landscape. In this era, the internet is an extremely important new technology that improves customer satisfaction. The use of internet by banks and other financial institutions is one of its most significant applications (Anuar, Adam & Mohammad, 2012).

At the moment, and with the advancement of information technology and the provision of internet banking, customers are now enjoying the internet facilities (Bambore & Singla, 2017). Success of internet access, new online banking features, household development of internet usage, reliable services to the customers for which they may be more satisfied than with manual system of banking are just few of the of the factors that influence the introduction of internet banking in Nigeria (Shrestha, 2019).

Reddy and Megharaja (2021) argues that internet banking is one of the components of electronic banking that gives customers access to their bank accounts via a web site and to enable them to enact certain transactions on their account, given compliance with stringent security checks. It could encompass any transactions involving the use of the internet. Banks are increasingly operating websites where customers are able not only to inquire about account balances, interest and exchange rates but also to conduct a variety of transactions (Shrestha, 2019). Similarly, Diwan (2021) and Birhanu (2021) describe that internet banking is a service provided by banks that enables users to conduct a range of financial and non-financial transactions online using the bank's website or application.

Furthermore, the provision of traditional (banking) services over the internet banking is the definition of internet banking (Sambaombe & Phiri, 2022). Customers can use internet banking to transact almost all their banking transactions online (Teshome, 2019). It is the most financially innovative method for yielding higher profitability as it allows one to check accounts, query the bank and transfer money to other people on various accounts (Abay, 2020).

According to this study, internet banking is a device that enables customers of a financial institution to do financial transactions using a secure website run by the institution, which could be a retail or virtual bank, credit union or society. It is a facility that allows customers to conduct a variety of monetary and non-monetary transactions through the internet, via the bank's application or website.

2.4.4 Telephone Banking

Telephone banking is a service that allows bank users to conduct financial transactions over the telephone without having the need to go to the banking hall or ATM points (Olomofe, 2018). Customers are allowed to access their accounts using telephone lines as a link to the financial institution's computer centre. Telephone banking is a facility that enables customers to call and find out about their positions with bankers by merely dialing the phone numbers issued to them by the banks (Kwaku & Martin, 2016). Instead of calling the respective banking institution and to speak in person to a customer service staff, a certain degree of development has been experienced enabling the customer to call a specific system usually called an automated account management system (Toufaily, Daghfous & Toffli, 2009). Therefore, the channel through which banking customers access their personal bank accounts in order to perform various transactions via their cell phones is known as the telephone banking. According to

Surafel (2016), telephone banking brings the bank services to the doorstep of the customers. Customers are not required to leave their premises.

The number of customers that physically visit the banking halls, has decreased since the introduction of telephone banking. According to Buddhika and Gunewardana (2020), this is the first step towards handling banking operations digitally and remotely. In other words, the terms electronic banking or e-banking emphasises both computer banking and telephone banking. Therefore, it is possible to acknowledge telephone banking as the first component of e-banking that shows on the screen.

Telephone banking, also known as telebanking, is a form of virtual or remote banking, which is essentially the delivery of branch financial services via telecommunication devices (Abay, 2020). Is an electronic device that allows bank customers to conduct retail banking transactions by dialling a touch-tone telephone or mobile phone component which is connected to an automated system of the bank via Automated Voice Response (AVR) technology (Mchomba, 2018). Mobile money services like M-Pesa, Tigopesa, EzyPesa, Halo Pesa and Airtel Money are good examples of this type of service (Mchomba, 2018).

This study defines telephone banking as any electronic banking transaction that can be performed by customers using their cell phone day or night.

2.4.5 Electronic Funds Transfer

This is an electronic oriented payment device that enables customers' accounts to be credited electronically within 24 hours (Ekwueme & Egbunike, 2012). Electronic funds transfer enables customers to transfer funds from their bank account to the merchant's account after making purchases or any form of transaction that requires payment. With this system, information is transferred among points electronically without having to go

through the rigours of incidence of papers (Parikh, 2016). Similarly, Olomofe (2018), argue that with the direct intervention of bank staff, bank customers can use the device to transfer cash from one bank account to another either inter-bank accounts or intra-bank accounts, using computer based system.

The system provides more suitable and cost-effective way of transferring funds as it is faster and more secured when compared to traditional modes like mail transfer and telegraphic transfer (Lehloenya, 2021; Bisu, 2020). Clearing House Automated Payment System (HHAPS) and Bankers Automated Clearing System (BACS) are at the moment, the applications of electronic funds transfer.

Funds are transferred electronically between bank accounts within a single institution or between institutions using a computer based system (Reddy & Megharaja, 2021). With electronic funds transfer, customers' accounts can be electronically credited within 24 hours (Abay, 2020). It is a device that enables customers to transfer funds from their bank account to the merchant's account after making purchases or engaging in any type of transaction that calls for payment (Reddy & Megharaja, 2021). This form of electronic banking eliminates the need for paper based procedures by transferring information electronically between sites (Diwan, 2021). In a similar vein, Olomofe (2018), contends that bank customers can use the device to transfer money between inter-bank accounts or intra-bank accounts utilizing a computer based system with the direct intervention of bank employees.

In this study, electronic fund transfer take place from one bank account to another electronically either single institution or across multiple institution through computer based system.

2.4.6 Electronic Wallet (EW)

Electronic wallet, according to Pinal (2012), is a system that stores a customer's information for easy retrieval during online purchases. It is a pre-loaded or online prepaid account facility that enables users to load money and information to purchase a variety of goods from payment of grocery stores, airline ticket and utility bills, all without using a debit or credit card.

Simon and Thomas (2016) believe that the electronic wallet always looks like a small pocket calculator with a plug that allows for direct or indirect electronic connection with another wallet. It allows unforgettable transactions with other wallet and stores an unforgettable amount of money. Since it is only the legitimate owner who knows the password that operates it, it is faster than cash money (Simon, & Thomas, 2016).

According to Pinal (2012), an electronic wallet is a system that keeps a customer's information accessible for easy retrieval when making purchases online. It is a pre-loaded or online prepaid account facility that allows customers to load money and information to pay for range of items, including utility bills, airline ticket and grocery stores without the need of using either debit or credit card. E-wallet is a device that stores users card details digitally, so that they buy things electronically with this kind of wallet. With electronic wallet, users can pay things online using laptop tablet or smartphone.

The electronic wallet, according to Simon and Thomas (2016), always resembles a small pocket calculator with a plug that allows a direct or indirect electronic connection with another wallet. It stores unforgettable amount of money and enables transactions with other wallet. It operates faster than cash money because only the rightful owner has access to the password (Simon & Thomas, 2016).

According to this study, electronic wallet is a type of pre-paid account in which a user can store his/her money for any future online transaction. An E-wallet is protected with a password. With the help of an E-wallet, one can make payment for groceries, online purchase and flight ticket, among others.

2.5 Automated Teller Machines (ATM)

ATM allows customers to have access to their bank account at any location. Nowadays, ATMs are not only located within the banking premises, they are also located in public places like the airports, train stations, hospitals among others (Mohammad & Dada, 2014). It reduces the workload for bank staff and create convenience for the user. Customers' complaints is alleviated from bank workers because the ATM is a "do it yourself" service. Additionally, ATMs are incredibly helpful to travellers. They don't need to carry bulky cash (notes) with them (Mohammad & Dada, 2014). With this invention, traders can withdraw cash without having to carry chunk of their money to the market to make transactions, which also reduce the fear of armed robbers (Kendie, 2016). ATMs offer round the clock service, allowing bank customers to withdraw money up to a certain limit depending on the daily withdrawal limit established by their bank (Hana, 2017).

Sowunmi, Amoo, Olaleye and Salako, (2014) argued that ATM helps to perform the duties of the cashier with respects to payment services. Automatic Teller Machines (ATMs) have been adopted and are still being adopted by banks. They provide a lot of benefits to both banks and their depositors. Mohammad and Dada (2014) asserted that ATM serve as the electronic device equivalent of traditional banking services that enable customers to conduct financial transactions. In the absence of a bank teller, customers can deposit cash, withdraw cash, transfer money and perform other financial transactions using an ATM. Customers perceptions of the ATM service quality will be

measured by the ATMs capacity to perform these functions to the satisfaction of customers (Dawit, 2019).

The automated teller machine (ATM) is a recognisable device that simulates the functions of a bank teller by accepting deposits from and making withdrawals to and from account holders and users of the ATM. The cash machine (ATM) combines a computer terminal, a record keeping system and a cash vault into a single device for your convenience. Customers are able to enter the bookkeeping system of a financial company using either a plastic card holding a personal identification number (PIN) or by punching a specific code number into a computer terminal that is linked to the computerised records of the financial company (Peter & Sylvia, 2008). ATM users all over the world now have an easier time obtaining certain banking services that were hitherto only available in bank offices. These services include the provision of a mini bank statement, the withdrawal of cash, the inquiry of a balance, the transfer of funds from one account to another, the deposit of cash, the purchase of certain utilities like air time, and the payment of bills and taxes (Tillya, 2013). In addition, the convenience of transporting large sums of money with an ATM card contributes to increased levels of consumer satisfaction. According to Mazursky (2010), ensuring the security of cash in transit guarantees consumer satisfaction. Thus in turn, leads to increased frequency of purchases, which both retains existing customers and draws in new ones.

Customers of banks now benefit from the convenience that ATM machines provide. Because of this, automated teller machines (ATMs) can now be found in a variety of locations, including universities, airports, train stations, hotels, gas stations, and grocery stores, unlike in the past that it was restricted to the premises of bank branches and other financial institutions (Reddy, 2021). According to Akrani (2011), an ATM offers a 24 hours service that is, which means that the service is available at any time of the day. At

any time of the day. or night, the client may withdraw cash up to a certain amount, regardless of the time of day. The usage of automated teller machines (ATMs) is a vital instrument that financial institutions use in order to improve client's loyalty, and ultimately, organisational success and profitability.

Automatic teller machine is a modern device that bank have introduced to give its customers 24/7 access to money without them having to visit the bank branches. (Reddy & Megharaja, 2021). It allows users to withdrawal without entering a banking hall. It is accessible around the clock for account balance enquiry, selling recharge cards and transferring fund (Birhanu, 2021). Additionally, it saves time in providing customer service delivery as customers do not have stay long on queue at banking halls. As a result, they can utilize that time for other beneficial pursuits (Birhanu, 2021).

The majority of ATM's are located outside of banks. Originally, it was introduced to serve as cash dispensing machines (Abay, 2020 & Shrestha, 2019). However, due to the quick advancement of technology, ATMs go to the extent of given account balances and payment of bills. ATM's are mostly situated outside the banks. It was introduced initially to serve as cash dispensing machines (Reddy & Megharaja, 2021). However, as a result of the rapid increase in technology, ATMs go to the extent of given account balances and bill payments. This electronic banking device gives banks a competitive advantage (Birhanu, 2021).

Based on this study, ATMs is an electronic machine capable of handling cash withdrawals, cash deposits, balance inquiries, transfer between accounts and bills payment without having the need of going to the bank branch or visiting the cashier.

2.5.1 Services of Automated Teller Machines (ATM)

ATM refers to a type of electronic banking outlet that enables consumers to carry out routine financial operations without the assistance of a teller or branch staff. According

to Kendie (2014) anyone who possesses a credit card or debit card can use an ATM. These days, automated teller machines offer a wide range of services. These services include, cash withdrawals, funds transfer and balance inquiry.

2.5.1.1 Cash Withdrawals

According to Chaer, Diniz and Ribeiro (2011), prompt withdrawals of cash contribute to increased levels of consumer satisfaction. ATMs give clients the ability to access their money instantaneously at any time and at any ATM of their choosing. This encourages them to use the service on a more consistent basis. In addition, Nwobum, Ngaikedi & Anyanwu, (2022) discovers that customers are more satisfied with their overall experience when they are able to meet their urgent needs. Thanks to the inexpensive cash withdrawals from their accounts. Customers who are happy with their purchases have a greater propensity to tell at least five or more other individuals about their experiences. The banking sector is extremely competitive and as a result, all competitors are working hard to compete with one another in order to attract more customers. Frequent utilisation of ATM machine is an indication that a bank is effective and can determine the level of customers with ATM services.

However, Kumbhar (2011) declares that the effectiveness of ATM services includes 24/7 withdrawal which facilitates customer satisfaction. Similarly, Akrani (2011) and Tillya (2013) assert that any time of the day or night, the ATM user is permitted to withdraw cash up to a specific limit. Effective service delivery has a positive correlation in determining customer satisfaction in the sense that, when a customer feels that the delivery method of the transactions that the bank is meant to supply is pretty good, the more the customers will derive satisfaction with the bank services. This is because effective service delivery has a positive correlation with customer satisfaction. According to Olatokun and Igbinedion (2009), automated teller machines allow account

users to withdraw cash outside of traditional banking hours and in locations that are more convenient. In addition, because ATMs are capable of automating services that are formerly carried out manually, they lower the expenses associated with satisfying certain depositor's expectations.

2.5.1.2 Funds Transfer

A funds Transfer is an on-line system of transaction that enables customers to instantaneous transfer of money from their bank accounts to the accounts of other customers. A user of an ATM can easily transfer money between accounts held by the same or different banks at any time (Tillya, 2013). Therefore, ATM is a machine that facilitates easy transfer of cash transactions without the need of going to the banking hall (Chalet, 2011).

According to Diwan (2021), instantaneous transfer of cash by customers from their bank accounts to the accounts of other customers via ATM transaction is called a funds transfer. It is a direct transfer of funds from one bank account into another (Reddy & Megharaja, 2021). When using an ATM, a user of ATM can easily transfer cash between accounts owned by the same bank or by a different bank at any moment (Tillya, 2013). Consequently, an ATM is a device that makes it simple to transfer money without having to visit a bank (Abay, 2020).

Customers find ATMs convenient since they can transfer money to another bank account without having to visit a branch of the bank (Olomofe, 2018). It provides bank customers access to fund transfers round-the-clock which is expected to induce customer satisfaction (Biset & Bonsa, 2019). ATMs have made it easy for users to transfer money from one account to another. With ATM, customer can easily transfer money between accounts any day any time (Biset & Bonsa, 2019).

According to this study, funds transfer refers to the transfer of funds from one eligible account to another of the same or different bank via ATM. It is the movement of money from one bank account to another through ATM.

2.5.1.3 Balance Inquiry

People used to go to the bank for a variety of reasons, among which was to update their passbooks so that they would always be aware of their most recent amount. People began to use the automated teller machines (ATMs) rather than going to the banks once a service that allows them to check their account balance is available. Customers can check their balances via ATMs without spending time on hold or in a bank line. Users can find out how much money they have in their account by utilizing an ATM service (Tillya, 2013). According to Anderson (2001), one of the important aspects that greatly affects customer satisfaction is the ability to check one's account balance via an automated teller machine. Conversely, Chaer *et al*, (2011), explain that ATM enable customers to check their account balance conveniently. Nanyanzi (2021) argued that use of ATM system of banking brought efficiency in the banking industry particularly in term of balance enquiry and bill payment on a 24/7 basis which is expected to induce customer satisfaction. Adhallah (2010) describe that customers are allowed to check account balance using ATM at more convenient time and places than during banking hours at branch.

2.5.2 Benefits of Automated Teller Machines (ATMs) for Customers

Travellers can greatly benefit from ATMs as they need not to carry a lot of cash with them. With the help of an ATM, customers can withdraw cash from any city across the country and even outside the country (Tillya, 2013).

Utility bills can be paid through ATMs. The water, electric, and phone accounts of ATM users can be registered with their bank. Users can then use an ATM to view their

utility bills and have their monthly charges deducted from their bank accounts (Tasaw, 2019).

ATMs are more than just money dispensing machines. Customers can also buy stamps, phone cards, train tickets, and even financial goods such as stocks at bank machines by using their ATM cards. A person's bank account is used to facilitate payments (Tillya, 2013).

Based on this study, ATMs are quite helpful to travellers since they reduce the amount of cash they need to carry. After that, users can view their utility bills and have their monthly charges to be automatically debited from their bank accounts via ATM. Additionally, customers can use their ATM cards to purchase financial commodities like stocks at bank machines, as well as phone cards, train tickets, and stamps.

The most important aspects of ATM service quality include convenient and secure locations, the functionality of the ATM, user-friendliness of the systems and procedures and an adequate number of machines (Zenebe, 2019). ATM has significantly reduced the workload of the cashier by allowing users to conduct different banking transactions at anytime and anywhere depending on a proximity to ATM points (Kendie, 2016). Other benefits of ATMs for Customers are as follows:

2.5.2.1 Convenience

A bank customer can use ATM to withdraw money from his account without the need to go to the Banking hall. A user friendly, computer driven mechanism called an ATM is available 24/7. The ATM has a simple, step-by- step instructions for users, because it is entirely a menu-driven device (Zenebe, 2019). ATM machines allow bank users to withdraw cash more than the normal branch hours at more convenient times and places (Tasaw, 2019). Low educated and not so literate can also use ATM.

According to Mcandrews (2011), factors such as a location that is convenient and secure. An adequate quantity of ATMs, a user-friendly system, and the operation of ATMs all play a significant influence in determining whether or not a client is satisfied. While Joseph and Stone (2013), claim that enough number of ATMs, convenient and secure location, user-friendly system, speed, minimum errors, cash back-up, cost, and service coverage are critical characteristics of ATM service quality. It is a general believe that among the most important feature of ATM service quality is service coverage.

2.5.2.2 Speed

ATMs improve customer satisfaction in terms of transaction speed as the user of ATM do not need to go to bank branches to withdraw money (Biset & Bonsa, 2019). Regarding ATM speed, Biset and Bonsa (2019), argue that, one of the benefits of using an ATM for customers is saving time, as there is no need to visit the bank, wait in a queue and wait in a queue or fill some information each time ones wants to transact (Premlatha & Sharma, 2012). ATMs are automated devices that process transactions more quickly than human tellers. According to Tasaw (2019) ATM services improve customer satisfaction in terms of time flexibility and provide value by handling a large volume of transactions quickly, a task that traditional services were unable to perform effectively. Therefore, customers use the machine to deposit and withdraw cash at the times and the locations that are more convenient than during the banking hours (Biset & Bonsa, 2019).

2.5.2.3 Acceptability

According to Oumer (2016), banks also gain customers' acceptance of their services through the use of ATMs. Due to the wide ATM networks that banks make available to

their customers, ATMs enables users to do banking at their own convenience and schedule from any location. Ebere, Udoka & Gloria (2015) asserts that if customers accept the new automated channels of service delivery in banks, this could lead to a significant change in how retail banks established and maintain a strong relationships with their customers. Automated teller machines may be another component of electronic banking used by banks to gain their clients' acceptance of their services (Biset & Bonsa, 2019). Curtsy of automated teller machines, customers have the ability to do banking whenever and wherever they like (Yen, Tsai & Chen, 2010). Many innovative ideas have been implemented in the banking industry in an effort to increase customer patronage of banks and reduce service costs (Ebere *et al.*, 2015).

Ebere *et al.* (2015) adds that internet banking and ATMs are some of the examples of these innovative ideas among others. Nevertheless, if the users fail to adopt the innovative ideas, the effects of such forward-thinking technology are invalidated. Consequently, the level of user acceptability is seen to be a vital element that measures the extent to which any new innovation or technology is prosperous or fruitless.

2.5.2.4 Safety

Since users can access their accounts whenever they want with an ATM card, ATM offers safety by eliminating the need to carry significant amounts of cash (Kendie, 2016). One can keep money in a bank and receive interest while still having ready access to them. Tague (2010) emphasizes that a plastic ATM card linked to a bank account reduces the hazards associated with carrying huge amount of money as well as the time and resources lost on writing cheques. Similarly, Tasaw (2019), describes that a significant number of people avoid moving with money.

2.5.2.5 Reliability

The speed at which an e-banking service, like ATM banking, is accurately delivered is referred to as reliability. It is the extent to which the ATMs provide accurate, dependable and timely services to the users (Tsehaye, 2019). The success of electronic banking depends on its reliability and customer service (Kendie, 2016). Reliability, convenience and responsiveness are the key dimensions of ATM service quality that improve customer satisfaction (Biset & Bonsa, 2019). Similarly, Ebere *et al.* (2015) state that reliability influences customers satisfaction towards using ATM services.

2.5.2.6 Cost Savings

According to Tague (2010), the term cost can be used to describe a wide range of different charges, including monetary costs, time costs, energy costs, and so on. Customers may find ATM, and other forms of electronic banking to be more convenient and affordable than conventional banking. When all things are taken into account, an ATM has the capacity to provide a banking service at the most affordable cost possible (Oumer, 2016). Additionally, by providing an alternative to waiting in line in bank halls, it saves customers time while they are receiving services (Ephream, 2016). The time that customers save can be used for other activities that could be of benefit to them (Ranasinghe & Kosala, 2017). ATMs save costs of employing bank tellers (Kendie, 2016). Meheret (2019) recognize cost savings as one of the most important dimensions of ATM that influence customer in carrying out financial transactions.

2.6 Concept of Waiting Time

Waiting is common for most of service-related industry. We wait almost everywhere, in hospitals, clinics, banks, supermarkets and many other places. Customer waiting time

for service typically represents the primary or first direct interaction connecting customers and service delivery process. According to Joseph and Simon, (2018); Kotler and Keller (2016); Lin, Xia, and Bei (2015); and Lahap *et al.*, 2018) waiting time is the amount of time customer waits in line before receiving services. Waiting for service is a common occurrence in any environment where customers are involved, including ATM terminals, petrol stations, department stores, hospitals among others (Joseph and Simon 2018; Burodo, Suleiman & Yusuf, 2021). Whenever customers visit a service facility, some of them must wait before getting the desired service. It implies that the customers must wait for their turn. When customers must wait a long time to be served in a queue. This situation can be frustrating (Joseph and Simon 2018; Burodo, Suleiman & Yusuf, 2021). Customers get dissatisfied as a results since they cannot get the desired level of service (Lahap *et al.*, 2018). When the demand for a service exceeds the capacity, service is delayed. The system will develop a queue when the capacity is insufficient in relation to demand (Adeniran et al., 2022a).

In most cases, the period of time customer spends waiting in a queue for a service delivery is the very first direct contact between them and service delivery process. Ahmed, Burodo and Suleiman (2022) define waiting time as the typically amount of time customers must wait for a service provider to complete the services they have requested over a period of time. Waiting time could either be objective or subjective. Actual or objective waiting time refers to the actual amount of time the consumer waited to be served. This could be calculated consciously and objectively by reading the clock to determine the actual time a consumer waited to be served. Subjective waiting, also known as perceived waiting time, is the length of time that a consumer perceives he or she has been waiting for a service (Kang & Moon, 2020).

Lee, Chen, and Ilie (2012), assert that perceived waiting time is significantly more influential than actual waiting time on consumer satisfaction. Customers have varying thresholds for tolerable waiting times, with some deeming five minutes excessive while others finding it just fine. In addition, human perception of waiting time is subjective because it is essentially dependent on background, personal experience, and value (Lee and Koubek, 2012). Iqbal, Whitman, and Malzahn (2012) and Lahap *et al.* (2018), find that customer satisfaction decreases when waiting times are longer than anticipated. Therefore, it is crucial that service providers do not gloss over customer perceived waiting time (PWT), but instead devise effective strategies to manage PWT in the service delivery process (Lee, Chen & Ilie, 2012; Lahap *et al.*, 2018). Previous study by Lahap *et al.* (2018), has distinguished between waiting conditions with high costs and those with low costs. Low-cost waiting refers to the scenarios that are less expensive in terms of money or other value to the consumer, and high-cost wait refers to waiting circumstances in which the cost of waiting is prohibitively high for the customer. When it comes to the cost of waiting for a service on an airplane, a delay may be considered an example of a high-cost wait, whereas waiting in queue at a restaurant could be considered an example of a low-cost wait. The banking sector is very competitive, so the length of time customer has to wait in line is a crucial factor to consider because it can have a negative impact on customer satisfaction. According to Decker (2018), there are waiting times that are acceptable or tolerable and those that are unsuitable. Acceptable waiting time refers to the amount of time that customers are willing to endure as normal for the delivery of a specific service, whilst unacceptable waiting time refers to the amount of time that customers regard to be relatively unreasonable to wait for a specific service to be finished by a service provider.

In many occasions, while using ATM machine for cash withdrawal, fund transfer and balance inquiry, customers have to wait for some time to get the desired service. This situation could turn out to become quite annoying when customers have to wait in a queue for a long time before being served. This necessitate the consideration of waiting time as a moderator.

2.7 Deposit Money Banks

A deposit money bank is a type of financial institution that is authorised by the regulatory body to collect deposits from surplus units, distribute those deposits in the form of loans to deficit units, and provide additional financial services. Deposit money banks are also required to execute other types of financial tasks (Nuhui, Hoti & Bektashi, 2017). It performs intermediating role by accepting deposits and use such to make loans of different maturities either fixed or at variable rates and earn profit through interest rates spread by charging for services provided (Olawumi, Lateef and Oladeji, 2017). Therefore, the principal role carried out by deposit money banks is to ensure there is adequate flow of money to service deficit sectors of the economy and facilitate the movement of funds amongst economic units.

2.8 An Overview of the Nigerian Banking System

In this section, the development of banking system, its legislation and financial operation from the era of free banking to the post universal banking period is to be discussed. This section discusses free banking era,

2.8.1 Free Banking Era: 1892-1951

Throughout this time period there is no legislation in place to regulate the founding or operation of financial institutions like banks. During this time, the ability of the

economy to properly absorb the rapid increase in financial assets was not a factor in the establishment of banks. As a result, the majority of banks are quickly founded, and almost immediately afterward, they all went into voluntary liquidation at the same breakneck pace. The majority of the financial institutions that failed during this time or period were local banks. These institutions are characterised by a lack of appropriate accounting standards, low capital, quick and indiscriminate expansion, fraudulent practices, unwise credit assessment and administration, record keeping and poor management (Olubisi, 2015).

2.8.2 Pre-Central Banking/Banking Boom Era: 1952-1958

The Pre-Central Banking/Banking Boom Era was the first time that attempts were made to regulate the banking sector. These attempts were done throughout this time period. This meant that it coincided with the time period in which the Banking Ordinance of 1952 is passed into law (Babarinde & Ajala, 2013). The legislation established rules for obtaining licenses, in addition to procedures and guidelines for the operation of banking businesses. The key accomplishments of this law include the limitation of banking operations to establishments that hold legal licenses, the prevention of the construction of banks that are not sustainable, and the implementation of commercial banking practises that are more orderly. Even so, this was not enough to avoid the failure of poorly managed financial institutions. Adenugba (2015), also describes the period as the era of first banking boom. He further argued that the state of the economy and the minimal regulation of the industry by the 1952 ordinance, gave birth to the establishment of more indigenous banks, all of which failed, during the period.

2.8.3 The Era of Banking Regulation: 1959-1985

Uche (2000), describes this Era of Banking Regulation as the third stage due to consolidated growth following the establishment of the CBN. This era saw the registration of cooperative banks by state administrations in order to service the burgeoning cooperative societies. In addition, more foreign institutions emerged between 1960 and 1975. The period also witness an increase in government securities transactions. The CBN made endeavours to bolster the securities market shortly after its establishment by the 1958 Act. The Act also gave considerable incentives to the development of the money and capital markets of the country. In this new and encouraging climate, more commercial banks sprang up in the country.

Furthermore, between 1959 and 1960, eight new commercial banks were established. And this brought the total number to 12, and it later increased to 17 by 1962 (Teriba, 2004). This led to 1960 when some short-term government debt instruments were introduced into the market to supplement the Commercial Papers that were already available. The call money programmed was initially implemented in 1962 in an effort to assist banks in managing their liquidity. Treasury certificates were first made available to the public in 1968, although certificates of deposit weren't available until 1975. 1976 saw the introduction of both the Bankers' Unit Fund and Stabilization Securities. Ogowewo and Uche (2006) stated that during the Era of Banking Regulation CBN helped in the emergence of the securities markets and instruments as well as the promotion of development banks. In 1960, the Lagos Stock Exchange was established, and reconstituted into Nigerian Stock Exchange in 1977.

Not until 1985, the global economic development environment allowed the Nigerian financial system to keep these basic traits. After that year, however, the environment-

imposed deregulation on the sector. A more intense engagement by the public sector in the financial industry took place during this time period. This took the form of direct credit, stringent supervision of interest rates, and a persistent increase in the paid-up capital of new banks. Although the policy aims were to promote good banking practises in order to protect clients, the control instrument gradually grew more onerous beginning with this period onward. Direct and selective credit controls were imposed on the size of lending to the private sector, and a minimum proportion of available credit was allocated to sectors that needed a substantial amount of credit (Ekezie, 1997). These measures are implemented in order to give priority to sectors like agriculture, manufacturing, mining, and so on.

2.8.4 The Era of Deregulation (1986-1993)

The concept of deregulatory does not mean that there are no regulatory agencies or that there is an absence of laws and order inside the system. Although it was called the deregulation period, the years 1986 to 1993 actually resulted in a significant increase in the number of regulations that were designed to address the distortions that were brought on by regulatory constraints. Having to do this is unavoidable due to the fact that in order to alter the pre-existing guidelines for how the game is played, new guidelines must first be established, hence the need for new regulations. The Structural Adjustment Programme (SAP) was implemented in Nigeria in 1986. This programme had a number of goals, one of which is to modify the structure and operational mechanism of the country's financial system. The interest rate structure as well as the foreign exchange market were made subject to the whims of demand and supply, otherwise known as a market-determined rate. As a result of the significant gap that existed between the official rate of foreign exchange and the rate on the parallel market,

there was a frenzy to get bank licenses, which led to unorthodox business activities (Olomofe, 2018).

The Nigeria Deposit Insurance Corporation, also known as the NDIC, was established in accordance with “Decree 22 of 1988 in order to guarantee the deposit obligations of licenced banks, give financial and technical help to the banks, and to contribute to the pursuit of a secure and reliable banking environment in Nigeria. Decree 24 of the Central Bank of Nigeria and Decree 25 of Banks and Other Financial Institution Decree (BOFID), both of 1991, were issued to replace the Banking Act of 1969. These two decrees were revised by Decree 3 and Decree 4 of 1997. They are devised with the intention of elevating the standard of banking operations. The National Economic Reconstruction Fund (NERFUND) was established through Decree 2 of 1989. The Bureau-De Change was also established in 1989 to provide small and medium enterprises with access to credit and foreign exchange. The Nigerian Export and Import Bank (NEXIM) was established in 1991 to promote the export of non-oil products by providing credit and risk bearing facilities. There were a total of 50 banks functioning in Nigeria in February 1988, with 34 of them being classified as commercial banks and 16 of them being classified as merchants banks (Olukotun, Ademola, Olusegun & Olorunfemi, 2013).

In 1990, the Central Bank of Nigeria (CBN) licenced a record 25 banks to open for business. The number of banks in operation increased to 119 in 1991 from 115 in 1990 (65 commercial and 54 Merchant). Magnum Trust Bank Limited, the newest and last of the major banks as at the period of this research opened for business in the first quarter of 1992, bringing the total to 120 (66 commercial and 54 Merchant). The formation of rural cooperative banks, which ultimately did not take place. This is because the Federal Government, through its various grass-roots-oriented programmes and organizations,

has performed significant research into the construction of a Community Banking System (Babarinde, 2010), it is now clear that such a system is feasible. The creation of community banks, as indicated in the Federal Government Budget Speech of 1990, is possibly the most innovative and revolutionary of all the new financial policies that the government has enacted since the time of deregulation. According to CBIC (1990), a self-sustaining financial institution that is owned and maintained by a community or a group of communities for the purpose of issuing credit, banking, and financial services to its members, mostly based on their self-recognition and credit-worthiness, is referred to as a community bank. In contrast to this, conventional banks almost entirely rely on viable and negotiable collateral as the foundation for their issuance or credit. This is the case in contrast to alternative lenders.

Community banks perform most of the services of conventional banks that includes ;acceptance of deposits, receipt of money or collection of proceeds of banking instruments on behalf of customers among others. Though, community banks are required not to engage in sophisticated banking services like international commercial, foreign exchange transactions and papers, corporate finance, etc., so as to allow them to retain their local focus (CBIC, 1990). Currently, the minimum paid-up share capital to be maintained for a National level community banking licence is 10,000,000,000. The community bank operates under the concept of unit banking, quite different from the concept of branch banking operated by older banks, comprising most Merchant Banks, and People's Bank (Olubisi, 2015).

2.8.5 The Era of Guided Deregulation: 1994-1998

This era saw the licencing of banks, the regulation of interest and exchange rates, the liquidation of distressed banks, the promulgation of the Failed Banks Decree and the establishment of Failed Banks Tribunals, an increase in the paid up capital of banks, and other measures that were necessary as a result of the overexposure during the deregulation era, which led to distress and erosion of public confidence in banking operations (Olubisi, 2015).

The era was characterised by a large number of policy reversals in the wake of the change in government. This possibly reflect a weariness with regard to SAP-induced reforms. Capital flight and a large-scale withdrawal of cash by depositors have increased as a result of the political instability, uncertain policy changes, and rising inflation. The macroeconomic policy that was implemented through the 1994 fiscal budget suffered a setback, which made the already precarious position of banks even worse. By 1994/1995, a total of 50% of the nation's banks were in a precarious financial position, and the ratio of non-performing loans to total loans stood at forty-three percent. The Central Bank of Nigeria (CBN) and the National Deposit Insurance Corporation (NDIC) acted in order to salvage the situation. These actions included the provision of liquidity support through accommodation facilities, the enforcement of holding action against further lending, the takeover, restructuring, and liquidation of terminally impaired institutions, and the imposition of holding action against further lending (Olubisi, 2015).

After being amalgamated or fused in January 1989 as part of the Inter-bank Foreign Exchange Market (IFEM), the official and market rates were eventually split apart in 1995 as part of a programme of "guided deregulation" of the foreign exchange market.

The market for foreign exchange was divided into two categories: the official market, which facilitated transactions for the government at a discounted rate of N22 to US\$1, and the Autonomous Foreign Exchange Market (AFEM), which catered to customers from all other industries at a cost of N80 to US\$1. Because of this segmentation, there were more opportunities for "rent-seeking," round tripping, and other forms of market abuse.

It became very necessary to ease market restrictions on foreign equity involvement as the need to attract and keep (foreign) capital within the Nigerian economy increased. This was due to the fact that the need to do so increased. As a result, Decree No. 7 of 1995 that addressed the Promotion of Nigerian Enterprises, and Decree No. 16 of 1995 of the Nigerian Investment Promotion Commission (NIPC) were enacted. These secure the unrestricted transferability of dividends, earnings, loan repayments, interests, and remittance of divestiture proceeds and eliminated all limits on foreign shareholding. The immediate result of these reforms was a boom in the capital market. It led to an increase in the number of securities that were listed on the Nigerian Stock Exchange (NSE), as well as increases in overall market capitalization, activity levels, and the relative size of the NSE in comparison to other African stock exchanges. As a consequence of this, throughout this time period, the NSE was scrutinised by the Standards and Poor's Emerging Markets index (Olubisi, 2015).

Incorporating the Nigerian Inter-Bank Settlement System (NIBSS) and introducing a card-based payment system in 1993 was another major achievement during the time period. In addition, in 1995, the updated clearing rules and the Magnetic Ink Character Recognition (MICR) technology for clearing cheques was introduced went into effect. In 1997, the government increased the minimum capital requirement for commercial and merchant banks to N500 million, which is a significant increase. Prior to that time,

the BOFI Decree 1991 (Oluseun, 2012) mandates a minimum capital basis of N40m for Merchant Banks and N50m for Commercial Banks.

2.8.6 Universal Banking Era (1999 – 2003)

The transition to a democratically elected government May 29, 1999 also brought about another millstones significant shifts throughout the entirety of the country's financial system. A few of the financial institutions that were hitherto in trouble were stabilised and reorganised so that they could function more effectively. The vast majority of the already existing banks expanded their branch networks, while a number of foreign banks also set up shop in Nigeria.

Oluseun (2012) provides that, assessment the functional distinction between commercial and merchant banking that was established as a result of the Banking Decree of 1969 was successfully eliminated, paving the way for uniform licences to be issued to all banks and allowing those banks to choose in which sector of the financial services market to compete. In August of 2001, the Small and Medium Enterprises Equity Investment Scheme was established. This scheme requires financial institutions to set aside 10% of their annual profits for the purpose of equity investment in Small and Medium Enterprises (SMEs). The idea was that, the Federal Government of Nigeria intends to use small and medium-sized enterprises (SMEs) as instruments for rapid industrialization, employment generation, poverty alleviation, and sustainable economic development. After the completion of this project, the Nigerian Industrial Development Bank (NIDB) underwent redevelopment, which was followed by the foundation of the Bank of Industry Limited (BOI) in October 2001. In addition, during this time period, a minimum capital base of one billion Naira was mandated for all banks to meet regulatory requirements.

In the five years leading up to 2004, the CBN extended its supervisory role over banks while working hard to close arbitrage windows in the foreign exchange markets. As part of this procedure, the CBN suspended 21 banks in 2002 for violating foreign exchange laws and implemented the Dutch Auction System (DAS). Furthermore, the CBN launched Project EAGLE, an internal reform project aimed at improving regulatory efficiency and effectiveness.

2.8.7 Post Universal Banking Era: 1999 to the present

On July 6, 2004, the Governor of the Central Bank of Nigeria, then, Professor Charles Soludo, delivered a speech at a Special Meeting of the Bankers Committee. He made the announcement of a 13-point Reform Agenda, which he titled as "the New Agenda for Repositioning the CBN and the Financial System for the 21st Century." The agenda is broken down to the following: An obligation imposed on banks to maintain a minimum capitalization level of N25 billions of which complete compliance was by the end of December 2005 (the expiration period is for 18 months). By the end of 2005, participation in the DAS and holding deposits from the public sector will be limited to just those banks that satisfy the condition. The names of financial institutions that met the requirements by the 31st of December in 2005 publicised. Withdrawal of funds from banks held by the public sector in increments was to begin in July 2004. The merging of financial institutions through mergers and acquisitions. Adoption of a regulatory framework that is risk-focused and rule-based; Implementation of a zero-tolerance policy within the regulatory framework as a whole, in particular with regards to the provisioning and dissemination of data and information (Olokoyo & Adegba, 2008).

Other objectives include the creation of a hotline and a confidential internet address (governor@cenbank.org) for all Nigerians who wanted to submit confidential

information with the Governor of the Central Bank about the activities of any bank or the financial system. However, “strict execution of the systemic banking distress contingency planning framework. Establishment of an Asset Management Company is a critical component in crisis response. Promotion of the implementation of inactive legislation relating to, for instance, the issuing of bogus checks and the vicarious liability of bank board members in cases of bank failures; Revision and updating of necessary legislation, as well as the creation of new ones, pertaining to the efficient operation of the banking system; Collaboration with the Economic and Financial Crimes Commission (EFCC) (An anticrime agency established by the Obasanjo democratic government) in establishing the Financial Intelligence Unit (FIU) and enforcing anti-money laundering and other economic crime measures; Single obligor limit of 10% of shareholders' funds, rather than the current 25%, with aggregate borrowing limited to 800% of shareholders' funds”.

The goal of the reform programme is to establish a banking sector that is diversified, robust, and trustworthy. This sector (i) guarantees the security of the money deposited by customers; (ii) plays important roles in the growth and advancement of the economy, and (iii) develops the skills and experience necessary to be successful participants in both the economic and financial sectors of Africa and the rest of the world. The number of banks fell from 89 to 25 as a direct result of the plan of reform, which had a direct influence on the industry. Given that the deadline of December 31, 2005, only 76 out of 89 banks were able to make it. With the exception of a few banks that remained independent, 76 institutions were been either merger, acquired, or were subjected to other forms of consolidation (Olubisi, 2015).

According to (Olubisi, 2015) when the re-capitalization notion was first presented, there was a great deal of pushback against it from both the industry professionals and

academics. Several observers believe that the activity was designed to get rid of the nation's smaller banks and cut down on the total number of banks. It immediately became an additional risk to loss of jobs because a decline in the number of small banks or their complete disappearance. In addition, the activity was criticised as an attempt to (miss) utilise share capitalization to push the creation of mega banks whose constituents would be strange bedfellows. This interpretation of the exercise led to criticism. The consolidation through coercion is not without its drawbacks as a policy. In reality, the Central Bank of Nigeria stated in its document titled Code of corporate governance for banks in Nigeria post consolidation. Consolidation poses among others, the following risks to governance fans. Technical incompetence on the part of the board and management; board disagreements brought on by the collision of several diverse company cultures; disagreements between executives and employees; elevated levels of risk; integration of elements that doesn't work very well; insufficient advancement and integration of technological innovations, accounting systems, and record keeping mechanisms; poor managerial capabilities; a significant increase in the number of unethical practices; lending related to insider information; filing of fake tax filings; continued concealment; ineffectiveness of internal controls; and inadequacy of internal controls". It was therefore, impossible to commend this policy on the assumption that its peripheral effect would be to improve corporate governance. This effect is one of the programme's unintended consequences. In addition, it is not obvious that a rise in the share capital of Nigerian banks would immediately generate any significant attitude shift. This is one of the most shocking findings (Olubisi, 2015; Olokoyo & Adegbaaju, 2008).

In addition, a strategy of forced consolidation does not come without any inherent risks. It raises the possibility that value-eroding mergers and acquisitions have already taken

place and it is being completed. Even in the best of circumstances, such as when they are entered into because of the identification of a strategic business purpose, mergers and acquisitions present a great deal of challenges for the parties involved. While the overarching strategy goal is to exert more regulatory pressure, the chances of unsuccessful consolidations increases significantly. By pushing banks to approach mergers with an eye to obtaining a balance sheet consolidation rather than on the synergies to be achieved, the Central Bank increased the possibility that ill-fitting entities may have combined their balance sheets. Ogowewo and Uche (2006) declared that, consolidated businesses that ended up destroying shareholder value could hardly be considered to have been successful mergers. These claims are supported, for example, by the history of Spring Bank following consolidation and up until its acquisition by the CBN.

The fact that many value-destroying consolidations were actually averted indicates that many partnerships that were formalised in memorandums of understanding collapsed throughout the exercise; nonetheless, this in no way negates the reality that some value-destroying consolidations were actually implemented.

According to Ogowewo and Uche (2006) hold that the risk of shareholder wealth erosion was enhanced in the case of banks that met the requisite capitalization amount not through a capitalization of reserves but rather by an issue of fresh shares. Specifically, this risk was elevated in the instance of banks that issued new shares to meet the needed capitalization amount. This was because the risk of shareholder value destruction was higher in the case of banks that met the minimum capitalization number. As a result of the consolidation, there will be a greater number of shares available for purchase, which will make it extremely difficult for these banks to retain the earnings per share they had prior to the consolidation. In addition, there will be

difficulties in integrating the two companies after the merger has been completed. It is clear from the Central Bank's circular to banks that was sent out in May 2006 that contrary to the reasoning of the Central Bank, the harmonisation of new partners cannot be mandated by fiat. It is interesting to note that the Central Bank did not see it necessary to use the increase in bank share capital in order to encourage bank mergers. Even before it was announced that a share capital of 25 billion would be required, developments in the Nigerian banking sector demonstrated that the industry was ready for consolidation and should proceed with it. Since the announcement in 2004 that a minimum share capital requirement of 2 billion was going to be implemented, the number of applications for new banking licences got virtually vanished. In addition, at the end of 2003, there were around a dozen or more financial institutions that were glaringly candidates for reorganisation. As a result, there was a significant amount of potential for further consolidation to take place in the Nigerian banking sector, it is to be recalled that in the absence of pressure from regulators, the mergers and acquisitions would have been strategic, and the danger of value-destructive consolidations would have been decreased. This is the most crucial point to keep in mind. A policy of "forced" consolidations is inferior to one that encourages strategic consolidations, notwithstanding the fact that the former policy presents more intellectual challenges (Olubisi, 2015; Olokoyo & Adegaju, 2008).

The result was an increase in the desire for worldwide expansion on the part of financial institutions, as projected. Nigerian banks at the time were actively expanding their operations abroad. For example, Zenith Bank NIG Ltd has branches in Ghana and Sierra Leone, while Access Bank NIG Ltd has branches in Ghana, Sierra Leone, and Cote d'Ivoire, the Democratic Republic of the Congo, the Gambia, and Rwanda. As of September 23, 2008, ten of Nigeria's twenty-four banks obtained full-fledged licenced

banks abroad. This is a testament to the size and pace of Nigeria's banking investments outside. These banks are: First Bank, Union Bank, Intercontinental Bank, Access Bank, Bank PHB, United Bank for Africa (UBA), Guaranty Trust Bank, Zenith Bank, and Oceanic Bank. Lastly, Fin Bank (previously First Inland Bank) made the cut after announcing on September 22 that it had acquired the Arab Gambian Islamic Bank (Uche, 2009) and thus entered the Gambia market. In addition, financial institutions turned to the capital market for equity funding in 2007 and 2008, with some even achieving a listing on an overseas exchange. During this time, for example, Guaranty Trust Bank was able to obtain a stock exchange quotation in London.

The current banking administration places a significant emphasis on the completion of "unfinished business" from the previous regime, specifically the consolidation agenda. It is essential to keep in mind that this time period coincided with a financial crisis in the overall financial system of the world. On a more upbeat note, the consolidation effort assisted Nigerian banks in developing some resistance to the ongoing financial crisis. The transition from one civilian government to another that took place in May 2007, was accompanied by a strong commitment from the Federal Government to make Nigeria one of the 20 largest economies in the world by the year 2020. The Financial System Strategy 2020 (FSS 2020), which is one of the broad policy frameworks for achieving this goal, is one of the broad policy frameworks for achieving this goal. The most important goal of the ongoing changes is to promote financial stability, and these measures are intended to do so by expanding on the achievements of past reforms.

Eight major interrelated factors, "including macroeconomic instability brought on by large capital inflows, significant failings in corporate governance at banks, a lack of sophistication on the part of investors and consumers, insufficient disclosure and poor transparency, significant weaknesses in the business environment, and unstructured

governance and management”, contributed to the creation of an extremely fragile financial system after the consolidation (Sanusi, 2010).

In collaboration with the NDIC, the CBN launched a unique assessment of Nigerian banks. The special assessment team's investigations found that, 10 out of 24 banking institutions were in critical condition, and they require the CBN to pump N620 billion into nine banks. Non-performing loans at the ten banks, in particular, reached N1, 696 billion. This accounts for 44.38% of total loans. The aggregate provisioning required by the 10 banks was N1, 221.52 billion; the capital adequacy ratio ranged between 1.01% and 7.41% respectively. And which is below the statutory minimum ratio of 10%; and the banks required N495.83 billion in additional capital injection. One essential component of previous changes was Universal Banking, which allowed banks to diversify and provided a significant challenge to regulators (Olomofe, 2018).

The initiatives taken by the CBN were: the following: Injecting a total of N620 billion into nine banks; Changing out the CEOs at 8 of the banks with new people who specialise in turnarounds. Reaffirming the guarantee of the local interbank market in order to ensure that all banks continue to have access to liquid assets. Guaranteeing the credit lines of foreign creditors and correspondent banks in order to ensure confidence and continue to maintain crucial banking connections between correspondent banks. The infusion of cash allows the banks to render services and prevent customers from withdrawing their money and running the banks. Sanusi (2010) submits that the present banking reform is founded on the following four pillars:

- i. **Enhance the quality of banks:** Reform of the regulatory framework; Risk-based oversight; consumer protection; Corporate governance; Disclosure and transparency.

- ii. **Establish financial stability:** Financial stability committee; Macro prudential issues; and Capital market development.
- iii. **Enable healthy financial sector evolution:** Structures of competition within the banking industry; enhancements to the cost structures of financial institutions via cost control and business process outsourcing; Payment systems that are dependable and secure Increased access to financial services and enhancements to the financial infrastructure, including credit bureaus and registrars.
- iv. **Ensure the financial sector contributes to the real economy:** Enhancing the efficiency of the development financing institutions that are already in place; Analysis of significant challenges to the expansion of the economy, such as those posed by electricity, port, and railway infrastructure; Taking advantage of the fact that the CBN acts as a consultant to the government on financial affairs; A deeper connection with the financial services industry.

In essence, therefore, the following results occurred. A supervisory system for banks and other financial organisations that places a strong emphasis on risk management. A stringent application of the framework for emergency preparation in the event of widespread banking distress. The setting up of the Asset Management Corporation of Nigeria, also known as AMCON, with the purpose of acquiring the non-performing assets of Nigeria's banks. Encouragement of the application of inactive laws, as well as the reform and updating of pertinent laws that are related to the efficient functioning of the banking system. The inclusion of a number of banks based in Nigeria in the list of the top 1000 banks in the world. The grouping of banks into three categories in accordance with their share capitalization (regional banks with a capitalization of N10 billion, national banks with a capitalization of N25 billion, and international banks with

a capitalization of N50 billion). The practise of "cheque truncation," in which clearing cheques are kept at the receiving banks rather than being forwarded on to the issuing/paying institutions, has recently become more widespread. Instead, just the digital/soft copy are transmitted to the banks that are responsible for issuing and paying the bills. Corporate Bonds. The Cash-less policy is being implemented with the intention of minimising the total number of monetary transactions that take place in the economy. It is expected of banks, given their role as intermediaries in the payments system, to encourage the use of electronic media for the payment and settlement of commercial transactions (Sanusi, 2010).

Certainly, it is unclear how much of an effect the examination of universal banking will have, because banks, by virtue of the holding company structure in which they operate, will continue to engage in activities that they perceive to be profitable. Because authorities in Nigeria might have considered the history of the banking business in the country, it is possible that the post-consolidation outlook for the industry is not favourable. As a result of the fact that financial authorities do not seem to view the study of banking history as being vital, there appears to be no archival policy in place which would have foster the study of banking history. The unpredictable character of Nigeria's banking policy is already displaying the effects of this situation. It appears that policies are being developed without considering the lessons that can be learned from history. And, this being the case, then the end effect is that the same mistakes that were committed in the past continue to appear in the present! The Central Bank of Nigeria's decision to abandon the universal banking concept serves as a crystal-clear illustration of this point. The inability of legislation to place constraints on the operations of universal banks is a more direct source of the liquidity problem than the abuses of

insiders. This are prevalent in almost of the sectors of the Nigerian economy. And this is an important factor in the development of the crisis (Olukotun *et al.*, 2013).

The economic and financial crisis that began in developed countries has now spread to other parts of the world and has contributed to a global recession. Instead of the subprime mortgage crisis, it is this global recession that is responsible for the harm on the financial systems of nations that had exchange control restrictions and currencies that could not be converted. In other words, an economic crisis has arisen in a number of developing countries as a direct result of the recession that was caused by the financial system in some of the world's largest economies. To be more specific, this has led to a decrease in the pricing of commodities as well as investments, credit, and exports. The value of the risk assets portfolios held by Nigerian banks that had been negatively impacted by exposure to these markets was significantly reduced. As a direct consequence of this, the liquidity and credit markets became extremely constrained, which causes issues for the financial system in Nigeria and other developing countries. The vast majority of countries in Africa are placed under this group. Therefore, it would be helpful at this stage to conduct a review of the structure and regulation of the Nigerian financial system. In the first instance, it will be to confront the challenges of financial stability that have been brought to light, both directly and indirectly, by the ongoing financial and economic crisis that is taking place all over the world (Olukotun *et al.*, 2013).

2.9 Evolution of ATM, and the Emergence and Development of ATM in Nigeria

Luther Simjian, an American inventor and businessman, was credited with a patent right of automated banking. The use of ATMs began with the invention of "army flight

simulator, a colour X-ray machine, a self-focusing camera among others, although he became most famous for his achievement in the Bankograph, a machine that was capable of accepting deposits of cash or checks at any time." By the year 1960, Simjian had been successful in convincing a bank in New York City to purchase several of his automatic deposit machines. The machine had a built-in microfilm camera that took a snapshot of every deposits and issued a copy as a receipt to Customers. However, the machine did not win the heart of people as anticipated (Kendie, 2016).

John Shepherd Barron, an inventor from Scotland, had the bright notion in 1967, that if vending machines could dispense chocolate bars, then why couldn't they dispense cash? As a result, he came up with the idea of a self-service machine that will distribute paper currency offering people availability twenty-four hours a day, seven days a week (Oumer, 2016). This notion was born out of his natural curiosity as well as his intense desire. The proposal was well received by Barclays, a London-based financial institution, and shortly thereafter, Shepherd-Barron placed its first automated teller machine (ATM) in a branch located on Enfield High Street. In contrast to today's automated teller machines, Shepherd-Barron did not utilise plastic card technology. Instead, it made use of paper vouchers that were printed with radioactive ink in order for the system to be able to read them (Oumer, 2016).

An engineer from Dallas named Donald Wetzel, who had previously played baseball professionally, came up with the idea for the first time of automated banking machine to be used in the United States. Plastic cards comparable to those in use today were employed in Wetzel's machine. However, rather than storing account information using radioactive ink, the cards instead had magnetic strips. The very first of Wetzel's devices was put into operation on Long Island in September of 1969 at a branch of a chemical bank. However, in order for the ATM to earn the trust of American's bank clients, the

company had to take a risk and a snowstorm had to occur first. In 1977, the chairman of Citi Bank took a massive risk by spending more than one hundred million dollars to install automated teller machines (ATMs) all throughout the city of New York. In January of the next year, a massive blizzard struck New York, dumping 17 inches of snow on the city, and this investment proved to be profitable. The fact that banks were closed for several days led to a 20% rise in ATM usage within a few days, which prompted Citi Bank to start an advertising campaign with the slogan. The Citi Never Sleeps. After that, virtually all of the other financial institutions in the nation decided to follow Citi's example. There are approximately 3.9 million automated teller machines (ATMs) operating across the globe (Honorine, 2018). This growth in the availability of electronic banking services has been greatly facilitated by globalisation.

In 1989, National Cash Registers (NCR) built a Mechanical Cash Dispenser at the now-defunct Societe Generale Bank of Nigeria (SGBN). That marks the beginning of the country's ATM industry. Cash Point 24 was the brand name that was used for SGBN's automated teller machine. Also, two years after SGBN, in December 1991, First Bank of Nigeria Plc introduced their very own automated teller machine (ATM). Additionally, they branded their automated teller machine with the moniker "First Cash." And in contrast, the automated teller machine at First Bank had a through-the-wall design, whilst that of SGBN was a drive-in system (Jegade, 2014). On the other hand, at that time, they were viewed as a sophisticated facility that was created for people who desired special service. The situation is very different currently, since automated teller machine technology appears to have become widespread and is universally accepted by customers across the country. At the moment, there is a significant push towards using bank cards and ATMs. However, the widespread use of automated teller machine technology in Nigeria can be attributed to the changes in that

banking sector that began in 2004. This is in addition to the earlier presence of the Interswitch network in the country in 2003. Both of these events occurred simultaneously.

As part of its reform agenda to move the country forward and towards a cashless economy and improves the quality of banking services, the Central Bank of Nigeria (CBN) ordered commercial banks in the country to place ATMs in their branches and other critical sites in order to serve their clients. This mandate was issued in 2004. According to Emeka and Favour (2012), this is because Nigerian banks used Inter switch Network to aggressively push out debit card services, leading to a 93% increase in debit card transactions between January 2005 and March 2006. The overall number of automated teller machines (ATMs) has also increased dramatically, from just 500 ATMs in 2006 to over 8,000 ATMs in 2009. This is in direct proportion to the rise in the volume of transactions, which increased from 1.6 million transactions in 2006 to over 500 million transactions in 2009. The value of ATM transactions also raised dramatically during the period. It rise from N698.19 billion to N937.39 billion, which represents a rise of 34.3%. As at the end of June 2012, the number of ATMs stood at 10,221, while the value of ATM transactions increased. From its beginning point of N937.39 billion in June 2012, this number continued to rise throughout the rest of the year, reaching N1.3 trillion by the end of the same year. The Central Bank of Nigeria (CBN) has reported that the value of financial transactions that were carried out through ATMs as of June 2014 has reached N1.7 trillion, which is an increase from N1.3 trillion that it was in 2012. In a similar vein, the number of ATMs that were operational in the country increased from 10,727 in the year 2012 to 15,000 as of June 2014. The quick growth documented over the ATM transactions in Nigeria cannot however be disassociated from the large attention and promotes of ATM usage by commercial

banks through various ATM advertising schemes in the country. This is because commercial banks in Nigeria have implemented a variety of ATM advertising programmes. It would appear that banks are no longer interested in maintaining personal relationships with their clientele. According to Fabunmi (2011), certain financial institutions have begun penalising their clients. In a sense, for not having an ATM card by debiting the account of such a client if the client withdraws less than a predetermined amount from an in-branch cashier.

Therefore, on November 6, 2012, the Bankers Committee of the CBN approved the immediate abolition of the N100 penalty that is imposed on consumers who use an ATM of a particular bank to transact in another. The apex bank argues that this will aid in minimizing the number of queues that form in front of ATM machines. As a consequence of this, the elimination of this fee had a positive impact on the number of customers using ATMs across the nation. And as a result, the frequency with which bank customers used ATMs owned by other financial institutions rose appreciably. For example, as at December 2013, it has increased to N66.8 million from N33.4 million when it was first recorded in January 2013 (Olubisi, 2015).

The CBN reinstated fees for using automated teller machines (ATMs) on September 1, 2014, and currently, banks in Nigeria are charging customers N65 for utilising remote-on-us ATMs after the third of such withdrawals during a given month. Withdrawals made from ATMs located at financial institutions other than the bank at which the account is domiciled are referred to as remote-on-us ATM withdrawals. The CBN argued that the reinstatement of the fee was necessary as a result of an increase in the rate at which bank customers use ATMs indiscriminately. This, according to the CBN, has caused banks to experience a decline in their profitability as well as an increase in their overhead costs. According to the apex bank, the introduction of the fee will

therefore, contribute to the reduction of the burden that the cost places on banks (Olubisi, 2015).

2.10 Review of Empirical Studies

This section reviews relevant and related studies on the subject matter. This is in order to provide evidence for the findings and arguments of existing studies. There is also the need for an empirical assessment of the contributions made by the various researches.

2.10.1 Empirical Review on ATM Services and Customer Satisfaction

This section provides some literature on ATM services and customer satisfaction in order to identify the established facts and identify the gaps of the current study.

There exist conflicting findings that investigate the relationship between ATM services and customer satisfaction. For example, Gabriel et al. (2015); Fyery (2015); Khan (2010); Mohammed and Dada, (2014); Syed and Khaliquzzaman, (2016); Ameer, Usman, Muhammad and Nimra (2016); Chi and Phong (2015); Kendie (2016) show that ATM services influence customer satisfaction positively. On the other hand, Matimbwa and Ochumbo (2018); Charles, (2016a); Matimbwa and Ochumbo (2018); Singh and Komal (2009); Enyeribe (2019) indicate that ATM services influence customer satisfaction negatively. Moreover, Joseph (2013) show that that ATM services have no effect on customer satisfaction. According to Barron and Kenny (1986), if the findings of the previous studies on direct relationship are mixed and inconsistent there are possible intervention of third variable which serves as a moderator. Based on this, the study proposes waiting time to moderate the relationship between ATM services and customer satisfaction.

Gabriel *et al.* (2015) investigate the influence of ATM technology on the level of service quality provided by the banking business in Ghana. Their investigation focus on GCB bank LTD. The research utilised a descriptive survey, and the participants include both customers and employees from ten different GCB Bank Ltd branches. A total of 272 clients and employees from 10 different locations are chosen using the approach of purposive sampling. Both closed-ended and open-ended questionnaires are developed in order to collect data from the individuals who were sampled for the study. The findings reveal that, the difficulties that consumers have with ATMs include, among other, accounts being debited without dispensing, ATMs being located in areas that are difficult to see, and ATMs not dispensing the denomination that customers demand. This last problem placed third. The research, on the other hand, demonstrates that the ATM service has made a good contribution to the supply of banking services at GCB Bank Ltd. as well as the Ghanaian banking industry as a whole. In conclusion, the research suggests that the management of GCB should take quick steps to address difficulties before it is too late, and the company starts losing consumers to competitors. Furthermore, the study suggests that the management should build new user-friendly, competitive systems and apps that will enable customers to reap the full benefits of ATMs. However, the weakness of the research is that it ignore other relevant ATM services like cash withdrawals, funds transfer and balance inquiry and only considered reliability, responsiveness, tangibility and assurance. In addition, the study employed multiple linear regression model which focused only on the direct relationship between independent and dependent variables without taking into account the effect of moderating variable. Geographically, the study is limited to Ethiopia, hence its findings and conclusions might not be applicable to Nigerian situation.

An investigation into the use of automated teller machines by customers of the Commercial Bank of Ethiopia in Mekelle city was carried out by Fyery (2015). The study analyses the data using descriptive statistics like frequency and percentage as well as the mean. The use of convenience sampling allowed for the selection of a sample size of 130 customers of ATMs. According to the data, ATM adopters in the bank use just a limited variety of services, with cash withdrawals making up the majority of their usage. This points to a positive and significant association between ATM services and customer happiness. In conclusion, the research suggests that the bank should step up its marketing efforts by educating its clients more thoroughly on the technology behind automated teller machines (ATMs) as well as the many kinds of services those machines offer. However, this study suffered the same weakness of the previous study conducted by Hana (2017) where study only utilizes descriptive statistics which cannot measure relationship. Additionally, the study carried out in Ethiopia and finding cannot be generalized as the results obtained from the study may not be applicable to Nigerian situation.

The Effect of ATM Service Quality on Customer Satisfaction Tasaw (2019) studies Awash Bank Main Branch, Addis Ababa. It uses quantitative data, explanatory research design and descriptive survey design was employed by the study. The population and sample size are 850 and 385 ATM users. Convenience sampling techniques is used to select sample for the study. The study adopts primary data through questionnaire collected from respondents using questioners. Multiple linear regression model was employed to analyze the data. The findings from the analysis reveals that there is a positive and significant relationship between Reliability, Tangibility, Assurance, Responsiveness and Accessibility and customer satisfaction of Awash ATMs Bank main branch. The study indicates that, Reliability have positive influence and the most

determining variable of all of the others. Despite the fact that accessibility and customer satisfaction are positively correlated but are not statistically significant, this study also succeeds in presenting demographic variables effects on customer satisfaction and discovers that people in different professions do not have the same level of satisfaction on Awash Bank's ATM. The study recommends that the ATM machine should always be loaded with sufficient cash and that the customer withdrawal limit from their account be increased. In case of electric power outage, the bank should offer a backup power supply and a data recovery mechanism. Despite the fact that the study contributes to the knowledge, but study used correlation and multiple linear regression methods to major only direct relationship. In addition to these, since the study only concentrated in Ethiopia, therefore, it cannot be generalized. Moreover, the study considers some ATM service quality such as responsiveness and reliability, it failed to incorporate ATM services like cash withdrawals, funds transfer and balance inquiry which would have contributed to customer satisfaction.

Mohammed and Dada (2014) carried out an empirical investigation of ATMs and customers' satisfaction in Kwara state Nigeria. Three commercial banks are chosen at random (First Bank of Nigeria Plc., Guaranty Trust Bank Plc., and First City Monument Bank Plc.). The purpose of the study is to investigate the effect that ATMs have on the level of customers satisfaction and also determine whether or not there is a connection between the services rendered by ATM and the level of satisfaction experienced by Nigerian consumers. Primary data is sourced via structured questionnaires. The study samples constitute about 180 customers (60 from each bank), the samples are identified during the course of their transactions at the ATM. The data were presented and analysed using descriptive and inferential statistical approach, with the aid of tables, percentages, and charts. The hypothesis is tested using the chi-square technique. The

findings reveals that, there is a significantly favourable association between the utilisation of ATMs and the level of customers satisfaction during the period under investigation. However, the study utilizes chi-square analysis which could not link the three variables i.e, independent, dependent and the moderating variables during analysis and assessment. Method used is only applicable to categorical data. The geographical location is only limited to Ilorin.

A research on customer satisfaction was carried out in Oman by Syed and Khaliquzzaman (2016). The study focuses on ATM and CDM services, accessibility, convenience, efficiency, responsiveness, security & privacy, and dependability” are the six factors that was introduced to determine how satisfied customers are with ATMs and CDMs. These dimensions were chosen after a review of the relevant literature and consultation with experts in subject matter. The major method of data collection is a questionnaire, which consists solely of questions with predetermined answers and is validated through the use of a pilot study. A research model that comprises of the six components as response variables and customer satisfaction as a latent variable has been constructed. Methods such as structural equation modelling (SEM) and descriptive statistics are utilised. The findings of the study shows that, each of the analysed variables has a substantial impact on the overall degree of satisfaction experienced by the target audience. However, the study employed chi-square analysis which is only applicable to categorized data and cannot evaluate relationship between more than two variables. Moreover, the study was conducted outside Nigeria and the findings cannot be applicable to Nigeria.

ATM Service Quality and its Effect on Customer Retention in the Pakistani Banks was examined by Ameer *et al.* (2016). The purpose of the study is to investigate the quality of service provided as well as the factors that contribute to customer satisfaction. The

quality of the service provided by ATMs is another factor that the research found to be important in keeping consumers loyalty. Data are gathered from a variety of Pakistani banks and then subjected to correlation and regression analysis. The findings indicate that the happiness of bank customers with the quality of service provided by ATMs is directly related to the customers' decision to continue banking with the institution. Although the study contributes to the knowledge, but it only focuses on some dimensions of ATM service quality, without incorporate ATM services like cash withdrawals, funds transfer and balance inquiry which would have improved the satisfaction customers. Additionally, it solely focuses on Pakistan, hence its findings and conclusions may not be applicable to Nigerian situation.

Chi and Phong (2015) try to determine how the quality of banking service influences the level of customer satisfaction with ATM service in Vietnam. The SERVPERF framework is used in the study to analyze the information gathered through a questionnaire survey. Explanatory Factor Analysis, also known as EFA, and Multiple Regression Analysis are the two types of inferential analyses that are utilised the most in this investigation. According to the findings of the study, ASSURANCE and TANGIBLES both have a positive and significant impact on the level of satisfaction experienced by customers. Although this study makes an important contribution to knowledge in terms of empirically establishing the link between ATM services and customer satisfaction but study restricted to only ATM service quality without considering ATM services (cash withdrawals, funds transfer and balance inquiry) that are the major determine of customer satisfaction. In addition on, the methodologies adopted in the study cannot account for the effect of moderating variable on the independent and dependent variables.

Kendie (2016) investigates the effect of ATM Service Quality on Customer Satisfaction at Selected Abyssinia Bank Branches in Addis Ababa. Basically, the study focuses the customers feeling about the quality of service they received from ATMs. The primary purpose of the study is to investigate how the quality of service provided by ATMs relates to the level of satisfaction of the customers. The Convenience Sampling method is utilised to pick a group of 381 customers as the sample. The core data for the study is gathered through the use of a questionnaire structured along the lines of a Likert scale. The information obtained is analysed using a quantitative research methodology. In addition, both descriptive and inferential statistical methods are adopted. The findings reveals a positive and substantial association existed between all service quality dimensions and customer satisfaction, as well as SQ characteristics and customer satisfaction. At the same time, there is a substantial correlation between customer satisfaction and the dimensions and attributes of service quality, and those dimensions and qualities exerts a positive significant influence on customer satisfaction. It is discovered that TANGIBLES are the factor that contributed the most to consumer happiness, among all of the variables. Although the study discovered a positive significant relationship between ATM services and customer satisfaction but the finding cannot be generalized as the condition and the period under which the research was conducted may be different from Nigeria.

Biset and Bonsa (2019) attempt to determine factors that influence the level of satisfaction that customers have when using ATM. The study data are sourced through the use of semi-structured questionnaires. The total of 200 copies of questionnaires are distributed to the study's respondents. About 176 copies equivalent to 88% are returned. The research employs both descriptive and inferential forms of statistical analysis. A correlation and multiple regression models are utilized. The descriptive study reveals

that about fifty percent (50%) of the respondents agreed that the primary advantage of using ATM services is the amount of time it saves. According to the findings, consumers express positive and considerable levels of contentment with the services associated with using ATMs for financial transactions. However, customers experienced various challenges that are associated with ATM services. These issues included, but are not limited to, “an unreliable network for ATM services, a limited amount of money that could be withdrawn per day, a reduction in balance without cash payment, bank charges for ATM services, a machine that ran out of cash, a card that got blocked or locked up, and waiting in queue to use ATM Machines. The outcomes of the multiple regression analysis also demonstrates that the responsiveness, reliability, efficiency, dependability, and convenience of ATMs had a significant and favourable influence on the level of satisfaction experienced by customers. The study recommends banks to regularly and frequently inspect their ATM in order to prevent network failure, shortages of cash in the ATM machine, and machine faults. This study suffers the same weakness of the previous study carried out by Tasaw (2019) where the study conducted in Pakistan and so, the finding cannot be generalized as the results obtained from the study may not be apply to Nigerian situation.

Magara (2018) investigates the impact of ATM adoption on the level of customer satisfaction using the Stanbic Bank ATM machines in Mbarara. The research is conducted using a quantitative survey design. The methodology used in the study was both descriptive and cross-sectional in nature. The study also used questionnaire to obtain primary data, and SPSS is used to analyse the data sourced from 144 respondents. The regression results reveals that, the provision of ATM services has a very favourable impact on the degree to which customers are satisfied. The findings also show that the majority of respondents agreed about the availability of ATM services

24/7, low-cost cash withdrawals, and accurate cash balance inquiries. Incorrect insertion of an ATM card, limited cash withdrawal, network malfunction, long line-ups, excessive financial costs, complexity of the ATM machines, and card retention are some of the issues associated with using a cash machine (ATM). The study recommends that the management should try to enhance the quality of the signals transmitted over their networks, ensure that their ATM machines are serviced on a regular basis, and educate their consumers on how to get the most out of their transactions. This helps the banks bring in new customers and keep the ones they already have as loyal patrons. However, the study only adopts the descriptive statistics like percentage, frequency, pie chart, mean and standard deviation which cannot be used to quantify the amount and directional relationship between dependent and independent variables.

Russel (2018) examines the factors affecting the customer's satisfaction with reference to ATM services in Dhaka city. Primary data is used for the purpose of study. A set of structured questionnaires are used to collect primary data. Sample size of the study is 200 and sampling techniques is random sampling. The study uses exploratory type of research. The results of reliability test, factor analysis, and regression analysis reveals that factors such as cost, network, security, location, and withdrawal limit are the most vital determinant of customer's satisfaction. In conclusion, it can be deduced from the research that an average of 62% of customers in the city of Dhaka are pleased with the services provided by ATMs. However, the study only concentrated in Dhaka city. Therefore, its findings and conclusions might not be applicable to Nigerian situation.

Ranasinghe and Kosala (2017) study the Impact of ATMs Service on Customer Satisfaction in Sri Lanka. The research investigates the impact of ATM service quality in Sri Lankan state banking sector. It also assesses the impact of demographic factors for the relationship between ATM service quality and customer satisfaction. A pilot

study comprising 30 states bank customers is used to check the initial reliability and validity of the constructs in the questionnaire. The factor analysis is employed to refine the measurement items and test for reliability and validity. The data is collected using a structured questionnaire. Regression, ANOVA and T-test are used to identify significant factors and frequency analysis was used to analyze customer satisfaction. The result reveals that the ATM service qualities have a positive impact on the customer satisfaction. The study adopts regression, ANOVA and factor analyses methods which centered only on the direct relationship between independent and dependent variables without considering the effect of moderating variable. Geographically, the study covers only Sri Lanka whose results and findings may not be applicable to Nigerian situation.

The quality of service provided by the ATMs in Addis Ababa, Ethiopia is investigated by Hana (2017). The purpose of the research is to evaluate the impact that the quality of service provided by ATMs operated by Commercial Bank of Ethiopia. The aspects of the ATM service examine includes dependability, convenience, responsiveness, efficient operation, security, and privacy. A structured questionnaire is used to collect primary data from the sample of 240 customers. The data is analysed using the descriptive analysis. The study finds that there is a positively significant effect on customer satisfaction across five of the six dimensions of ATM service quality, with the exception of reliability. Although the study records a significant positive relationship between ATM services and customer satisfaction but the finding cannot be generalized; the condition and the period under which the research was conducted may be different from Nigeria. In addition, the study only utilized descriptive statistics which cannot measure relationship.

Iberahim, Mohd, Mohd and Saharuddin (2016) study Customer Satisfaction on Reliability and Responsiveness of Self-Service Technology for Retail Banking Services.

The study evaluates the quality of service provided by ATMs at one of the primary ATM service points provided by a Malaysian bank. In addition to investigating the relationship between the dependability and responsiveness of ATM services and consumer satisfaction, as well as to validate the factors that determine how services can be improved. The data collected with the aid of a questionnaire survey of 271 respondents and observations at the service point. Data is analysed using descriptive statistics and multiple regression. Result shows that the relationships of three out of four elements of ATM service quality dimensions are important to maximizing customer satisfaction. However, the weakness of the research was that it has only considered consistency, dependability, timeliness and technology without incorporating other relevant ATM services like cash withdrawals, funds transfer and balance inquiry.

Sefer, Sudi, Tubay, Hande and Serpil (2015) examine the Ultimate Point in the Service Provided by Banks to their Customers: Customer Satisfaction in the Common Use of ATMs. To achieve this objective, questions relating to customer satisfaction are posed to ATM users, and the responses they provide are subjected to SPSS statistical software version 17.0, where factor analyses of the responses and tests of their dependability are performed. The respondents, amounting to 550 bank customers are selected at random from a pool of 60 ATM terminals. The findings indicate that bank clients are extremely pleased with ATMs, despite the fact that there is a paucity of information and research pertaining to these machines. However, the results obtained from the study is only applicable to Pakistan.

Kibona and Mgaya (2015), investigate the perceptions that customers have towards ATM utilization in Tanzania. A total of 110 customers who possessed and make use of the ATM cards were sampled. The data that are acquired through the survey are analysed using the SPSS and excel. Furthermore, percentage analysis is performed to

identify the primary factors that contribute to consumer attitude. According to the findings of the study, there is a strong and positive association between factors such as gender, age, marital status, occupation, and location of the ATM and the perspective that customers have towards the utilisation of ATM services. However, the study only utilized descriptive statistics which cannot major relationship. Additionally, the study only concentrated in Tanzania, therefore, it cannot be generalized.

Adeleye and Samson (2015) conduct an empirical study on the effect of the quality of service provided by ATM services on customer satisfaction. The research utilised a survey approach, in which participants are questioned about the services offered by ATMs terminals. The majority of the people investigated in the study are customers of the UBA in Lagos metropolitan area. The respondents are regular users of ATM services. Both multiple logistic regression and Pearson correlation analysis were used to analysed the data. The findings indicate that there is a significantly favourable association between ATM services and the level of customer satisfaction. The study recommends that bank should do routine and frequent inspections of ATM machines in order to prevent network failure, a lack of cash in the ATM, and machine faults, all of which have the potential to cause customer dissatisfactions. However, the study does not take into consideration ATM service quality such as tangible, reliability, responsiveness, assurance and empathy. Also, the regression and the correlation methods adopted in the study cannot assess the effect of moderating variable. However, one bank was used for the study whose results cannot be generalized to other banks. Additionally, the study restricted to Lagos metropolis and their results is not applicable to Northern part of the country.

An investigation into the relationship between ATM services and customers satisfaction in Nigeria is carried out by Odusina (2014). The goal of the study was to empirically

investigate the usage of ATM machines as well as the customers satisfaction. It has come to light that in spite of the growing number of ATM terminals, the needs of customers are not being served adequately, as evidenced by the fact that customers may frequently be seen waiting in line in huge numbers at a variety of ATM designated centers, in addition to the poor service. Therefore, the study conducts a comparative examination of three banks located in Ogun State, which are the First Bank, the Guaranty Trust Bank, and the Skye Bank. However, questionnaires are given out to everyone who participated in the survey. A total of 200 customers from each of the three banks are sampled. The data is analysed with the chi-square statistical technique. The findings indicate that there is a positive and significant association between ATM Usage and Customers' Satisfaction. Although this study makes an important contribution to knowledge in terms of empirically establishing the link between ATM usage and customer satisfaction, but the method adopted by the study is only applicable to categorical data and effect of moderating variable cannot be assessed. In addition, there can be no global generalization since the geographical location was only Malawi.

Abdulrahman and Premalatha (2015) investigate customers' perceptions on ATM services in Sokoto state. The expansion and development of ATM services in the banking industry contribute significantly to the process of assessing how customers feel about the use of these machines. The level of confidence that consumers have in an ATM is directly proportional to the extent to which that institution's services are utilised by its customers. But there hasn't been a lot of research done on how customers feel about the level of confidence they have in the services provided by ATMs, particularly in Sokoto state. The majority of the research focuses on using percentage analysis as its primary way of analysis. According to the findings of the survey, customers in Sokoto state, report a high level of satisfaction with their perceptions of the trustworthiness of

the services provided by ATMs. However, the ATM services (cash withdrawals, funds transfer and balance inquiry) with affect customer satisfaction were not considered in the study. Moreover, the study considered only trust as the determinant of customer satisfaction.

Yousaf, Sadia, Nouman and Azhar (2014) conducted a study on the Performance Evaluation of Automated Teller Machine (ATM) with Fuzzy TOPSIS using Sample Survey Results. In this study survey was conducted to collect the opinions of ATM users and service provider of ATM for the ATM's Service Quality factors. The questionnaire is distributed using convenience sampling as well as judgmental sampling technique to a number of ATM users and to staff that are the responsible of operations of ATMs in each six banks. The study uses a sample of 100 customers and 6 representatives from the banks. The samples of 100 customers were divided into sub samples and each sub-sample contained different number of customers. The results indicate that ATM services contributes positively to customer satisfaction. Despite the contribution of this study to the knowledge, but the condition and the period under which the research was conducted may be different from Nigeria.

Elliot, Mary and Akosue (2014) study the impact of ATM on Customer Satisfaction of Banks in Ghana: A Case Study of Kumasi, Ghana. Questionnaires are administered to users and nonusers of Automated Teller Machines, as well as bank staffs, to source data for the study. An analysis of the data is done with descriptive statistics and the chi - square test., the results showed that, the demand for direct service transactions with bank employees had reduced with the ATM introduced in Ghana. It also reveals that there is positive significant relationship between ATM services and customer satisfaction of banks in Ghana. ATM service quality dimensions that produced an effect on customer satisfaction were the reduced time spent on transactions, delivery of

renewed ATM cards on time as well as safety during withdrawals at ATM service points. However, the chi-square analysis used in this study is only applicable to categorical data which cannot link the three variables i.e., independent, dependent and the moderating variables during the analysis and assessment. In addition, the coverage is only limited to Ghana, it cannot be generalized; the condition and the period under which the research is conducted may be different from Nigeria.

Singh (2011) examines the relationship between the provision of ATM services and levels of customer satisfaction in India. The study relies on primary source of data, the respondents constituted about 400 ATM card holders chosen at random. It is concluded that each of the selected banks will be represented equally in the poll. The data are gathered by means of a well-structured questionnaire with the express purpose of determining the degrees of satisfaction. The analysis of variance (ANOVA) and factor analysis are utilised in the search for relevant components, while frequency analysis is utilised in the investigation of customers' levels of satisfaction. According to the findings, ATM services such as withdrawing cash and transferring funds both contribute to increased levels of customer satisfaction. However, the ANOVA used in this study is not a measure of relationship rather than measure of significance difference test. However, geographically, the study is limited to India, hence its findings and conclusions might not be applicable to Nigerian situation.

Kumar, Varaprasad, Sridharan, and Unnithan (2013) study the factors that influence the level of customer satisfaction using ATM machines in India. A study model has been constructed as a result of a review of the relevant literature and the recommendations made by professionals. This model is comprises of six factors, including cash availability, transaction speed, perceived quality, simplicity of use, and convenience of payment and certainty of fees". The validated data is analysed using regression analysis

in order to determine the nature of the relationship that exists between the six independent components and the level of satisfaction experienced by the customer. The findings reveal that, all of the criteria are found to have an effect on the level of satisfaction a customer has, however only one of the six, long queue exert a negative effect during the period under consideration. It is observed that the availability of cash and the speed of transactions have a positive and significant influence on the level of satisfaction that customers have with ATMs. Though, this study suffered the same weakness of the previous study conducted by Gabriel, Eugene, and Daniel (2015).

Lasisi and Abubakar (2014) study the ATM services and user satisfaction: the case of UBA in Sokoto Metropolis. The aims of the study is to measure the satisfaction of customers with ATM services such as cash withdrawal, cash deposit, transfer of fund between accounts and bill payments. A cross-sectional survey design is adopted. The sample consist of 100 UBA customers and the data is analyzed by using multiple logistic regression analysis. The results show that the ATM services have a positive significant impact on ease of use, cost and security. The findings from the reviews above shown that ATM services have a positive significant and influence on customer satisfaction. However, the study does not considered other aspects of the ATM services like cash withdrawals, funds transfer and balance inquiry. Also, the logistic regression analysis method which does not consider the effect of moderating variable was adopted in the study.

Charles (2016a) carried out a study on the factors that influence customer satisfaction using ATM services. The purpose of the study is to assists managers with the required information about the fundamental components of ATM banking services. Especially, those aspects whose functionality has a significant impact on the level of customers satisfaction. The performance of ATM banking is evaluated based on 25 different

service quality indicators, and 353 customers who use ATM cards to perform banking transactions. The first thing that emerges from the regression analyses of the performance of the 25 ATM banking qualities and customers' preference is that the 25 attributes taken from empirical studies give an ideal model for predicting customers' levels of satisfaction. The results further show that there are 12 key variables (cost, system failure, accuracy, ease of access, etc.) that have a positive influence on customers' satisfaction with ATM banking. However, the study adopted multiple linear regression method which cannot quantify the relationship between the independent, dependent and the moderating variables. The geographical location was only Malawi and cannot be generalized for the entire world.

Matimbwa and Ochumbo (2018) carry out a research on the relationship between ATM services and customer satisfaction in Tanzania. The purpose of the study is to investigate factors that influence customer satisfaction with the ATM services provided by CDRB Bank in Tanzania, more specifically in Iringa Municipal. Bearing that various researchers have come to different conclusions regarding the dimensions of customer satisfaction in relation to ATMs, the study sought to determine which ATM dimensions truly associate with customer satisfaction. The population of the study consists of 340 ATM cardholders, out of which, 100 customers are chosen as samples of the study. Descriptive and inferential analysis is conducted. The regression analysis results indicates that customers typically make use of fundamental ATM services like checking their balance and withdrawing money. In addition, it is shown that there is a negative and significant association between Privacy and total Customer Satisfaction. Although the study considers some measures of customer satisfaction such as security and privacy However, the study does not considered other important ATM services like

cash withdrawals, funds transfer and balance inquiry that can induce customer satisfaction.

Singh and Komal (2009) compare and contrasts the levels of customer satisfaction experienced by clients of Union Bank of India and Yes Bank based on a variety of proxies pertaining to ATM banking services. The information regarding numerous facets of ATM services, such as the location of ATMs, the processing time, the availability of cash, the quality of notes, ATMs grievances settlement, safety and security, sufficient numbers of ATMs and so on was gathered from forty (40) ATM cardholders of Union Bank of India. Descriptive statistics are used in order to analyse the data collected from the respondents. The findings therefore indicate that ATM services by the public banks provide clients with a higher level of satisfaction than those offered by private banks. The majority of respondents from both banks were unhappy with “the resolution of their ATM complaints, as well as the sufficient number of ATMs in the city, working conditions, cash availability, and quality of notes, all point to a negative substantial association between the services provided by ATMs and their clients. The study recommends that bank management should prioritise the development of an appropriate process for the settlement of customer grievances. In addition to this, as the number of customers continues to grow on a daily basis, the number of ATMs should also grow to ensure customer satisfaction. In addition, financial institutions operating in the private sector ought to focus their attention on the quality of the services provided by ATMs in order to boost levels of customer satisfaction. However, the chi-square analysis used in this study is only applicable to categorical data which cannot link the three variables i.e., independent, dependent and the moderating variables during analysis and assessment.

Charles (2016a) investigates the impact of ATM banking on customers' levels of satisfaction. The sample of the study consists of 353 ATM cardholders and the research focused solely on performance indicators. A structured questionnaire that contained multi-dimension and multi-attribute Likert measurement scales is design in sourcing the data. This allowed respondents to score not only the performance of the ATM banking services but also their overall satisfaction with their particular banks. The impact of ATM services is evaluated using regression analysis. The results indicate that the performance of ATM services has a predictive capability of customer happiness with the bank. The study therefore concludes that ATM services despite its power to affect customers' levels of satisfaction with their bank, does not have the ability to convince them to switch banks. Therefore, banks might be able to increase their customer satisfaction ratings by making enhancements to the banking services offered by ATM machines. However, the study employed linear regression method which cannot quantify the relationship between the independent, dependent and the moderating variables.

Enyeribe (2019) examines the impact of Automated Teller Machines (ATM) Services on Customer Satisfaction in Sokoto and Zamfara States of Nigeria. The study adopts primary source of data. Qualitative method of research analysis is used to investigate if the ATMs services in Nigeria are meeting up with the customers' expectations, perceived service quality and perceived service cost that are known to be the antecedents of overall customer satisfaction. Moreover, the study examined the two effects of customer satisfaction; customers' loyalty and complains. The findings of the reveal that ATMs services in Nigeria are not meeting customers' satisfaction. With reference to the types of complaints, customers' loyalty to the ATMs services in Nigeria is for lack of better alternatives. The study recommends that the Central Bank of Nigeria

is advised to formulate monitoring policies aimed at improving ATMs service quality, reduce service cost and customer complains. However, the findings from the above empirical reviews revealed that ATM services have a negative relationship with significant customer satisfaction. This study suffers the same weakness of the previous study carried out by Hana (2017) where the study utilized only descriptive statistics which cannot measure relationship.

Joseph (2013) assesses the effect of ATM on Customer Satisfaction in the Tanzanian Banking Sector. A study of NMB Ifakara Branch. A Samples of 96 ATM users of NMB Ifakara Branch were selected. The study collects data using semi-structured questionnaires which are organized, coded and analyzed using SPSS software version 20.0. Descriptive is employed and the result was presented in tabular form with frequencies and percentages. Regression models are also adopted for the analysis. The findings of the study show customers are satisfied with services offered by the ATM in terms of reliability, security, safety, and accuracy. However, customers have a problem with daily withdrawal limit and the inadequate ATM machines. The study recommends that the daily withdrawal limit to be increase. The findings from the above empirical reviews discovered there is no relationship between ATM services and customer satisfaction. This study suffers the same weakness of the previous study carried out by Biset and Bansa (2019) where similar ATM service quality variables were utilized and conducted in Tanzania.

In the light of the above empirical reviews, it is clear that many researchers have conducted research on ATM services and customer satisfaction in Nigeria and other part of the world. However, the variables used in these studies cannot account for the effect of moderating variable on the independent and dependent variables. Additionally, most of the previous studies considered ATM service quality such as responsiveness and

reliability, without incorporating other relevant ATM services like cash withdrawals, funds transfer and balance inquiry which would have contributed to customer satisfaction.

Furthermore, in terms of methodological gap, the above empirical studies used different tools of analysis. For example, Charles (2016b) uses Regression analysis. The results indicate that the performance of ATM services has a predictive capability of customer satisfaction with the bank. Lasisi and Abubakar (2014) use multiple logistic regression. The findings from the reviews shown that ATM services have a positive significant and influence on customer satisfaction. In the same vein Chi and Phong (2015) adopt explanatory factor analysis EFA and Multiple Regression. According to the findings of the study, assurance and tangibles both have a positive and significant impact on the level of customer satisfaction. Moreover, Russel (2018) use Factor Analysis and Regression Analysis. The results of factor analysis, and regression analysis shows that factors such as cost, network, security, location, and withdrawal limit are the most vital determinant of customer's satisfaction. Furthermore, Safer, Tugbay and Serpil (2015) use Factor Analysis. The findings from the analysis reveals that bank customers are satisfied with services provided by ATM. While Iberahim, Mohd, Mohd and Saharuddin (2016). The results reveals that the relationships of three out of four dimensions of ATM service quality are important to maximizing customer satisfaction. Then Elliot, Mary and Akosue (2014) use Descriptive statistics and Chi-Square. The results shows that there is positive significant relationship between ATM services and customer satisfaction. Another authors Adeleye and Samson (2015) use Regression analysis and Pearson correlation. The findings indicate that there is a positive significant relationship between ATM services and the level of customer satisfaction. However, Joseph (2013) employs frequencies, percentages and regression model is adopted for the

analysis. The findings from the empirical review reveals that there is no relationship between ATM services and customer satisfaction. Similarly, Matimbwa and Ochumbo (2018) use regression analysis. The findings from the analysis shows that a negative and significant relationship between privacy and total customer satisfaction. To fill the existing gap, this study employs partial least squares structural equation modelling (PLS-SEM) for questionnaire data and queuing model analysis is used for observed data to fill this existing gap.

Geographically, the researcher could not find any work that was written on Automated Teller Machine and customer satisfaction with respect to cash withdrawals, funds transfer and balance inquiry considering waiting time as moderator in some selected Deposit Money Banks in Nigeria. This study therefore measures ATM services by cash withdrawals, funds transfer, and balance inquiry to fill the gap.

2.10.2 Empirical Review on Waiting Time and Customer Satisfaction

Previous studies that examine the relationship between waiting time and customer satisfaction have produced contradictory results. For instance, study by Lahap et al. (2018) reveal that perceived waiting time have positive significant influence on customer satisfaction towards fast food restaurants. On the other hand, study by Ahmed, Rahman and Mizanur, (2017) discover a negative correlation between waiting time and cash withdrawals using ATM.

Moreover, it is observed that a good number of the studies on waiting time and customer satisfaction have been conducted but quite a number of them focused on other industries other than banking sector. For instance, Bielen and Demoulin, (2007) study focus on health care industry, Lahap, *et al*, (2018) and Patel, Chaudhary, Patel & Makwana, (2012) focus on restaurant. But even the few studies that are conducted on

banking sector (Ikotun, Ademuyiwa & Famule, 2016; Odewole, 2016; Ahmed, Rahman and Mizanur, 2017 & Joseph and Simon (2018) none of them conducted study using ten banks. Therefore, this study considers ten banks namely: GT Bank, UBA, Zenith Bank, First Bank, Eco Bank, Access Bank, Union Bank, Ja'iz Bank, Polaris Bank and Unity Bank in an attempt to bridge this gap.

Ahmed, Rahman and Mizanur, (2017) try to Minimize Waiting Time in ATM Services by Applying Queuing Model. The data was obtained from a bank's ATM in Sylhet city in Bangladesh whilst applying little's Theorem and M/M/1 queuing model in the process. The aim of this study is to determine optimal service level for a case ATM base on a customer-defined criterion of wait time not exceeding eight (8) minutes. Direct non-participatory observation and questionnaire are engaged to record time measurements and primary data. The research reveals that although queuing theory is applicable in finding optimal service levels. But the study discovered a negative correlation between waiting time and cash withdrawals using ATM.

Odewole (2016) studies waiting lines, banks' effective delivery systems and technology driven services in Nigeria: A Case Study. The Direct non-participatory observation is adopted to record time measurements and primary data. The time measurements are based on customers' arrival times to the banking hall and the service times of the customers who arrived at the bank between the hour of 12.00pm and 1.00pm which have been previously observed to be the bank's peak period. Data are fitted into the model and the results computed and analyzed. The findings of the study show that both arrival of customers and service time rate of servers follow a poisson exponential probability distribution, respectively. The results reveal that the mean service rate, the mean time spent in the queue by a customer, and aggregate service rate to enjoy ATM

services by a customer are significantly reduced and the waiting time is short in a technology driven bank.

Ikotun, Ademuyiwa and Famule (2016) conduct a Comparative Analysis of Customers' Queue Management of First Bank Plc. and Guaranty Trust Bank Plc, Isokun Ilesa, Nigeria. The data for this study is analysed using a queuing model and various other statistical methods. The data for this study is acquired through direct observation in two banks, one of which belonged to old generation banks and the other one from the new generation bank. The findings of the research indicate that Guaranty Trust Bank is more effective than First Bank in the sense that the latter has a longer service time than Guaranty Trust Bank has, which can be linked to the fact that a pool of consumers prefer it for a variety of reasons.

Patel, Chaudhary, Patel and Makwana (2012) attempt to minimize the Waiting Time of Customer and Gain more Profit in Restaurant using Queuing Model. The data is obtained from a restaurant in Ahmedabad. Then the arrival rate, service rate, utilization rate, waiting time in queue and the probability of potential customers are computed based on the data using Little's Theorem and M/M/1 queuing model. The arrival rate at Born Vivant during its busiest period of the day is 2 customers per minute (cpm) while the service rate is 2.05cpm. The average number of customers in the restaurant is 90 and the utilization period is 0.976.

Bielen and Demoulin (2007) attempt to determine how customers evaluate their overall satisfaction with both the service they received and the amount of time they had to wait for it in Belgium healthcare service sector. The complete sample consists of 946 different respondents. The study employs inferential statistics to analyse data. The findings reveal that satisfaction with waiting time is not only a factor that determines

overall service satisfaction. In addition, factors that determine whether or not a customer is satisfy with the amount of time spent waiting include how long they believe they have been waiting, how satisfied they are with the information provided in the event of delays, and how happy they are with the waiting environment.

Lahap *et al.* (2018) study the Effect of Perceived Waiting Time on customer satisfaction: A Focus on Fast Food Restaurant in Malaysia. The current study is aimed at investigating the effect of perceived waiting time on customer satisfaction in respect to fast food restaurant in Malaysia. The study employs simple random sampling method and 384 copies of questionnaires are distributed. The study analysed data using SPSS software such as descriptive analysis, reliability and validity test, factor analysis and correlation analysis. The result from the analysis discovers that perceived waiting time significantly influence customer satisfaction towards fast food restaurants. The study recommends that the need for the fast food operators to improve the quality of their service delivery.

Although, the reviewed studies made important contribution to knowledge and are important in providing an understanding of waiting time and customer satisfaction. But there is methodological gap as some studies by (Ahmed, Rahman & Mizanur, 2017; Patel, Chaudhary, Patel & Makwana 2012; Ikotun, Ademuyiwa & Famule, 2016) use Little's Theorem and M/M/1 queuing model. Whilst study by Bielen & Demoulin (2007) employ Regression analysis. However, factor analysis and correlation analysis are used in another study by (Lahap *et al.*, 2018). However, the methodology adopted by previous authors do not take into consideration moderating variables which normally reveals hidden relationship between the study variables. To address this lacuna, this study employs partial least squares structural equation modelling (PLS-SEM) as a tool of analysis for questionnaire data and queuing model analysis for observed data.

Moreover, all the geographical location considered in the studies were not Nigeria particularly Sokoto metropolis and therefore, the results obtained may not be fully applicable to Nigerian situation. Additionally, the studies conducted by the researchers under this section centered on the relationship between customers waiting time in respect to ATM services. Whereas the current study focuses on the investigation on the conformity between the results of customer waiting time obtained from the questionnaire data and the results of the customer waiting time obtained from the observational data.

2.11 Theoretical Review

This section discusses theories related to effect of ATM services and waiting time on customer satisfaction in the banking industry. These theories are applied in so as to justify the choice of the research topic.

2.11.1 Theory of Reasoned Action (TRA)

According to the TRA, a person's purpose is a result of these two fundamental determinants or factors. The individual's favourable or negative appraisal of themselves while engaging in the behaviour constitutes the personal element. According to Ajzen and Fishbein's research from 1980, this aspect is referred to as one's attitude towards the behaviour. One of these determinants or elements is of a personal nature, and the other reflects social impact. The individual's judgement of the amount of social pressure that is being put on him or her to engage in or abstain from the behaviour in issue is the second factor that determines intention. This element is referred to as the subjective norm (Ajzen & Fishbein, 1980). This is due to the fact that it deals with perceived prescriptions. Beliefs are said to be the driving force behind attitudes, according to the notion. Someone who believes that engaging in a particular behaviour will lead to the

majority of good results will have a favourable attitude towards engaging in that activity, whereas someone who believes that engaging in similar behaviour will lead to the majority of undesirable consequences will have an unfavourable attitude. The beliefs that underpin a person's attitude towards the conduct (i.e. the act of consuming or buying halal or non-halal products) are referred to as behavioural beliefs. A subjective norm is also a function of views that designate people or groups to think whether he or she should or should not conduct the behaviour. Subjective norms can be influenced by both objective and subjective factors. The beliefs that form the basis of an individual's subjective norm are referred to as normative beliefs. A person who feels that the majority of the referents with whom he is driven to comply think that he should perform the activity will receive social pressure to perform the behaviour.

2.11.2 Theory of Planned Behavior (TPB)

Theory of Planned Behavior (TPB) is an extension of Azjen and Fishbein's Theory of Reasoned Action (TRA). This expansion is essential owing to the fact that the original model was unable to account for behaviours that are under individuals' entire volitional control only in part (Azjen & Fishbein, 1980). According to the TPB, the degree to which an individual engages in a particular behaviour is dependent on the degree to which they intend to engage in that behaviour (see Figure1). According to TPB, intention and internet purchase behaviour are assumed to be influenced by attitude towards the target conduct, subjective norms for participation in the behavior, and perceived behaviour control. A good or negative judgement of executing a particular behaviour is an example of an attitude towards that behaviour. Because the TPB is a generic theory, it does not specify the precise beliefs that are connected with any particular behaviour. As a result, determining those beliefs is up to the preference of the researcher conducting the study. TPB provides a rigorous theoretical basis for testing

such a premise, in addition to a framework for testing if attitudes are truly connected to intent to participate in a particular behavior, which itself should be related to the actual behaviour. The purpose of testing whether attitudes are related to intent to engage in a behaviour is to determine whether attitudes are related to real behaviour. According to the hypothesis, one's beliefs about how important referent others feel about internet purchasing, as well as one's views on how important others feel, should also impact one's purpose to make purchases via the internet. Last but not least, according to Azjen (1991), views that an individual possesses the opportunity and resources necessary to engage in a behaviour are a factor in how much control that individual feels they have over that behaviour.

Mathieson (1991), Taylor and Todd (1995a, b), and Harrison & Freeman (1999) are only a few examples of the researchers in the field of information systems who have made use of TPB in their research. Celik (2008), George (2002), Jarvenpaa and Todd (1997), Limayem, Khalifa and Firni (2000), Pavlou and Chai (2002), Suh and Han (2003), Song and Zahedi (2001), Tan and Teo (2000), and other researchers have used TRA and TPB as a foundation for their research on online shopping behaviour.

2.11.2.1 Attitude and Intention/Behavior

Attitudes are generated by the ideas that are necessary to carry out the behaviour. An individual's pleasant or negative mood that is related with the performance of a particular behaviour is what is meant by the term behavioral contagion. An individual will have a positive attitude towards a specific behaviour if he or she feels that engaging in the behaviour will result in predominantly positive results and that engaging in the behaviour will lead to those outcomes. Several previous research (Celik, 2008; George, 2002; Pavlou & Chai, 2004) discovered a large direct association between an

individual's mindset and their propensity to make purchases over the internet. Celik (2008) discovered that attitude has a substantial relationship to one's intention to engage in internet banking, while Pavlou and Chai (2002) established that attitude is a major predictor of one's intention to engage in electronic commerce in two countries: Greece and the United States.

2.11.2.2 Subjective Norms and Intention

The perceived social pressure to engage in or abstain from a certain behaviour is an example of the subjective norm. According to Ajzen (1991), it is a presumption that the subjective norm is determined by the whole collection of available normative beliefs concerning the anticipations of significant referents. Pavlou & Chai (2002) behave that, research, there is a substantial relationship between subjective norms and intention in both the United States and Greece. On the other hand, there it no correlation between perceived norm and internet shopping (George, 2002).

2.11.2.3 Perceived Behavior Control and Intention/Behavior

People's beliefs of their own abilities to carry out specific behaviours are referred to as their perceived behavioural control. Azjen draws parallels between Bandura's concept of perceived self-efficacy and the idea of perceived behavioural control (Bandura & Walters, 1997). A direct connection between perceived behavioural control and actual behavioural achievement is also incorporated into TPB. It is assumed that perceived behavioural control is governed by the whole set of available control belief, which refers to beliefs about the presence of elements that may help or impede performance of the behaviour. This is done by drawing an analogy to the expectancy-value model of attitude. Together, purpose and perceived behavioural control can be utilised to make accurate predictions about future behavior, to the extent that the former accurately

reflects the latter. Chai and Pavlou (2004); George, (2004) declare that researchers have come to contradictory conclusions on the relationship between a person's perceived ability to regulate their behaviour and their intentions. The degree to which an individual believes they have control over their behaviour is rarely a reliable indicator of their intentions or actions.

2.11.3 Technology Acceptance Model (TAM)

Davis (1989) is the first person to conceptualise what is now known as the technology acceptance model (TAM), which is grounded in the psychology of research theory of reasoned action (TRA). The behavioural intention of an individual is a result of their attitude towards the behaviour they are attempting to do as well as the subjective norms that surround the performance of the action, according to the TRA's hypothesis, which states that individual behaviour is driven by behavioural intention. In other words, it asserts that a person's attitude towards a certain behaviour and their thoughts about that behaviour play a role in both the person's behaviour as well as their purpose to behave in a certain way. Because of this, behaviour is the result of both attitudes and beliefs working together (Fishbein & Ajzen, 1975).

In the meanwhile, TAM posits that a user's attitude towards utilising technology, subsequent behavioural intentions, and actual usage may all be predicted by the user's perception of the technology's ease of use as well as its perceived usefulness. It was also assumed that perceived ease of use influenced people's perceptions of the usefulness of technology.

TAM has been applied in numerous studies testing user acceptance of information technology, for example, word processors (Davis, Bagozzi & Warshaw, 1989) spreadsheet applications (Mathieson, 1991), e-mail (Szajna, 1996) web browser (Morris

& Dillon, 1997) telemedicine (Hu, Chau, Sheng & Tam, 1999), websites (Koufaris, 2002) e-collaboration (Dasgupta, Granger & McGarry, 2002), and blackboard (Landry, Griffith & Hartman, 2006). In the context of this investigation, e-learning refers to a system that, in order to fulfil its mandate of providing information to and engaging in conversation with students through the medium of a computer interface. This system makes use of the Internet and web technologies.

2.11.4 Innovation Diffusion Theory (IDT)

Rogers (1995) made some adjustments to the Innovation Diffusion Theory, which was first presented in 1962. According to Rogers (1962), the main objective of the theory of innovation diffusion is to determine how, why, and at what pace new ideas and technology move across a social system. In the context of the various theories of change, the Innovation Diffusion theory takes an alternative perspective to the investigation of changes. It sees change as primarily being about the development or reinvention of products and behaviours so that they become better fits for the needs of individuals and groups. This has shifted the focus away from the convincing individuals to change and places it on the evolution of products and behaviours. Les Robinson, (2009) in the process of innovation diffusion, it is not the individuals who change but rather the innovations themselves. On the other hand, diffusion refers to the process by which an innovation is disseminated among the participants of a social system over the course of time and through certain channels (Rogers, 2003). Fichman (2000) defines diffusion as the process through which a technology spreads over a population of organisations. According to Rogers (1962) the term diffusion of innovations often refers to the process through which new ideas go from one civilization to another, or from a focal point or institution within one society to other portions of that same society.

According to Sahin & Thompson (2006), the overall notion of innovation diffusion can be broken down into four primary components.

2.11.4.1 Innovations

Innovation is defined as an idea, practice, or object that is perceived as new by an individual or other unit of adoption. An innovation is defined as any product or service, new or old that provides the user with an untried application when the user employs it; alternatively, an innovation can be defined as any product or service that a user seems to be novel in its application when the user employs it (Rogers, 1983).

2.11.4.2 Communication Systems

The communication system functions as a conduit through which users are able to exchange information with one another. It is a method that manages the flow of information between users, both in and out of the system. The faster the transmission of innovations occurs, the more effective and efficient a communication system must be. Rogers has categorised the many avenues of communication as either mass media or interpersonal. Rogers is of the opinion that the interpersonal channel is the more significant one for the dissemination of new inventions or technologies, despite the fact that mass media may disseminate information at a faster rate. In contrast, diffusion is a very social process that involves interpersonal communication relationships (Rogers, 2003). The process of patterned communication is conceptualised by Raetzsch, (2018) as a social imitation, which is the repetition of something new by members of a society. For instance, one may see someone washing their hands, and they may imitate the action.

2.11.4.3 Time

This is regarded as the temporal component of the process of innovation dissemination is truly responsible for recording the adopter classification and pace of adoptions. It starts counting down from the time an innovation is first conceived and continues until it is no longer considered an innovation at all. It keeps track of how quickly the innovation is embraced by a variety of people and how quickly it spreads throughout a society.

2.11.4.4 Social System

According to Rogers (2003), a network is a set of interrelated units engaged in a joint problem solving to accomplish a common goal. If a social system does not recognise an innovation as one, then that innovation is of no use. If a society does not acknowledge new ideas or practices, it ceases to be a society. The only way for an innovation to spread throughout a society is for that society to first acknowledge its status as an innovation and then to spread the information about it both within that society and to other societies. Rogers (2003) in the course of his examination of the social systems, divided the members of the society into five distinct categories based on the degree to which they demonstrated inventiveness. Rogers (2003) provides that, innovativeness can be defined as the degree to which an individual is relatively early in adopting new ideas in comparison to other members of a system. Kaasinen (2005) reveals that, in this categories of the variability around the mean of 50% of the target population has embraced an innovation.

2.11.5 The Adopter Categorization

Understanding the user acceptance of various innovations in target audiences can be made easier with the help of the innovation diffusion theory. Ryan and Gross (1943)

identifies five distinct sorts of adopters who take use of a newly developed technology or innovative practise as it makes its way through society. On the basis of the dimension of time, these five categories of people can be distinguished from one another. People who are seen to be laggards have a more pessimistic outlook on new technologies and ideas, in contrast to those who are considered to be innovators. Rogers (1995) identifies five distinct types of adopters and classified them accordingly. Even going so far as to assign precise notional percentages for each segment, Rogers did this. a. Innovators: 2.5%; b. Early Adopters: 13.5%; c. Early Majority: 34%; d. Late Majority: 34%; and e. Laggards: 16%. a. However, the 20:60:20 Rule is a useful rule of thumb that may be applied to a variety of situations (Les Robinson, 2009).

2.11.5.1 The Innovators

Kaasinen (2005) declares that, innovators are courageous individuals who are willing to take risks and act as gatekeepers for others who come after them. According to Rogers (2003), the adoption as decision process requires the potential adopter to gather information regarding the technology, examine the technology, and consider whether or not it provides sufficient improvement to deserve the investment of energy and time that is required to add it to his or her range of skills. Innovators are quick to respond to changes in the environment and quick to adopt new practices. They not only contribute their time and efforts, but also give others with an accurate information flow that they can use in their own work. Innovators are more akin to risk takers in that they are willing to test out new technology on their own. Therefore, they ought to be ready to deal with innovations that are not profitable and that are unsuccessful, in addition to a certain amount of ambiguity regarding the innovation (Sahin & Thompson, 2006).

a) **The Early Adopters**

According to Kaasinen (2005), early adopters are opinion leaders who are the first people in their organisation to accept a new technology or practice and are eager to retain their position by assessing innovations for the benefit of others. Early adopters as opposed to innovators, have a more constrained relationship with the boundaries of the social system (Sahin & Thompson, 2006). The early adopters of a new technology or innovation play a prominent part in the process of its subsequent widespread adoption. The judgement of this group will have a direct impact not only on whether or whether the idea spreads further, but also on how quickly it does so. According to Nelson, et al (2014), leaders play a crucial position in practically every stage of the innovation process, from the very beginning to the very end, notably in terms of the deployment of the resources that drive innovation ahead. In light of this, it is essential for this type of adopters, even though there are few of them, to play a role in reducing the levels of ambiguity that exist around the acceptance of innovation. One more argument highlights the significance of early adopters. They become an independent test bed, where kinks are worked out and the innovation is reimagined to better meet the requirements of the general public (Les Robinson, 2009). This category has a more significant role in disseminating information to the other participants of a social system on the innovation. Because they are the advisers of a social group regarding an invention, their opinion not only goes a far deciding the outcome of an innovation but it also go a long way towards determining the rate at which other users will embrace the innovation in the future.

b) The Early Majority

The early majority consists of consumers who are more cautious about adopting a new technology but are nevertheless likely to do so. When they want to employ a new technology or a new innovation, they typically rely on the information that was provided by the early adopters. Even though they take some time to determine whether or not to use an innovation, they don't want to be the ones who accept it last since they don't want to be the ones left behind. The early majorities are pragmatists who are comfortable with the concepts that are fairly progressive. But they won't act unless there is sufficient confirmation that the advantages outweigh the risks. They are followers who are influenced by mainstream fashions and are cautious of fads in the fashion industry. They are looking to hear phrases such as industry standard and endorsed by normal, respectable folks (Les Robinson, 2009). Moore (1991) conducted research on the categories in relation to the incorporation of technological items in commercial settings.

2.11.6 The Kano Model

According to Ejeta (2016), achieving high levels of customer satisfaction is contingent upon possessing an in-depth comprehension of the requirements and prerequisites posed by the client. At this point, in the late 1970s, Professor Noriaki Kano of Tokyo Rika University and several of his colleagues from Japan established the Kano model with the intention of defining service quality in the context of customer needs (Berger, Blauth, Boger, Bolster, Burchill and DuMouchel, 1993). The Kano model originates in social psychology and was partially inspired by Frederick Hertzberg's Motivator-Hygiene Theory (Berger *et al.*, 1993; Lofgren and Witell 2008; Chen, Lin and Huang, 2006). However, the majority of the quality standards that came before, including

Hertzberg's own, tended to be linear and one-dimensional in their approach. According to Huiskonen and Pirttila (1998) the term linearity refers to the idea that the degree to which a customer's happiness rises (or falls) should more or less follow a linear pattern whenever there is an increase or reduction in the quality of any service attribute.

Kano, Seraku, Takahashi & Tsuji (1984) on the other hand, challenge this conventional viewpoint and advanced the idea of a non-linear and two-dimensional quality, which they defined as the degree to which a service is performed, and the degree to which the customer is satisfied. Because of this non-linearity, perceived service quality attributes may not always provide the intended satisfaction or may induce discontent. They claimed that, sometimes service attributes may exhibit a non-linear pattern. This non-linearity may cause dissatisfaction. The ability to define quality in a more nuanced fashion is made possible by juxtaposing the quality parameters of service performance and customer happiness along a two-dimensional axis. Therefore, Kano *et al.* (1984) distinguish three types of service requirements that influence customer satisfaction in different ways when they are met. These are, 'must be' (basic) quality requirements, 'one dimensional' (performance) quality requirements, and 'attractive' (excitement) quality requirements. When all the three types of service requirements are met, customer satisfaction increases. These prerequisites are what might be referred to as the fundamental characteristics of service quality in terms of how satisfied the customer is. As a result of this, the customer will be severely unsatisfied with the product or service if these needs are not effectively met. Therefore, satisfying the requirements that are labelled as "must be" can only result in a state that is not dissatisfied (Matzler and Hinterhuber, 1998). In other words, they are a required prerequisite for customer pleasure; yet, customer satisfaction cannot be achieved solely through their presence (Busacca and Padula, 2005). According to Redfern, Hannan, Norman & Martin (2002),

one-dimensional requirements lead to customer satisfaction when they are met, but lead to dissatisfaction when they are not. As these needs become more useful, they will ultimately lead to increased consumer satisfaction. Therefore, it is possible to say that, for one dimensional needs, the greater the perceived service quality, the higher the customer's happiness, and vice versa. According to Busacca and Padula (2005), having them is both necessary and sufficient for achieving high levels of customer satisfaction. According to Lofgren and Wittell (2008), these requirements are extremely significant in terms of the creation of a competitive advantage through the creation of a different and being spoken among customers.

Attractive requirements are service attributes which please customers when they are present but do not dissatisfy when absent (Berger *et al.*, 1993). As a result, the level of happiness that a given service brings to its customers is most strongly influenced by these aspects of the service (Matzler, Hinterhuber, Bailom & Sauerwein, 1996).

2.12 Theoretical Framework

An information systems theory known as the technology acceptance model (TAM) attempts to represent the process through which people come to accept and use a technology. It is a model that simplifies the interplay between personal ideas, attitudes, and intentions to use computer technology (Smarkola, 2007). This model may be found in the literatures.

The Theory of Reasoned Action served as the foundation for the TAM when it was first developed. According to Nikola and Andrina (2015) Fred Davis's technology acceptance model (TAM), which was first presented more than a quarter of a century ago, has become the preeminent paradigm for researching the elements that influence users' adoption of technology. The Technology Acceptance paradigm (TAM) is a

paradigm that investigates the problem of how people come to accept and make use of a particular technology (Ajzen & Fishbein, 1980). It is hypothesised that there are two distinct characteristics, perceived utility and perceived ease of use that are basic predictors of user acceptability. According to Davis (1989), ideas such as the perceived usefulness of technology and the perceived simplicity of using technology are what contribute to favourable attitudes and intents to accept and utilise technology.

The TAM denotes two behavioral beliefs, perceived usefulness (PU) and Perceived ease of use PEOU do have influence on an individual's intention to use technologies. In contrast to Perceived usefulness (PU) and Perceived ease of use (PEOU), which refer to process expectancy and outcome expectancy respectively (Liaw, 2002). Studies documented that TAM as the framework revealed that perceived usefulness and perceived ease of use are the important predictors of attitude towards technology use and intention to use (Cheung & Huang, 2002; Teo, 2008; Teo, Lee & Chai, 2008). Venkatesh and Davis (2000) indicate that subjective norm, perceived usefulness, and perceived ease of use were direct determinants of the intention to use. Bertrand and Bouchard (2008) explain that there are a number of meta-analyses on the TAM that have demonstrated that it is a valid, strong and powerful model for predicting user acceptance.

This study considered Technology Acceptance Model (TAM) after extensive review of relevant theoretical models as it involves two primary predictors for the potential adopters i.e perceived usefulness and perceived ease of use. TAM has the capacity to explain and assess the relationship between ATM services and customer satisfaction. Unlike other models, such as theory of reasoned action, theory of planned behaviour, innovation diffusion theory, and the Kano model are examples of theories and models that are unable to provide a direct or categorical linkage between their assumptions and

the need for the research in such a way that a suitable and detailed explanation can be extracted from them. TAM is the appropriate model that can explain the assumptions of the study and it is upon the theory's assumptions that this research is hinged on.

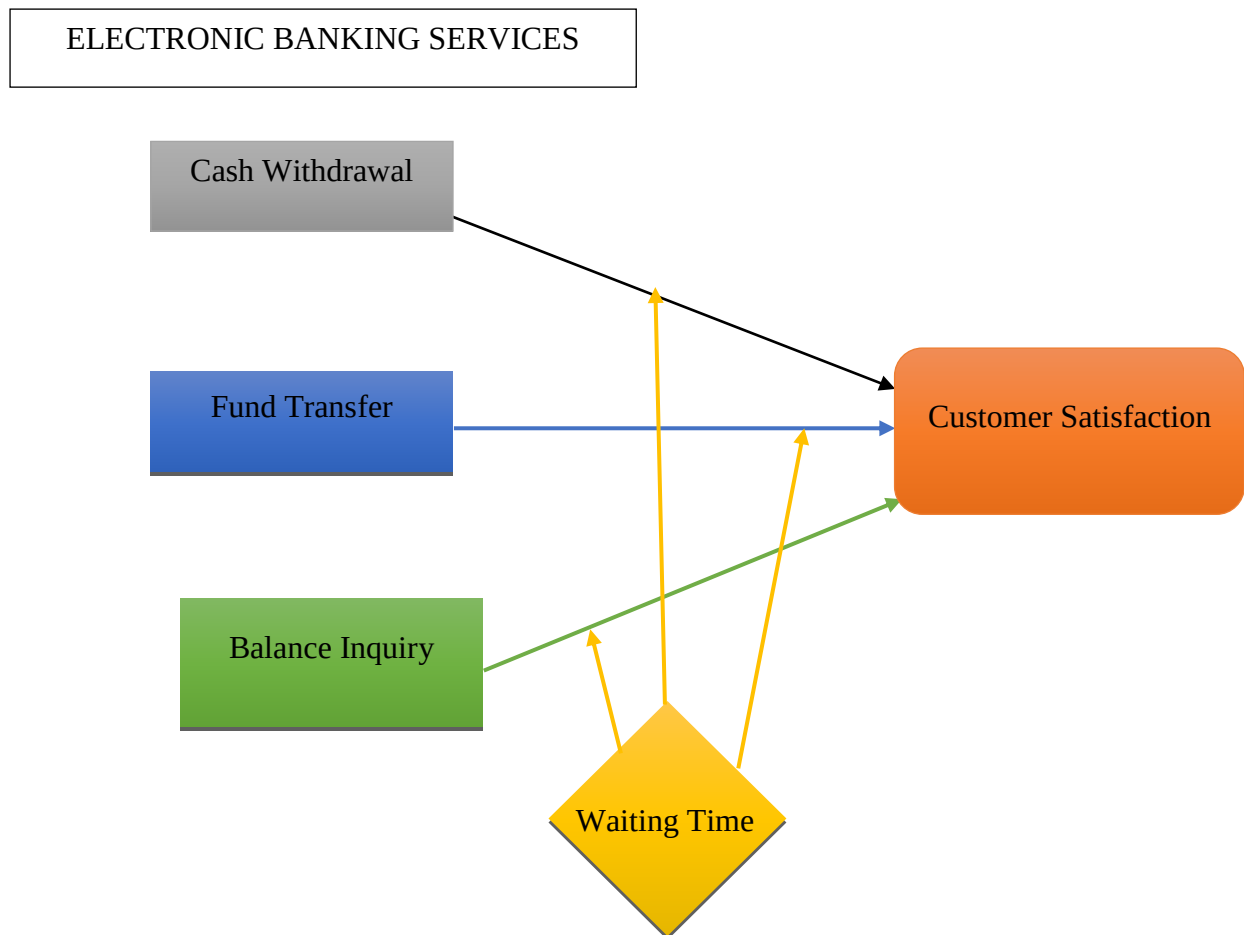


Figure 2.1: Research Model

Theoretical Framework Representation

2.13 Summary of Gaps

This section summarises the gaps identified after extensive literature review. These gaps include: Methodological gap, literature gap and geographical gap.

2.13.1 Literature Gap

Several studies by Adeleye and Samson, (2015); Chi and Phong (2015); Ameer, Usman, Muhammad and Nimra (2016); Hana, (2017); Kendie, (2016); handle ATM service quality and customer satisfaction. Similarly, Several studies by Jyotiranjana, Saboohi and Saboohi ,(2013); Lasisi and Abubakar, (2014); Ranasinghe and Kosala, (2017); Charles, (2016b); Matimbwa and Ochumbo, (2018); Mohammed and Dada, (2014); Syed and Khaliquzzaman, (2016); Odusina, (2014); Sefer , Sudi, Tuğbay, Hande and Serpil, (2015); Russel, (2018); Elliot, Mary and Akosue, (2014); Singh (2011); Kumar, Varaprasad, Sridharan and Unnithan (2013); Matimbwa and Ochumbo (2018) conducted studies on the effect of Automated Teller Machine (ATM) services on Customer Satisfaction. Furthermore, studies by Bielen and Demoulin (2007); Joseph and Simon (2018); Lahap et al. (2018); Tom and Lucey, (1997); Patel, Chaudhary, Patel and Makwana (2012) have been done on the effect of waiting time on customer satisfaction. None of the above studies have been done on the effect ATM services and waiting time on customer satisfaction, specifically using cash withdrawal, fund transfer and balance inquiry as determinants of ATM system.

In addition, the findings of prior research that explore the association between the services provided by ATMs and the level of satisfaction experienced by customers are inconsistent. For instance, Mohammed and Dada (2014); Syed and Khaliquzzaman (2016); Ameer, Usman, Muhammad and Nimra (2016); Chi and Phong (2015) and Elisabet (2016) suggest that ATM services have a beneficial influence on the level of customer satisfaction.

In other studies, by Matimbwa and Ochumbo (2018); Charles (2016b); Kumar, Varaprasad, Sridharan and Unnithan (2013) indicate that ATM services have no effect

on customer satisfaction. Barron and Kenny (1986) provide that, if the findings of the previous study are inconsistent or mixed results there are possible intervention of third variable which is moderator. The purpose of a moderating variable is to provide insights into how and why the relationship between the two variables changes. Moderating variable helps in improving the accuracy of result and enhancing the validity of conclusions. Based on this, the study proposes waiting time to moderate the relationship between ATM services and customer satisfaction.

2.13.2 Methodological Gap

From the empirical review, there exists methodological weaknesses as most of the studies used the same statistical tools in their analysis. For example, Lasisi and Abubakar (2014) used multiple logistic regression. In the same vein Chi and Phong (2015) adopt explanatory factor analysis EFA and Multiple Regression. Russel (2008) use Factor Analysis and Regression Analysis. Safer, Tugbay and Serpil (2015) used Factor Analysis. While Ibrahim, Mohd and Saharuddin (2016) used Descriptive statistics and Multiple Regression. Then Elliot, Mary and Akosue (2014) use Descriptive statistics and Chi-Square. Charles (2016a) use Regression analysis. Another authors Adeleye and Samson (2015), use Regression analysis and Pearson correlation. Furthermore, Matimbwa and Ochumbo (2018), Odusina (2017) use Chi- square.

However, Kibona and Mgaya (2015), Abdurahman and Premalatha (2015) use Percentage Analysis. Moreover, Singh (2011), uses Anova and Factor Analysis. Ranasinghe and Kosala (2017) used Regression, Anova and T- test. Hana (2017), uses Mean. None of the studies used PLS-SEM. Therefore, this study intends to fill this existing gap by employing a rigorous statistical tool such as the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach is adopted for questionnaire data

and queuing model analysis is used for observed data. However, studies using PLS-SEM are conducted in Malasia by Naala (2017); Yarima (2007).

2.13.3 Geographical Gap

The researcher could not find any work on the effect of ATM services and waiting time on customer satisfaction in Sokoto metropolis using the three dimensions of ATM system such as cash withdrawal, fund transfer and balance inquiry as defined in this study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the methodology employed for the study. The chapter therefore presents the research design, population of the study, sample size and sampling technique, instruments of data collection, questionnaire design, and observational method, pilot test and pre-test, validity and reliability test, measurement of research variables and method of data analysis.

3.2 Research Design

The study adopts survey research design. This is because, it investigates the opinions of the respondents regarding their satisfaction with ATM services. The study has one independent variable namely ATM services. The automated teller machine (ATM) is an electronic device that performs the functions of a bank teller by offering a variety of services such as the provision of a mini bank statement, the withdrawal of cash, the balance inquiry, the transfer of funds from one account to another, the deposit of cash, the purchase of certain utilities like air time, and the payment of bills. The study also has one dependent variable i.e. Customer satisfaction. The judgments or feelings that customers have about products or services after comparing the performance that he or she felt compared with expectations can be referred to as customer satisfaction. ATM services are proxied by Cash Withdrawals (CW), Fund Transfer (FT) and Balance Inquiry (BI). It also includes waiting time as a moderator variable. Partial Least Square Structural Equation Modeling (PLS-SEM) was adopted for this study.

The Research philosophy adopted for the purpose of this study is Positivism research paradigm. A research philosophy is a belief about the way in which data about a

phenomenon should be gathered, analyzed and used (Saunders, Lewis & Thornhill, 2009). As a philosophy, positivism adheres to the view that only “factual” knowledge gained through observation (the senses), including measurement, is trustworthy. In positivism studies the role of the researcher is limited to data collection and interpretation in an objective way. The positivist paradigm is desirable when a study intends working with observable social reality and that the outcome of such investigation is a law-like generalization similar to those used by the physical and natural sciences (Saunders, Lewis & Thornhill, 2009). This paradigm is described by quantitative or scientific approaches to explain, predict and analyze testable hypotheses relating to associations between measurable variables since it assumes that reality is objective or independent of observers.

3.3 Population of the Study

Population may be defined as the total number of units (individuals, organisations, events, objects or items) that are of interest to a research from which samples are selected for measurement (Blossfeld et al, 2015). Therefore, the population of the study consists of the entire deposit money banks (DMBs) in Sokoto metropolis. The study choice Sokoto due to its proximity and dense population when compared with Kebbi and Zamfara. Additionally, the attribute of Sokoto are comparative to that of Kebbi and Zamfara. Due to financial and time constraints, the study limit the data collection to the ATMs of the banks with the majority of customers (ATM users) which include ATM belonging to GT Bank with three branches, UBA with four branches, Zenith Bank with three branches, First Bank with five branches, Eco Bank with two branches, Access Bank with four branches, Union Bank with two branches, Jaiz Bank with one branch, Polaris Bank with one branch and Unity Bank with two branches. There are one hundred and seven (107) ATMs points belonging to these ten banks. However, the

population of the study is infinite. This is because, Nigerian banks allow account holders to use their ATM services regardless of whether or not they have account with them. In addition, travelers can equally use any bank's ATM in the course of their journey. In this case, the population of users of a particular ATM is not easy to be determined.

3.3.1 Sampling Technique

This study uses both sampling and purposive sampling techniques. In the course of selecting the 107 ATMs for the study, stratified sampling technique was used because, heterogeneity associated with the different ATMs of different banks. For instances, the operations of the banks and their service to the customers differ, the amount that can be withdrawn from ATMs at once do differ from bank to bank, the operation charges also differ. Additionally, the opinion of one bank users on their satisfaction of the usage of ATM cannot be used to justify the other customers in other banks.

However, purposive sampling technique is used in the selection of respondents (ATM users) and the number of respondents was selected based on the number of functional ATM per bank (see Table 3.1). Because, in the course of selecting the targeted respondents, anybody the researcher met on queue automatically become part of the sample. But, anybody who is not on queue is not part of the study, because, those on queue are ready for service. Some have escorted other people but they are not ready to perform ATM transactions. Gabriel et al. (2015) uses purposive sampling in an earlier study.

3.3.2 Sample Size

A sample size of 384 is drawn from the infinite population table. The sample of 384 is determined using Krijcie and Morgan (1970) sampling approach for calculating sample size for infinite (unknown) population. A 95% confidence level (with a Z-value of 1.96), population proportion P=0.5. The formula for calculating sample size with infinite population using Krijcie and Morgan (1970) is stated below:

$$SS = \frac{Z^2 P(1-P)}{C^2}$$

Where:

Z = Z value (e.g. 1.96 for 95% confidence level).

P = population proportion (expressed as decimal) assumed to be 0.5 (50%), it is the margin of error.

C = confidence level = 0.05.

Hence, given P = 0.5, Z = 1.96 and C = 0.05.

The above formula returns a sample size of:

$$\begin{aligned} SS &= \frac{1.96^2 \times 0.5(1-0.5)}{0.05^2} \\ &= \frac{3.8416 \times 0.5(0.5)}{0.0025} \\ &= \frac{3.8416 \times 0.25}{0.0025} \\ &= 384. \end{aligned}$$

The number of functional ATMs observed at each bank selected for the study are presented in table 3.1. The sample sizes of ATMs users per bank are calculated using the formula below and presented in table 3.1

$$\text{Sample size of ATMs Users per bank} = \frac{X_i}{\sum_{i=1}^{10} X_i} \times \text{total sample size}$$

Where:

X_i = Total number of ATMs in each bank

$\sum X_i$ = Total number of ATMs in all banks

This is achieved by dividing the number of ATMs of each Bank to the total number of ATMs in all the banks multiplied by total sample size. For instance, number of ATMs in GTB is 14, total number of ATMs in all the banks is 107 and the total sample size is 384, then 14 divided by the total number of ATMs in all the banks (107) x Sample size which is 384 i.e (14/107*384=50). Therefore, 50 ATM users represent GTB. Same applied to determine the number of respondents for each bank as presented in Table 3.1 above.

Table 3.1: Disproportionate Sample Sizes of ATMs users in Each Bank

S/N	Banks	Branches	Number of Functional ATMs	Sample Size
1	GT Bank	i. Bello Way ii. Maiduguri Branch iii. Danfodiyo Branch	4 5 5 (Total=14)	$\frac{14}{111} \times 384$ = 50
2	UBA Bank	i. Aliyu Jodi ii. Kano Road I iii. Kano Road II iv. Danfodiyo Branch	5 6 6 2 (Total=19)	$\frac{19}{107} \times 384$ = 68
3	ZENITH Bank	i. Kano Road 2 ii Fodiyo Road iii. Emir Yahaya	5 5 2 (Total=12)	$\frac{12}{107} \times 384$ = 43
4	FIRST Bank	i. Abdullahi Fodiyo ii. Kano Road 2 iii. Ibrahim Dasuki Road iv. Kofa Atiku v. Danfodiyo Branch	4 9 5 1 3 (Total=22)	$\frac{22}{107} \times 384$ = 79
5	ECO Bank	i. Kano Road 2 ii. Tsohowar Kasuwa	3 2 (Total=5)	$\frac{5}{107} \times 384$ = 18
6	ACCESS Bank	i. Kano Road 2 ii. Danfodiyo Branch iii. Maiduguri Branch iv. Kano Road I	3 1 4 7 (Total=15)	$\frac{15}{107} \times 384$ = 54
7	UNION Bank	i. Bello Way ii. Market branch	6 2 (Total=8)	$\frac{8}{107} \times 384$ = 29
8	JA'IZ Bank	i. Bello way	1	$\frac{1}{107} \times 384$ = 2
9	POLARIS Bank	i. Maiduguri Branch	5	$\frac{5}{107} \times 384$ = 22
10	UNITY Bank	i. Kano Road 2 ii. Aliyu Jodi	3 3 (Total=6)	$\frac{6}{106} \times 384$ = 22
Total			107	= 384

Source: Researcher field work, 2022.

3.4 Instruments of Data Collection

This study employs primary data. It adopts survey research method in order to generate primary data from respondents (i.e. ATM users of the selected banks) at their respective ATM outlets. The questions focused on issue about ATM services, effects of waiting time on ATM services and how ATM services and waiting time will characterize customers' satisfaction.

3.4.1 Questionnaire Design

The questionnaire is designed to solicit the opinions of customers with respect to attitudinal disposition of customers toward ATM services and waiting time. Respondents are required to complete the questionnaire. The questionnaire consists of two sections. The first section of the questionnaire is used for collection of demographic information of respondents such as gender, age, occupation educational level and other characteristics. Cash withdrawals, funds transfer, balance inquiry, customer satisfaction and waiting time were the five variables that made up the second part of the questionnaire.

3.4.2 Observational Method

Observation method is a method to observe and describe the behavior of a subject and it involves the basic technique of simply watching the phenomena until some hunch or insight are gained. It is a data collection method in which a person (usually trained) observes subjects of phenomenon and records information about characteristics of the phenomena (Forouk, Moude, Okpanachi, Samuel & Moses, 2015). The observational method of data collection is employed to collect information on the ATM users' arrival time, waiting time as well as service time. The observational data are collected in order

to know the average waiting time for each ATM user and the total average waiting time for all the ATM users for ten banks in Sokoto metropolis of Sokoto state.

3.4.3 Pilot Test and Pre-test

A pilot test is a small-scale evaluation of the overall study to determine the efficacy of predetermined methods. Several rounds of pre-testing are conducted for this study. In the first stage, the researcher presented a questionnaire to the supervisory team on multiple occasions, as well as to the advisory panel which comprised of a select group of academic experts. After validating the contents, they made useful suggestions on the fitness of the items adapted to measure the construct. Consequently, some of the instruments were re-worded for easy understanding. Malhotra (2008) describes validity and reliability of the instrument for data collection as the primary concern of the pilot study before actual full study. He adds that the sample size for the pilot test is between the ranges of fifteen to thirty respondents.

Thus, a total of 30 copies of the questionnaire were distributed to the respondents. However, a total of 28 copies of the questionnaire are filled and returned which are used to test the validity, internal consistent and reliability of the data. The reason behind giving the questionnaire to the respondents to fill is to help the researcher determine the strengths and the weaknesses of the questionnaire format and wording. The study use Cronbach's alpha coefficient to test the inter-item consistency reliability. After conducting reliability test using SPSS version 23, the results of the pilot test provide acceptable cronbach alpha values above the threshold of 0.70 for all items in the questionnaire.

3.4.4 Validity and Reliability Test

Validity test is the extent to which a test accurately measures what it is supposed to measure. Therefore, to achieve validity of this tool, the researcher gave the instrument to the research supervisors and experts in the field of test as well as measurement to make their input in order to ensure the stability of the measurement. The instruments are adjudged to be satisfactory in terms of what they are expected to measure.

Reliability on the other hand, is the extent to which a variable or set of variables are consistent in what it is intended to measure. In other words, reliability is the degree to which research method produces stable and consistent results. Reliability test is conducted to ensure the quality of the questionnaire and guarantee a scale to produce consistent results. Table 3.2 presents the test results.

Table 3.2: Reliability Test Results of the Survey Instruments

S/N	Variables	Number of items	Cronbach Alpha
1	Cash Withdrawal	6	0.832
2	Fund Transfer	6	0.738
3	Balance Inquiry	4	0.708
4	Waiting Time	4	0.781
5	Customer Satisfaction	13	0.719
Total Number of items.		33	

The reliability results of the plot test in Table 3.2 shows that, the Cronbach's alpha values for cash withdrawal, fund transfer, balance inquiry, waiting time and customer satisfaction are all above 0.60. Hence, the data indicates that all the variables are reliable.

3.4.5 Measurement of Research Variables

This section presents independent variables, moderating variable and dependent variable of the study. Table 3.3 shows the variables and their measurement.

Table 3.3: Variables and Measurement

S/N	Variables	Measurement	Source
1	ATM Service	Cash withdrawal, funds transfer and balance inquiry	(Shemsu, 2017; Oduri, 2016; Magara, 2018; Hana, 2017)
2	Customer Satisfaction	Speed, accessibility, security, trust, accessibility and usefulness	(Oduri, 2016; Magara, 2018)
3	Waiting time	Service time	(Joseph, 2013)

Source: Current survey

From the above table, the questionnaire is adapted in a such a way that ATM services is measured by 16 items (Shemsu, 2017; Oduri, 2016; Magara, 2018 & Hana, 2017). Waiting time was measured by 4 items (Joseph, 2013), while Customer satisfaction is measured by 13 items (Oduri, 2016; Magara, 2018). All the research questions are rated using a 5 Likert scale from 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree and 5 = strongly disagree. Since the value of the Cranach's alpha is above 0.7, the instrument adapted is reliable.

3.5 Method of Data Analysis

This study relies on quantitative method of data analysis in analysing the needed relationship between the dependent and independent variables of the study. Descriptive statistics, which include frequency, percentage, mean, standard deviation, minimum and maximum values were used to describe the demographic features of the respondents. The inferential statistics which include Variance inflation factor for multicollinearity test, correlation analysis, PLS-SEM, Heterotrait-Monotrait Ratio, coefficient of

determination (R^2 value), effect size (f^2), and predictive relevance (Q^2), Goodness-of-Fit Index (GoF), and queuing model are used in the data analysis. The Partial Least Squares Structural Equation Modelling (PLS-SEM) was adopted owing to the fact that is a statistical method for modelling complex multivariate analysis of relationships between the observed and latent variables.

Furthermore, PLS-SEM 3 version was adopted for this study due to the complexity of the research model. Because it can be implemented in intricate structural equation models containing a great number of hypotheses and constructs, PLS-SEM makes it possible to provide answers to preexisting inquiries that are connected to one another in a manner that is both methodical and all-encompassing. The underline assumptions of this PLS-SEM model are; predictors need not to be independent, the system is a function of a few underlying latent variables, the system should exhibit homogeneity and measurement error in X is acceptable (Urbach & Ahlemann, 2010). Equally, it can run the model with 50 or more instruments (Chin, 2010). The model is considered suitable for the study due to capacity after collecting raw data from the field, the entire usable responses are coded and keyed-in to the Statistical Package for the Social Sciences (SPSS Version 23) and Smart PLS v3.0.

In terms of the sequence and relationship among the constructs. The study has four exogenous latent variables which include three independent variables (CW, FT & BI), one moderating variable (waiting time). The dependent variable (endogenous variable) in this study is customer satisfaction.

3.5.1 Queuing Model Used

To justify the results of waiting time obtained from the questionnaire data, observational data were collected at the different ATM points and queuing model analysis was

employed in the analysis so that queue length and waiting time can be predicted. The first-in-first-out (FIFO) approach was adopted as it in line with ATM queue discipline.

According to Kendall's notation (1953), the model for the system could be portrayed as either m/m/1 (single server model): FCFS / or m/m/s (multi-server model): FCFS /. Either of these representations is acceptable. The following parameters are taken into consideration when developing the models.

i. Single Server Model (m/m/1)

Mean arrival rate = λ

Mean service rate = μ

$$\text{Utilization factor, } P = \frac{\lambda}{\mu} \quad (1)$$

$$\text{Average number of customers in the system, } L_s = \frac{\lambda}{\mu - \lambda} \quad (2)$$

$$\text{Average number of customers in the queue, } L_q = L_s - \frac{\lambda}{\mu} \quad (3)$$

$$\text{Average time spent in the system, } W_s = \frac{1}{\mu - \lambda} \quad (4)$$

$$\text{Average time spent in the queue, } W_q = \frac{P}{\mu - \lambda} \quad (5)$$

Where, λ and μ represent mean customer arrival and service rates respectively, n signifies number of observations (customers) and S is sample space.

ii. Multi-Server Model (m/m/s)

$$\text{Utilization factor, } P = \frac{\lambda}{s\mu} \quad (6)$$

Probability of zero customers in the system,

$$P_0 = \frac{1}{\left[\sum_{n=0}^{s-1} \frac{(\lambda/\mu)^n}{n!} + \frac{(\lambda/\mu)^s}{s!} \cdot \frac{1}{1 - \lambda/(s\mu)} \right]} \quad (7)$$

$$\text{Average number of customers in the system, } L_s = L_q + \frac{\lambda}{\mu} \quad (8)$$

$$\text{Average number of customers in the queue, } L_q = \frac{P_0(\lambda/\mu)^s P}{s!(1-P)^2} \quad (9)$$

$$\text{Average time customer spent in the system, } W_s = W_q + \frac{1}{\mu} \quad (10)$$

$$\text{Average time customer spent in the queue, } W_q = \frac{L_q}{\lambda} \quad (11)$$

Where, λ , μ , n and S are as defined earlier and $!$ is factorial.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter includes a discussion on the findings of the study, as well as the results that have been established as a result of the analysis of the data. The outcome of the pilot study is also reported. During the process of carrying out the analysis of the data, both descriptive and inferential statistics are utilised. The use of descriptive analysis is carried out so that the characteristics of the variables and the demographic aspects of the respondents could be described. The chapter also presents the results of the analysis of methodologies listed in chapter three section 3.5 as well as data collection process, and Response Rate of the Questionnaires, data cleaning, missing data and assessment of outliers, multicollinearity, and demographic profile of the respondents. Using the PLS-SEM 3 version approach, the chapter presents the measurement model to test the goodness of the measuring instrument using indicator reliability, internal consistent reliability, convergent validity and discriminant validity analysis. In addition, structural model was used in testing the empirical results of the hypotheses.

4.2 Frequencies of the Data Collected

The total of 384 copies of questionnaires are distributed to the customers that used ATMs of GT bank, UBA, Zenith Bank, First Bank, Eco Bank, Access Bank, Union Bank, Ja'iz Bank, Polaris Bank and Unity Bank in Sokoto metropolis. The banks are used as strata and the purposive sampling technique is employed to select the respondents for the study. Moreover, research assistants are employed to guide the respondents on the completion of the questionnaire. Out of 384 questionnaires, 367 copies are returned. This provides a response rate of 95.57%. Consequently, a response

rate of this study is considered sufficient for the analysis. The copies of the returned questionnaire are coded and entered into the SPSS version 22. Table 4.1 shows the distribution of the study sample and the respond rate of the questionnaires.

Table 4.1 below presents the frequency of the response rate on the questionnaire distributed:

Table 4.1: Response Rate of the Questionnaires

Response	Frequency/Rate
No. of questionnaires distributed	384
Returned questionnaires	367
Questionnaires not returned	17
Response rate	95.57%

Source: Researcher field work, 2021.

Table 4.1 shows a high response rate because the data were collected during the peak time (time for festivity and end of the month) when many customers were on the queue patronizing ATM.

4.2.1 Data Cleaning

Data cleaning is an essential step in the process of conducting any significant study in general and multivariate analysis in particular (Pallant, 2010). Similarly, the quality and meaningfulness of outcomes of the research greatly relies on the quality of the data (Hair, Black, Babin & Anderson *et al.*, 2010). Moreover, the missing data, multicollinearity and outliers were carefully investigated and properly adjusted as presented below:

4.2.2 Missing Data

The condition known as missing data occurs when the desired values for one or more variables cannot be obtained for the purpose of analysis (Hair, *et al.* 2010; Joseph *et al.*, 2010). This study uses SPSS version 22 for descriptive statistics in order to detect and replace missing data.

Thus, it is the duty of a researcher to detect and treat such missing information properly because missing values in data could cause major issues for any data analysis (Tabachnick & Fidell, 2001). Accordingly, Hair, Sarstedt, Hopkins and Kuppelwieser (2014) classified missing data into known and ignorable, and unknown and non-ignorable. All the missing values in this case are unknown and cannot be ignored because they are due to non-response from the respondents and have taken place at random. By using probability sampling to select respondents, the researcher makes these missing data ignorable. To determine the extent of missing data, Hair et al. (2014) postulate that the most direct means to assess the extent of missing data is by tabulating (1) the percentage of variables with missing data for each case, (2) the number of cases with missing data for each variable and, (3) the number and percentage of the overall missing data. This indicate not only the extent, but also any high levels of missing data that occur (Hair, Black, Babin, Anderson & Tatham, 2016).

The result indicated that out of 14680 data cases only 47 data cases are randomly missed, accounting for 0.32% of the total data cases. Specifically, cash withdrawal has ten missing values; fund transfer with six missing values; balance inquiry eleven, waiting time and customer satisfaction are having five and twelve missing values respectively. Even though, there is no general acceptable level of missing values in a data set, but, 5% or less is considered insignificant by many researchers (Hair *et al.*, 2010; Sekaran & Bougie 2003; Tabachnick & Fidell, 2007). Moreover, mean can be

used to replace the identified missing values (Joseph *et al.*, 2010). In order to detect missing values, table 4.2 indicates the total frequency and percentages across the individual variables of the study.

Table 4.2 Frequency Distribution of the Missing values

Latent variables	Frequency
Cash withdrawal	10
Fund transfer	6
Balance enquiry	11
Waiting time	8
Customer satisfaction	12
Total	47
Percentage of missing value	0.32

Source: Researcher fieldwork, 2021.

4.2.3 Assessment of Outliers

An outlier is a case, an observation, or a subset of observations that is markedly different from all of the other cases in a certain set of data. Outliers can also be a subset of observations. In addition, observations that are considerably different from all of the other cases in a data set are considered to be outliers according to this definition (Byrne, 2010). In a similar vein, Joseph *et al.* (2010), suggest that the identification of outliers might be approached from either a univariate or multivariate perspective, depending on the number of constructs that were taken into consideration in the study. Additionally, researchers make use of a variety of these outliers detective viewpoints as is practically possible, looking for a consistent pattern that can be applied across views in order to identify outliers (Hair, *et al.*, 2010; Joseph *et al.*, 2010). The use of standardised values of a variable that is referred to as a z-score allows for the identification of univariate outliers that may exist (Tabachnick & Fidell, 2007). Hence, no case of univariate

outliers is identified from the responses collected in this study. Therefore, for further multivariate analysis, all 367 cases are considered. Since there is no case of outlier, no need to treat any univariate outliers.

4.2.4 Multicollinearity

The phenomenon known as multi collinearity occurs when two or more exogenous latent constructs are found to be intricately connected to one another. According to the definition provided by Sekaran and Bougie (2010), multicollinearity is an instance in which at least two independent variables in a multiple regression model are extremely connected to one another. The assumptions of multiple regression technique include: no single independent variable has a perfect linear relationship with one another, the dependent and independent variables should be measured on a continuous scale, there should be a moderator variable that is a nominal variable with at least two groups, the variables of interest (the dependent variable and independent variable and moderator variable) should have a linear relationship, which you can check with a scatterplot, the data must not show multicollinearity (See Table A1 in the Appendix II) and the distribution of the variables should be approximately normal. Tabachnick & Fidell (2007). In addition, multicollinearity's problematic arises when latent variables are highly correlated. According to the findings of Hair *et al.* (2010), there is a strong correlation between the values of two or more independent variables when the correlation is 0.9 or higher.

There are a variety of approaches that may be used by a researcher (Peng & Lai, 2012; Tabachnick & Fidell, 2007) in order to determine whether or not there is multicollinearity among the independent variables. The Pearson correlation, the Variance Inflated Factor (VIF), the tolerance index, and the condition index are the

most common methods for finding multicollinearity among exogenous latent constructs (Hair *et al.*, 2010, Peng & Lai, 2012; Tabachnick & Fidell, 2007).

For the purpose of determining whether or not there is a high degree of correlation between the independent variables, this research utilised the Pearson correlation matrix. The threshold of 0.9 and above for multi collinearity to occur among the independent variables is suggested by (Hair *et al.*, 2010). In addition, Pallant (2010), recommended the use of correlation value of 0.7 and above as the threshold multi collinearity among independent variables. In this instance, the outcome of the Pearson correlation test reveals that not a single one of the independent variables has a significant relationship with any of the other independent variables.

Table 4.3 Correlation Matrix of the Exogenous Latent Variable

No Latent Variable	1	2	3	4
Cash withdrawal	1			
Fund transfer	.556	1		
Balance inquiry	.436	.574	1	
Waiting time	.327	.334	.431	1

Source: Researcher fieldwork, 2021.

The result in table 4.3 showed that the correlations between the independent variables are adequately below the recommended threshold values of .90 or more (Hair *et al.*, 2010) and 0.7 and above (Pallant, 2010). This indicates that the latent constructs are not highly correlated or extremely interrelated. As a result, there is no evidence to suggest that there is a problem with multicollinearity among the independent variables in this study. Additionally, multicollinearity is tested using tolerance value and Variance Inflated Factor (VIF) as shown in table A1 (in Appendix). Tolerance value and VIF are

proposed as the most significant and reliable techniques for testing multicollinearity among the exogenous latent variables (Hair *et al.*, 2010).

Considering the result in table A1 (in Appendix), the VIF value ranges between 1.0579 and 2.7632 (refers to table A1 in the appendix) adequately below the threshold value of 5 and above (Hair, Ringle & Sarstedt, 2011). Therefore, according to the tolerance index and the values of the VIF for the exogenous latent constructs, none of the variables are strongly connected with one another. As a result, the researcher came to the conclusion that there is no controversy regarding the existence of multicollinearity amongst the independent variables of the study.

4.3 Characteristics of the Respondents

Tables 4.4, 4.5, 4.6, 4.7, 4.8 and 4.9 show the descriptive analysis of the demographic profile of the respondents which include demographic features such as gender, age, occupation, educational level, ATM services patronage and frequency in using ATM services. The gender of those who participated in this survey is detailed in Table 4.4.

Table 4.4: Distribution of Respondents by Gender

SEX	Frequency	Valid Percent
Male	203	55.3
Female	164	44.7
Total	367	100.0

Source: Researcher field work, 2021.

Table 4.4 shows that two hundred and three (203) of the respondents representing 55.3% are male, while one hundred and sixty-four (164) representing 44.7% are female. This implies that there are more male customers than female during the period of research. Most a times, in the Northern part of the country males are the majority users

of ATM services as they are even holding cards of their wives. Therefore, male gender are more affected by waiting time at the ATM points.

Table 4.5: Age of Respondents

AGE	Frequency	Valid Percent
Less than 20 years	56	15.3
Between 21-30 years	217	59.1
Between 31-40 years	57	15.5
Between 41-50 years	30	8.2
Above 50 years	7	1.9
Total	367	100

Source: Researcher field work, 2021

Table 4.5 indicates that fifty six (56) respondents, representing 15.3% are below the age of 20 years, two hundred and seventeen of the respondents, representing (59.1%) are within the range of 21-30 years, fifty seven (57) of the respondents representing 15.5% are within the range of 31-40 years, thirty (30) respondents, representing (8.2) are within the range of 21-30 years; while seven (7) of the respondents representing 1.9% are above 50 years. Therefore, the data indicates that majority of the ATM users that patronized the ATM services are within the range of 21-30 years. The majority of ATM users are between the ages of 21 and 30. This may be due to the reason that they are youth, they are unrestricted by age and can move anywhere, whereas elderly people may not be able to operate it.

Table 4.6: Distribution of Respondents by Occupation

Occupation	Frequency	Valid Percent
Unemployed	130	35.4
Civil Servant	133	36.2
Trading	48	13.1
Others	56	15.3
Total	367	100

Source: Researcher field work, 2021.

The results in Table 4.6 shows that one hundred and thirty (130) respondents representing 35.4% were not employed, one hundred and thirty-three 133(36.2%) are self-employed; 48(13.1) engages in trading; while fifty-six (56) representing 15.3 engages themselves in other businesses. The implication of the above results is that civil servants patronized ATM services more than any other category of customers in other occupations. The majority of ATM users are civil servants. This is because, civil servants are working class people, they use their monthly salary to purchase necessities such as foodstuff, clothing and fuel. They are regularly withdrawing cash from ATM more than other categories of customers in other occupations.

Table 4.7: Distribution of Respondents by their educational qualifications

Educational Level	Frequency	Valid Percent
Primary Certificate	2	0.54
Secondary Certificate	72	19.62
First Degree	218	59.40
Masters Degree	58	15.80
Others specify	17	4.63
Total	367	100.00

Source: Researcher fieldwork, 2021.

Considering the results in table 4.7 two (2) respondents, representing 0.54% obtains primary school certificates; seventy two (72) of the respondents that represent 19.62% have secondary school certificate; two hundred and eighteen (218) respondents, representing (59.40%) obtained first degree; fifty eight (58) respondents, representing 15.80% acquired master's degree; while 17(4.63%) of the respondents have other qualifications such as Diploma, NCE, HND, PhD etc. The above results indicate that most of the customers that patronized ATM services in this study are degree holders. The majority of customers who used the ATM services in this study are degree holders.

They are the working class people and hence fall within the civil servants category. Since they are youth, they are open to travel.

Table 4.8: Analysis of respondents' opinions on ATM patronage

ATM patronization	Frequency	Valid Percent
Cash withdrawal	178	48.5
Fund transfer	31	8.4
Balance inquiry	2	.5
Cash withdrawal and Fund transfer	77	21.0
Cash Withdrawal and Balance Inquiry	17	4.6
Fund transfer and Balance Inquiry	11	3.0
All of the above	51	13.9
Total	367	100.0

Source: Researcher field work, 2021.

Table 4.8 shows that 178(48.5%) of the respondents use ATM; 31(8.4) of the respondents use fund transfer; 2 respondents representing 0.5% use balance inquiry; 77 respondents, representing 21.0% patronized both Cash withdrawal and Fund transfer; 17 respondents, representing 4.6% use cash Withdrawal and Balance Inquiry; 11 respondents, representing 3.0% use fund transfer and Balance Inquiry; while 51 respondents, representing 13.9% patronize all the ATM services states in this study. Hence, the analysis indicates that majority of the customers patronized cash withdrawal. Even though, Nigerian banks allow account holders to enjoy more than one ATM service simultaneously. But majority of ATM users are interested in withdrawing cash than enjoying other ATM services such as funds transfer and checking balance or doing more than one transaction concurrently. This is informed by high number of the study respondent's from the civil service category.

Table 4.9: Analysis of respondents' opinions on frequency in using the ATM services

ATM	Frequency	Valid Percent
Daily	53	14.4
Once a week	145	39.5
Once two weeks	100	27.2
once a month	69	18.8
Total	367	100

Source: Researcher field work, 2021.

Table 4.9 indicates that fifty-three (53) respondents, representing 14.4% use ATM daily; one hundred and forty-five (145) respondents, representing 39.5% use ATM once a week; one hundred (100) respondents, representing 27.2% use ATM once two weeks; while sixty-nine (69) respondents, representing 18.8% use ATM once a month. Hence, this indicates that majority of the customers in this study use ATM services once a week. Because, most of them know their weekly average demand and will withdraw once to meet up the demand.

Table 4.10: Descriptive Statistics for CS, CW, FT, BI and WT

Variables	N	Minimu m	Maximu m	Mean	Std. Deviation
Customer Satisfaction	367	1.00	4.31	2.1326	.51576
Cash Withdrawal	367	1.00	4.75	1.9493	.65786
Fund Transfer	367	1.00	4.00	2.0771	.64381
Balance Inquiry	367	1.00	4.25	1.8895	.71468
Waiting Time	367	1.00	4.50	2.3317	1.05684

Note: CS= Customer Satisfaction, CW= Cash Withdrawals, FT= Fund Transfer, BI= Balance Inquiry and WT= Waiting Time.

Table 4.10 shows the descriptive statistics (minimum, maximum, mean and standard deviation) of study variables customer satisfaction, cash withdrawals, funds transfer,

balance inquiry and waiting time. The results of mean = $2.13 \approx 2$ for customer satisfaction imply that the respondents agree and satisfied with the security, convenience, trust, usefulness accessibility and charges of ATM services.

Also the mean value $1.94 \approx 2$ for cash withdrawals, implies that the respondents are not satisfied with the hitches associated with cash withdrawal. These hitches include ATM run out cash, withdrawal error, dispensing error and daily transaction limits.

The average response on funds transfer is $2.077 \approx 2$ implies that the customers are satisfied with banks' activities associated with fund transfer using ATM in terms of error free in fund transfer, fasterness of the transfer using ATM, safety of holding cash and smoothness of business operations.

The results of average balance inquiry $1.889 \approx 2$ implies that the respondents are satisfied with the ease of use of ATM for checking account balance, limitedness of number of times to view their account balance and printing of mini statement of the account balance.

The average response on waiting time is $2.33 \approx$ which implies that, the customers are satisfied with the duration of their waiting time at the ATM points and agreed that ATM saves time in carrying out bank transactions.

4.4 Goodness of Measurement Model

The PLS-SEM analysis supports the individual item reliability, internal consistency, content and convergent validity, as well as discriminant validity, through the assessment of the measurement model, also known as the outer model. In other words, the evaluation of the outer model checks to see if the survey items measure the constructs that they are supposed to measure, so assuring that the measure is both valid and

reliable. It would appear that evaluation of the accuracy of measures is related to outer model analysis (Hair *et al.*, 2011; Ramayah, Lee & In, 2011).

PLS-SEM Algorithm is utilised in this study, although an outside model is used to examine the reliability and validity of the construct measurements. According to Hair, Ringle and Sarstedt (2013), the PLS-SEM analysis utilises two primary criteria to evaluate the quality of the outer model. These criteria are reliability and validity. As a result of this, Ramayah *et al.* (2011), suggested making use of indicator reliability, internal consistency reliability, convergent validity, and discriminant validity when determining how good an outer model is. The PLS-SEM Algorithm is depicted here in Figure 4.1, which describes the measurement model.



Figure 4.1: PLS-SEM Algorithm – Complete Direct relationship

Source: Field work analysis 2021.

Figure 4.1 presents the study's complete model before deletion. The items that have less than 0.4 loadings are deleted based on the rule of thumb.

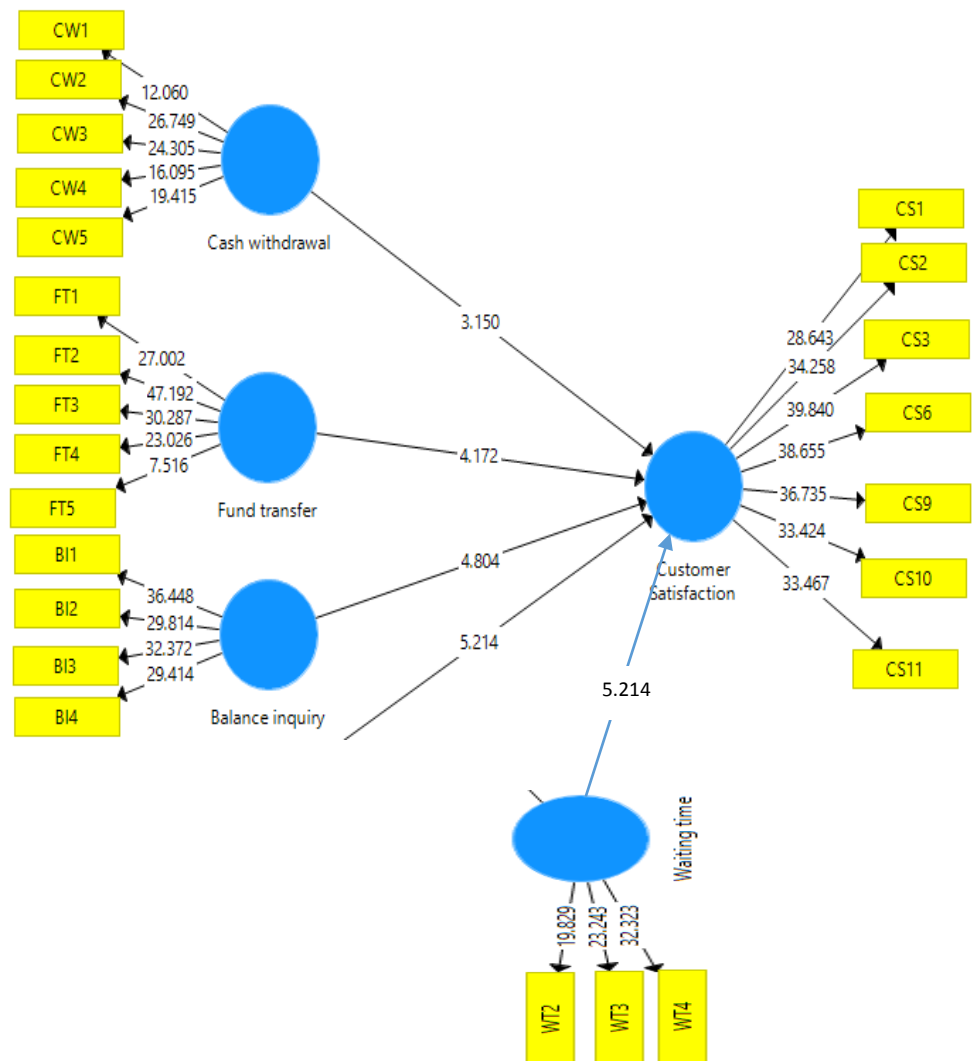


Figure 4.2: PLS-SEM Algorithms for Measurement Model.

Source: Field work analysis 2021.

Based on Figure 4.2 of the measurement model, items CW6, FT6, WT1, CS4, CS5, CS7, CS8, CS12, and CS13 are all deleted from the model in order to have a reliability and validity as the two major criteria for assessing the model's quality to evaluate the goodness of the model (Hair *et al.*, 2010). The purpose of the reliability test is to determine whether or not the measuring equipment consistently measures the characteristics that it is designed to measure. To put it in another way, the validity test

examines the extent to which a measure or group of measures accurately represents the notion that is being investigated. Validity refers to the degree to which the notion being studied may be defined precisely by the measuring tool being used. As a result, the purpose of this research was to evaluate the quality of the measurement model by analysing its convergent validity, discriminant validity, indicator reliability, and internal consistency reliability.

4.4.1 Indicator Reliability

PLS-SEM Algorithms in run and observations were made on them in order to identify and remove any items that did not satisfy the predetermined criteria. On the basis of these observations, six out of the total of thirty-three items or measures were eliminated. This was done primarily not due to the fact that the threshold of an outer loading value greater than 0.4 was not met; rather, it is done due to the fact that their removal increased the value of composite reliability and AVE, both of which are of the utmost significance to the study. Because of this, the complete model is reduced to just 27 items and measures, all of which have loadings that fall within the range of 0.4293-0.8437 hence improve the value of composite reliability and AVE (refer to Appendix A2), making them suitable for further investigation.

4.4.2 Internal Consistency Reliability

The degree to which the components of a set are positively connected to one another is an indication of the reliability of the internal consistency. It demonstrates the degree to which the indicators that are assessing the construct give scores that are comparable to one another when the construct is measured over a period of time (Sekaran & Bougie, 2010; Hair *et al.*, 2013). Hence, internal consistency reliability measures the stability of the result concerning items of the same test (Hair *et al.*, 2010; Sun, Chou, Stacy, Ma,

Unger & Gallaher (2007). Cronbach's alpha coefficient and composite reliability coefficient are the most commonly used methods of evaluating the internal consistency reliability for the research's measuring instrument (Hair *et al.*, 2010; Peterson & Kim, 2013).

Sekaran and Bougie (2010) recommends that reliabilities of less than 0.60 should be deemed to be bad, reliabilities in the range of 0.70 should be considered acceptable, and reliabilities beyond 0.80 should be considered good. In addition, Hair *et al.* (2012) came to the conclusion that Cronbach's alpha and composite reliability do not presume that equal indicators are loading the construct equally. According to what we can tell, the value of the composite dependability coefficient can range anywhere from 0 to 1. The threshold value should not be lower than 0.60, but a value of 0.70 or above is seen as being more appropriate (Hair *et al.*, 2012; Hair *et al.*, 2013; Henseler, Ringle, and Sinkovics, 2009). Additionally, Nunnally and Bernstein (1994) claim that a composite reliability coefficient between 0.60 and 0.70 identifies average internal consistency, whereas a number between 0.70 and 0.90 is deemed to be appropriate. Due to the limits of each measure, Hair *et al.* (2011) and Hair *et al.* (2013) argue that it is more appropriate to apply different measures of internal consistency reliability. This was stated in both the studies.

Consequently, in this study, both composite reliability and Cronbach's alpha coefficient for all the constructs are assessed and the results in table 4.5 shows that composite reliability coefficient exceeds the suggested threshold value of 0.70 as suggested by (Hair, Sarstedt, Ringgle & Mena, 2012; Hair *et al.*, 2013; Sekaran & Bougie, 2013). The Cronbach's alpha coefficient on the other hand range between 0.6345 and 0.9263 (refers to Appendix A2). Therefore, these indicated the reliability of the measurement model.

Table A2 (in appendix) presents the composite reliability coefficient with value ranges between 0.8027 to 0.9379 which is higher than 0.7 indicating high levels of internal consistency and reliability (Hair *et al.* 2011; Bagozzi & Yi, 1991). As a result, it is possible to demonstrate that the instruments are reliable.

4.4.3 Convergent Validity

The degree to which a particular metric correlates positively with other measurements of the same concept is what is meant by the term "convergent validity." Therefore, the average variance extracted (AVE) is the usual measure to establish convergent validity on the construct level. It is considered to be the grand mean of the squared loadings of the indicators associated construct (Hair *et al.*, 2013; Ringle, Sarstedt & Straub, 2012; Sarstedt & Schloderer, 2010). This is because AVE is viewed as the grand mean of the squared loadings of the indicators associated construct. The general consensus is that a latent variable ought to be able to account for a sizeable amount of the variance associated with each indicator—typically at least fifty percent of the total. On the other hand, an AVE that is less than 0.50 indicates that, on average, more error is left by the items than is explained by the construct (Hair Jr. *et al.*, 2014; Hair, Ringle et al., 2012). In addition, Hair *et al.* (2011), suggest that indications with extremely low outer loading (below 0.4) should always be eliminated from the scale. This is in accordance with their recommendation that these indicators never be used.

For the purpose of this study, the convergent validity is determined by analysing the outer loadings and AVE values of the indicator (Hair, *et al.*, 2013; Henseler et al., 2009). In this regard, the outer loadings of the indicator as well as the AVE values are evaluated in accordance with the threshold values of 0.4 and above for the outer loadings of the indicator and 0.5 for the AVE values (Hair *et al.*, 2011; Hair *et al.*, 2013;

Henseler *et al.*, 2009). The findings of the PLS analysis, which are reported in Table 4.5, showed that the outer loadings of the indicator satisfied the threshold values of 0.4 and above. This is discovered after eliminating 6 items from the study. In addition, the findings demonstrated that the AVE values for all the constructs lie within the range of 0.5050 to 0.6381 (refer to Appendix A2); moreover, these values are greater than the threshold values of 0.5. As a result, it is reasonable to draw the conclusion that the findings present the evidence required for convergent validity to be established.

4.4.4 Discriminant Validity

Discriminant validity is defined as the degree to which a given latent variable is actually distinct from the other latent variables. Because of this, a higher level of discriminant validity suggests that a latent variable is unique in comparison to other latent variables and that it represents a different set of phenomena than other latent variables (Duarte & Raposo, 2010). According to Hair *et al.* (2013) and Henseler *et al.* (2009), the Fornell and Larcker criterion is the method that is most commonly used to measure the discriminant validity of a test. As a result, the discriminant validity of this study is determined by following the guideline provided by Fornell and Larcker (1981), which states that evaluation should be carried out utilising correlation among the components with the square roots of AVE. In a similar manner, discriminant validity can be determined utilising Chin (1998), yardstick by connecting the indicator loadings with additional indicators that appear in the cross-loadings.

Table 4.11: Latent Variable Correlation and Variance Extracted *Fornell-Larcker Criterion*

Latent Constructs	Balance inquiry	Cash withdrawal	Customer Satisfaction	Fund transfer	Waiting time
Balance inquiry	0.7988				
Cash withdrawal	0.5462	0.7106			
Customer Satisfaction	0.5633	0.4910	0.7760		
Fund transfer	0.6204	0.5237	0.5583	0.7350	
Waiting time	0.3989	0.3617	0.4642	0.4502	0.7591

Source: PLS-SEM output

From Table 11 (in appendix) the values of AVE range between 0.5050 and 0.6021 which recommend that the values are acceptable. According to Table 11 (which can be found in the appendix), the square root of AVE is found to be significantly higher than the correlations among the reflective latent components, indicating that sufficient discriminant validity is achieved. Therefore, discriminant validity can be proven if the indicator's outer loading on a latent construct is greater than its cross loadings in relation with other latent constructs (Chin, 1998; Hair *et al.*, 2013; Heseler *et al.*, 2009). This is found to be the case when Hair *et al.*, 2013 found that the indicator's outer loading on a latent construct was higher than its cross loadings in relation with other latent constructs.

Because the loadings are greater than the cutoff value of 0.5 (Chin, 1998; Heseler *et al.*, 2009) table 4.6 demonstrates that there is no issue with the discriminant validity of this study. Additionally, the factor loading of each indicator (which is highlighted in bold) is greater than its cross loadings.

Table 4.12: Heterotrait-Monotrait Ratio (HTMT)

Latent Constructs	Balance inquiry	Cash withdrawal	Customer Satisfaction	Fund transfer
Balance inquiry				
Cash withdrawal	0.6873			
Customer Satisfaction	0.6484	0.5795		
Fund transfer	0.7838	0.6815	0.6622	
Waiting time	0.5485	0.5094	0.5972	0.6405

Source: PLS-SEM output.

Comparing the item loadings with the cross loadings is another method that is utilised in the investigation of discriminant validity (see appendix A3). It can be seen that all of the item loadings are greater than the cross loadings, which indicates that the discriminant validity of the test is satisfactory. This indicates that the proposed model is credible to proceed with hypotheses testing.

Finally, the heterotrait–monotrait (HTMT) ratio of correlation measure is used to evaluate the discriminant validity of the reflective constructs as it is considered more superior than the two methods discussed above. Henseler, Ringle and Sarstedt (2015) argued that although, the Fornell-Larcker criterion and the examination of cross-loadings are the dominant approaches for evaluating discriminant validity, they do not reliably detect the lack of discriminant validity in common research situations. Therefore, they propose the HTMT an alternative approach, based on the multitrait-multimethod matrix, to assess discriminant validity via the HTMT ratio of correlations.

4.4.5 Assessment of the Structural Model Direct Relationship

Assessment of structural model is the next stage after establishing the measurement mode (outer model). In particular, once the specified reliability and validity index had been met by the latent variables, the next stage, which is the evaluation of the structural

model (inner model), could then take place. This study assesses the structural model which involves evaluating the model's predictive capabilities and abilities to measure relationships between the constructs. Therefore, structural model assessment in this study involved the coefficients of determination, the determination of the latent variables' path coefficients, individual independent variables effect size and the model's predictive relevance (Hair Jr *et al.*, 2014; Hair *et al.*, 2010; Anderson & Gerbing, 1988; Barclay, Haggins & Thompson, 1995).

The coefficient of determination (R^2 value) is an essential principle for the assessment of the structural model (Hair *et al.*, 2012; Hair *et al.*, 2011; Henseler *et al.*, 2009). Hair *et al.* (2016), state that the value of R^2 is referring to the collective effects of the exogenous latent variables on the latent endogenous variable. In this study, the endogenous variable R^2 value is 0.44.36 (refer to table 4.9). However, the satisfactory R^2 level value differs with research framework (Hair *et al.*, 2010). Falk and Miller, (1992); Hair *et al.*, (2010) recommended 0.10 R^2 value as the minimum tolerable level. Furthermore, Chin (1998) considered the coefficient values of .67, .33, and .19 in PLS-SEM as significant, moderate and weak respectively. Similarly, according to Cohen, (1988) R^2 values of 0.02 to 0.12, 0.13 to 0.25 are considered as small and moderate while values above 0.26 are regarded as significant.

Table 4.13: Coefficient of Determination (R^2)

Latent Constructs	R Square	R Square Adjusted	Variance Explained (R^2)
Customer Satisfaction	0.436	0.4379	44.36%

Source: PLS-SEM output.

The above results in table 4.13 clearly shows that the model explains only 0.4436 of the total variances in customer satisfaction. Therefore, in conclusion, 44.36% of the variance in customer satisfaction as recommended by Chin (1998), R^2 value explained by exogenous construct is moderate. Figure 4.3 and Table 4.13 indicates estimation for

the direct relationship that comprises moderating variables. The R^2 value for customer satisfaction is found to be 0.4436, signifying that 44.36% of the variance customer satisfaction could be explained by Cash withdrawals, Fund transfer and Balance Inquiry.

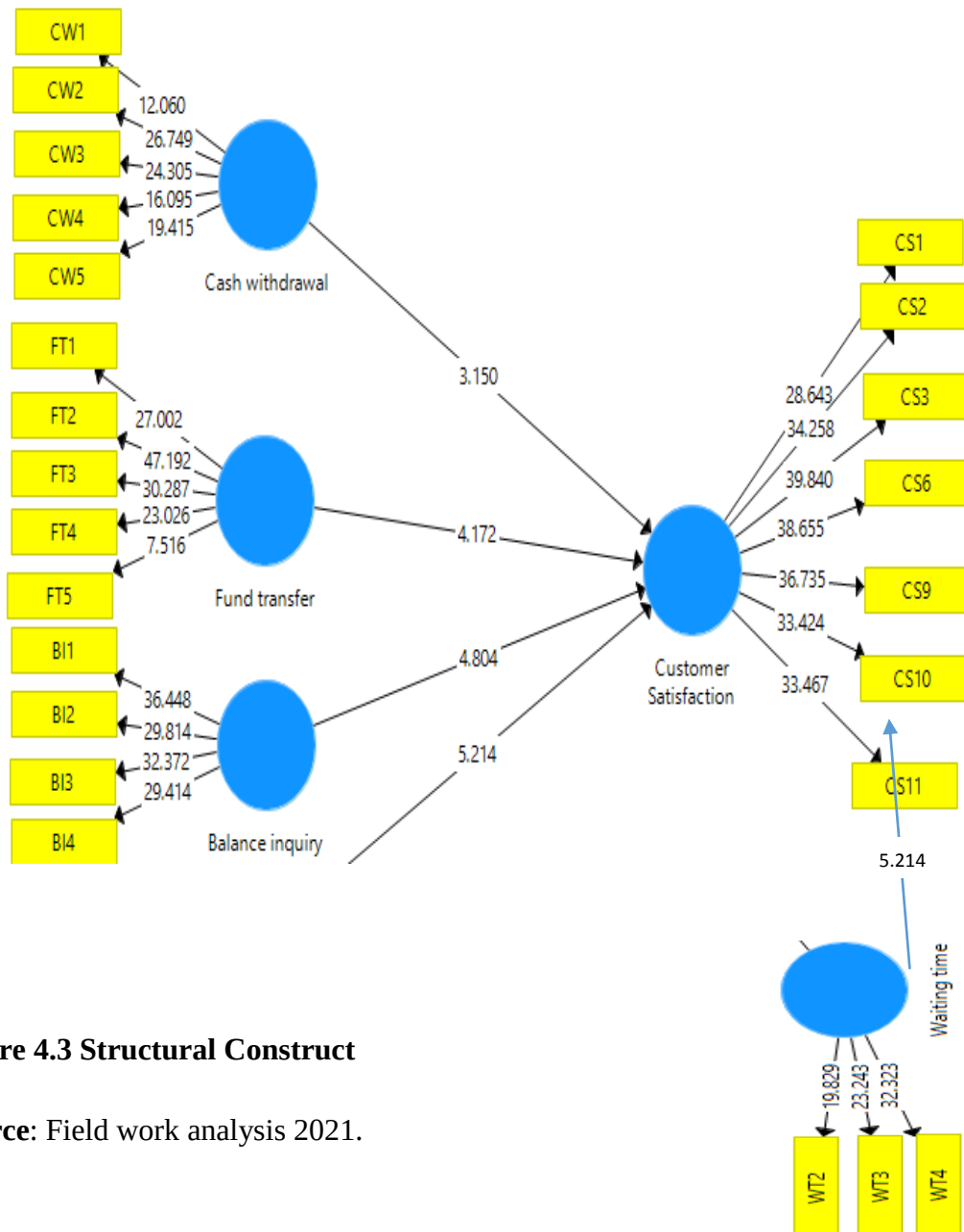


Figure 4.3 Structural Construct

Source: Field work analysis 2021.

Table 4.14: Results for Direct Relationship Hypotheses Testing

Hypotheses	Path	B	Standard Dev.	T Statistics	P Values	95% Confidence Interval of the Direct Effect	Decision
H ₁	Cash withdrawal -> Customer Satisfaction	-0.146	0.048	3.150	0.001	(0.072,0.223)	Rejected
H ₂	Fund transfer -> Customer Satisfaction	0.214	0.051	4.172	0.0000	(0.128,0.298)	Rejected
H ₃	Balance inquiry -> Customer Satisfaction	0.269	0.056	4.804	0.000	(0.175,0.360)	Rejected
H ₄	Waiting time -> Customer Satisfaction	0.207	0.040	5.214	0.000	(0.143,0.275)	Rejected

Note: **significant @ 0.05

Source: PLS-SEM output.

Considering the results shown in Table 4.14 and Figure 4.3 above, it is discovered a negative relationship between cash withdrawals and customer satisfaction (Beta β = -0.146, t = 3.150, p < 0.0001). Hence H₁ is rejected. Therefore, we accept null hypothesis that there is significant relationship between cash withdrawals and customer satisfaction. Hypothesis 2 predicts a significant relationship between fund transfer and customer satisfaction. Nevertheless, the result shows that fund transfer has a significant influence on customer satisfaction (Beta β = 0.214, t = 4.172, p < 0.0000). Hence H₂ is rejected. Hypothesis 3 predicts that balance inquiry has a significant relationship with customer satisfaction indicating that balance inquiry has a significant influence on customer satisfaction (Beta β = 0.269, t = 4.804, p < 0.000) rejecting hypothesis 3. From the analysis. However, it is discovered positive relationship between waiting time and customer satisfaction (Beta β = 0.207, t = 5.214, p < 0.0000). This implies that, waiting time has a significant influence on customer satisfaction. The condition on whether the hypothesis is supported or rejected is based on when the β and the t -value conditions are satisfied at one tail hypotheses.

4.4.6 Assessment of Effect Size (f^2)

The evaluation of effect size is studied in this study in order to determine whether or not the missing exogenous variable has a significant influence on the endogenous variable represented by the model. The formula for Cohen's effect size is used in this investigation to determine the magnitude of the impact that the exogenous variables had on the model's endogenous variables. According to Cohen (1988), an effect size value of 0.02 represents a small effect size, 0.15 represents a medium effect size, and 0.35 represents a big effect size. However, Chin, Marcolin and Newsted (2003) stress the importance of considering even the smallest effect size of an exogenous variable because of the possibility that it would have an effect on the endogenous variables.

Table 4.15: f Square

Latent Constructs	f Square	Effect size
Balance inquiry	0.0631	Small
Cash withdrawal	0.0294	Small
Fund transfer	0.0480	Small
Waiting time	0.0566	Small

Source: PLS-SEM output

The above result in Table 4.15 exhibits the effect size of the particular exogenous variable on the respective endogenous variable in the model. Specifically, the table reveals the effect sizes of the four exogenous variables (CW, FT, BI and WT) in relation to CS were all small in the model.

4.4.7 Moderating Effect

The product indicator approach using PLS-SEM is employed by this study to detect and estimate the strength of moderation effect (Helm, Eggert & Gernefeld, 2010; Henseler &

Chin, 2010; Henseler & Fasssott, 2010). Adopting from the above-mentioned procedure (Chin, *et al*, 2003; Vinzi, Chin, Henseler and Wang 2010) the moderation model in figure 4.4 represent PLS-SEM bootstrapping testing. Moreover, Table 4.16 indicates the estimates after applying the applied product indicator approach to study the moderating influence of waiting time on the association between exogenous and endogenous latent variable.

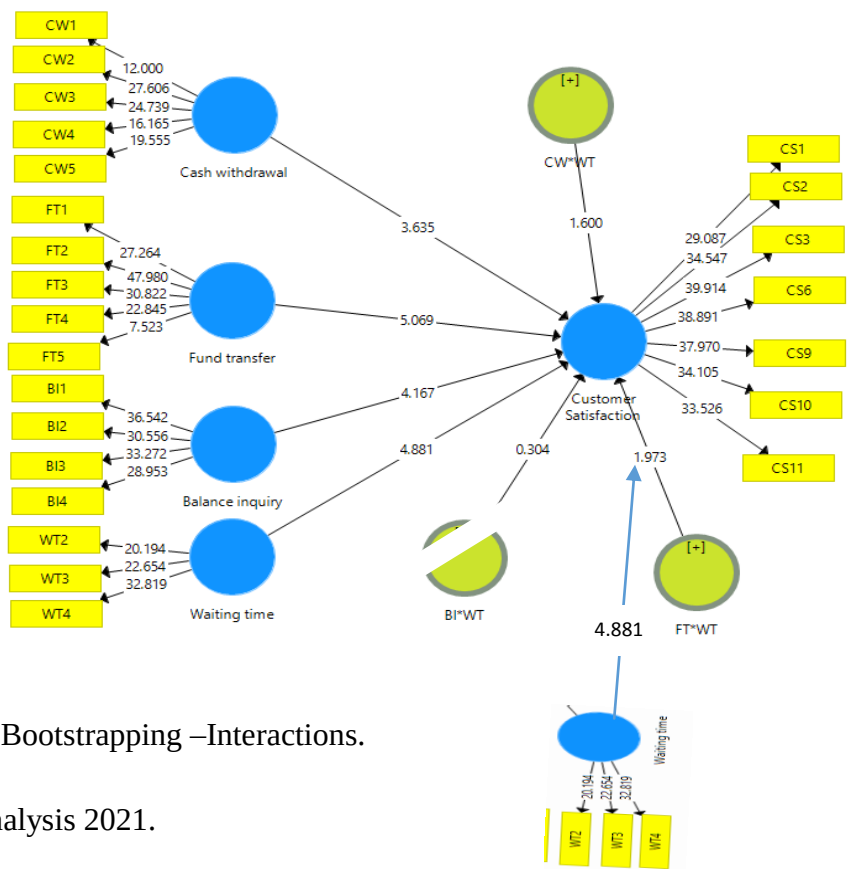


Figure 4.4: PLS-SEM Bootstrapping –Interactions.

Source: Field work analysis 2021.

Table 4.16: Results for moderation Relationship Hypotheses Testing

Hypotheses	Path	B	Standard Dev.	T Statistics	P Values	95% Confidence Interval of the Direct Effect	Decision
H5	CW*WT -> Customer Satisfaction	-0.0650	0.0400	1.950	0.045**	(0.003,0.136)	Rejected
H6	FT*WT -> Customer Satisfaction	0.1030	0.052	1.973	0.024**	(0.014,0.186)	Rejected
H7	BI*WT -> Customer Satisfaction	-0.017	0.054	0.304	0.380	(-0.107,0.071)	Accepted

Source: PLS-SEM output

Figure 4.4 and Table 4.16 above represent PLS-SEM bootstrapping respectively testing the moderation effects of WT on the relationships among CW, FT, BI and CS. The figure shows a positive coefficient on the relationship between cash withdrawal (CW) and waiting time (WT) indicating a positive significant relationship between cash withdrawal (CW) and waiting time (WT). The latter implies that customers are not satisfied due to poor service on cash withdrawal. Therefore, null hypothesis is rejected.

Similarly, the figure shows a negative coefficient between balance inquiry (BI) and waiting time (WT). Thus, null hypothesis is accepted.

The Table 4.16 results has shown that two out of three of the hypotheses in relation to moderation effects in this study are rejected. The result indicates that, the interaction term is significant CW*WT in relation to CS ($\beta = -0, 0650$, $t = 1.950$, $p < 0.045$). This indicates that waiting time negatively moderates the relationship between cash withdrawals and customer satisfaction, hence H_5 is rejected. Additionally, the result shows significant effect of the FT*WT in relation to CS ($\beta = 0.1030$, $t = 1.973$, $p < 0.024$). This signifies that, waiting time positively moderates the relationship between fund transfer and customer satisfaction; hence, H_6 was also rejected. In contrast, the result shows that there is no significant effect of the BI*WT in relation to CS ($\beta = -$

0.017, $t = 0.304$ $p < 0.380$). This indicates that waiting time does not moderate the relationship between balance inquiry and customer satisfaction. Hence null hypotheses are accepted.

4.4.8 Assessment of Predictive Relevance (Q^2)

Assessment of the structural model's predictive significance is another essential component of structural model evaluation (Hair *et al.*, 2011). [Citation needed] (Hair *et al.*, 2011). The Q^2 is defined as a measurement of how well a model predicts the data of omitted cases by Hair Jr *et al.*, 2014 and Chin, (1998) respectively. The Stone and Geisser's Q^2 test is the measurement that utilises the majority of the time when evaluating the predictive significance of a model. In this particular investigation, the predictive significance of the model was evaluated using the Stone-Geisser's Q^2 test, which involved a blindfolding method (Hair Jr. *et al.*, 2013). Once the Q^2 statistic is greater than zero, a research model can be considered to have predictive value (Henseler *et al.*, 2009). In addition, Hensler *et al.* (2009) found that when the Q^2 values of a research model were greater, it indicates that the model had a higher predictive significance. The redundancy of the endogenous latent variable (customer satisfaction) as determined by cross-validation is presented in Table 4.10.

Table 4.17: Predictive Relevance (Q^2)

Latent Construct	SSO	SSE	$Q^2 (=1-SSE/SSO)$
WT	2128	2128.	
CS	1330	1026.669	0.228
CW	1330	1330	
FT	1862	1862	
BI	1064	1064	

Note: WT= Waiting time, CS= Customer satisfaction, CW= Cash withdrawals, FT= Funds transfer and BI= Balance inquiry.

From Table 4.17, the results show that the Q^2 values for all the endogenous latent variable (customer satisfaction) is greater than zero (0.228), thus, implies the existence of the predictive power of the model (Hair Jr. *et al.*, 2013; Henseler *et al.*, 2009).

4.4.9 Assessment of Goodness-of-Fit Index (GoF)

It has been suggested by Hair *et al.* (2014), Hair *et al.* (2013), Henseler and Sarstedt, (2013), and Sarstedt and Schloderer (2010) that there is no such thing as a global measure of GoF that can be obtained using PLS-SEM. In addition, Hair, Ringle and Sarstedt (2011), questioned the usefulness of the GoF in PLS-SEM by pointing out that the results of their simulation indicate that it is not utilised for model validation, but that it can be valuable to evaluate how well the model can clarify various data groupings.

Table 4.18 Model Fit

Fit Summary	Saturated Model	Estimated Model
SRMR	0.0683	0.0683
d_ULS	1.7615	1.7615
d_G1	0.5402	0.5402
d_G2	0.4491	0.4491
Chi-Square	1302	1302
NFI	0.8122	0.8122

Source: PLS-SEM output

As a result, given the preceding considerations, the research does not take into account the GoF index for the purpose of model validation; rather, it focuses on other indices that are more pertinent for PLS-SEM model validation.

4.4.10 Importance-Performance Map Analysis

The importance-performance map analysis (IPMA), also called importance-performance matrix analysis, extended the standard path coefficient estimates of PLS-SEM results

reporting by increasing the dimension to the analysis that considered the average values of the latent variable scores (Höck, Ringle, & Sarstedt, 2010).

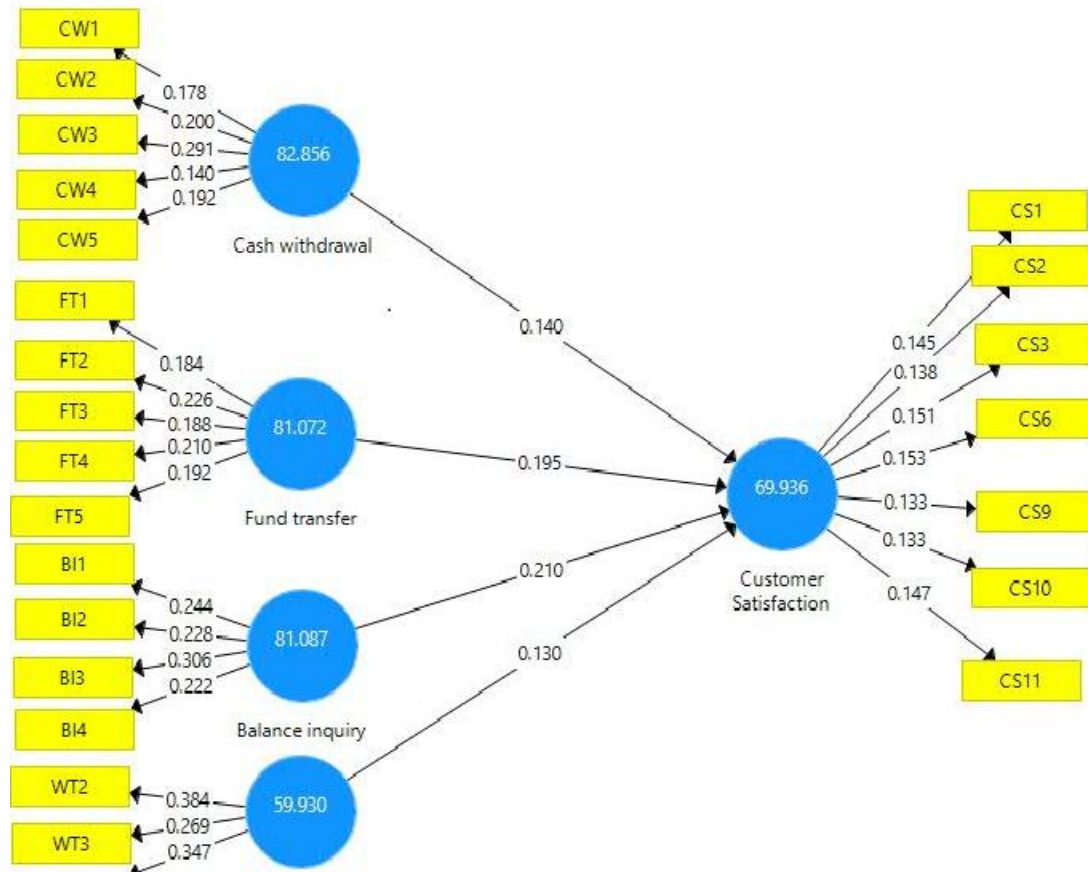


Figure 4.5: PLS Path Model and IPMA Results

It is vital to note that the graphical representation of IMPA results differs from that of PLS-SEM results. Because, the IPMA the results shows the unstandardized and rescaled outer weights of the measurement models. The mean values scores from 0 (lowest) to 100 (highest) indicate the construct's performance. In this study, Cash withdrawals, Balance enquiry, Fund transfer and Waiting time has a performance of 83, 81, 81 and 60 respectively. Hence, all constructs show a relatively high performance as shown in (Appendix A4).

4.5 Determination of Average Waiting Time for ATM Users in Sokoto Metropolis

The second level of analysis is to determine the average waiting time for ATM users in Sokoto metropolis. The analysis is done through observational data using queuing system model. It includes system utilization, mean waiting time in the queue, throughput, traffic intensity, average waiting time, and other related queuing parameters for ATMs users at ten selected banks (GT Bank, UBA, Zenith Bank, First Bank, Eco Bank, Access Bank, Union Bank, Ja'iz Bank, Polaris Bank and Unity Bank) in Sokoto metropolis.

There are two major methods of solving a queuing problem namely; mathematical model and simulation. The former was used in this study to obtain approximated time distributions for arrival and service and the later was used to obtain the queuing model parameters. The study employs both single and multiple servers queuing model due to the presence of many ATMs in the banking premises.

Table 4.19: Queue Model Summary of GT Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	2.33
μ	mean service rate	5
c	number of servers in parallel	14
n	Number of clients in the system	50
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.03328571
L	mean number of customers in the system	$0.466 \times 60 = 27.96 = 28$
L_q	mean number of customers in the queue	$5.838145e-18$
W	mean waiting time in the system	$0.2 \times 60 = 12$ seconds
W_q	mean waiting time in the queue	$2.505642e-18$
X	The throughput	2.33
	The traffic intensity	0.466
$\lambda + W$	Average Waiting Time	$2.33 + 0.2 = 2.53$
Q_1	First Quartile	4.7825
Q_2	Second Quartile	12.115800
Q_3	Third Quartile	24.959

Source: Observational data (2022).

Table 4.19 shows queuing model summary of ATMs users at GT Bank in Sokoto Metropolis. The information is collected on 50 users ($n = 50$) and 14 ATMs machines ($c = 14$). The result of mean rate of arrival is 2.33 ($\lambda = 2.33$) implying that there is 2.33 minutes interval on average between arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 5$ implying that customers spent 5 minutes on average for their transactions while using ATM Machines at GT Bank. The mean number of customers in the system (users of ATMs machine at GT Bank) per hour is 28 users ($L=28$). The result of mean number of customers in the queue per minute is $5.838145e-18$ ($L_q=5.838145e-18$) which is approximately zero implying no queue observed at the ATM machines at GT Bank. The result of mean waiting time in the system is 12 seconds ($W=12$ sec) which means that customers spent only 12 seconds waiting before having access to ATM machines. The result of mean waiting time in the queue is $2.505642e-18$ ($W_q=2.505642e-18$) implying customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at GT Bank is 0.466 (46.6%) implying that ATM machines were only busy for 46.6% of the working hours per day implying that the machines are under-stressed. The throughput of the system revealed that the number of customers served per unit time is 2.33 ($X=2.33$) implying that, approximately 2 users on the average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.03328571 < 1$ implying that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at GT Bank is 2.45 minutes.

Table 4.20: Queue Model Summary of UBA Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	3.13
μ	mean service rate	5.0
c	number of servers in parallel	19
n	Number of clients in the system	68
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.8237
L	mean number of customers in the system	0.5934783X60=35.61
L_q	mean number of customers in the queue	7.482858e-24
W	mean waiting time in the system	0.2173913X60=13.043
W_q	mean waiting time in the queue	2.740974e-24
X	The throughput	2.73
	The traffic intensity	0.5934783
$\lambda + W$	Average Waiting Time	3.13+0.22=3.35
Q_1	First Quartile	4.361175
Q_2	Second Quartile	10.638400
Q_3	Third Quartile	23.248700

Source: Observational data (2022).

Table 4.20 shows queuing model summary of ATMs users at UBA Bank in Sokoto metropolis. The information is collected on 68 users ($n = 68$) and 19 ATMs machines ($c = 19$). The result of mean rate of arrival is 3.13 ($\lambda = 3.13$) implying that there is 3.13 minutes interval on average between arrival any two customers (inter-arrival) at UBA banks ATMs. The result of mean service rate is $\mu = 5.0$ implying that customers spent 5 minutes on average for their transactions while using ATM Machines at UBA Bank. The mean number of customers in the system (users of ATMs machine at UBA Bank) per hour is 36 users ($L=36$). The result of mean number of customers in the queue per minute is 7.48285e-18 ($L_q=57.48285e-18$) which is approximately zero implying no queue observed at the ATM machines at UBA Bank. The result of mean waiting time in the system is 13 seconds ($W=13$ sec) which means that customers spent only 13 seconds waiting before having access to ATM machines. The result of mean

waiting time in the queue is $2.74097e-18$ ($W_q=2.74097e-18$) implying customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at UBA Bank is 0.5934 (59.34%) implying that ATM machines were only busy for 59.34% of the working hours per day implying that the machines were under-stressed. The throughput of the system revealed that the number of customers served per unit time is 3.13 ($X=3.13$) implying that approximately 3 users on average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.8237 < 1$ implying that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at UBA Bank is 3.35 minutes.

Table 4.21: Queue Model Summary of ZENITH Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	2.33
μ	mean service rate	4.0
c	number of servers in parallel	12
n	Number of clients in the system	43
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.0485
L	mean number of customers in the system	$0.4825 \times 60 = 28.95$
L_q	mean number of customers in the queue	$8.954594e-15$
W	mean waiting time in the system	$0.25 \times 60 = 15$
W_q	mean waiting time in the queue	$4.639686e-15$
X	The throughput	1.93
	The traffic intensity	0.4825
$\lambda + W$	Average Waiting Time	$2.33 + 0.25 = 2.58$
Q_1	First Quartile	6.6544
Q_2	Second Quartile	14.7182
Q_3	Third Quartile	31.4069

Source: Observational data (2022).

Table 4.21 shows queuing model summary of ATMs users at Zenith Bank in Sokoto metropolis. The information was collected on 68 users ($n = 68$) and 12 ATMs

machines ($c = 12$). The result of mean rate of arrival is 2.33 ($\lambda = 2.33$) implying that there is 2.33 minutes interval on the average in between the arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 4.0$ implying that customers spent 4 minutes on the average for their transactions while using ATM Machines at Zenith Bank. The mean number of customers in the system (users of ATMs machine at Zenith Bank) per hour is 29 users ($L = 29$). The result of the mean number of customers in the queue per minute is 8.954594×10^{-18} ($L_q = 8.954945 \times 10^{-15}$) which is approximately zero implying no queue observed at the ATM machines at Zenith Bank. The result of the mean waiting time in the system is 15 seconds ($W = 15 \text{ sec}$) means that customers spent only 15 seconds waiting before having access to ATM machines. The result of mean waiting time in the queue is 4.639686×10^{-15} ($W_q = 4.639686 \times 10^{-18}$) implying that customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at Zenith Bank is 0.4825 (48.25%) implying that ATM machines the only busy for 48.25% of the working hours per day implying that the machines were under-stressed. The throughput of the system revealed that the number of customers served per unit time is 2.33 ($X = 2.33$) implying that approximately 2 users on average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.0485 < 1$ implying that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at Zenith Bank is 2.58 minutes.

Table 4.22: Queue Model Summary of First Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	1.03
μ	mean service rate	4.4
c	number of servers in parallel	22
n	Number of clients in the system	79
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.0106405
L	mean number of customers in the system	$0.2340909 \times 60 = 14.046$
L_q	mean number of customers in the queue	1.023959×10^{-37}
W	mean waiting time in the system	$0.2272727 \times 60 = 13.638$
W_q	mean waiting time in the queue	9.941352×10^{-38}
X	The throughput	1.03
	The traffic intensity	0.4825
$\lambda + W$	Average Waiting Time	$1.03 + 0.23 = 1.26$
Q_1	First Quartile	12.26310
Q_2	Second Quartile	31.26285
Q_3	Third Quartile	71.41598

Source: Observational data (2022).

Table 4.22 shows queuing model summary of ATMs users at First Bank in Sokoto metropolis. The information is collected on 79 users ($n = 79$) and 22 ATMs machines ($c = 22$). The result of mean rate of arrival is 1.03 ($\lambda = 1.03$) implying that there is 1.03 minutes interval on average between arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 4.4$ implying that customers spent 4 minutes on the average for their transactions while using ATM Machines at First Bank. The mean number of customers in the system (users of ATMs machine at First Bank) per hour is 14 users ($L=14$). The result of mean number of customers in the queue per minute is 1.023959×10^{-37} ($L_q=1.023959 \times 10^{-37}$) which is approximately zero implying no queue observed at the ATM machines at First Bank. The result of mean waiting time in the system is 14 seconds ($W=14$ sec) means that customers spent only 14 seconds waiting before having access to ATM machines. The result of mean waiting time in the queue is 9.941352×10^{-38} ($W_q=9.941352 \times 10^{-38}$) implying customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The

traffic intensity of ATM machine at First Banks is 0.4825 (48.25%) implying that ATM machines are only busy for 48.25% of the working hours per day implying that the machines were under-stressed. The throughput of the system reveals that the number of customers served per unit time is 1.03 ($X=1.03$) implying that approximately 1 users on average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.0106405 < 1$ implying that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at First Bank is 1.26 minutes

Table 4.23: Queue Model Summary of ECO Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	1.45
μ	mean service rate	2.5
c	number of servers in parallel	5
n	Number of clients in the system	18
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.116
L	mean number of customers in the system	$0.5800455 \times 60 = 34.803$
L_q	mean number of customers in the queue	4.54588×10^{-5}
W	mean waiting time in the system	$0.4000314 \times 60 = 24.0$
W_q	mean waiting time in the queue	3.135089×10^{-5}
X	The throughput	1.45
	The traffic intensity	0.58
$\lambda + W$	Average Waiting Time	$1.45 + 0.4 = 1.85$ (2.25 mins)
Q_1	First Quartile	13.84363
Q_2	Second Quartile	37.83370
Q_3	Third Quartile	49.76370

Source: Observational data (2022).

Table 4.23 shows queuing model summary of ATMs users at Eco Bank in Sokoto metropolis. The information is collected on 18 users ($n=18$) and 5 ATMs machines ($c=5$). The result of mean rate of arrival is 1.45 ($\lambda=1.45$) implying that there is 1.45 minutes interval on average between arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 2.5$ implying that customers spent 5 minutes on

average for their transactions while using ATM Machines at Eco Bank. The mean number of customers in the system (users of ATMs machine at Eco Bank) per hour is 35 users ($L=35$). The result of mean number of customers in the queue per minute is $4.54588e-05$ ($L_q=4.54588e-18$) which is approximately zero implying no queue observed at the ATM machines at Eco Bank. The result of mean waiting time in the system is 24 seconds ($W=24$ sec) means that customers spent only 24 seconds waiting before having access to ATM machines. The result of mean waiting time in the queue is $3.135089e-05$ ($W_q=3.135089e-18$) implying customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at Eco Bank is 0.58 (58%) implying that, ATM machines are only busy for 58% of the working hours per day, it implies that the machines were under-stressed. The throughput of the system revealed that the number of customers served per unit time is 1.45 ($X=1.45$) implying that approximately 1 user on average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.116 < 1$ implying that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at Eco Bank is 2.25 minutes.

Table 4.24: Queue Model Summary of Access Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	1.01
μ	mean service rate	3.5
c	number of servers in parallel	15
n	Number of clients in the system	54
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.0192381
L	mean number of customers in the system	$0.2885714 \times 60 = 17.31$
L_q	mean number of customers in the queue	9.183543×10^{-23}
W	mean waiting time in the system	$0.2857143 \times 60 = 17.142858$
W_q	mean waiting time in the queue	9.092616×10^{-23}
X	The throughput	1.01
	The traffic intensity	0.2885714
$\lambda + W$	Average Waiting Time	$1.01 + 0.29 = 1.3$
Q_1	First Quartile	11.43433
Q_2	Second Quartile	28.51200
Q_3	Third Quartile	62.46420

Source: Observational data (2022).

Table 4.24 shows queuing model summary of ATMs users at Access Banks in Sokoto metropolis. The information is collected on 54 users ($n = 54$) and 15 ATMs machines ($c = 15$). The result of mean rate of arrival is 1.01 ($\lambda = 1.01$), meaning that there is 1.01 minutes interval on average between arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 3.5$ implying that customers spent 5 minutes on the average for their transactions while using ATM Machines at Access Bank. The mean number of customers in the system (users of ATMs machine at Access Bank) per hour is 17 users ($L=17$). The result of mean number of customers in the queue per minute is 9.1835×10^{-23} ($L_q = 9.1835 \times 10^{-23}$) which is approximately zero implying no queue observed at the ATM machines at Access Banks. The result of mean waiting time in the system is 17 seconds ($W=17$ sec) means that customers spent only 17 seconds waiting before having access to ATM machines. The result of mean waiting time in the queue is

9.0926e-23 ($W_q=9.0926e-23$) implying customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at Access Banks is 0.2886 (28.86%) implying that ATM machines were only busy for 28.86% of the working hours per day implying that the machines are under-stressed. The throughput of the system revealed that the number of customers served per unit time is 1.01 ($X=1.01$) implying that approximately 1 users on average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.0192 < 1$, it implies that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at Access Bank is 1.3 minutes.

Table 4.25: Queue Model Summary of Union Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	2.93
μ	mean service rate	4
c	number of servers in parallel	8
n	Number of clients in the system	29
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.0915625
L	mean number of customers in the system	$0.7325 \times 60 = 43.95$
L_q	mean number of customers in the queue	$1.096345e-07$
W	mean waiting time in the system	$0.25 \times 60 = 15$
W_q	mean waiting time in the queue	$3.741793e-08$
X	The throughput	2.93
	The traffic intensity	0.7325
$\lambda + W$	Average Waiting Time	$2.93 + 0.25 = 3.18$
Q_1	First Quartile	6.6544
Q_2	Second Quartile	14.7182
Q_3	Third Quartile	31.4069

Source: Observational data (2022).

Table 4.25 shows queuing model summary of ATMs users at Union Bank in Sokoto metropolis. The information is collected on 29 users ($n = 29$) and 8 ATMs machines (

$c = 8$). The result of mean rate of arrival is 2.93 ($\lambda = 2.93$) implying that there is 2.93 minutes interval on average between arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 4$ implying that customers spent 4 minutes on the average for their transactions while using ATM Machines at Union Bank. The mean number of customers in the system (users of ATMs machine at Union Bank) per hour is 44 users ($L=44$). The result of the mean number of customers in the queue per minute is $1.0963e-07$ ($L_q=1.0963e-07$). This translates to approximately zero implying no queue observed at the ATM machines at Union Banks. The result of mean waiting time in the system is 15 seconds ($W=15$ sec) meaning that, customers spent only 15 seconds waiting before having access to ATM machines. The result of mean waiting time in the queue is $3.472e-08$ ($W_q=3.472e-08$) implying customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at Union Bank is 0.7325 (73.25%). This implies that, ATM machines are only busy for 73.25% of the working hours per day implying that the machines were under-stressed. The throughput of the system revealed that the number of customers served per unit time is 2.93 ($X=2.93$) implying that approximately 3 users on the average are usually on the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.0916 < 1$ implying that the system is stable and no any additional ATM machine is required. The average Waiting Time per ATM machine user at Union Bank is 3.18 minutes.

Table 4.26: Queue Model Summary of Ja'iz Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	1.1
μ	mean service rate	4
c	number of servers in parallel	1
n	Number of clients in the system	2
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.275
L	mean number of customers in the system	$0.2750143 \times 60 = 16.5$
L_q	mean number of customers in the queue	1.434919×10^{-5}
W	mean waiting time in the system	$0.250013 \times 60 = 15.0008$
W_q	mean waiting time in the queue	1.304472×10^{-5}
X	The throughput	1.1
	The traffic intensity	0.275
$\lambda + W$	Average Waiting Time	$1.1 + 0.25 = 1.35$
Q_1	First Quartile	30.8587
Q_2	Second Quartile	32.8897
Q_3	Third Quartile	34.9206

Source: Observational data (2022).

Table 4.26 describes queuing model summary of ATMs users at Ja'iz Bank in Sokoto metropolis. The information is collected on 2 users ($n = 2$) and 4 ATMs machines each ($c = 4$). The result of mean rate of arrival is 1.1 ($\lambda = 1.1$) suggests that there is 1.1 minutes interval on average between arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 4$ implying that customers spent 4 minutes on average for their transactions while using ATM Machines at Ja'iz Bank. The mean number of customers in the system (users of ATMs machine at Ja'iz Bank) per hour is 17 users ($L=17$). The result of mean number of customers in the queue per minute is 1.435×10^{-5} ($L_q=1.435 \times 10^{-5}$) which is approximately zero implying no queue is observed at the ATM machines at Ja'iz Bank. The result of mean waiting time in the system is 15 seconds ($W=15$ sec). It means that, customers spent only 12 seconds waiting before having access to ATM machines. The result of mean waiting time in the queue is

1.3045e-07 ($W_q=1.3045e-07$), implying that, customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at Ja'iz Bank is 0.275 (27.5%) implying that ATM machines are only busy for 46.6% of the working hours per day implying that the machines are under-stressed. The throughput of the system revealed that the number of customers served per unit time is 1.1 ($X=1.1$). This reveals that, implying that approximately 2 users on average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.06875 < 1$, implying that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at Ja'iz Bank is 1.35 minutes.

Table 4.27: Queue Model Summary of Polaris Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	2.42
μ	mean service rate	2
c	number of servers in parallel	6
n	Number of clients in the system	22
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.2016667
L	mean number of customers in the system	1.210411X60=72.62
L_q	mean number of customers in the queue	0.0004112643
W	mean waiting time in the system	0.5001699X60=30.01
W_q	mean waiting time in the queue	0.0001699439
X	The throughput	2.42
	The traffic intensity	1.21
$\lambda + W$	Average Waiting Time	2.42+0.5=2.92 (3.32 mins)
Q_1	First Quartile	23.10448
Q_2	Second Quartile	63.14310
Q_3	Third Quartile	83.63972

Source: Observational data (2022).

Table 4.27 reveals the queuing model summary of ATMs users at Polaris Bank in Sokoto metropolis. The information is collected on 22 users ($n = 22$) and 6 ATMs

machines ($c = 6$). The result of mean rate of arrival is 2.42 ($\lambda = 2.42$) implying that there is 2.42 minutes interval on average between arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 2$ implying that customers spent 5 minutes on the average for their transactions while using ATM Machines at Polaris Bank. The mean number of customers in the system (users of ATMs machine at POLARIS Bank) per hour is 73 users ($L=73$). The result of mean number of customers in the queue per minute is 0.00041 ($L_q=0.00041$). This is approximately zero implying no queue observed at the ATM machines at Polaris Bank. The result of the mean waiting time in the system is 30 seconds ($W=30$ sec) means that customers spent only 30 seconds waiting before having access to ATM machines. The result of mean waiting time in the queue is 0.00017 ($W_q=0.00071$). It means that, customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at Polaris Bank is 1.21 (121%) implying that ATM machines are only busy for 121% of the working hours per day implying that the machines are over-stressed as a result of usage beyond the working hours period. The throughput of the system revealed that the number of customers served per unit time is 2.42 ($X=2.42$) implying that approximately 2 users on average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.03328571 < 1$ implying that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at Polaris Bank is 3.32 minutes.

Table 4.28: Queue Model Summary of Unity Bank ATMs Users

Parameters	Description of Parameters	Results
λ	mean rate of arrival	2.31
μ	mean service rate	3
c	number of servers in parallel	6
n	Number of clients in the system	22
$\rho = \lambda / (c\mu)$	utilization of the server; also the probability that the server is busy	0.1283333
L	mean number of customers in the system	$0.7700226 \times 60 = 46.201$
L_q	mean number of customers in the queue	2.263822×10^{-5}
W	mean waiting time in the system	$0.3333431 \times 60 = 20.001$
W_q	mean waiting time in the queue	9.800094×10^{-6}
X	The throughput	2.31
	The traffic intensity	0.77
$\lambda + W$	Average Waiting Time	$2.31 + 0.33 = 2.64$ (3.04 mins)
Q_1	First Quartile	22.05430
Q_2	Second Quartile	60.27295
Q_3	Third Quartile	79.83795

Source: Observational data (2022),

Table 4.28 shows queuing model summary of ATMs users at Unity Bank in Sokoto metropolis. The information is collected on 22 users ($n = 22$) and 6 ATMs machines ($c = 6$). The result of the mean rate of arrival is 2.31 ($\lambda = 2.31$) implying that there is 2.31 minutes interval on average between arrival any two customers (inter-arrival). The result of mean service rate is $\mu = 3$ implying that customers spent 5 minutes on average for their transactions while using ATM Machines at Unity Bank. The mean number of customers in the system (users of ATMs machine at Unity Bank) per hour is 46 users ($L=46$). The result of the mean number of customers in the queue per minute is 2.2638×10^{-5} ($L_q=2.2638 \times 10^{-5}$) which is approximately zero implying no queue observed at the ATM machines at Unity Bank. The result of mean waiting time in the system is 20 seconds ($W=20$ sec), means that customers spent only 20 seconds waiting before having access to ATM machines. The result of the mean waiting time in the queue is

9.8001e-06 ($W_q=9.8001e-06$). It implies customers spent approximately zero minute on average in the queue implying adequacy of ATM machines for the users. The traffic intensity of ATM machine at Unity Bank is 0.77 (77%), suggesting that, ATM machines are only busy for 77% of the working hours per day implying that the machines are under-stressed. The throughput of the system reveals that the number of customers served per unit time is 2.31 ($X=2.31$) implying that approximately 2 users on average are usually in the system at a particular time. The result of utilization of the server (the probability that the server is busy) $\rho = 0.1283 < 1$ implies that the system is stable and no any additional ATM machine is required. Average Waiting Time per ATM machine user at Unity Bank is 3.04 minutes.

4.6 Discussion of Results

The study examines the effect of automated teller machine (ATM) services and waiting time on customer satisfaction in selected deposit money banks in Nigeria. Findings from the Partial Least Square Structural Equation Modelling (PLS-SEM) and queuing model analysis reveal the extent to which ATM services and waiting time influenced customer satisfaction. Partial Least Squares Structural Equation Modeling (PLS-SEM) for questionnaire data and queuing model analysis was used for observed data. The hypotheses of the study are developed to test whether or not there is significant effect between ATM services and customer satisfaction. And whether or not there is moderating effect between ATM services and customer satisfaction.

- i. It is discovered that there is negative significant relationship between cash withdrawals and customer satisfaction as the p-value shows 0.0001 at 5% level of significance. Since P. value calculated (0.0001) is less than 5% level of significance, the research rejects the null hypotheses and accepts alternative

hypothesis that hitches the customers do experience during cash withdrawals from ATM has significant negative effect on customer satisfaction.

The result also support the findings of Singh and Komal (2009); Russel (2018); Ranasinghe and Kosala (2017); Odusina (2014).

Also, inconsistence with findings of Kendie (2016); Gabriel *et al* (2015); Fyery (2015); Biset and Bonsa (2019) whose findings indicate positive significant relationship between ATM services and customer satisfaction.

The reason for the negative significant relationship between cash withdrawals and customer satisfaction is that ATMs are only allowed to inside the baking premises by Central Bank policy, which limits their ability to accommodate customer needs. The ability of customers to utilize ATMs has been influenced by the redesign of currency and covid-19. Customer satisfaction is also affected by the daily withdrawal limit, machine running out of cash and dispensing error. That is to say, customers are left feeling let down by the way banks designed the withdrawal process.

- ii. The study also reveals that, fund transfer has significant p-value of (0.0000) which is less than 5% level of significance. The stated null hypotheses is rejected. Based on this result, it shows that there is a positive significant relationship between fund transfer and customer satisfaction.

The result also support the findings of Singh (2011).

Although, the interaction between fund transfer and customer satisfaction was found to be positively significant, implying that utilizing an ATM to transfer money is faster than doing it over the cashier counter.

- iii. Balance inquiry has significant p-value of (0.0000) which is also less than the chosen significant value of 5% (0.05). The null hypotheses is rejected because of

the presence of positive and significance relationship between the dependent and independent variable. This means that, there is a positive significant relationship between Balance inquiry and customer satisfaction. This contrast the findings of the previous study by Matimbwa and Ochumbo (2018).

Specifically, the empirical results add to the body of knowledge particularly on how customers derived more satisfaction through checking account balance via ATM than checking account balance across the cashier counter. Again, the result also extends the body of knowledge by explaining how customers are viewing their account balance 24-hours a day using ATM card.

- iv. There is a significant relationship between waiting time and customer satisfaction as the probability values show (0.0000), which is less than the 5% (0.05) level of significance. The empirical evidence from the findings shows that, there is a significant positive relationship between waiting time and customer satisfaction. This implies that the waiting time has a significant influence on customer satisfaction. The result support the findings of Kumar, Varaprasad, Sridharan and Unnithan (2013); Lahap, et al. (2018); Bielen and Demoulin (2007); Elliot, Mary and Akosue, (2014) whose findings of their study show that waiting time has a positive relationship with customer satisfaction. In contrast, this result does not support other previous studies by Joseph and Simon (2018); Tom and Lucey (1997), which reported negative and significant relationship between waiting time and customer satisfaction.

The introduction of ATM helps customers in saving their time while doing bank transactions, as evidenced by the significant positive relationship between waiting time and customer satisfaction implying that customers are also not worried with the length of time they spent waiting in line.

- v. In line with the fifth objective, the fifth hypothesis states that waiting time moderate the relationship between cash withdrawal and customer satisfaction. Therefore, the result indicates that the interaction term is significant CW*WT in relation to CS ($\beta = -0.0650$, $t = 1.950$, $p < 0.045$), hence, H_5 is rejected while accepting alternative hypothesis that waiting time moderate the relationship between cash withdrawal and customer satisfaction. In contrast, the findings of Ahmed, Rahman and Mizanur (2017) does not support this.

As the study proved the moderate effect of waiting time on the relationship between cash withdrawal and customer satisfaction. This implies that customer are not worried about waiting in line to use ATM services.

- vi. Based on the results, since the p-value (0.024) is less than 5% (0.05) level of significance, therefore, null hypothesis is rejected. This finding discovered that there is enough evidence to suggest that waiting time moderate the relationship between funds transfer and customer satisfaction. Empirically, the result accepted alternative hypothesis and also coincides with the findings of the previous study by Odewole (2016).

Given the significant and positive moderating effect of waiting time on the relationship between funds transfer and customer satisfaction, customers typically receive faster transfer of cash from ATMs than from the cashier counter. Similarly, they are interested in using ATM as it attracts less charges.

- vii. The study also shows that there is no significant effect of the Balance Inquiry and Waiting time (BI*WT) in relation to customer satisfaction (CS). For instance, from the result of this study ($\beta = -0.017$, $t = 0.304$, $p < 0.380$), it indicates that waiting time does not moderate the relationship between balance

inquiry and customer satisfaction. Hence null hypotheses is accepted. However, this finding does not support the previous study of Bielen and Demoulin (2007). The relationship between balance inquiry and customer satisfaction is not moderated by waiting time as the ATM has not always been printing mini statement of the customer's account balance after their transactions.

- viii. From the results of the queuing model analysis on observational data, it is obtained that the average waiting time of ATM users for the selected banks is between 1.3 minute and 3.35 minute with total average of 2.41 minute. This result is approximately equal to what it obtained in the analysis of questionnaire.
- ix. The results also reveal that with exception of polaris bank, ATM machines are under utilized. This results implies that the ATM machine at polaris bank are not sufficient. This may be as a result of the number of customers or ATM patronage.
- x. The results also reveals that mean waiting time of ATM users on queue is approximately zero. Implying that no queue are observed during the course of the data collection.

On the basis of the above it is opt to provide a summary of these findings in a single table incorporating all the findings of the study. Hence, Table 4.28 summarises the results.

Table 4.29: Summary of hypotheses testing

Hypotheses	Statement of Hypotheses	Findings
H01	Cash withdrawals using ATM has no significant effect on customer satisfaction.	Rejected
H02	ATM funds transfer has no significant effect on customer satisfaction.	Rejected
H03	Balance inquiry using ATM has no significant effect on customer satisfaction.	Rejected
H04	Waiting time has no significant effect on customer satisfaction.	Rejected
H05	Waiting time does not moderate the relationship between cash withdrawals and customer satisfaction.	Rejected
H06	Waiting time does not moderate the relationship between funds transfer and customer satisfaction.	Rejected
H07	Waiting time does not moderate the relationship between balance inquiry and customer satisfaction.	Accepted
H08	The average waiting time obtained from the respondents is in conformity with the observed queue waiting time.	Rejected

CHAPTER FIVE

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the concluding remarks and it consists of five sub-sections beginning with introduction. Section two provides a summary of the study, section three gives the findings and conclusions, section four focuses on recommendations and section five suggests areas for further research.

5.2 Summary

The study consists of five chapters. Chapter one deals with background to the study. The background to the study discusses issues on ATM services, waiting time and how ATM services improved customer satisfaction. The introduction of automated teller machines (ATM) is now a global phenomenon, so to reduce the long waiting queues in the banking halls and to serve as an alternative way of providing effective services to different categories of customers. It also enhances and improves service delivery in the banking industry in the world over. Nevertheless, the problem associated with satisfaction provided by ATM services are discussed in the statement of the research problem. Particularly, the study probes into issues bordering on whether or not inefficiency in managing time could result in dissatisfaction of customers to assess ATM services. Furthermore, it poses questions relating to cash withdrawal using ATM providing customer satisfaction. Additionally, it also poses question on whether waiting time moderate the relationship between funds transfer and customer satisfaction.

Consequently, objectives and hypotheses of the study which are to guide in generating data for the study are clearly stated in this chapter. However, the significance of the

study discusses the importance of this study to government agents, customers, Nigerian banking system, researchers, travelers, investors and organizations.

Chapter two is sub-divided into two main parts namely: Literature review and theoretical framework which basically provides an overview of the Nigeria Banking system. The study accounts for the evolution of ATM and also gives a brief history of the emergence and development of ATM in Nigeria. The concept of customer satisfaction and yardsticks for measuring customer satisfaction have been taken care of. The study equally reviews related literatures on the effect of ATM services on customer satisfaction as well as effect of waiting time on customer satisfaction. Finally, the chapter provides the theoretical framework of the study.

Chapter three presented the methodology of the study. It begins with the research design, which is the conceptual structure at which the research is based; it forms the blueprint for collection, organization, measurement and the analyzing of the data based on the research questions of the study. The current study employed used purposive sampling in selecting respondent for the study.

Furthermore, questionnaire items are well structured, simply worded, clearly stated and it reduces ambiguity. The all the questions are not repetitive, and not double-barreled. Five (5) point Likert item scale is adopted to make it easy for the respondents. The respondents are friendly approached in friendly manner for data collection and are assured of the confidentiality of their response. In addition, the study employs both descriptive and inferential statistics. Descriptive analysis was applied to describe the characteristics of the variables and demographic features for the respondents. In addition to this, the process of collecting data as well as difficulties with survey replies, non-response bias, data cleansing, multicollinearity, missing values, and outliers are

discussed. This chapter offers the measurement model by utilising the PLS-SEM approach in order to verify the goodness of the measuring instrument by employing construct validity and internal consistent reliability assessments. The study also uses structural model in testing the empirical results of the hypotheses and other inferential statistics in relations to the objectives of the study.

Chapter four presents the results of the empirical investigation into the effect of automated teller machines (ATM) and waiting time on customer satisfaction. The results reveal that there is negative significant relationship between cash withdrawals and customer satisfaction as the p-value shows 0.0001 at 5% level of significance. Since P. value calculated (0.0001) is less than 5% level of significance, the research rejects the null hypotheses and accepts alternative hypothesis that hitches the customers do experience during cash withdrawals from ATM has significant negative effect on customer satisfaction. It was also discovered that fund transfer has significant p-value of (0.0000) which is less than 5% level of significance. The stated null hypotheses is rejected. Based on this result, it shows that there is a positive significant relationship between fund transfer and customer satisfaction. There is significant relationship between waiting time and customer satisfaction as the probability values shows (0.0000) which is less than the 5% (0.05) level of significance. The empirical evidence from the findings of this study shows that there is a significant positive relationship between waiting time and customer satisfaction. Moreover, waiting time moderate the relationship between cash withdrawal and customer satisfaction. However, waiting time does not moderate the relationship between balance inquiry and customer satisfaction. Thus, the null hypotheses is accepted.

5.3 Findings and Conclusions

This study examines the effect of ATM services on customer satisfaction in selected Deposit Money Banks (DMBs) in Nigeria using waiting time as moderating variable. It employs Partial Least Squares Structural Equation Modeling (PLS-SEM) and queuing model analysis for both descriptive and inferential data analyses. As a result, several findings are realized. The main ones are drawn below:

The results indicate that the influence of ATM cash withdrawals and customer satisfaction is significantly negative. This implies that ATM do not play any critical role in satisfying customers.

In line with the findings of earlier studies, whereas funds transfer positively and insignificantly influence customer satisfaction. This means that customers are satisfied with the service of ATM in terms of funds transfer.

In line with the findings of the reviewed literatures, the balance inquiry is positively and significantly related to customer satisfaction considered in this study. The positive impact of balance inquiry on customer satisfaction indicates that customers will be willing to use ATMs more frequently for checking balance the more satisfied they are.

Again, in accordance with the findings from the reviewed literatures, whereas waiting time have a significant and positive influence on customer satisfaction in using ATMs. This implies that customers are not worried about how much time they spent on ATM transaction as long as the service is provided.

Based on the findings of the study, the following conclusions are made:

- i. It is concluded that the customers are dissatisfied with the way in which ATM banks handle their withdrawal services due to some problems like running out of cash by ATM, not dispensing but debited, limit to cash withdrawal.
- ii. The study also concludes that customers are satisfied with the ATM service of funds transfer. This is understandable for the reason that, funds transfer using ATM is faster than transfer across the cashier counter. Furthermore, ATM funds transfer smoothens business operations.
- iii. The study concludes that the customers are satisfied with balance inquiry service of ATM machines. The positive relationships noticed may also be due to fact that ATM card allows customers to view their account balance 24-hours a day.
- iv. It is also concludes that the customers are satisfified with the waiting time while using ATM. The positive relationships noticed may also be due to fact that ATM save time in carrying out bank transaction than doing transaction across the counter.
- v. It concludes that, waiting time moderate the relationship between cash withdrawals and customer satisfaction.
- vi. It also concludes that, waiting time moderate the relationship between funds transfer and customer satisfaction.
- vii. It concludes from the study that, waiting time does not moderate the relationship between balance inquiry and customer satisfaction.
- viii. It concludes from the results of the queuing model analysis on observational data that the average waiting time of ATM users for the selected banks is between 1.3 minute and 3.35 minute with total averege of 2.41 minute. This is approximely equal to what is obtained under the questionnaire data.

- ix. The study concludes that with exception of polaris bank,ATM machines were under utilized. This implies that the ATM machine at polaris bank are not sufficient. This may be as a result of number of customers or ATM patronage.
- x. It is concludes that mean waiting time of ATM users on queue is approximetly zero. This implies that no queue were observed during data collection.

5.4 Recommendations

In line with the findings, the study made the following recommendations:

- i. The deposit money banks (DMBs) in Sokoto metropolis should stock their ATM machines with cash at all the time to ensure that cash withdrawal by customers are not hindered. Since cash withdrawal have negative and significant effect on customer satisfaction bank should ensure that ATM machines dispenses cash at any giving time. Moreover, banks should review their maximum withdrawal limit set for ATM in order to improve the satisfaction of the customers.
- ii. As there is positive significant relationship between fund transfer and customer satisfaction, deposit money banks in Sokoto metropolis, as a matter of priority, should enhance the security of ATM systems and ATM machines user interface to make the operation more reliable, simpler and smoother for the users.
- iii. The deposit money banks (DMBs) in Sokoto metropolis should ensure that ATM prints a mini statement of the customer's account balance so that they can know their account status.
- iv. The deposit money banks are strongly advised to always make all their available ATM machines functional as this will drastically reduce the time to be spent by the customers.
- v. The management of the bank should ensure orderliness (first come, first serve) of ATM users during cash withdrawals so as to minimize their waiting time

thereby preventing customers from switching to another ATM bank for transactions.

- vi. It is established that waiting time moderate the relationship between fund transfer and customer satisfaction. Bank should ensure that fund transfer using ATM is free from transaction error in order to increase the speed of the customers in carrying out bank transaction.
- vii. Bank should further improve ATM balance inquiry service so as to enhance customer satisfaction while checking account balance.
- viii. The study recommended that the management of the banks especially Polaris bank should provide more ATM machines or make the available ones functional for use by the customers as the result revealed that the available ATM machines were over-stressed due to high rate of patronage.
- ix. The bank management should make sure that the ATM machines are up-to-date and functional so as to maintain the zero queue being observed during the study.

5.5 Suggestions for Further Research

This research suggests the need for further studies to take consideration the following practical, theoretical, as well as methodological aspects.

Practically, the study focuses on Automated Teller Machine and customer satisfaction with respect to cash withdrawals, funds transfer and balance inquiry considering waiting time as moderator in some selected Deposit Money Banks in Nigeria. The study is limited to Sokoto metropolis. As such, the results obtained may differ if other neighboring states had been included in the study. Take examples of Kan City, Lagos, Kaduna, and Port Harcourt, the population is higher there. Therefore, future researches should consider other states particularly North-West zone of the country. The study employs quantitative approach in investigating the extent to which waiting time

moderate the relationship between ATM services and customer satisfaction. Therefore, the future research may consider any other possible moderating variables besides waiting time to study the relationship. The current study used variables like cash withdrawals, funds transfer and balance inquiry. The future studies should include variables such as cash deposit and bills payment to expand the framework. Future study may consider comparative analysis in the level of satisfaction of customers from different banks so as to ascertain the level of workability of approaches adopted by the banks in servicing their customers. The study also suggests a comparative study between Nigeria and other developing countries that introduced ATM services. The comparative study may allow the two or more countries to have more insight on the moderating effect of waiting time on the relationship between ATM services and customer satisfaction in their individual countries and to assess their areas of strengths and weaknesses.

Methodologically, this study employed SmartPLS path modeling for data analysis which may likely have its limitations (Hair et al., 2016). Therefore future research may use any other second-generation statistical package for more accuracy and justifiable argument related to limitations associated with PLS-SEM 3 version.

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APPENDICES

Appendix I

USMANU DANFODIYO UNIVERSITY, SOKOTO
FACULTY OF MANAGEMENT SCIENCES,
DEPARTMENT OF BUSINESS ADMINISTRATION,
QUESTIONNAIRE FOR BANK CUSTOMER'S IN SOKOTO METROPOLIS

Dear Sir/Ma

I am a student of the above mentioned school. I am currently undertaking a research titled "Effect of Electronic Banking Services on Customer Satisfaction in Nigerian Deposit Money Banks: Moderating Role of Waiting Time

The study is pure for academic purpose and the data would be treated with utmost confidentiality.

Thank you for your cooperation

Yours sincerely

Muhammad Sani Burodo

Adm. No: 17410905004

SECTION A: Demographic Characteristics of Respondents

1. Gender:

- a. Male ☐
- b. Female ☐

2. Age

- a. Less than 20 years ☐
- b. Between 21 – 30 years ☐
- c. Between 31 – 40 years ☐
- d. Between 41 – 50 ☐
- e. Above 50 years ☐

3. Occupation

- a. Unemployed ☐
- b. Civil Servant ☐
- c. Trading ☐
- d. Others Specify

4. Educational level (You can tick your highest qualification only)

- a. Primary School Certificate ☐
- b. Secondary School Certificate ☐
- c. First Degree/HND ☐
- d. Masters Degree ☐
- e. Others specify

5. Which of the following ATM services do you patronize? You can tick more than one option

- a. Cash Withdrawals ☐
- b. Fund Transfer ☐

- c. Balance Inquiry []
6. What is your frequency in using the ATM services?
- a. Daily []
- b. Once a week []
- c. Once two weeks []
- d. Once a month []

SECTION B: Customer's Perception of ATM Services and Waiting Time

The following list of statements are used to get relevant information on how you derive maximum satisfaction from the use of ATM services such as cash withdrawal, fund transfer and balance inquiry. Thus, please indicate your level of agreement with each statement by ticking [☒] on the spaces provided under each option. The options range from:

1. Strongly agree
2. Agree
3. Undecided
4. Disagree
5. Strongly disagree

S/N	Variables	1	2	3	4	5
	CASH WITHDRAWAL					
CW1	There are times where the ATM runs out of cash.					
CW2	ATM withdrawal error settled quickly in my bank.					
CW3	There are cases in which either the ATM dispense the cash without debiting the account or debiting the account without dispensing cash.					
CW4	There are cases I faced ATM transaction related problems during usage of ATM from different banks ATM terminals					
CW5	ATM charges for withdrawing money from different banks' ATM terminals worries me a lot.					
CW6	ATMs daily transaction limit for withdrawal affects my business transaction.					
	FUND TRANSFER					
FT1	Using ATM for funds transfer is free from transaction error.					
FT2	Funds transfer using ATM is faster than transfer across the cashier counter.					
FT3	With funds transfer using ATM, I need not to travel with cash.					
FT4	ATM funds transfer smoothens business operations.					
FT5	My bank encourages me to use ATM fund transfer.					
FT6	I feel protected with my bank transactions using ATM fund transfer.					
	BALANCE INQUIRY					
BI1	Checking account balance via ATM is faster than checking account balance across the cashier counter					
B12	ATM card allows me to view my account balance 24-hours a day					
BI3	I am informed from my bank to use ATM system in checking account balance					
B14	ATM has been printing mini statement of your account balance					
	CUSTOMER SATISFACTION					
CS1	I am satisfied with the security of the bank that locks the ATM card immediately it is reported lost.					
CS2	Ease of use is a major factor encourages me to use ATM services.					
CS3	I am very satisfied with the ATM service as the machines are placed in convenient place					

CS4	There are provision of security personnel to protect ATM users from any physical attack.					
CS5	ATM system has improved my trust in using ATM facilities.					
CS6	I get faster transaction from ATM whenever I go.					
CS7	I trust the security of the ATMs as they are placed in secure place.					
CS8	ATM system is useful to me because it is always ready to solve customer problems.					
CS9	I trust ATM because it helps me to monitor my bank account outside of bank hours through balance enquiries.					
CS10	ATM provides me with easy access to transact business with bank.					
CS11	I find an ATM system useful, because it ensures logical protection of customer data.					
CSS12	ATM service is useful to me due to the less charges in transaction.					
CS13	Accessibility to ATM services motivate me to use it.					
	WAITING TIME					
WT1	I do not mind waiting as long as the service is Provided					
WT2	Am satisfied are you with the amount of time that you have waited in line					
WT3	My bank transaction across the counter take time.					
WT4	The introduction of ATM save time in carrying out bank transaction.					

Appendix II

TABLE A1

Table 4.4	
Collinearity Statistics (<i>VIF</i>)	
Items	VIF
BI1	1.6831
BI2	1.7846
BI3	1.8017
BI4	1.4782
CS1	2.0168
CS10	2.2182
CS11	2.1818
CS12	1.9736
CS2	2.0909
CS3	2.3912
CS5	2.7632
CS6	2.7340
CS7	2.4075
CS9	2.1901
CW1	1.0948
CW2	1.7536
CW3	1.6820
CW4	1.4973
CW5	1.5600
FT1	1.9934
FT2	2.2493
FT3	1.7583
FT4	1.4657
FT5	1.0579
WT2	1.1786
WT3	1.3126
WT4	1.2921

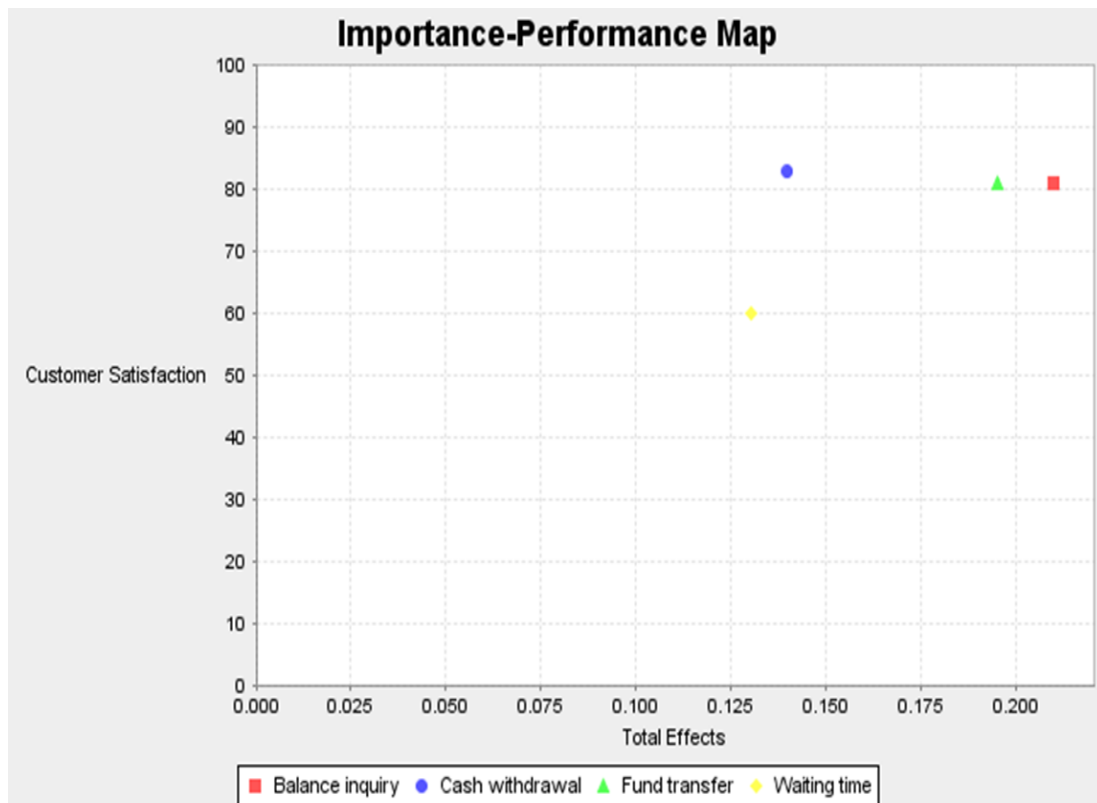
Table A2 Indicator Loadings and Internal Consistency Reliability

Latent Constructs	Items	Outer Loadings	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)	Items Deleted
Customer Satisfaction			0.9263	0.9271	0.9379	0.6021	CS4
	CS1	0.7280					CS8
	CS2	0.7388					CS13
	CS3	0.8030					
	CS5	0.8203					
	CS6	0.8159					
	CS7	0.8093					
	CS9	0.7790					
	CS10	0.7635					
	CS11	0.7623					
	CS12	0.7322					
Cash withdrawal			0.7502	0.7535	0.8342	0.5050	CW6
	CW1	0.5589					
	CW2	0.7850					
	CW3	0.7846					
	CW4	0.6771					
	CW5	0.7227					
Fund transfer			0.7697	0.7928	0.8493	0.5403	FT6
	FT1	0.7962					
	FT2	0.8437					
	FT3	0.7901					
	FT4	0.7396					
	FT5	0.4293					
Balance inquiry			0.8106	0.8120	0.8757	0.6381	
	BI1	0.8089					
	BI2	0.8025					
	BI3	0.8231					
	BI4	0.7591					
Waiting time			0.6345	0.6452	0.8027	0.5762	WT1
	WT2	0.7206					
	WT3	0.7435					
	WT4	0.8102					

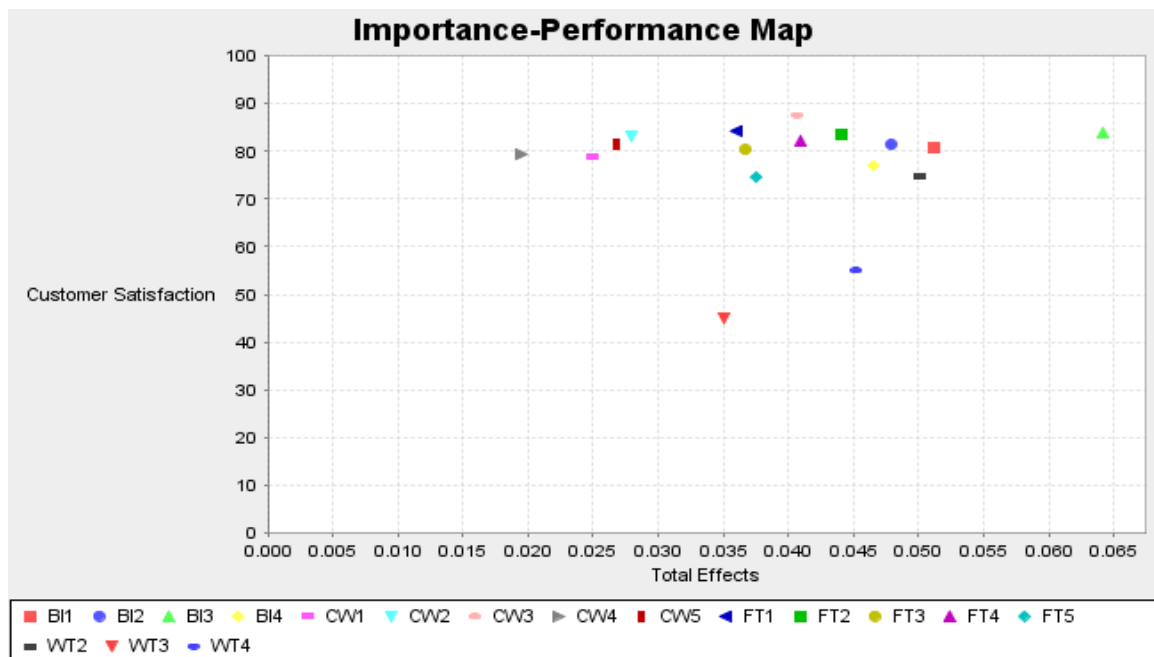
Table A3

Factor loading and Cross loadings

Latent Constructs	Balance inquiry	Customer Satisfaction	Cash withdrawal	Fund transfer	Waiting time
BI1	0.8089	0.4703	0.4591	0.4990	0.3706
BI2	0.8025	0.4151	0.4287	0.4802	0.3325
BI3	0.8231	0.4635	0.4617	0.5331	0.2656
BI4	0.7591	0.4467	0.3928	0.4671	0.3059
CS1	0.4320	0.7280	0.3674	0.4252	0.3465
CS10	0.4211	0.7635	0.3477	0.3727	0.3603
CS11	0.4662	0.7623	0.4127	0.4427	0.3265
CS12	0.3962	0.7322	0.3718	0.4050	0.3210
CS2	0.4247	0.7388	0.3674	0.4252	0.3732
CS3	0.4401	0.8030	0.3930	0.4624	0.3815
CS5	0.4068	0.8203	0.3795	0.4500	0.3896
CS6	0.4379	0.8159	0.3637	0.4482	0.4110
CS7	0.4740	0.8093	0.4285	0.4623	0.3505
CS9	0.4660	0.7790	0.3725	0.4296	0.3387
CW1	0.4292	0.3696	0.5589	0.5592	0.3468
CW2	0.4405	0.3599	0.7850	0.3234	0.2645
CW3	0.4139	0.3951	0.7846	0.3727	0.2492
CW4	0.3058	0.2777	0.6771	0.2507	0.1917
CW5	0.3086	0.3069	0.7227	0.3038	0.2026
FT1	0.4918	0.3752	0.4523	0.7962	0.3822
FT2	0.5381	0.4707	0.4109	0.8437	0.3549
FT3	0.5228	0.4157	0.3994	0.7901	0.3648
FT4	0.4069	0.4393	0.3502	0.7396	0.3143
FT5	0.2762	0.3185	0.2991	0.4293	0.2158
WT2	0.3413	0.3430	0.3655	0.4344	0.7206
WT3	0.2270	0.2966	0.1857	0.2418	0.7435
WT4	0.3284	0.4044	0.2651	0.3396	0.8102



APPENDIX: IPMA



APPENDIX: IPMA

APPENDIX: MISSING VALUE TABLE

Statistics	Valid	Missing	Minimum	Maximum
Bank_name	367	0	1	3
BRANCH	367	0	1	3
GENDER	367	0	1	2

AGE	367	0	1	5
OCCUPATION	367	0	1	5
EDUCATIONAL_LEVEL	367	0	1	5
ATM_PATRONIZATION	367	0	1	7
FREQUENCY_OF_ATM_SERVICES_USAGE	367	0	1	4
CW1	366	1	1	5
CW2	365	2	1	5
CW3	363	4	1	5
CW4	366	1	1	5
CW5	367	0	1	5
CW6	364	3	1	5
FT1	367	0	1	5
FT2	365	2	1	33
FT3	367	0	1	5
FT4	367	0	1	5
FT5	364	3	1	5
FT6	366	1	1	5
BI1	367	0	1	5
BI2	365	2	1	5
BI3	364	3	1	5
BI4	361	6	1	5
CS1	366	1	1	5
CS2	366	1	1	5
CS3	367	0	1	33
CS4	365	2	1	5
CS5	366	1	1	5
CS6	365	2	1	5
CS7	365	2	1	5
CS8	366	1	1	5
CS9	367	0	1	5
CS10	367	0	1	5
CS11	366	1	1	5
CS12	366	1	1	5
CS13	367	0	1	5
WT1	366	1	1	5
WT2	363	4	1	44
WT3	367	0	1	5
WT4	364	3	1	5

APPENDIX: Assessment of Outliers

Results of Test of Skewness and Kurtosis

Descriptive Statistics

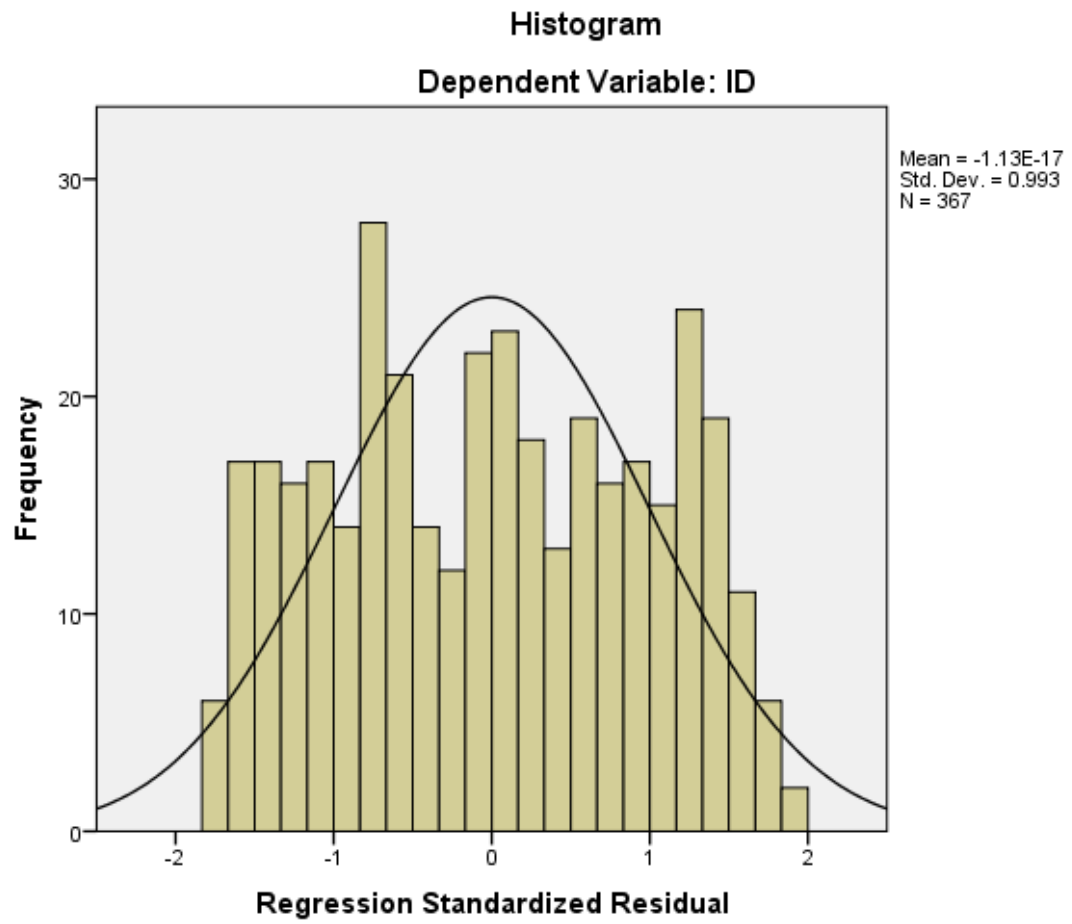
Items	N	Std. Deviation		Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error	Statistic	Std. Error

FT1	367	1.274	-.142	.127	-1.207	.254
FT3	367	.986	1.728	.127	2.673	.254
FT4	367	.837	1.313	.127	2.132	.254
BI1	367	1.001	1.811	.127	2.777	.254
CS3	367	1.900	11.760	.127	188.115	.254
CS9	367	.829	1.337	.127	2.103	.254
CS10	367	.829	1.289	.127	1.979	.254
CS13	367	.871	1.259	.127	1.885	.254
WT3	367	1.106	1.035	.127	.303	.254
MEAN(CW1,2)	367	.805	2.715	.127	7.976	.254
MEAN(CW2,2)	367	1.329	.220	.127	-1.291	.254
MEAN(CW3,2)	367	1.114	1.175	.127	.429	.254
MEAN(CW4,2)	367	.987	1.327	.127	1.449	.254
MEAN(CW6,2)	367	1.123	.995	.127	.275	.254
MEAN(FT2,2)	367	1.892	12.266	.127	198.570	.254
MEAN(FT5,2)	366	.970	.930	.128	.596	.254
MEAN(FT6,2)	367	1.018	1.024	.127	.420	.254
MEAN(BI2,2)	367	.866	1.580	.127	2.397	.254
MEAN(BI3,2)	367	1.141	.998	.127	.148	.254
MEAN(BI4,2)	367	1.171	.781	.127	-.315	.254
MEAN(CS1,2)	367	1.100	1.054	.127	.066	.254
MEAN(CS2,2)	367	.914	1.444	.127	2.305	.254
MEAN(CS4,2)	367	1.328	.048	.127	-1.278	.254
MEAN(CS5,2)	367	.919	1.080	.127	1.240	.254
MEAN(CS6,2)	367	1.058	.602	.127	-.616	.254
MEAN(CS7,2)	367	1.038	.573	.127	-.553	.254
CS8_1	367	1.107	.640	.127	-.548	.254
CS11_1	367	.849	1.012	.127	1.433	.254
CS12_1	367	.944	1.042	.127	.963	.254

Descriptive Statistics

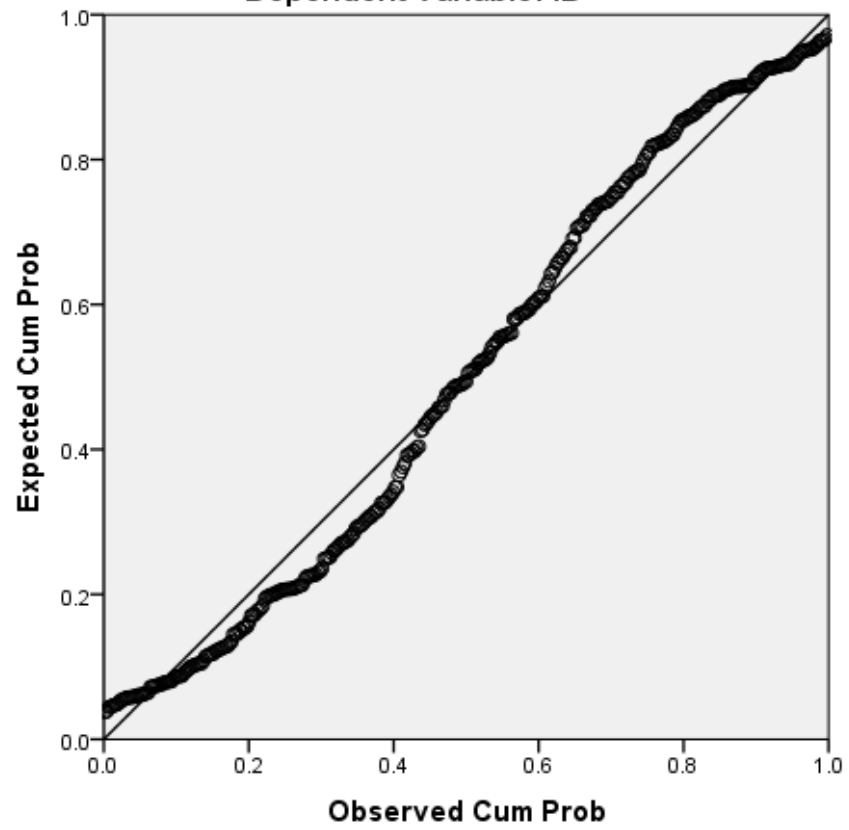
	N	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
FT1	367	1.274	-.142	.127	-1.207	.254
FT3	367	.986	1.728	.127	2.673	.254
FT4	367	.837	1.313	.127	2.132	.254
BI1	367	1.001	1.811	.127	2.777	.254
CS3	367	1.900	11.760	.127	188.115	.254
CS9	367	.829	1.337	.127	2.103	.254
CS10	367	.829	1.289	.127	1.979	.254
CS13	367	.871	1.259	.127	1.885	.254
WT3	367	1.106	1.035	.127	.303	.254
MEAN(CW1,2)	367	.805	2.715	.127	7.976	.254
MEAN(CW2,2)	367	1.329	.220	.127	-1.291	.254
MEAN(CW3,2)	367	1.114	1.175	.127	.429	.254
MEAN(CW4,2)	367	.987	1.327	.127	1.449	.254
MEAN(CW6,2)	367	1.123	.995	.127	.275	.254
MEAN(FT2,2)	367	1.892	12.266	.127	198.570	.254
MEAN(FT5,2)	366	.970	.930	.128	.596	.254
MEAN(FT6,2)	367	1.018	1.024	.127	.420	.254
MEAN(BI2,2)	367	.866	1.580	.127	2.397	.254
MEAN(BI3,2)	367	1.141	.998	.127	.148	.254
MEAN(BI4,2)	367	1.171	.781	.127	-.315	.254
MEAN(CS1,2)	367	1.100	1.054	.127	.066	.254
MEAN(CS2,2)	367	.914	1.444	.127	2.305	.254
MEAN(CS4,2)	367	1.328	.048	.127	-1.278	.254
MEAN(CS5,2)	367	.919	1.080	.127	1.240	.254
MEAN(CS6,2)	367	1.058	.602	.127	-.616	.254
MEAN(CS7,2)	367	1.038	.573	.127	-.553	.254
CS8_1	367	1.107	.640	.127	-.548	.254
CS11_1	367	.849	1.012	.127	1.433	.254
CS12_1	367	.944	1.042	.127	.963	.254
Valid N (listwise)	366					

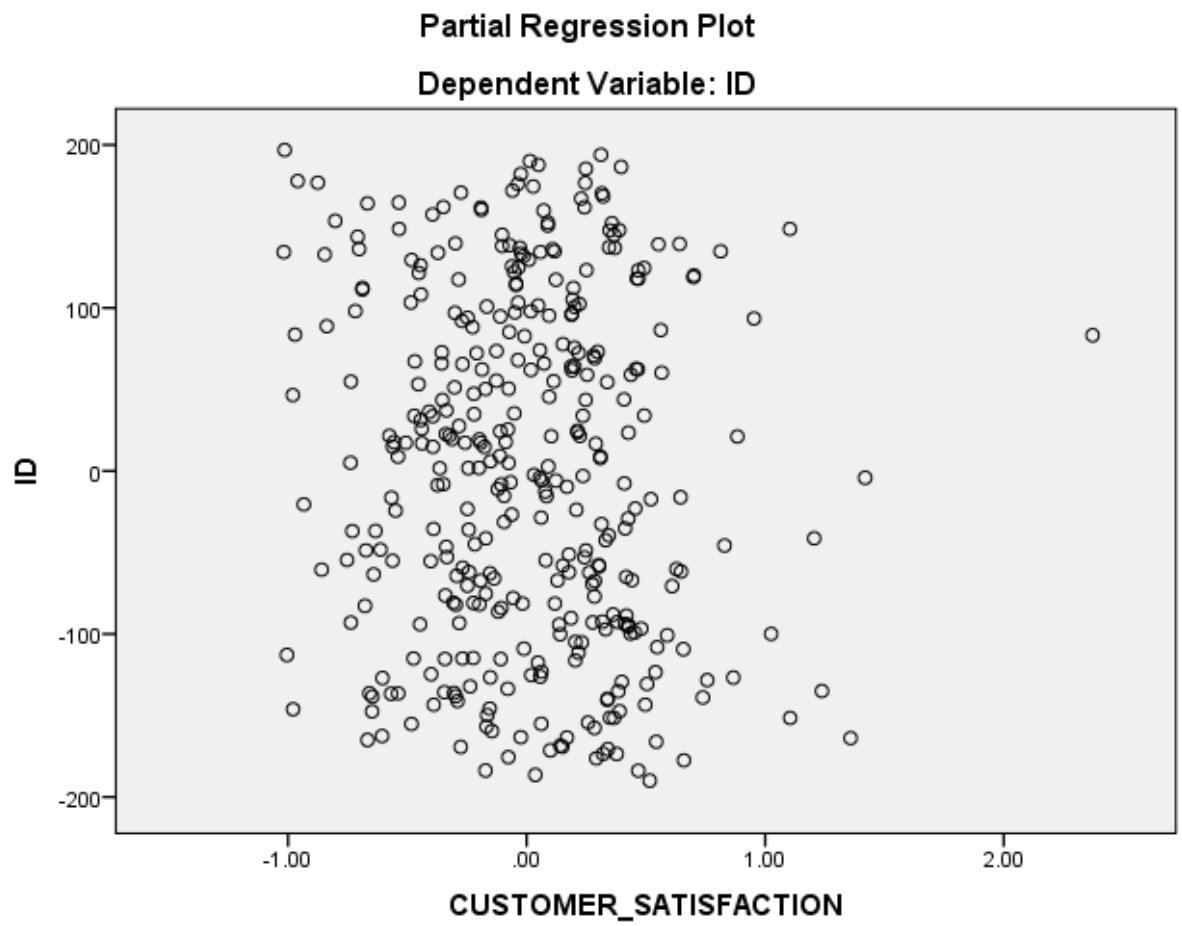
APPENDIX: NORMALITY ANALYSIS



Normal P-P Plot of Regression Standardized Residual

Dependent Variable: ID





APPENDIX: ASSESSMENT OF NON-RESPONSE VIAS

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.573	16.886	16.886	5.573	16.886	16.886
2	2.659	8.058	24.945	2.659	8.058	24.945
3	1.804	5.468	30.412	1.804	5.468	30.412
4	1.531	4.639	35.052	1.531	4.639	35.052
5	1.444	4.377	39.428	1.444	4.377	39.428
6	1.362	4.129	43.557	1.362	4.129	43.557
7	1.298	3.934	47.491	1.298	3.934	47.491
8	1.164	3.526	51.017	1.164	3.526	51.017
9	1.102	3.340	54.357	1.102	3.340	54.357
10	1.043	3.161	57.518	1.043	3.161	57.518
11	.996	3.019	60.537			
12	.972	2.945	63.482			
13	.892	2.704	66.187			
14	.840	2.545	68.732			
15	.813	2.464	71.196			
16	.781	2.366	73.563			
17	.699	2.118	75.681			
18	.685	2.076	77.757			
19	.677	2.051	79.809			
20	.655	1.985	81.794			
21	.618	1.873	83.666			
22	.605	1.833	85.500			
23	.576	1.747	87.247			
24	.529	1.603	88.850			
25	.516	1.563	90.412			
26	.488	1.479	91.892			
27	.467	1.414	93.306			
28	.435	1.317	94.623			
29	.404	1.225	95.848			
30	.379	1.149	96.997			
31	.350	1.059	98.056			
32	.338	1.026	99.082			
33	.303	.918	100.000			

Extraction Method: Principal Component Analysis.

APPENDIX III

R-Cord for Queuing Model Analyses

GTBANK

Set queue model input parameters

```
library(queueing)
input_mm3 <- NewInput.MMC(lambda = 2.33, mu = 5, c=14,n = 50)
```

Create queue class object

```
output_mm3 <- QueueingModel(input_mm3)
```

queue model report

```
Report(output_mm3)
## The inputs of the model M/M/c are:
## lambda: 2.33, mu: 5, c: 14, n: 50, method: Exact
##
## The outputs of the model M/M/c are:
```

```
Poisson Distribution for Arrival Process
curve(dpois(x, input_mm3$lambda),
      from = 0,
      to = 50,
      type = "l",
      lwd = 2,
      xlab = "Number of customers",
      ylab = "Probability",
      main = "Poisson Distribution for Arrival Process",
      ylim = c(0, 0.25),
      n = 50)
```

2: Exponential Distribution Plot for Interarrival Time

```
curve(dexp(x, rate = 1/input_mm3$lambda),
      from = 0,
      to = 50,
      type = "l",
      lwd = 2,
      xlab = "Interarrival Time",
      ylab = "Probaility",
      main = "Exponential Distribution for Interarrival Time",
      ylim = c(0, 1))
abline(h = 0)
set.seed(300)
n <- 50
sim <- rexp(n,rate=2.33)
sim.min <- round(sim * 60, 4)
```

Plot of the histogram and boxplot

```
bins.range <- 0.3
breaks.points <- seq(0,max(sim.min)+1,bins.range)
hist(sim.min,col='chartreuse',border='seagreen',density=30, xlab="Arrival Time (Mins)")
```

```

boxplot(sim.min,col='chartreuse',border='seagreen',horizontal=F,ylab='Minutes',staplew
ex=1,
      main='Interarrival times')
text(y=boxplot.stats(sim.min)$stats, labels=boxplot.stats(sim.min)$stats, x=1.25)
abline(h=quantile(sim.min,c(0.25,0.75)), col="red")
## Result of first and third quantiles and median
h=quantile(sim.min,c(0.25,0.5,0.75))
h

```

Probability distribution plot

```

time <- seq(0,0.45,0.001)
plot(time*60,dexp(time*60,rate=1/2.33),type='l',xlab='Minutes',
      ylab='Probability density',main='Probability distribution',col='blue',lwd=2)
# Cumulative distribution plot
plot(time*60,pexp(time*60,rate=1/2.33),type='l',xlab='Minutes',
      ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)

```

UBA

Set queue model input parameters

```

library(queueing)
UBA <- NewInput.MMC(lambda = 2.73, mu = 4.6, c=19,n = 68)
output_UBA <- QueueingModel(UBA)

```

queue model report

```

Report(output_UBA)
## The inputs of the model M/M/c are:
## lambda: 2.73, mu: 4.6, c: 19, n: 68, method: Exact
##
## The outputs of the model M/M/c are:

```

queue model summary

```

summary(output_UBA)
##  lambda mu c k m    RO    P0    Lq    Wq    X
## 1   2.73 4.6 19 NA NA 0.0312357 0.5524025 7.482858e-24 2.740974e-24 2.73
##      L    W    Wqq    Lqq
## 1 0.5934783 0.2173913 0.01181056 1.032243

```

Poisson Distribution for Arrival Process

```

curve(dpois(x, UBA$lambda),
      from = 0,
      to = 68,
      type = "l",
      lwd = 2,
      xlab = "Number of customers",
      ylab = "Probability",
      main = "Poisson Distribution for Arrival Process",
      ylim = c(0, 0.25),
      n = 68)

```

Plot of the histogram and boxplot

```
bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.UBA)+1,bins.range)
hist(sim.min.UBA,col='pink',border='seagreen',density=30, main="Histogram for
UBA",xlab="Arrival Time (Mins)")

boxplot(sim.min.UBA,col='blue',border='seagreen',horizontal=F,ylab='Minutes',staplew
ex=1,
        main='Interarrival times')
text(y=boxplot.stats(sim.min.UBA)$stats, labels=boxplot.stats(sim.min.UBA)$stats,
x=1.25)
abline(h=quantile(sim.min.UBA,c(0.25,0.75)), col="red")
### Result of first and third quantiles and median
hh=quantile(sim.min.UBA,c(0.25,0.5,0.75))
hh
```

Probability distribution plot

```
time.UBA <- seq(0,0.45,0.001)
plot(time.UBA*60,dexp(time.UBA*60,rate=1/2.73),type='l',xlab='Minutes',
      ylab='Probability density',main='Probability distribution',col='blue',lwd=2)
### Cumulative distribution plot
plot(time.UBA*60,pexp(time.UBA*60,rate=1/2.73),type='l',xlab='Minutes',
      ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)
```

ZENITH BANK

Set queue model input parameters

```
library(queueing)
ZBANK <- NewInput.MMC(lambda = 1.93, mu = 4, c=12,n = 43)
output_ZBANK <- QueueingModel(ZBANK)
```

queue model report

```
Report(output_ZBANK)
## The inputs of the model M/M/c are:
## lambda: 1.93, mu: 4, c: 12, n: 43, method: Exact
```

Poisson Distribution for Arrival Process

```
curve(dpois(x, ZBANK$lambda),
      from = 0,
      to = 43,
      type = "l",
      lwd = 2,
      xlab = "Number of customers",
      ylab = "Probability",
      main = "Poisson Distribution for Arrival Process",
      ylim = c(0, 0.25),
      n = 43)
## Simulation ### Number of simulated samples
```

```
set.seed(300)
n <- 43
sim.ZBANK <- rexp(n,rate=1.93)
sim.min.ZBANK <- round(sim.ZBANK * 60, 4)
```

plot of the histogram and boxplot

```
bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.ZBANK)+1,bins.range)
hist(sim.min.ZBANK,col='blue',border='seagreen',density=30, main="Histogram for
Zenith Bank",xlab="Arrival Time (Mins)")
```

```
boxplot(sim.min.ZBANK,col='blue',border='seagreen',horizontal=F,ylab='Minutes',stap
lewex=1,
        main='Interarrival times')
text(y=boxplot.stats(sim.min.ZBANK)$stats,
labels=boxplot.stats(sim.min.ZBANK)$stats, x=1.25)
abline(h=quantile(sim.min.ZBANK,c(0.25,0.75)), col="purple")
## Result of first and third quantiles and median
hhh=quantile(sim.min.ZBANK,c(0.25,0.5,0.75))
hhh
##   25%   50%   75%
## 6.6544 14.7182 31.4069
```

Probability distribution plot

```
time.ZBANK <- seq(0,0.45,0.001)
plot(time.ZBANK*60,dexp(time.ZBANK*60,rate=1/1.93),type='l',xlab='Minutes',
      ylab='Probability density',main='Probability distribution',col='red',lwd=2)
## Cumulative distribution plot
plot(time.ZBANK*60,pexp(time.ZBANK*60,rate=1/1.93),type='l',xlab='Minutes',
      ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)
```

FIRST BANK

Set queue model input parameters

```
library(queueing)
FBANK <- NewInput.MMC(lambda = 1.03, mu = 4.4, c=22,n = 76)
output_FBANK <- QueueingModel(FBANK)
```

queue model report

```
Report(output_ZBANK)
## The inputs of the model M/M/c are:
## lambda: 1.93, mu: 4, c: 12, n: 43, method: Exact
```

Poisson Distribution for Arrival Process

```
curve(dpois(x, FBANK$lambda),
      from = 0,
      to = 76,
      type = "l",
      lwd = 2,
      xlab = "Number of customers",
```

```

ylab = "Probability",
main = "Poisson Distribution for Arrival Process",
ylim = c(0, 0.25),
n = 76)
## Simulation ### Number of simulated samples
set.seed(300)
n <- 76
sim.FBANK <- rexp(n,rate=1/1.03)
sim.min.FBANK <- round(sim.FBANK * 60, 4)
plot of the histogram and boxplot

bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.FBANK)+1,bins.range)
hist(sim.min.FBANK,col='blue',border='seagreen',density=30, main="Histogram for
First Bank",xlab="Arrival Time (Mins)")

boxplot(sim.min.FBANK,col='blue',border='seagreen',horizontal=F,ylab='Minutes',stapl
ewex=1,
        main='Interarrival times')
text(y=boxplot.stats(sim.min.FBANK)$stats,
labels=boxplot.stats(sim.min.FBANK)$stats, x=1.25)
abline(h=quantile(sim.min.FBANK,c(0.25,0.75)), col="purple")
## Result of first and third quantiles and median
hhh=quantile(sim.min.FBANK,c(0.25,0.5,0.75))
hhh
##      25%      50%      75%
## 12.26310 31.26285 71.41598
Probability distribution plot

time.FBANK <- seq(0,0.45,0.001)
plot(time.FBANK*60,dexp(time.FBANK*60,rate=1/1.03),type='l',xlab='Minutes',
      ylab='Probability density',main='Probability distribution',col='red',lwd=2)
## Cumulative distribution plot
plot(time.FBANK*60,pexp(time.FBANK*60,rate=1/1.03),type='l',xlab='Minutes',
      ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)

```

ECO BANK

Set queue model input parameters

```

library(queueing)
ECOBANK <- NewInput.MMC(lambda = 1.45, mu = 2.5, c=5,n = 18)
output_ECOBANK <- QueueingModel(ECOBANK)

```

queue model report

```

Report(output_ECOBANK)
## The inputs of the model M/M/c are:
## lambda: 1.45, mu: 2.5, c: 5, n: 18, method: Exact
##
## The outputs of the model M/M/c are:

```

Poisson Distribution for Arrival Process

```
curve(dpois(x, ECOBANK$lambda),
      from = 0,
      to = 18,
      type = "l",
      lwd = 2,
      xlab = "Number of customers",
      ylab = "Probability",
      main = "Poisson Distribution for Arrival Process",
      ylim = c(0, 0.25),
      n = 18)
```

Simulation

```
set.seed(300)
n <- 18
sim.ECOBANK <- rexp(n,rate=1/1.45)
sim.min.ECOBANK <- round(sim.ECOBANK * 60, 4)
```

plot of the histogram and boxplot

```
bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.ECOBANK)+1,bins.range)
hist(sim.min.ECOBANK,col='blue',border='seagreen',density=30, main="Histogram for
Eco Bank",xlab="Arrival Time (Mins)")
```

```
boxplot(sim.min.ECOBANK,col='blue',border='seagreen',horizontal=F,ylab='Minutes',s
taplewex=1,
        main='Interarrival times')
text(y=boxplot.stats(sim.min.ECOBANK)$stats,
labels=boxplot.stats(sim.min.ECOBANK)$stats, x=1.25)
abline(h=quantile(sim.min.ECOBANK,c(0.25,0.75)), col="purple")
## Result of first and third quantiles and median
hhh=quantile(sim.min.ECOBANK,c(0.25,0.5,0.75))
hhh
##   25%   50%   75%
## 13.84363 37.83370 49.76370
```

Probability distribution plot

```
time.ECOBANK <- seq(0,0.45,0.001)
plot(time.ECOBANK*60,dexp(time.ECOBANK*60,rate=1/1.45),type='l',xlab='Minute
s',
      ylab='Probability density',main='Probability distribution',col='red',lwd=2)
## Cumulative distribution plot
plot(time.ECOBANK*60,pexp(time.ECOBANK*60,rate=1/1.45),type='l',xlab='Minute
s',
      ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)
```

ACCESS BANK

Set queue model input parameters

```
library(queueing)
ACCESSBANK <- NewInput.MMC(lambda = 1.01, mu = 3.5, c=15,n = 54)
output_ACCESSBANK <- QueueingModel(ACCESSBANK)
```

queue model report

```
Report(output_ACCESSBANK)
## The inputs of the model M/M/c are:
## lambda: 1.01, mu: 3.5, c: 15, n: 54, method: Exact
```

Poisson Distribution for Arrival Process

```
curve(dpois(x, ACCESSBANK$lambda),
      from = 0,
      to = 54,
      type = "l",
      lwd = 2,
      xlab = "Number of customers",
      ylab = "Probability",
      main = "Poisson Distribution for Arrival Process",
      ylim = c(0, 0.25),
      n = 54)
```

Simulation

```
set.seed(300)
n <- 54
sim.ACCESSBANK <- rexp(n,rate=1/1.01)
sim.min.ACCESSBANK <- round(sim.ACCESSBANK * 60, 4)
```

plot of the histogram and boxplot

```
bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.ACCESSBANK)+1,bins.range)
hist(sim.min.ACCESSBANK,col='blue',border='seagreen',density=30,
     main="Histogram for Access Bank",xlab="Arrival Time (Mins)")
```

```
boxplot(sim.min.ACCESSBANK,col='blue',border='seagreen',horizontal=F,ylab='Minutes',
        staplewex=1,
        main='Interarrival times')
text(y=boxplot.stats(sim.min.ACCESSBANK)$stats,
     labels=boxplot.stats(sim.min.ACCESSBANK)$stats, x=1.25)
abline(h=quantile(sim.min.ACCESSBANK,c(0.25,0.75)), col="purple")
## Result of first and third quantiles and median
hhh=quantile(sim.min.ACCESSBANK,c(0.25,0.5,0.75))
hhh
```

Probability distribution plot

```
time.ACCESSBANK <- seq(0,0.45,0.001)
plot(time.ACCESSBANK*60,dexp(time.ACCESSBANK*60,rate=1/1.01),type='l',xlab
```

```
='Minutes',
  ylab='Probability density',main='Probability distribution',col='red',lwd=2)
## Cumulative distribution plot
plot(time.ACCESSBANK*60,pexp(time.ACCESSBANK*60,rate=1/1.01),type='l',xlab
='Minutes',
  ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)
```

UNION BANK

Set queue model input parameters

```
library(queueing)
UNIONBANK <- NewInput.MMC(lambda = 2.93, mu = 4, c=8,n = 29)
output_UNIONBANK <- QueueingModel(UNIONBANK)
```

queue model report

```
Report(output_UNIONBANK)
## The inputs of the model M/M/c are:
## lambda: 2.93, mu: 4, c: 8, n: 29, method: Exact
```

Poisson Distribution for Arrival Process

```
curve(dpois(x, UNIONBANK$lambda),
  from = 0,
  to = 29,
  type = "l",
  lwd = 2,
  xlab = "Number of customers",
  ylab = "Probability",
  main = "Poisson Distribution for Arrival Process",
  ylim = c(0, 0.25),
  n = 29)
```

```
set.seed(300)
n <- 29
sim.UNIONBANK <- rexp(n,rate=1/2.93)
sim.min.UNIONBANK <- round(sim.ZBANK * 60, 4)
```

plot of the histogram and boxplot

```
bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.UNIONBANK)+1,bins.range)
hist(sim.min.UNIONBANK,col='blue',border='seagreen',density=30, main="Histogram
for Union Bank",xlab="Arrival Time (Mins)")
```

```
boxplot(sim.min.UNIONBANK,col='blue',border='seagreen',horizontal=F,ylab='Minute
s',staplewex=1,
  main='Interarrival times')
text(y=boxplot.stats(sim.min.UNIONBANK)$stats,
  labels=boxplot.stats(sim.min.UNIONBANK)$stats, x=1.25)
abline(h=quantile(sim.min.UNIONBANK,c(0.25,0.75)), col="purple")
## Result of first and third quantiles and median
```

```
hhh1=quantile(sim.min.UNIONBANK,c(0.25,0.5,0.75))
hhh1
```

Probability distribution plot

```
time.UNIONBANK <- seq(0,0.45,0.001)
plot(time.UNIONBANK*60,dexp(time.UNIONBANK*60,rate=1/2.93),type='l',xlab='
Minutes',
      ylab='Probability density',main='Probability distribution',col='red',lwd=2)
## Cumulative distribution plot
plot(time.UNIONBANK*60,pexp(time.UNIONBANK*60,rate=1/2.93),type='l',xlab='
Minutes',
      ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)
```

JA'IZ BANK

Set queue model input parameters

```
library(queueing)
JBANK <- NewInput.MMC(lambda = 1.1, mu = 4, c=4,n = 2)
output_JBANK <- QueueingModel(JBANK)
```

queue model report

```
Report(output_JBANK)
## The inputs of the model M/M/c are:
## lambda: 1.1, mu: 4, c: 4, n: 2, method: Exact
```

Poisson Distribution for Arrival Process

```
curve(dpois(x, JBANK$lambda),
      from = 0,
      to = 2,
      type = "l",
      lwd = 2,
      xlab = "Number of customers",
      ylab = "Probability",
      main = "Poisson Distribution for Arrival Process",
      ylim = c(0, 0.25),
      n = 2)
```

Simulation

plot of the histogram and boxplot

```
bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.JBANK)+1,bins.range)
hist(sim.min.JBANK,col='blue',border='seagreen',density=30, main="Histogram for
Ja'iz Bank",xlab="Arrival Time (Mins)")

boxplot(sim.min.JBANK,col='blue',border='seagreen',horizontal=F,ylab='Minutes',stapl
ewex=1,
        main='Interarrival times')
text(y=boxplot.stats(sim.min.JBANK)$stats,
```

```

labels=boxplot.stats(sim.min.JBANK)$stats, x=1.25)
abline(h=quantile(sim.min.JBANK,c(0.25,0.75)), col="purple")
## Result of first and third quantiles and median
hhh2=quantile(sim.min.JBANK,c(0.25,0.5,0.75))
hhh2
##    25%    50%    75%
## 31.87418 32.88965 33.90512

```

Probability distribution plot

```

time.JBANK <- seq(0,0.45,0.001)
plot(time.JBANK*60,dexp(time.JBANK*60,rate=1/1.1),type='l',xlab='Minutes',
     ylab='Probability density',main='Probability distribution',col='red',lwd=2)
## Cumulative distribution plot
plot(time.JBANK*60,pexp(time.JBANK*60,rate=1/1.1),type='l',xlab='Minutes',
     ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)

```

POLARIS BANK

Set queue model input parameters

```

library(queueing)
PBANK <- NewInput.MMC(lambda = 2.42, mu = 2, c=6,n = 22)
output_PBank <- QueueingModel(PBANK)

```

queue model report

```

Report(output_PBank)
## The inputs of the model M/M/c are:
## lambda: 2.42, mu: 2, c: 6, n: 22, method: Exact

```

Poisson Distribution for Arrival Process

```

curve(dpois(x, PBANK$lambda),
     from = 0,
     to = 22,
     type = "l",
     lwd = 2,
     xlab = "Number of customers",
     ylab = "Probability",
     main = "Poisson Distribution for Arrival Process",
     ylim = c(0, 0.25),
     n = 22)

```

Simulation

plot of the histogram and boxplot

```

bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.PBANK)+1,bins.range)
hist(sim.min.PBANK,col='blue',border='seagreen',density=30, main="Histogram for
Polaris Bank",xlab="Arrival Time (Mins)")

```

```

boxplot(sim.min.PBANK,col='blue',border='seagreen',horizontal=F,ylab='Minutes',stapl
ewex=1,

```

```

    main='Interarrival times')
text(y=boxplot.stats(sim.min.PBANK)$stats,
labels=boxplot.stats(sim.min.PBANK)$stats, x=1.25)
abline(h=quantile(sim.min.PBANK,c(0.25,0.75)), col="purple")
## Result of first and third quantiles and median
hhh=quantile(sim.min.PBANK,c(0.25,0.5,0.75))
hhh
##    25%    50%    75%
## 23.10448 63.14310 83.63972

```

Probability distribution plot

```

time.PBANK <- seq(0,0.45,0.001)
plot(time.PBANK*60,dexp(time.PBANK*60,rate=1/2.42),type='l',xlab='Minutes',
      ylab='Probability density',main='Probability distribution',col='red',lwd=2)
## Cumulative distribution plot
plot(time.PBANK*60,pexp(time.PBANK*60,rate=1/2.42),type='l',xlab='Minutes',
      ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)

```

UNITY BANK

Set queue model input parameters

```

library(queueing)
UNITYBANK <- NewInput.MMC(lambda = 2.31, mu = 3, c=6,n = 22)
output_UNITYBANK <- QueueingModel(UNITYBANK)

```

queue model report

```

Report(output_UNITYBANK)
## The inputs of the model M/M/c are:
## lambda: 2.31, mu: 3, c: 6, n: 22, method: Exact

```

Poisson Distribution for Arrival Process

```

curve(dpois(x, UNITYBANK$lambda),
      from = 0,
      to = 22,
      type = "l",
      lwd = 2,
      xlab = "Number of customers",
      ylab = "Probability",
      main = "Poisson Distribution for Arrival Process",
      ylim = c(0, 0.25),
      n = 22)

```

```

set.seed(300)
n <- 22
sim.UNITYBANK <- rexp(n,rate=1/2.31)
sim.min.UNITYBANK <- round(sim.UNITYBANK * 60, 4)

```

plot of the histogram and boxplot

```

bins.range <- 0.3
breaks.points <- seq(0,max(sim.min.UNITYBANK)+1,bins.range)

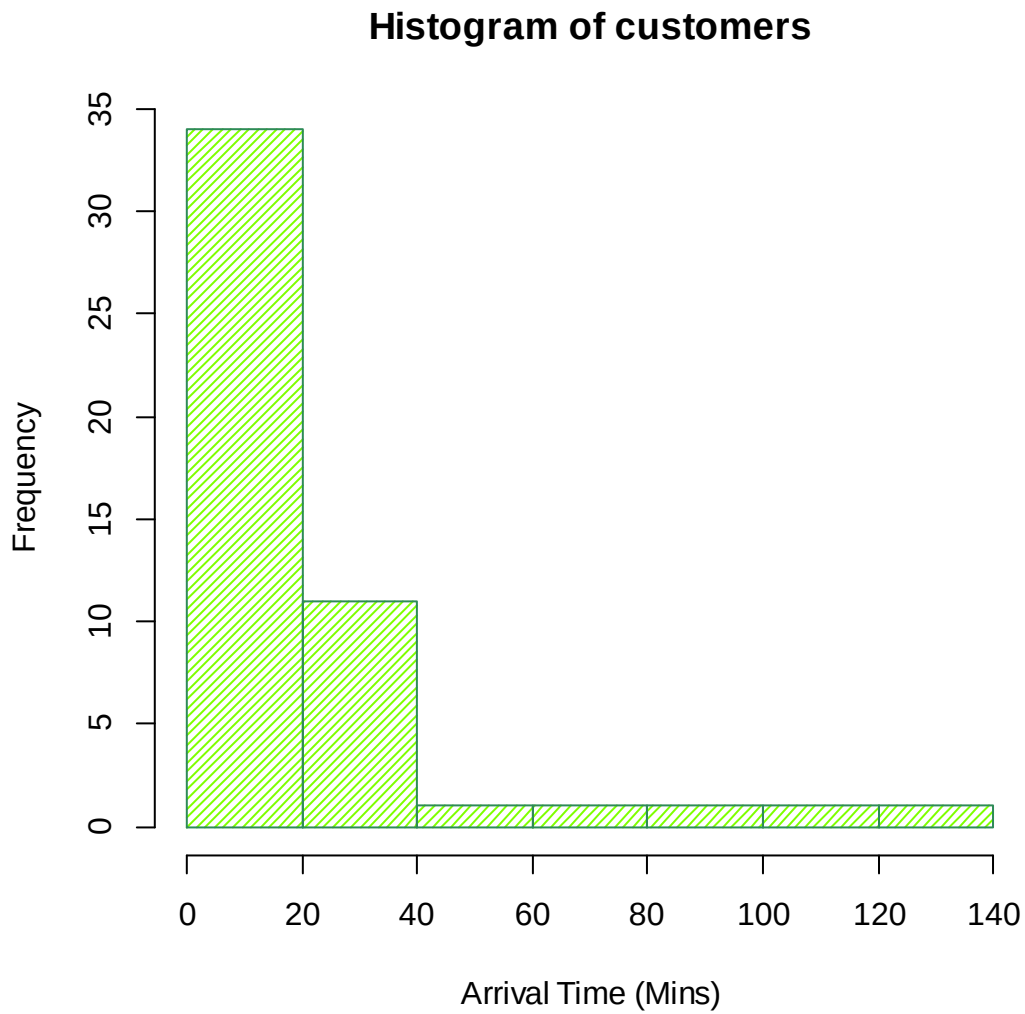
```

```
hist(sim.min.UNITYBANK,col='blue',border='seagreen',density=30, main="Histogram  
for UNITY Bank",xlab="Arrival Time (Mins)")
```

```
boxplot(sim.min.UNITYBANK,col='blue',border='seagreen',horizontal=F,ylab='Minute  
s',staplewex=1,  
        main='Interarrival times')  
text(y=boxplot.stats(sim.min.UNITYBANK)$stats,  
labels=boxplot.stats(sim.min.UNITYBANK)$stats, x=1.25)  
abline(h=quantile(sim.min.UNITYBANK,c(0.25,0.75)), col="purple")  
## Result of first and third quantiles and median  
hhh=quantile(sim.min.UNITYBANK,c(0.25,0.5,0.75))  
hhh  
##    25%    50%    75%  
## 22.05430 60.27295 79.83795
```

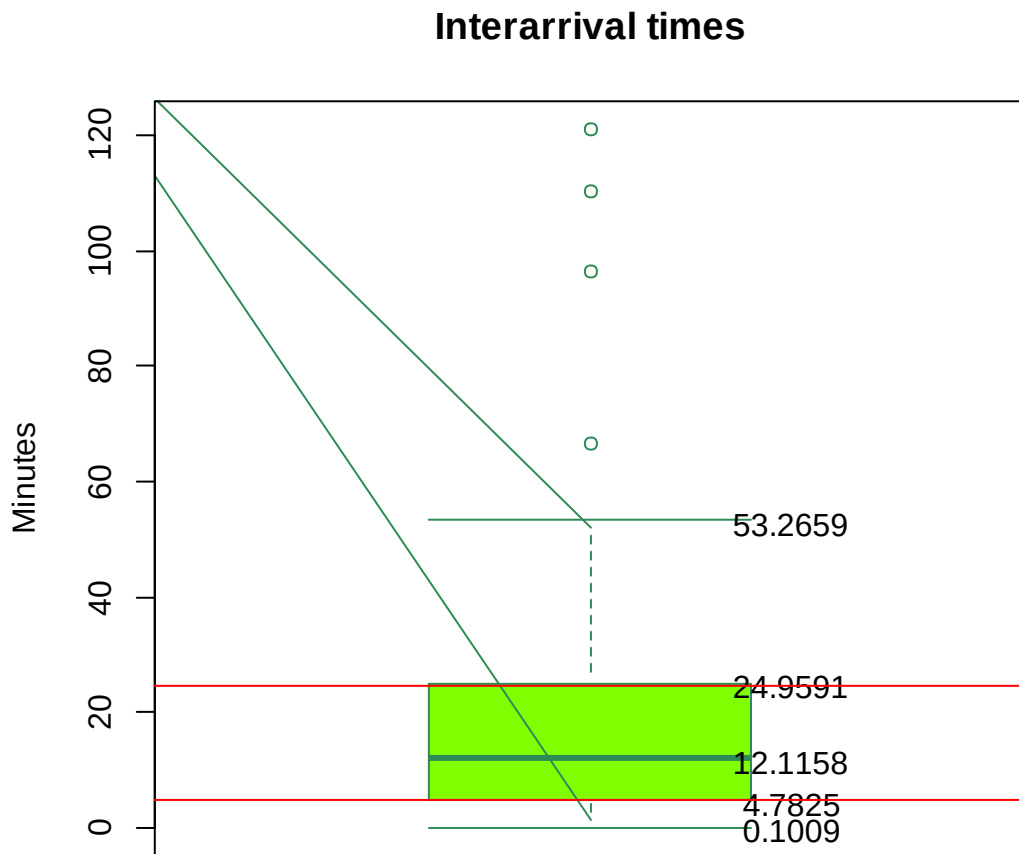
Probability distribution plot

```
time.UNITYBANK <- seq(0,0.45,0.001)  
plot(time.UNITYBANK*60,dexp(time.UNITYBANK*60,rate=1/2.42),type='l',xlab='M  
inutes',  
      ylab='Probability density',main='Probability distribution',col='red',lwd=2)  
## Cumulative distribution plot  
plot(time.UNITYBANK*60,pexp(time.UNITYBANK*60,rate=1/2.42),type='l',xlab='M  
inutes',  
      ylab='Cumulative probability',main='Cumulative distribution',col='red',lwd=2)
```



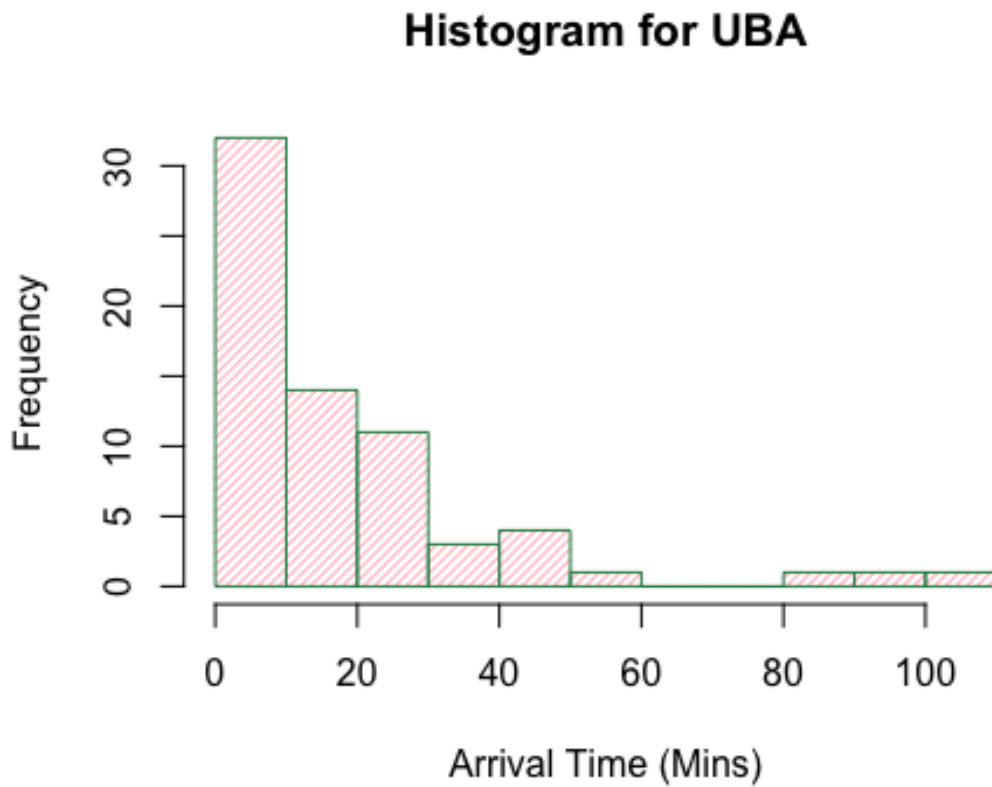
Graph 1: Histogram for Arrival Time of ATMs Users at GTBank

Graph 1 shows the histogram for arrival time of customers (ATM users) and their frequencies at GTBanks from Graph 1, it is observed that 35 users arrived at ATM in the first 20 minutes of the working hours, 10 users arrived after next 20 minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days.



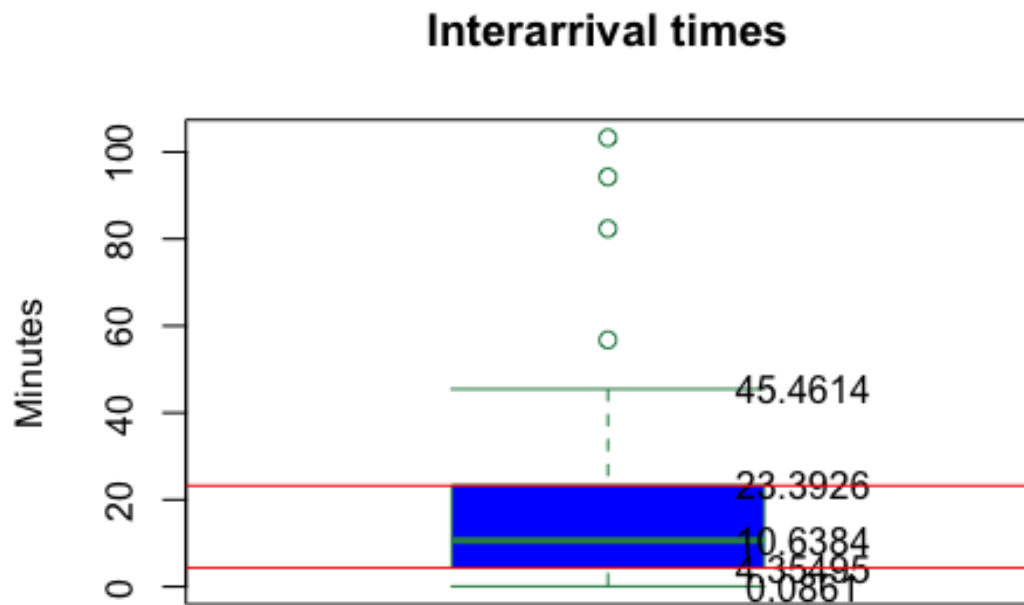
Graph 2: Box-Plot for Arrival of ATMs Users at GTBank

Graph 2 shows the box-plot for arrival time of customers (ATM users) at GTBanks. From Graph 2, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.1009, 4.7825, 12.1158, 24.9591 and 53.2659 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours



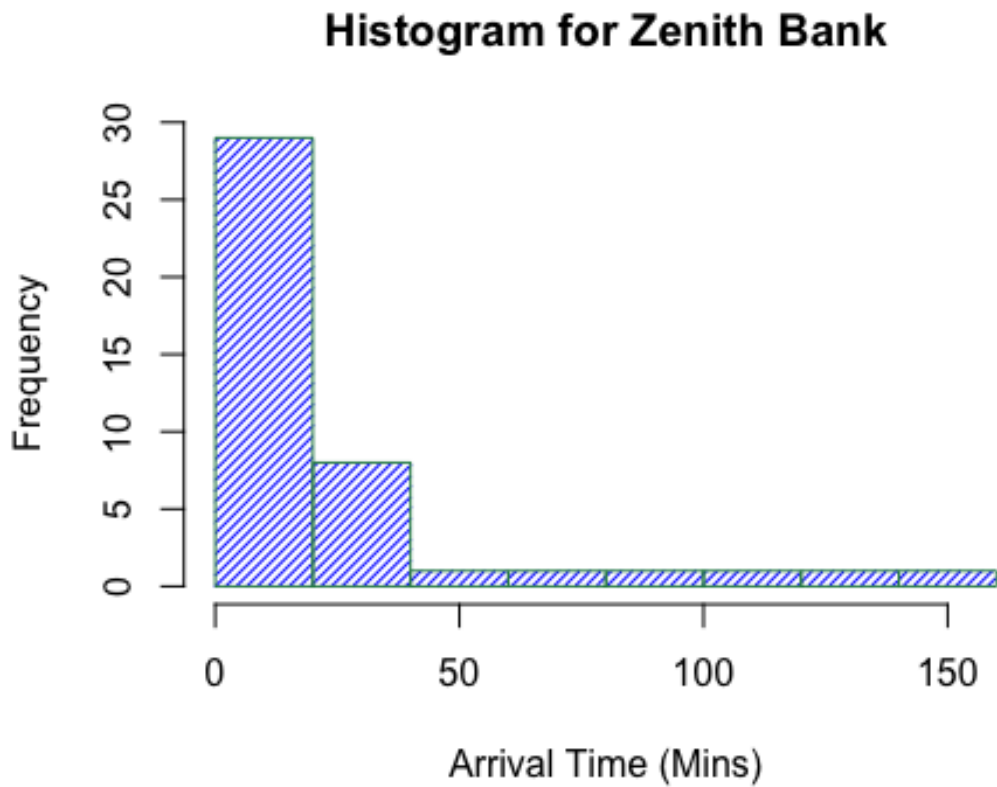
Graph 3: Histogram for Arrival Time of ATMs Users at UBA Bank

Graph 3 shows the histogram for arrival time of customers (ATM users) and their frequencies at UBA banks. From Graph 3, it is observed that over 30 users arrived at ATM in the first 10 minutes of the working hours, 14 new users arrived after next 10 minutes, 12 new users arrived in next ten minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 30 minutes to be precise.



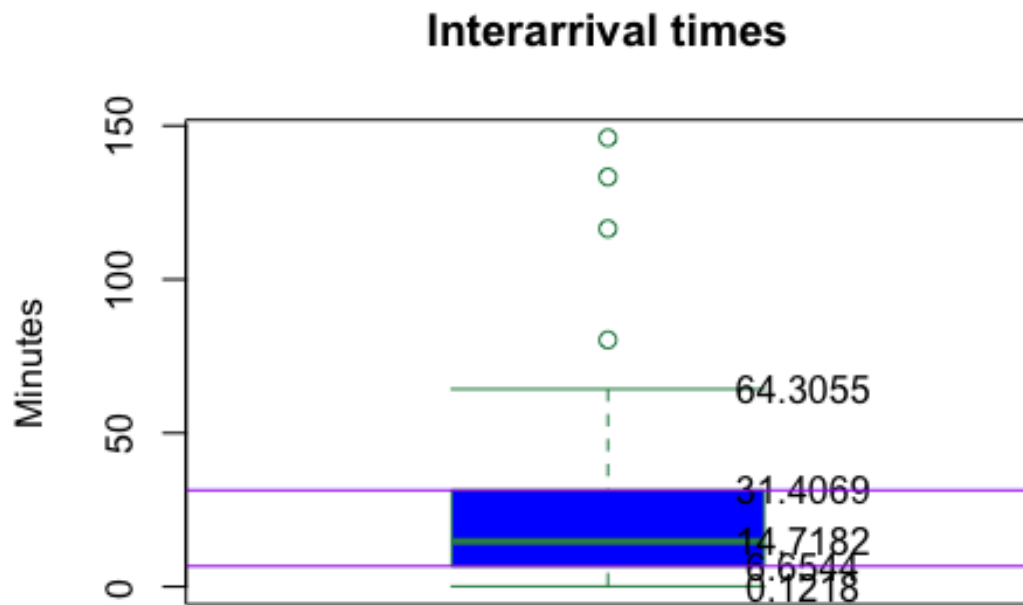
Graph 4: Box-Plot for Arrival of ATMs Users at UBA Bank

Graph 4 shows the box-plot for arrival time of customers (ATM users) at UBA Banks. From Graph 4, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.0861, 4.3549, 10.6384, 23.3926 and 45.4614 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours.



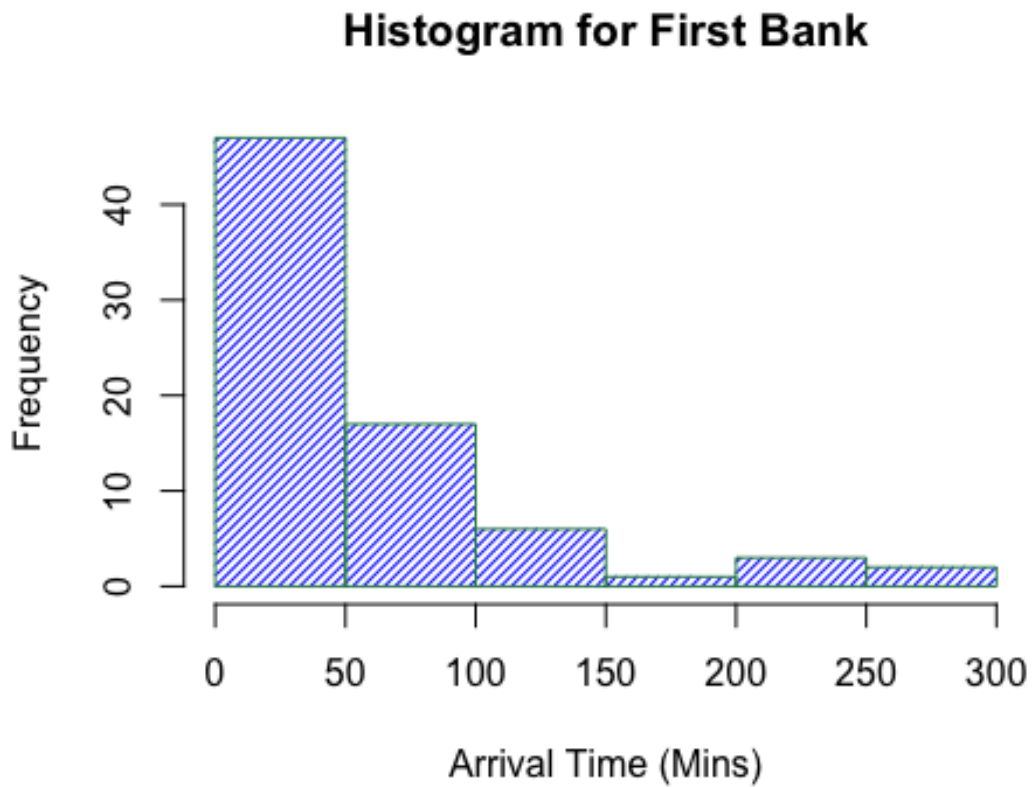
Graph 5: Histogram for Arrival Time of ATMs Users at Zenith Bank

Graph 5 shows the histogram for arrival time of customers (ATM users) and their frequencies at Zenith banks. From Graph 5, it is observed that about 30 users arrived at ATM in the first 20 minutes of the working hours, 8 new users arrived after next 20 minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 40 minutes to be precise.



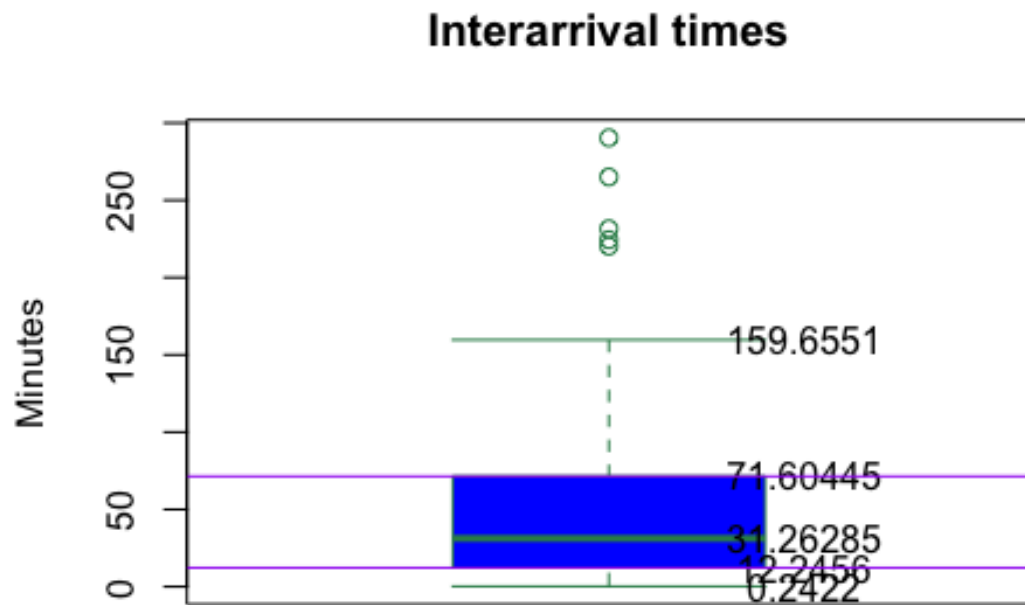
Graph 6: Box-Plot for Arrival of ATMs Users at ZENITH Bank

Graph 6 shows the box-plot for arrival time of customers (ATM users) at ZENITH Banks. From Graph 6, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.1218, 6.65544, 14.7182, 31.4069 and 64.3055 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours.



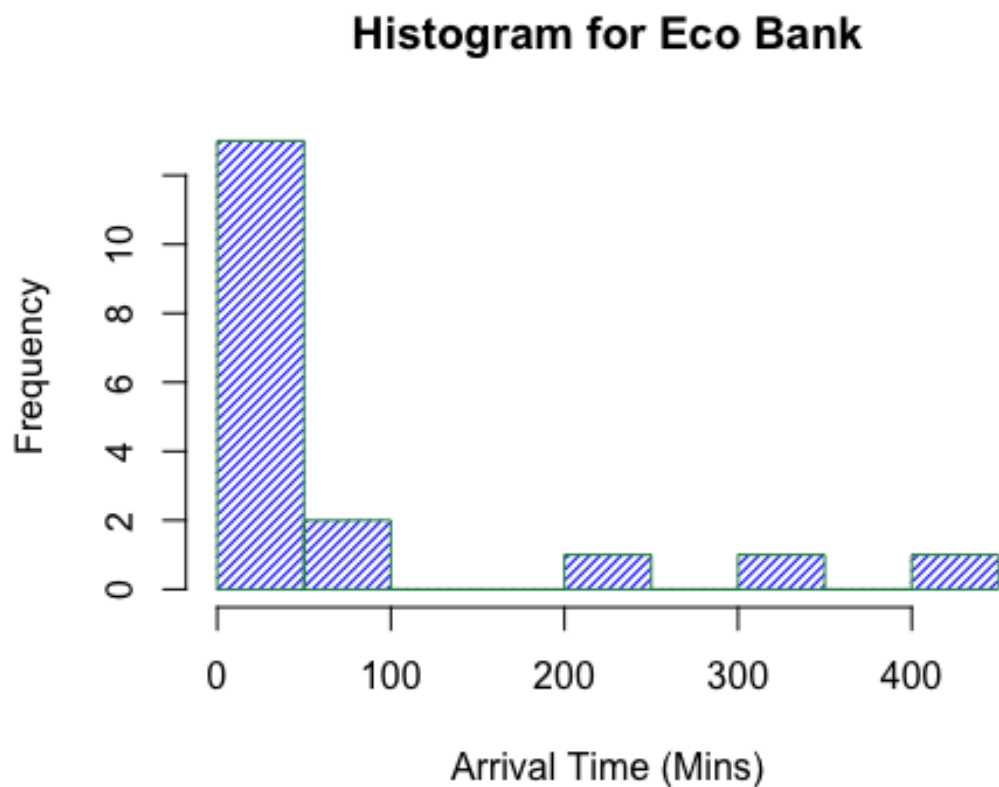
Graph 7: Histogram for Arrival Time of ATMs Users at FIRST Bank

Graph 7 shows the histogram for arrival time of customers (ATM users) and their frequencies at FIRST banks. From Graph 7, it is observed that over 50 users arrived at ATM in the first 50 minutes of the working hours, 15 new users arrived after next 50 minutes, 5 new users arrived in next 50 minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 2 hours to be precise.



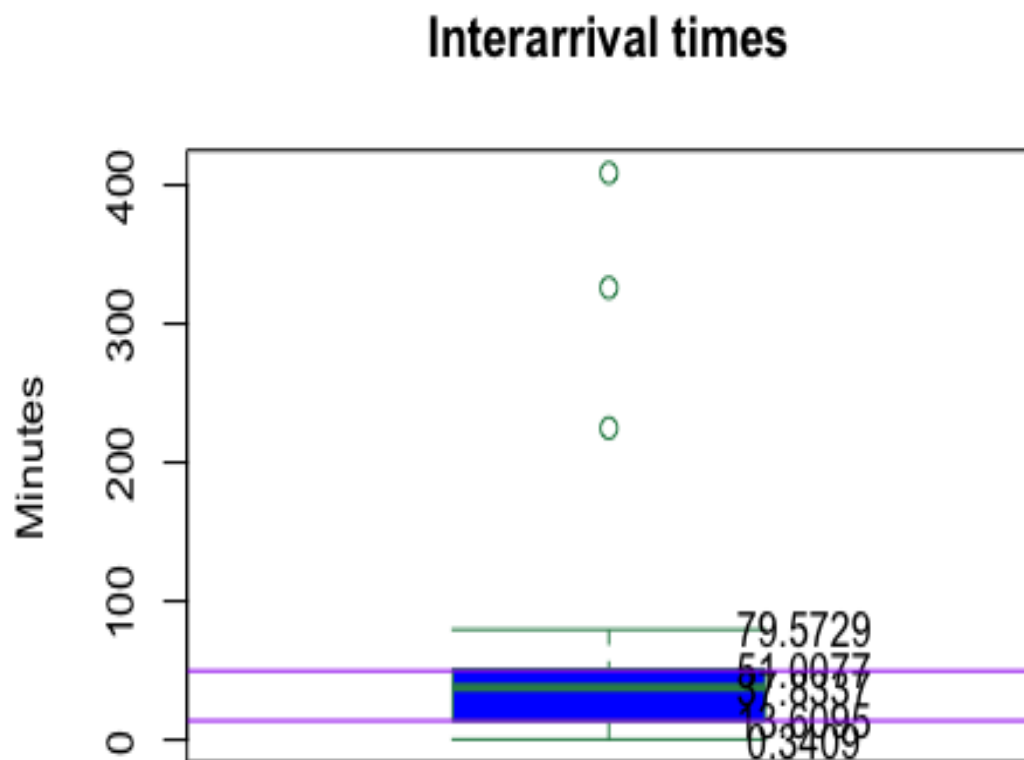
Graph 8: Box-Plot for Arrival of ATMs Users at FIRST Bank

Graph 8 shows the box-plot for arrival time of customers (ATM users) at FIRST Banks. From Graph 8, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.2422, 12.2456, 31.2629, 71.6045 and 159.6551 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours.



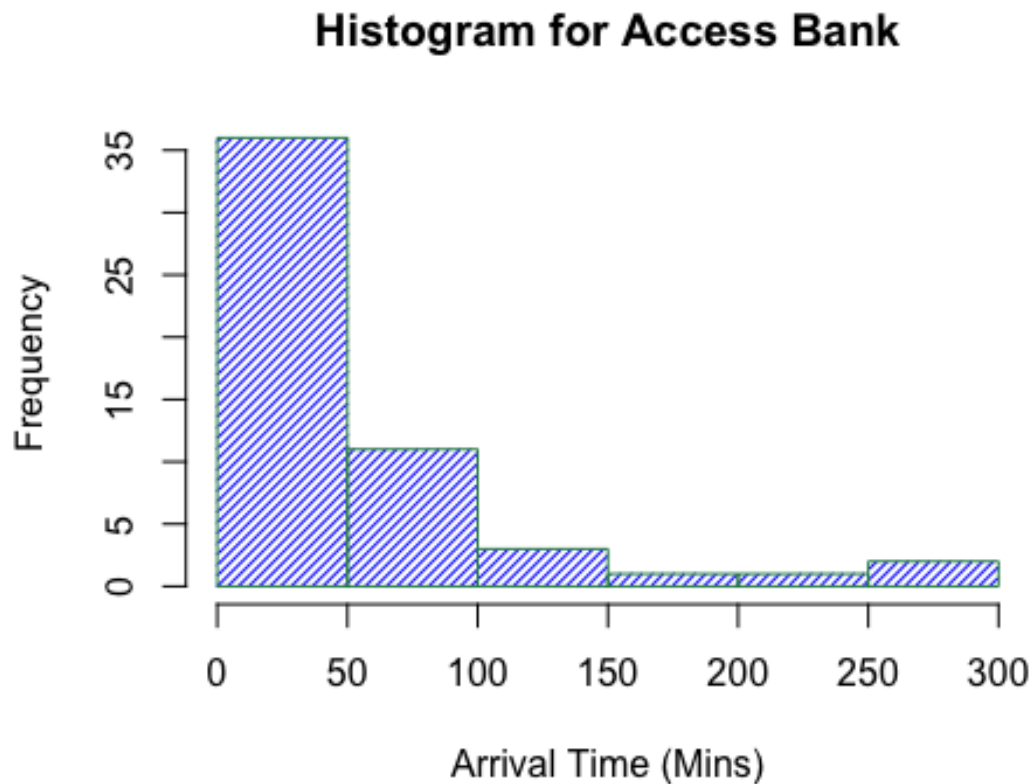
Graph 9: Histogram for Arrival Time of ATMs Users at ECO Bank

Graph 9 shows the histogram for arrival time of customers (ATM users) and their frequencies at ECO banks. From Graph 9, it is observed that over 10 users arrived at ATM in the first 50 minutes of the working hours, 2 new users arrived after next 10 minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 50 minutes to be precise.



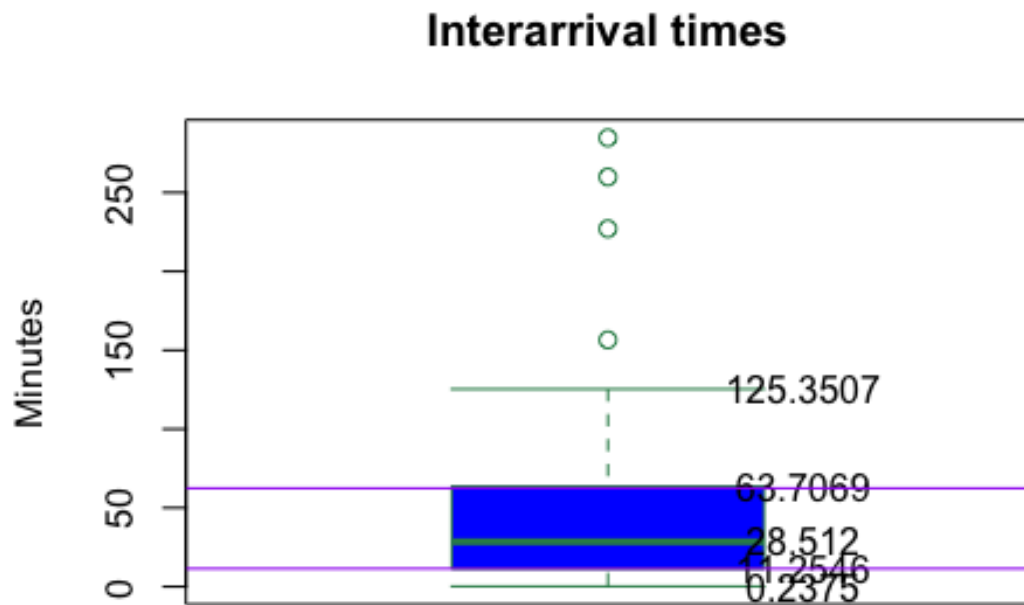
Graph 10: Box-Plot for Arrival of ATMs Users at ECO Bank

Graph 10 shows the box-plot for arrival time of customers (ATM users) at ECO Banks. From Graph 10, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.3409, 13.6095, 37.8337, 51.0077 and 79.5729 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours.



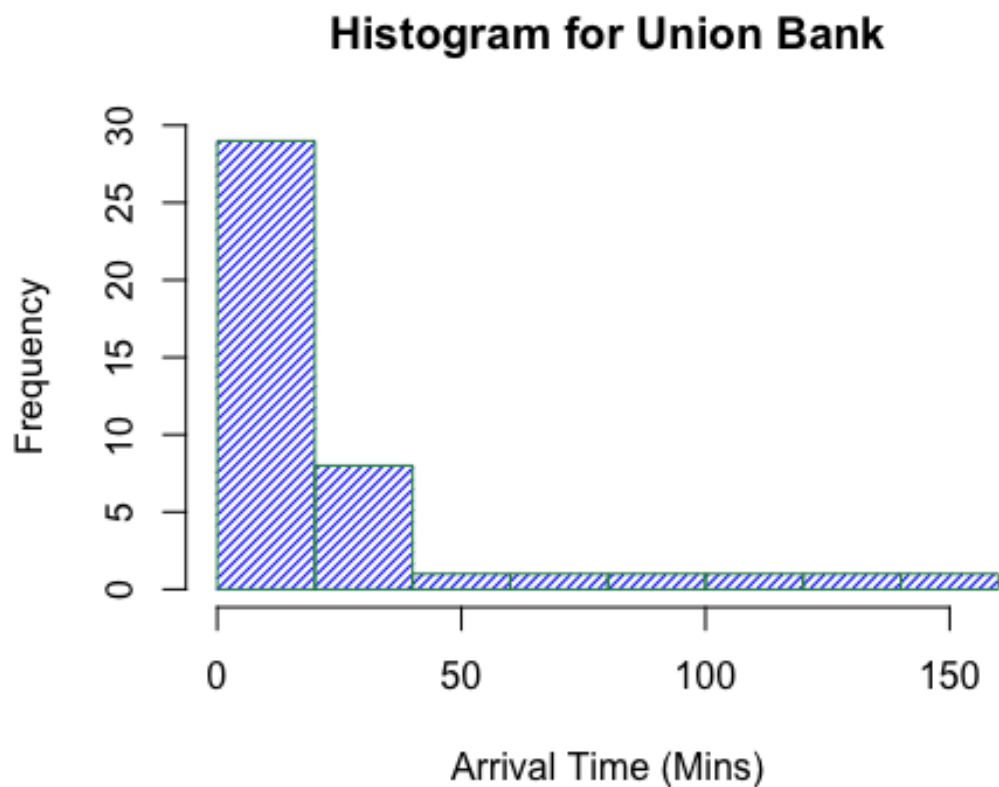
Graph 11: **Histogram for Arrival Time of ATMs Users at ACCESS Bank**

Graph 11 shows the histogram for arrival time of customers (ATM users) and their frequencies at ACCESS banks. From Graph 11, it is observed that over 35 users arrived at ATM in the first 50 minutes of the working hours, 10 new users arrived after next 50 minutes, 5 new users arrived in next 50 minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 100 minutes (1 hour, 40 minutes) to be precise.



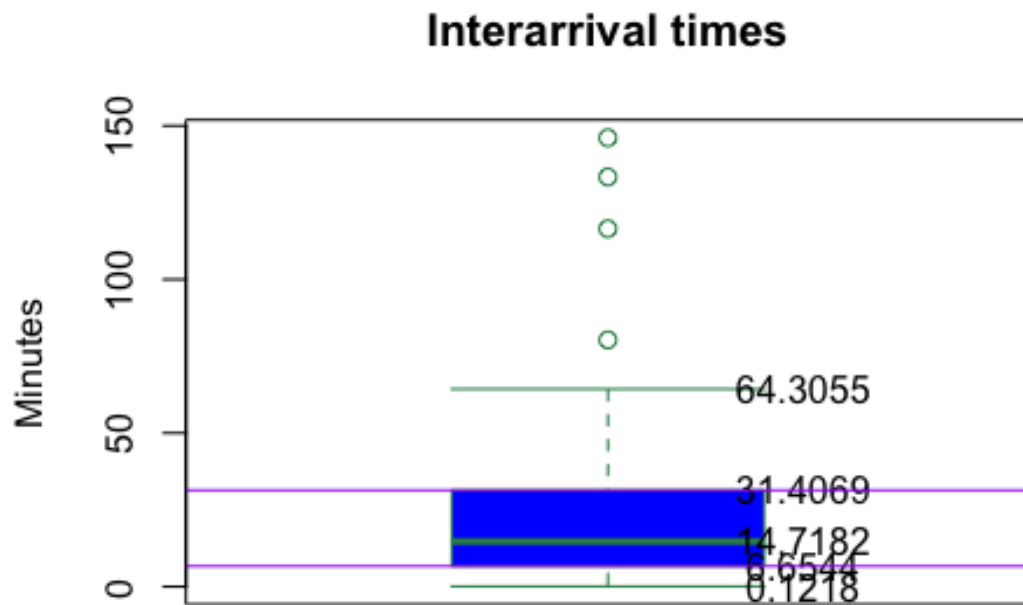
Graph 12: Box-Plot for Arrival of ATMs Users at ACCESS Banks

Graph 12 shows the box-plot for arrival time of customers (ATM users) at ACCESS Banks. From Graph 12, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.2375, 11.2546, 28.512, 63.7069 and 125.3507 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours.



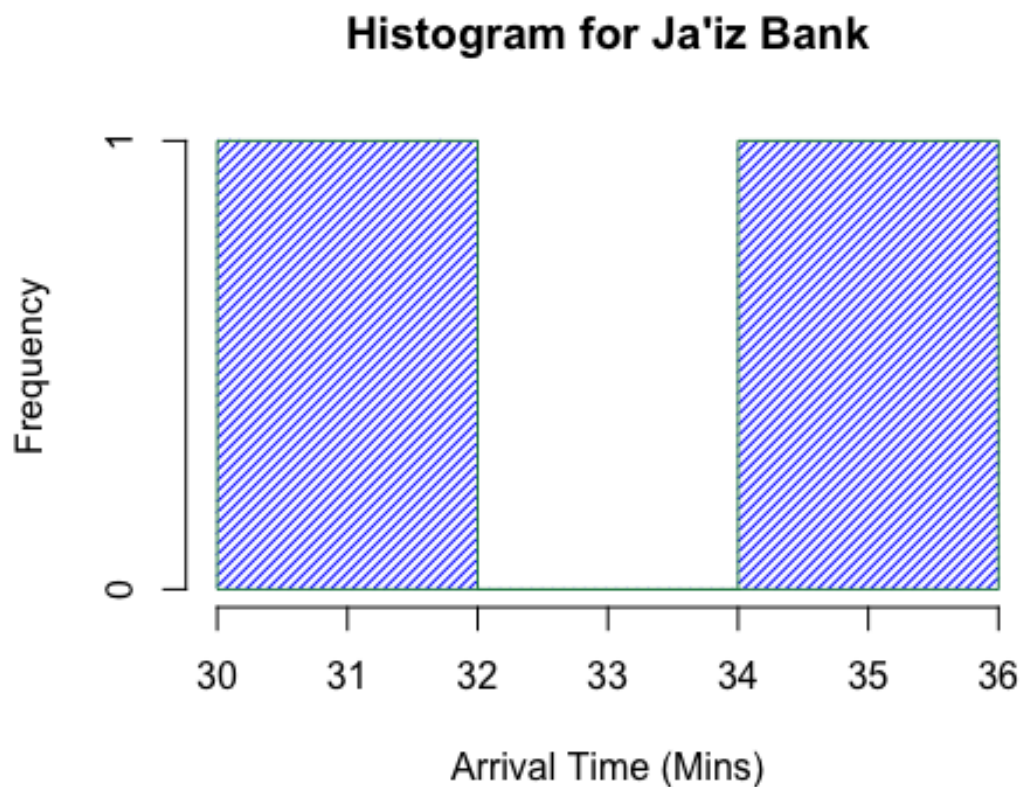
Graph 13: Histogram for Arrival Time of ATMs Users at Union Bank

Graph 13 shows the histogram for arrival time of customers (ATM users) and their frequencies at Union banks. From **Graph 13**, it is observed that over 25 users arrived at ATM in the first 20 minutes of the working hours, 8 new users arrived after next 20 minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 40 minutes to be precise.



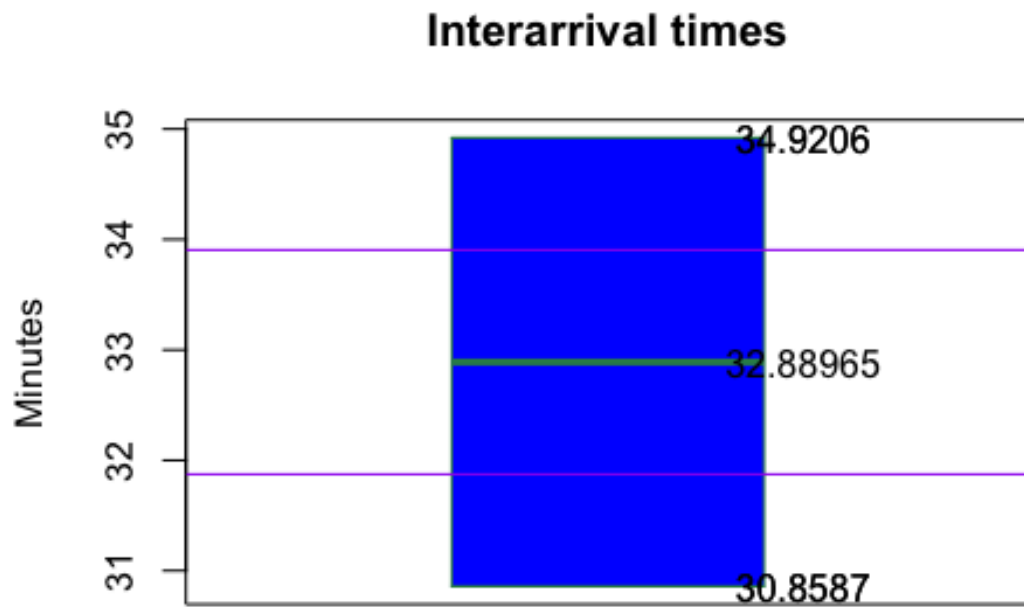
Graph 14: Box-Plot for Arrival of ATMs Users at UNION Bank

Graph 14 shows the box-plot for arrival time of customers (ATM users) at UNION Banks. From **Graph 14**, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.1218, 6.6544, 14.7182, 31.4069 and 64.3055 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours.



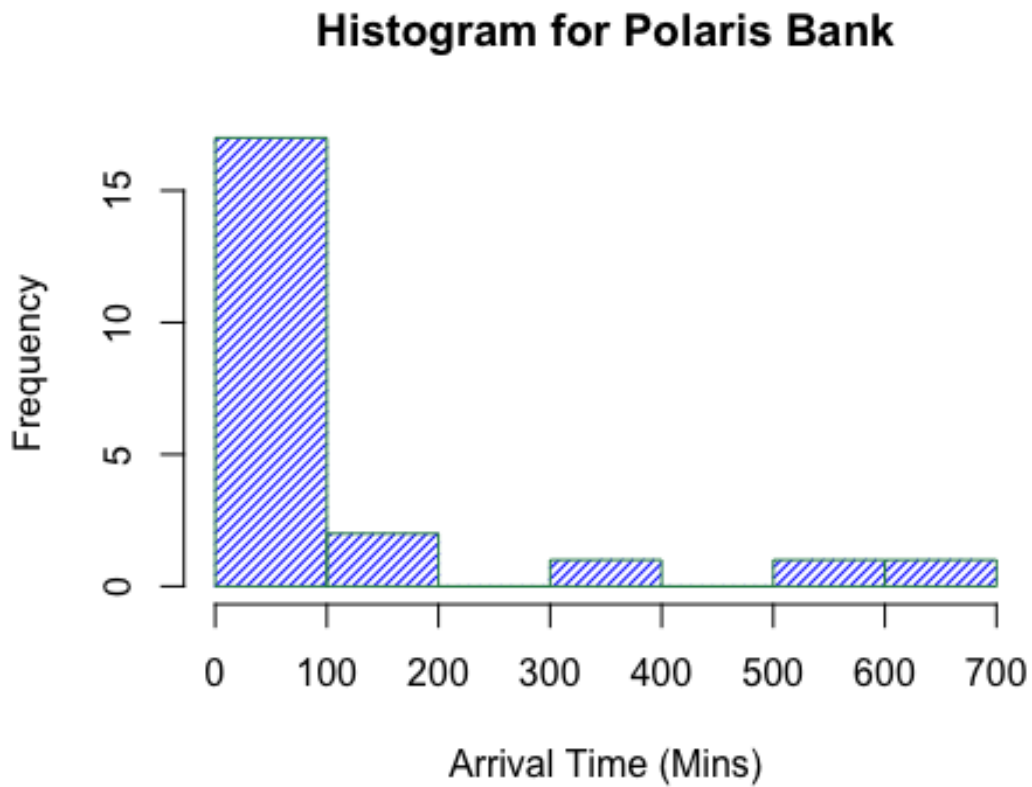
Graph 15: Histogram for Arrival Time of ATMs Users at JA'IZ Bank

Graph 15 shows the histogram for arrival time of customers (ATM users) and their frequencies at JA'IZ banks. From **Graph 15**, it is observed that over 1 users arrived at ATM in the first 32 minutes of the working hours and 1 new users arrived after next 36 minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 36 minutes to be precise.



Graph 16: Box-Plot for Arrival of ATMs Users at JA'IZ Bank

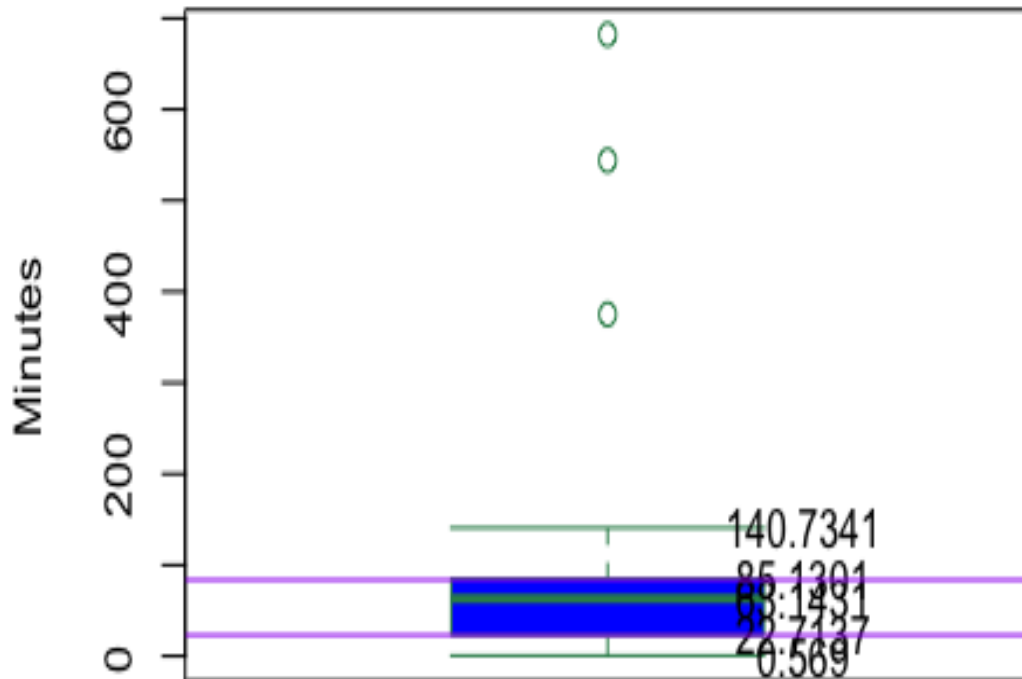
Graph 16 shows the box-plot for arrival time of customers (ATM users) at JA'IZ Banks. From **Graph 16**, it is observed that the minimum arrival minutes, median arrival minutes, and maximum arrival minutes are 30.8587, 32.8897 and 34.9206 minutes respectively. No outlier points was observed implying that ATM machines at JA'IZ bank at available for use after working hours.



Graph 17: Histogram for Arrival Time of ATMs Users at Polaris Bank

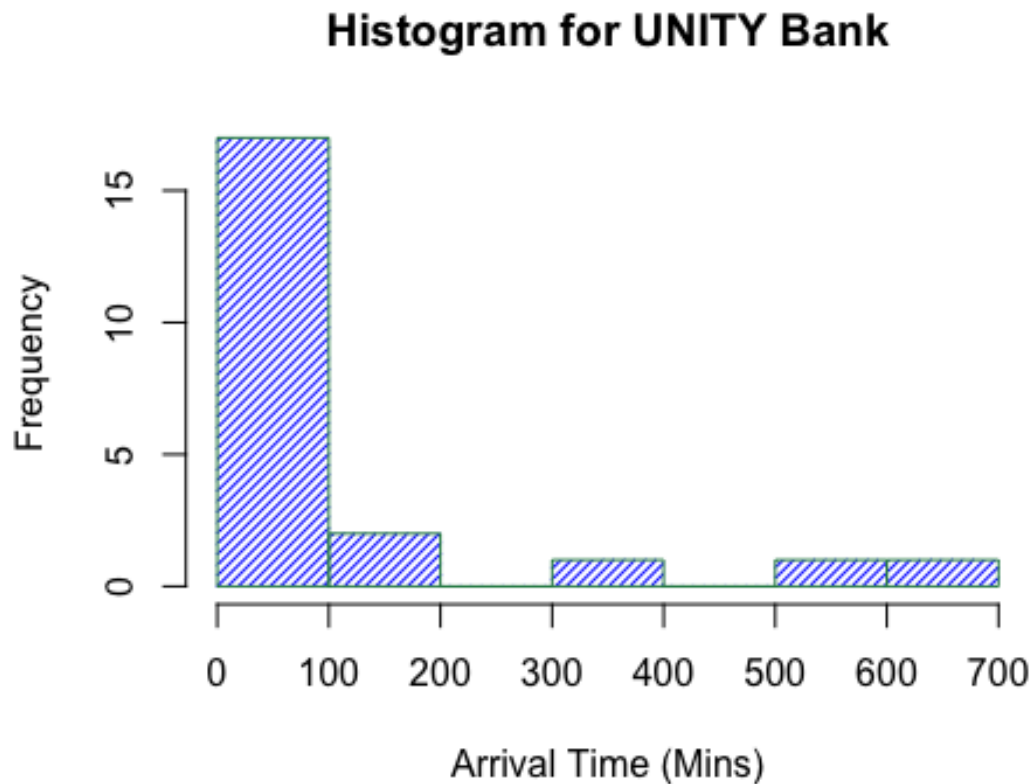
Graph 17 shows the histogram for arrival time of customers (ATM users) and their frequencies at Polaris banks. From **Graph 17**, it is observed that over 15 users arrived at ATM in the first 100 minutes of the working hours, 3 new users arrived after next 100 minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 100 minutes to be precise.

Interarrival times



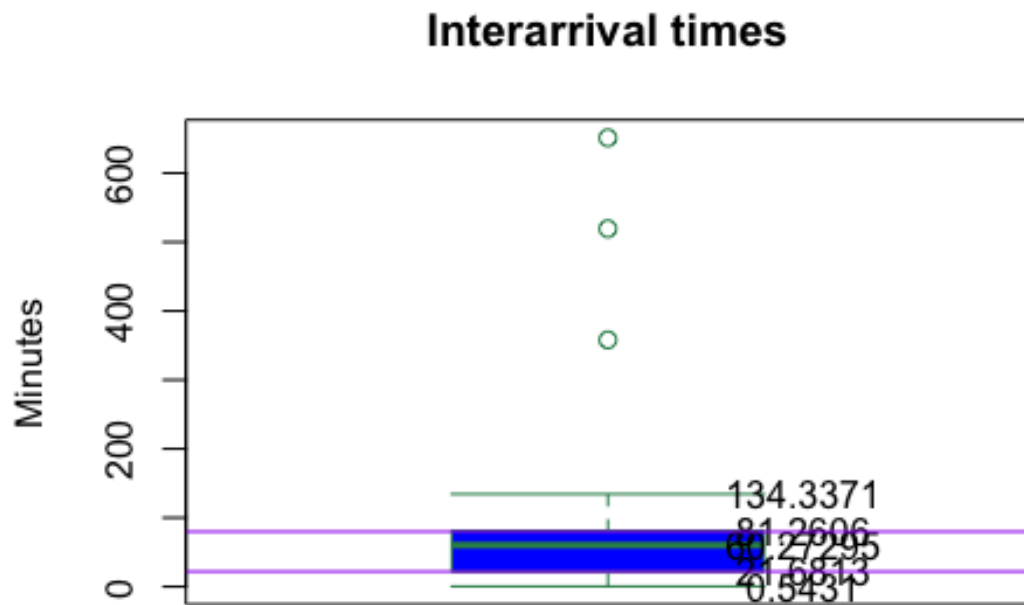
Graph 18: Box-Plot for Arrival of ATMs Users at Polaris Bank

Graph 18 shows the box-plot for arrival time of customers (ATM users) at POLARIS Banks. From fig **Graph 18**, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.569, 23.10448, 63.14310, 83.63972 and 140.7341 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours.



Graph 19: Histogram for Arrival Time of ATMs Users at Unity Bank

Graph 19 shows the histogram for arrival time of customers (ATM users) and their frequencies at Unity banks. From **Graph 19**, it is observed that over 15 users arrived at ATM in the first 100 minutes of the working hours, 2 new users arrived after next 100 minutes and less users arrived in the subsequent minutes. This implies that majority of the ATM users arrived at and utilized ATM at earlier time of the days, first 100 minutes to be precise.



Graph 20: Box-Plot for Arrival of ATMs Users at UNITY Bank

Graph 20 shows the box-plot for arrival time of customers (ATM users) at UNITY Banks. From **Graph 20**, it is observed that the minimum arrival minutes, the first quartile arrival minutes, median arrival minutes, third quartile arrival minutes and maximum arrival minutes are 0.5431, 22.0543, 60.27295, 79.83795 and 134.3371 minutes respectively as well as some outliers time of arrival. The outlier points imply that ATM users arrived at and utilized ATM even after the working hours.