A FRAMEWORK FOR THE ADOPTION OF MOBILE BANKING APPLICATIONS IN THE KENYAN BANKING SYSTEMS

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Research Project Report Submitted in Partial Fulfillment of the Requirements of Master of Science Degree in Information Systems (MSc.IS) of the University of Nairobi.

MAY 2014
DECLARATION

I, Obenga Evelyn Moraa, do hereby declare that this research project report is entirely my own work and where there’s contribution of other individuals, it has been duly acknowledged. To the best of my knowledge, this research work has not been carried out before or previously presented in any other educational institution for any award.

Signature------------------------ Date--------------------------

Obenga Evelyn Moraa

P56/73485/2012

I, Dr. Robert Oboko, do hereby certify that this project report has been presented for examination with my approval as the University of Nairobi supervisor

Signature------------------------ Date--------------------------
ACKNOWLEDGEMENTS

Firstly, I would like to express my deepest gratitude to God for His strength and grace that has made this project successful.

My sincere gratitude goes to my supervisor Dr Robert Oboko for his constant guidance above all his viable suggestions and priceless advice throughout my project, which tremendously contributed to my success within the shortest time possible.

I would like to thank my family for their endless support, patience and love throughout the project period. I sincerely appreciate their personal sacrifices that enabled me achieve the project goals.

I will also not forget to acknowledge the contributions from individuals and organizations that made this project a success. Without their support, it would be impossible to accomplish this task.
ABSTRACT

Adoption of Mobile Banking applications has become fundamental in the banking industry owing to the values that are transacted using these systems. The mobile revolution has transformed the lives of Kenyans, providing not just communication but also basic financial access in the form of phone based money transfer and storage.

More emphasis has been put in the development ignoring the adoption drivers. As a result financial service providers have spent lots of money procuring and developing mobile banking applications which the customers, who are the main users of such systems, have not embraced.

This study sought to develop a framework for the adoption of mobile-banking applications in the in the Kenyan banking sector, be able to apply the framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank as well as validate the conceptual framework.

A survey is used to collect quantitative data on the model’s predictors; intention to use and individual characteristics was used. The study established that performance expectancy, effort expectancy, facilitating conditions, perceived trust and transaction duration were key determinants for Mobile Banking applications acceptance, adoption and usage. The study further demonstrated that age, gender and awareness were moderating factors on perceived trust only.

Key words: Mobile banking applications, framework, adoption
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<th>Description</th>
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<tbody>
<tr>
<td>ANOVA</td>
<td>Analysis and Analysis of Variance</td>
</tr>
<tr>
<td>CI</td>
<td>Condition index</td>
</tr>
<tr>
<td>EE</td>
<td>Effort expectancy</td>
</tr>
<tr>
<td>FC</td>
<td>Facilitating conditions</td>
</tr>
<tr>
<td>IQR</td>
<td>Inter quartile range</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>KMO</td>
<td>Kaiser Meyer-Olkin</td>
</tr>
<tr>
<td>PCA</td>
<td>Principal Component analysis</td>
</tr>
<tr>
<td>PE</td>
<td>Performance expectancy</td>
</tr>
<tr>
<td>PT</td>
<td>Perceived trust</td>
</tr>
<tr>
<td>TAM</td>
<td>Technology Acceptance Model</td>
</tr>
<tr>
<td>TD</td>
<td>Transaction duration</td>
</tr>
<tr>
<td>TOMI</td>
<td>Trust enhanced technology Model</td>
</tr>
<tr>
<td>UTAUT</td>
<td>Unified Theory of Acceptance and Use of Technology</td>
</tr>
<tr>
<td>VIF</td>
<td>Variance inflation factor</td>
</tr>
</tbody>
</table>
CHAPTER 1: INTRODUCTION

This chapter presents the theoretical research background and problem statement, purpose of the study and research questions. It also introduces the reader to the research objectives and subsequently, research questions and justification of the study.

1.1 Background

Over the years, mobile banking has evolved from a simple information delivery channel to a comprehensive banking transaction channel and the journey has been fueled by both growing business needs and progress in mobile technology Kiran (2012).

While referring to White’s work (1998), Julio and Jose (2010) observe that mobile banking is already widely used by financial institutions in many countries and are becoming more sophisticated. Wessels and Drennan(2010) also agree with the fact that the retail banking sector has experienced changes brought about by the interaction between competitive pressure, customer needs, and technological innovation. They observe that a service delivery evolution has occurred as customers move toward technology-based self-service as opposed to traditional interpersonal service encounter.

According to Kiran (2012), technology driven progress of mobile banking can be depicted as in figure 1. The model steps may be explained as follows:

![Figure 1: Evolution of Mobile Banking Technology](source: Kiran 2012)
**SMS banking:** The early generations of mobile banking were powered by short message service (SMS) communication. Using SMS banking, banks could alert customers about activities on their bank accounts and customers could request for information by sending an SMS to a published number. This mode of banking was quite popular but had the following limitations:

**WAP banking:** In time, mobile banking progressed to Wireless Access Protocol (WAP) banking which allowed customers to access their bank accounts using a real time data communication mode. This improved the customer experience as information access was now real time and secure.

**USSD:** WAP banking, while quite popular, was restricted to a specific set of devices and the use of Unstructured Supplementary Service Data (USSD) came into practice which permitted a real-time interactive access to bank accounts on basic handsets.

**Mobile web:** The mobile communication technology progressed and mobile devices began supporting full-fledged web pages. This vastly enhanced customer experience on smart phones and sophisticated handsets which provided an almost desktop like experience. Mobile banking began progressing in this direction by providing an almost Internet banking kind of experience on the mobile phone.

**Application on mobile phone:** The mobile devices have become advanced and it is possible to have applications installed on the mobile phone to provide a rich user interface. The new generation mobile banking applications offer several comprehensive features such as:

- Pre-stored customer relationship information to improve response times and customer experience
- Enhanced communication layer security through use of encryption algorithms
- Richer user interface and mobile device specific user interface enhancing customer experience
- Richer user experience leads to more comprehensive features being offered on mobile banking

**1.2 Problem Statement**

Mobile banking is attractive because it is a convenient approach to perform remote banking, but there are adoption shortfalls in the present mobile banking implementations that are giving the users a negative perception on the use of these systems and this has contributed to less usage of
Mobile Banking among the banking customers (Chikomo et al, 2006). Only a few customers have taken Mobile Banking as a full fledged service using it for account management and financial operations, such as bill payment and funds transfers. Most of the customers would rather use Mobile Banking to get financial information, such as account information or currency exchange rates from their banks (Mennes 2009)

More emphasis has been put in the development ignoring the adoption drivers. As a result financial service providers have spent lots of money procuring and developing mobile banking applications which the customers, who are the main users of such systems, have not embraced. A recent report, (Kenya Bankers Association, 2012) points out that one of the main reasons why banks embraced Mobile Banking was to reduce queues in the banking halls, but it seems that this objective has not been achieved by mobile banking.

One of the major banks in Kenya has over the past 3 or so years been piloting an Mobile Banking environment that involves direct communication with customers (without passing through a mobile service provider), which is thought to be a more secure way of providing secure mobile banking services. The challenge so far is that the implementation has not been studied from adoption point of view to know factors influencing adoption. Therefore, they have limited information on ways of improvement of the process as well as allowing others to learn from their experience.

1.3 Objectives

1. To develop a framework for the adoption of mobile-banking applications in the in the Kenyan banking sector.

2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial banks.

3. To validate the conceptual framework.
1.4 Research Questions

This research seeks to answer the following questions

1. What is the influence of performance expectancy on behavioral intention in the adoption of Mobile Banking applications?

2. What is the effect of effort expectancy on behavioral intention in the adoption of Mobile Banking applications?

3. What is the effect of perceived trust on behavioral intention in the adoption of Mobile Banking applications?

4. What is the influence of facilitating conditions on behavioral intention in the adoption of Mobile Banking applications?

5. Is there any relationship between transaction duration and behavioral intention in the adoption of Mobile Banking applications?

1.5 Hypotheses

H1: Performance expectancy has a direct relationship with behavioral intention to adopt Mobile Banking applications.

H2a: Effort expectancy has direct effect on behavioral intention to adopt Mobile Banking applications.

H2b: Effort expectancy and age have a direct effect on behavioral intention to adopt mobile banking applications

H2C: Effort expectancy and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3a: Perceived trust has a direct effect on behavioral intention to adopt Mobile Banking applications.

H3b: Perceived trust and gender have a direct effect on behavioral intention in the adoption of Mobile Banking applications.
H3c: Perceived trust and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3d: Perceived trust and age have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H4: Facilitating conditions have a direct relationship with behavioral intention to adopt Mobile Banking applications in M-banking.

H5: Transaction duration has a direct effect on behavioral intention to adopt M-banking.

1.6 Significance of the Study

Through the implementation of this study’s findings, the banks will have a sound framework for adoption of mobile banking systems that will lead to improved integrity, confidentiality and system availability. The customers will benefit from this research due to increased system reliability and having a system that suits them.

1.7 Justification of Study

Adoption of banking systems particularly those involving customer accounts and financial transactions is paramount. Failure to address adoption factors will lead to rejection of the system and this will result financial losses due to adoption of systems that stakeholders will not embrace. It is therefore important to examine the factors that are key in the adoption of mobile banking systems.

1.8 Key Definitions

**Mobile Banking** - Conducting a number of financial transactions through a mobile device such as a mobile phone or personal digital assistant.

**Internet Banking** - This is a system that allows customers of a financial institution to conduct financial transactions on a secure website operated by the institution, which can be a retail or virtual bank, credit union or building society. Internet banking is also referred to online banking or E-banking
**Mobile payments** - involve the use of a mobile device to pay for goods or services either at the point of sale or remotely

**Mobile banking services** – transactions and activities that can be performed on a mobile banking service.
CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In this chapter, the researcher reviews the mobile banking adoption frameworks that have been used elsewhere. The chapter ends by comparing the discussed frameworks and deriving a proposed adoption framework for mobile banking system.

2.2 Mobile Banking Adoption Models

Mobile banking systems adoption by users can be attributed to various drivers or factors that are interrelated. Various models have been put forth to facilitate understanding of mobile banking systems adoption. In this section we will discuss the theoretical models and illustrate the key constructs of mobile banking systems adoption that each model addresses.

This study reviews various models that have been developed and used in earlier research to explain technology usage and behavior. These models are:

1. Trust enhanced technology Model (TOMI)
2. Rukiza et al Secure systems adoption model
3. Senk adoption model
4. Unified Theory of Acceptance and Use of Technology

2.2.1 Trust Enhanced Technology Model (TOMI)

This model is a result of modifications to the TAM model which in its original form fails to address a group of factors which include security, trust, trust attitudes and concerns related to security and trust. In this model all these factors have been grouped as trust.

To include security and trust factors into the original TAM model, Tomi et al (2008), added two factors to TAM namely: disposition to trust and perceived trust to mobile banking systems adoption. Disposition to trust describes whether a person is attitudinally willing to trust others or not while perceived trust indicates whether a person perceives that a particular solution is secure and trustworthy or not. Tomi et al (2008) found out that the security risks that they were focusing
on described the perceived security of mobile banking solutions and corresponded with the perceived trust factor. In their research they found out that the perceived security trustworthiness of different aspects of mobile banking affects the attitudes towards integration of a secure application in banking mobile banking solutions.

**Figure 2: TOMI Model Source: Tomi et al, 2008**

### 2.2.2 Rukiza Systems Adoption Model

Rukiza et al (2007)’s research validated a framework which satisfied the following hypothesis:

- Higher levels of perceived mobile banking security from the user perspective have positive significance on perceived trust thus adoption. They also found out that security measures should include both technical and non-technical security aspects. This will enhance confidentiality, integrity and accountability of critical information being transmitted between the bank and the mobile banking user. Hence it will reduce security risks, and increase privacy and trustworthiness to users.

- Perceived usefulness would have a positive influence on the behavioral intention of a user on the application.

- Perceived trust has a positive influence on behavioral intention of a user on the usage of the intended application adoption.
Behavioral intention has a direct and positive effect on the actual usage and adoption of technology. They also pointed out that organizations should conduct regular awareness training programmes to stakeholders at all levels.

Figure 3: Rukiza systems adoption model Source: Rukiza et al, 2007

2.2.3 Senk Adoption Model

This model focuses on four system adoption factors namely:

1. Perceived ease of use
2. Perceived usefulness
3. Trust
4. Attitude
**Perceive ease of use**

This variable is defined as the degree to which the stakeholder believes that adoption of the Mobile Banking application is effortless. From the organization point of view this involves the integration in the IT infrastructure as well as the actual use of the application.

**Perceived usefulness**

This is the degree to which an organization adopting the Mobile Banking application increases the performance of the organization. Senk (2013) identified five benefit dimensions for adoption of a secure system.

1. Perceived flexibility benefits
2. Improved resource access
3. Perceived cost and liquidity benefits
4. Perceived quality benefits
5. Improved focus on core business

**Trust**

Trust is interpreted as a semantic inversion off perceived risk. There are five types of risks identified under this variable namely:

1. Perceived risk
2. Perceived social risks
3. Perceived financial risks
4. Perceived operational risks
5. Perceived strategy and compliance risks
**Attitude**

This variable represents the adopter’s individual positive or negative behavior towards an innovation and is considered to be independent from the other variables.

![Diagram of Senk Adoption Model](source:senk2013)

**Figure 4: Senk Adoption Model Source: Senk 2013**

### 2.2.4 Unified Theory of Acceptance and Use of Technology

UTAUT considers four constructs hypothesized to have a significant role as direct determinants of user acceptance and usage behavior. The four constructs include; performance expectancy, effort expectancy, social influence, and facilitating conditions.

The constructs are moderated by age, gender, experience and voluntariness of use to determine user acceptance and usage behavior such that;

- The influence of performance expectancy on behavioral intention is considered to be moderated by gender and age such that the effect is stronger for men and particularly the younger men.
• The influence of effort expectancy on behavioral intention is considered to be moderated by age gender and experience such that the effect is stronger for women, particularly the younger women and at early stages of experience.

• The influence of social influence on behavioral intention is considered to be moderated by age gender, experience and voluntariness of use such that the effect is stronger for women, particularly the older women in mandatory settings in early stages of experience.

• Facilitating conditions are considered not to have significant influence on behavioral intention.

• The influence of facilitating conditions on usage is considered to be moderated by age and experience such that the effect is stronger for older people, particularly with increasing experience.

• The influence of cost on usage behavior will be taken to be stronger among older people particularly with increasing experience.

• Behavioral intention is considered to have significant positive influence on usage.

Figure 5: UTAUT Model  Source: Venkatesh et al. (2003)
### 2.3 Summary of the Gaps in the Reviewed Adoption models

Table 1: Summary of the Gaps in the Reviewed Adoption models

<table>
<thead>
<tr>
<th>MODEL</th>
<th>GAPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust enhanced technology Model (TOMI), Tomi et al (2008)</td>
<td>Fails to address facilitating conditions which include the adoption cost and if the system can fit in the existing infrastructure.</td>
</tr>
<tr>
<td>Rukiza et al Secure systems adoption model, Rukiza et al (2007)</td>
<td>Concentrates with perceived trust from the user perspective which may not be the same perception from the organization perspective.</td>
</tr>
<tr>
<td>Senk adoption model, Senk (2013)</td>
<td>Does not address facilitating conditions which include the adoption cost and if the system can fit in the existing infrastructure.</td>
</tr>
<tr>
<td>Unified Theory of Acceptance and Use of Technology, Venkatesh et al. (2003)</td>
<td>Fails to address transaction time which is likely to be a major factor which will affect adoption and usage of mobile banking applications</td>
</tr>
</tbody>
</table>
2.4 THE CONCEPTUAL FRAMEWORK

This research identifies five factors that affect the adoption of Mobile Banking application in the Kenyan mobile banking systems namely:

1. **Performance expectancy**
2. **Effort expectancy**
3. **Perceived trust**
4. **Facilitating conditions**
5. **Transaction duration**

**Figure 6: Conceptual Framework**
**Performance expectancy**

This refers to the degree to which the stakeholders believe that using Mobile Banking application will help them achieve their performance needs.

**Effort expectancy**

Effort expectancy refers to the degree of ease associated with the use of Mobile Banking application in performing mobile banking transactions.

**Perceived trust**

This is the degree to which the users believe that the system will be able to cater for mobile banking needs. Perceived trust has a positive influence on behavioral intention of a user on the usage of the intended application adoption.

**Facilitating conditions**

This is the degree to which an individual believes that the Kenyan banks and technical infrastructure exist to support use of system or service. The compatibility of the new system with the current mobile banking implementations is also considered here. This factor also looks at the cost of implementation, whether the bank directors and shareholders will be willing to fund the implementation of the Mobile Banking application.

**Transaction duration**

There is a likelihood that the customers may be concerned about the time it takes to perform mobile banking transactions using the Mobile Banking application compared to the current implementations. As much as the users may appreciate the strengths that the application comes with, the various activities involved may increase the duration of the transaction and this may have effects on the willingness to use this service. This research therefore proposes transaction duration as a factor worth considering during the adoption of Mobile Banking application.
2.5 Operationalization of Variables

Table 2: Definition of Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factors/indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectancy</td>
<td>1. Number of reported frauds within a given period of time</td>
</tr>
<tr>
<td></td>
<td>2. Number of complaints is a specific period</td>
</tr>
<tr>
<td>Effort Expectancy</td>
<td>1. The frequency of the system use in a certain period of time</td>
</tr>
<tr>
<td></td>
<td>2. The number of people who find the system easy to use.</td>
</tr>
<tr>
<td></td>
<td>3. The number of customers who find the system clear and understandable</td>
</tr>
<tr>
<td>Perceived trust</td>
<td>1. The number of who believe that the use of Mobile Banking application will seal the mobile banking loopholes.</td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>1. Availability of resources for implementation eg cost</td>
</tr>
<tr>
<td></td>
<td>2. Degree of compatibility with existing implementations</td>
</tr>
<tr>
<td></td>
<td>3. Appreciation by the management</td>
</tr>
<tr>
<td>Transaction Duration</td>
<td>1. No. of steps/authentication to access the system</td>
</tr>
<tr>
<td></td>
<td>2. Response time</td>
</tr>
<tr>
<td></td>
<td>3. Frequency of the system access by users</td>
</tr>
<tr>
<td></td>
<td>4. No of transaction rollbacks and timeouts</td>
</tr>
<tr>
<td>Level of awareness</td>
<td>1. No. of participants who are aware/have knowledge of the mobile banking system</td>
</tr>
<tr>
<td>Level of experience</td>
<td>1. The number of participants and the duration that they have used the system</td>
</tr>
<tr>
<td>Behavioral intentions</td>
<td>1. The number of participants who would be intending to use the system in the near n months</td>
</tr>
</tbody>
</table>
|                           | 2. The number of participants who predict they will be using the system in the next n months.
2.7 Hypotheses

H1: Performance expectancy has a direct relationship with behavioral intention to adopt Mobile Banking applications.

H2a: Effort expectancy has direct effect on behavioral intention to adopt Mobile Banking applications.

H2b: Effort expectancy and age have a direct effect on behavioral intention to adopt mobile banking applications.

H2C: Effort expectancy and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3a: Perceived trust has a direct effect on behavioral intention to adopt Mobile Banking applications.

H3b: Perceived trust and gender have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3c: Perceived trust and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3d: Perceived trust and age have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H4: Facilitating conditions have a direct relationship with behavioral intention to adopt Mobile Banking applications in M-banking.

H5: Transaction duration has a direct effect on behavioral intention to adopt M-banking.
CHAPTER 3: METHODOLOGY

3.1 Introduction
In this chapter, the researcher describes the research approach, research design, the sampled population and the data collection instruments used to carry out the research.

3.2 Research Approach
A quantitative approach was used in this research. The approach was implemented through a survey method.

3.3 Research Design
This study is conducted for the purpose of testing the hypothesis derived from the model presented. It is believed that studies employing hypothesis testing usually tend to explain the nature of certain relationships, or establish the differences among groups or the independence of two factors or more in a situation. Hypothesis testing offers an enhanced understanding of the relationships that exist among variables.

This research used a survey technique in the collection of data. Survey research uses scientific sampling and questionnaire design to measure characteristics of the population with statistical precision.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Variables</th>
<th>Data Collection</th>
<th>Instruments</th>
<th>Scale</th>
<th>Data sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Dependent-Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td></td>
<td>Independent- Performance Expectancy</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>H2a</td>
<td>Dependent-Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td></td>
<td>Independent- Effort expectancy</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>H2b</td>
<td>Dependent-Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td></td>
<td>Independent- Effort expectancy, Age</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>H2c</td>
<td>Dependent-Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td></td>
<td>Independent- Effort expectancy, Awareness</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>H3a</td>
<td>Dependent-Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td></td>
<td>Independent- Perceived trust</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>H3b</td>
<td>Dependent-Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
</tbody>
</table>
Table 3: Research Design Summary

<table>
<thead>
<tr>
<th>Independent</th>
<th>Dependent</th>
<th>Survey</th>
<th>Questionnaires</th>
<th>Interval</th>
<th>Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3c</td>
<td>Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>Independent</td>
<td>Perceived trust, awareness</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>H3d</td>
<td>Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>Independent</td>
<td>Perceived trust, age</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>H4</td>
<td>Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>Independent</td>
<td>Facilitating conditions</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>H5</td>
<td>Behavioral Intention</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
<tr>
<td>Independent</td>
<td>Transaction duration</td>
<td>Survey</td>
<td>Questionnaires</td>
<td>Interval</td>
<td>Customers</td>
</tr>
</tbody>
</table>

3.2 Target Population

The study’s target population was the 1012 customers for the Barclays Bank which has already implemented the mobile banking app. These customers were the suitable candidates for this research since they are users of the mobile banking applications and could therefore be able to give the required information.

3.3 Sample Size

Stratified sampling was employed during the research. This method is used when the parent population or sampling frame is made up of sub-sets of known size. These sub-sets make up different proportions of the total, and therefore sampling should be stratified to ensure that results are proportional and representative of the whole. In the case of this research, the subsets of known sizes were individual branches and several branches made up the significant percentage of the entire banking industry. Questionnaires were also distributed to male and female customers in equal proportions.

A sampling factor of 0.3 was used to obtain the sample:

\[
0.3 \times 1012 = 303 \text{ respondents.}
\]

Table 4 gives a breakdown of the number of respondents from each bank.
Table 4: Breakdown of the Respondents

<table>
<thead>
<tr>
<th>Bank</th>
<th>Branch Selected</th>
<th>Population</th>
<th>Sample of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barclays Bank</td>
<td>Bishops gate branch</td>
<td>153</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Moi avenue</td>
<td>309</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Queensway Branch</td>
<td>368</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Market branch</td>
<td>183</td>
<td>78</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>1012</strong></td>
<td><strong>303</strong></td>
</tr>
</tbody>
</table>

*Source: Researcher*

On the basis of the above sample size, the researchers expected to obtain at least 40% of usable responses.

In each branch we looked at the factors which customers consider important in the adoption of the mobile banking applications.

### 3.4 Instrument Development and Design

The design of the research instrument consisted of two sections; part one covered the demographic characteristics of the respondents and part two covered measurements for the variables in the conceptual framework (and hypotheses).

The determinants in the conceptual framework were: Performance expectancy, Effort expectancy, Perceived Trust, Facilitating conditions and Transaction Duration, gender, Experience, Awareness, Age, Behavioral intention.

### 3.5 Pilot Study

A pilot study involving 15 respondents was conducted to test the adequacy of the research instrument and to uncover potential problems for the main study. Reliability and validity tests were used as key determinants for the usefulness of the research instrument.

Each determinant had four to six questions. Factor analysis was employed to select two or three questions for every determinant. All scale questions were measured on a 5-point scale with points strongly disagree, disagree, neutral, agree and strongly agree.
3.6 Questionnaire Administration and Response rate

The questionnaires were delivered by hand to the customers at the various branches. Each questionnaire was accompanied by an introductory letter explaining the purpose of the study. Among the distributed copies 245 were returned of which 214 were found usable for analysis. 31 were discarded since they were incomplete to an extent of being unusable for analysis. The overall response rate was 71%.

The good response rate was due to the fact that a number of limitations observed during the pilot study were rectified. The questionnaire was also not unnecessarily long for the customers.

3.7 Data Management

3.7.1 Data Editing and Coding

After collecting data, coding was required so that it could be stored in the statistical package. Data was edited by checking and adjusting for errors, omissions, legibility and consistency in order to ensure completeness, consistency and readability of the data. This was done using frequency distribution in the statistical package. Data was coded by assigning characters/numbers to each answer and edited before it was entered into the statistical package. Each question or item in the questionnaire has a unique variable name, some of which clearly identify the information such as gender and age.

A coding sheet was used to keep information about how each variable was coded. It comprised a list of all variables in the questionnaire, the abbreviated variable names that were used in the statistical package and the way in which the responses were coded. Screening and cleaning of data before data analysis stage was necessary to make sure that there was no errors at the stage of keying data due to, mainly, human errors. By using descriptive statistics in the statistical package (such as frequency analysis) the data was screened by checking each variable to see if the score was out of range or for continuous variables, checking minimum, maximum, mean and standard deviation. After finding errors it was necessary to go back to the questionnaires to confirm the data before correcting the error in the data file.
3.7.2 Data Management for Multivariate Analysis

Data management is necessary before data analysis. It is essential to examine the data by checking the data file for errors. Data was then cleaned to a most suitable format for multivariate analysis by using missing data analysis.

3.7.2.1 Missing Data Analysis

The responses from the questionnaires have already been filtered and only usable questionnaires were used in the data file, but some missing data values existed. The missing values analysis was done and produced this output.

Table 5: Missing Data Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Count</th>
<th>Percent</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Q1</td>
<td></td>
<td></td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Q2</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Q4</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Q5</td>
<td></td>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Q6</td>
<td></td>
<td></td>
<td>3</td>
<td>1.40</td>
</tr>
<tr>
<td>Q7</td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Q8</td>
<td></td>
<td></td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Q9</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Q10</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Research Data 2014

Table 6: Univariate Statistics

| Variable | N     | Mean  | Std. Deviation | Missing | No. of Extremes(a,b) |
|----------|-------+-------+----------------+---------+---------------------|
|          |       |       |                | Count   | Percent  | Low | High |
| Gender   | 214   | 1.458 | 0.499          | 0       | 0.00     | 0   | 0    |
| Age      | 214   | 2.794 | 0.911          | 0       | 0.00     | 0   | 16   |
| Q1       | 214   | 5.196 | 1.218          | 0       | 0.00     | 5   | 0    |
| Q2       | 214   | 4.271 | 1.211          | 0       | 0.00     | 0   | 0    |
| Q4       | 214   | 3.734 | 1.002          | 0       | 0.00     | .   | .    |
| Q5       | 212   | 4.057 | 0.801          | 2       | 0.93     | .   | .    |
| Q6       | 211   | 3.877 | 0.880          | 3       | 1.40     | .   | .    |
| Q7       | 213   | 3.577 | 0.932          | 1       | 0.47     | 3   | 0    |
| Q8       | 213   | 3.981 | 0.995          | 1       | 0.47     | 19  | 0    |
| Q9       | 214   | 3.846 | 1.052          | 0       | 0.00     | .   | .    |
| Q10      | 213   | 3.080 | 1.068          | 1       | 0.47     | 0   | 0    |
| Q11 | 213 | 2.333 | 1.067 | 1 | 0.47 | . | . |
| Q12 | 213 | 2.319 | 1.060 | 1 | 0.47 | . | . |
| Q13 | 214 | 4.196 | 0.502 | 0 | 0.00 | . | . |
| Q14 | 214 | 4.304 | 0.594 | 0 | 0.00 | 0 | 0 |

A Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).

B Indicates that the inter-quartile range (IQR) is zero.

Source: Research Data 2014

As seen from table 5 and 6 above, the highest number of missing data in a single question was 3, which represents a percentage less than 5.

### 3.7.2.2 Multivariate Outlier Analysis

This is the stage after missing data analysis with respect to examining the data before data analysis. Multivariate outlier analysis was tested using a statistical package. It was necessary to calculate the Mahalanobis distance which is the distance of a particular case from the centroid of the remaining cases, where the centroid is the point created by the means of all the variables. Computation of the Mahalanobis measure revealed that there were no cases with outlier characteristics.

### 3.7.2.3 Multivariate Normality Analysis

Multivariate normality is the most fundamental assumption in multivariate analysis. Normality is the correspondence to the normal distribution which is the benchmark for statistical methods. Normal is used to describe a symmetrical, bell shaped curve, which has the greatest frequency of scores in the middle, with smaller frequencies towards the extremes.

Normality can be assessed by obtaining skewness and kurtosis values. Skewness indicates the symmetry of a distribution while kurtosis provides information about the peakedness of the distribution. Negative kurtosis indicates a flatter distribution while a positive kurtosis indicates a peaked distribution.

A positive skewness indicates a distribution shifted to the left while a negative skewness reflects a shift to the right. In general skewness of 1 indicates moderate skewness. Kurtosis values less
than 1 are negligible, values from 1-10 indicate moderate non-normality while values greater than 10 indicate severe non-normality.

**Table 7: Multivariate Normality Analysis**

<table>
<thead>
<tr>
<th>Description</th>
<th>N</th>
<th>Skewness</th>
<th>Std. Error</th>
<th>Kurtosis</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>214</td>
<td>0.170</td>
<td>0.166</td>
<td>-1.990</td>
<td>0.331</td>
</tr>
<tr>
<td>Age</td>
<td>214</td>
<td>1.588</td>
<td>0.166</td>
<td>3.357</td>
<td>0.331</td>
</tr>
<tr>
<td>Duration of Mobile Banking application usage</td>
<td>214</td>
<td>-1.438</td>
<td>0.166</td>
<td>1.538</td>
<td>0.331</td>
</tr>
<tr>
<td>Frequency of Mobile Banking application usage</td>
<td>214</td>
<td>0.411</td>
<td>0.166</td>
<td>-1.402</td>
<td>0.331</td>
</tr>
<tr>
<td>I have an understanding of mobile banking application</td>
<td>214</td>
<td>-1.621</td>
<td>0.166</td>
<td>2.355</td>
<td>0.331</td>
</tr>
<tr>
<td>Mobile Banking application is necessary in the Kenyan Banks</td>
<td>214</td>
<td>0.227</td>
<td>0.166</td>
<td>0.113</td>
<td>0.331</td>
</tr>
<tr>
<td>Mobile Banking application is easy to learn</td>
<td>211</td>
<td>-2.292</td>
<td>0.167</td>
<td>7.644</td>
<td>0.333</td>
</tr>
<tr>
<td>Mobile Banking application is easy to use</td>
<td>213</td>
<td>-1.112</td>
<td>0.167</td>
<td>1.823</td>
<td>0.332</td>
</tr>
<tr>
<td>I believe that adoption of Mobile Banking applications will solve the banks’ transaction needs</td>
<td>213</td>
<td>-1.557</td>
<td>0.167</td>
<td>3.516</td>
<td>0.332</td>
</tr>
<tr>
<td>Using Mobile Banking applications makes me feel better than those who do not use it</td>
<td>214</td>
<td>-1.663</td>
<td>0.166</td>
<td>3.913</td>
<td>0.331</td>
</tr>
<tr>
<td>Bank officials are available to offer help on Mobile Banking application use when I need it</td>
<td>214</td>
<td>-0.828</td>
<td>0.166</td>
<td>-0.255</td>
<td>0.331</td>
</tr>
<tr>
<td>I know how to use Mobile Banking application well</td>
<td>212</td>
<td>1.072</td>
<td>0.167</td>
<td>0.382</td>
<td>0.333</td>
</tr>
<tr>
<td>I mind transaction duration when doing a Mobile banking transaction</td>
<td>213</td>
<td>0.986</td>
<td>0.167</td>
<td>0.371</td>
<td>0.332</td>
</tr>
<tr>
<td>I intend to continue using Mobile Banking application in the near future</td>
<td>214</td>
<td>0.326</td>
<td>0.166</td>
<td>0.172</td>
<td>0.331</td>
</tr>
</tbody>
</table>

**Source: Research Data 2014**

As seen in table 7, the maximum skewness value in this research was 1.588 and the maximum kurtosis for the data was 7.644. The above results are therefore acceptable in this research.
CHAPTER 4: FINDINGS AND DISCUSSIONS

4.1 Demographics and Descriptive Statistics

4.1.1 Gender of Respondents

Table 8: Gender of Respondents

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Male</td>
<td>116</td>
<td>54.2</td>
<td>54.2</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>98</td>
<td>45.8</td>
<td>45.8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>214</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Source: Research Data 2014*

As shown in table 8 and figure 7, majority (54.2%) of the respondents in this survey were male while the rest 45.8% were female.
### 4.1.2 Age of respondents

**Figure 8: Age of respondents**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 20 Yrs</td>
<td>3</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>21-30 Years</td>
<td>87</td>
<td>40.7</td>
<td>40.7</td>
<td>42.1</td>
</tr>
<tr>
<td>31-40 Yrs</td>
<td>104</td>
<td>48.6</td>
<td>48.6</td>
<td>90.7</td>
</tr>
<tr>
<td>41-50 Yrs</td>
<td>5</td>
<td>2.3</td>
<td>2.3</td>
<td>93.0</td>
</tr>
<tr>
<td>51-60 Yrs</td>
<td>9</td>
<td>4.2</td>
<td>4.2</td>
<td>97.2</td>
</tr>
<tr>
<td>Above 60 Yrs</td>
<td>6</td>
<td>2.8</td>
<td>2.8</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>214</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Research Data 2014*

Majority 48.6% of the respondents in this study were aged between 31-40 years of age, those who aged between 21-30 followed at 40.7%, 51-60 years at 4.2%, above 60 years at 2.8% and the remaining 1.4% were aged below 20 years as shown in the table 8 and figure 9 above.
EXPERIENCE

Table 9: Duration of Mobile banking application usage

<table>
<thead>
<tr>
<th>Duration</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>5</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>1-2 Years</td>
<td>17</td>
<td>7.9</td>
<td>7.9</td>
<td>10.3</td>
</tr>
<tr>
<td>2-3 Years</td>
<td>40</td>
<td>18.7</td>
<td>18.7</td>
<td>29.0</td>
</tr>
<tr>
<td>3-4 Years</td>
<td>16</td>
<td>7.5</td>
<td>7.5</td>
<td>36.4</td>
</tr>
<tr>
<td>&gt; 4 Years</td>
<td>136</td>
<td>63.6</td>
<td>63.6</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>214</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

*Source: Research Data 2014*

![Figure 10: Duration of mobile banking application usage](image)

Table 9 and figure 10 reveals that 63.6% of the respondents had used the application for more than four years, 7.5% between 3-4 years, 18.7% between 2-3 years, 7.9% between 1-2 years and 2.3% below 1 year.
Table 10: Frequency of Mobile banking application usage

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Weekly once</td>
<td>76</td>
<td>35.5</td>
<td>35.5</td>
<td>35.5</td>
</tr>
<tr>
<td>Weekly Several Times</td>
<td>63</td>
<td>29.4</td>
<td>29.4</td>
<td>65.0</td>
</tr>
<tr>
<td>monthly once</td>
<td>16</td>
<td>7.5</td>
<td>7.5</td>
<td>72.4</td>
</tr>
<tr>
<td>Monthly several times</td>
<td>59</td>
<td>27.6</td>
<td>27.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>214</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Research Data 2014*

Figure 11: Duration of Usage Graph

From table 10 and figure 11, 35.5% of the population use the mobile banking application weekly once, 29.4% weekly several times, 27.6% monthly several times and 7.5% monthly once.
Table 11: Understanding of mobile banking application:

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Disagree</td>
<td>13</td>
<td>6.1</td>
<td>6.1</td>
<td>6.1</td>
</tr>
<tr>
<td>Disagree</td>
<td>16</td>
<td>7.5</td>
<td>7.5</td>
<td>13.6</td>
</tr>
<tr>
<td>Neutral</td>
<td>10</td>
<td>4.7</td>
<td>4.7</td>
<td>18.2</td>
</tr>
<tr>
<td>Agree</td>
<td>149</td>
<td>69.6</td>
<td>69.6</td>
<td>87.9</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>26</td>
<td>12.1</td>
<td>12.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>214</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 12: Understanding of mobile banking application. Source: spss

Table 11 and figure 12 reveals that 69.6% of the respondents understood the mobile banking application, 12.1% strongly understand the usage of mobile banking application, 4.6% neutral while 13.6 did not understand the usage of mobile banking application.
### Table 12: Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>214</td>
<td>1.458</td>
<td>0.499</td>
</tr>
<tr>
<td>Age</td>
<td>214</td>
<td>2.757</td>
<td>0.923</td>
</tr>
<tr>
<td>Duration of Mobile Banking application usage</td>
<td>214</td>
<td>5.196</td>
<td>1.218</td>
</tr>
<tr>
<td>Frequency of Mobile Banking application usage</td>
<td>214</td>
<td>4.271</td>
<td>1.211</td>
</tr>
<tr>
<td>I have an understanding of mobile banking application</td>
<td>214</td>
<td>3.734</td>
<td>1.002</td>
</tr>
<tr>
<td>Mobile Banking application is necessary in the Kenyan Banks</td>
<td>214</td>
<td>4.192</td>
<td>0.518</td>
</tr>
<tr>
<td>Mobile Banking application is easy to learn</td>
<td>211</td>
<td>3.877</td>
<td>0.880</td>
</tr>
<tr>
<td>Mobile Banking application is easy to use</td>
<td>213</td>
<td>3.577</td>
<td>0.932</td>
</tr>
<tr>
<td>I believe that adoption of Mobile Banking applications will solve the banks’ transaction needs</td>
<td>213</td>
<td>3.981</td>
<td>0.995</td>
</tr>
<tr>
<td>Using Mobile Banking applications makes me feel better than those who do not use it</td>
<td>214</td>
<td>3.846</td>
<td>1.052</td>
</tr>
<tr>
<td>Bank officials are available to offer help on Mobile Banking application use when I need it</td>
<td>214</td>
<td>3.692</td>
<td>1.056</td>
</tr>
<tr>
<td>I know how to use Mobile Banking application well</td>
<td>212</td>
<td>4.344</td>
<td>1.057</td>
</tr>
<tr>
<td>I mind transaction duration when doing a Mobile banking transaction</td>
<td>213</td>
<td>2.319</td>
<td>1.060</td>
</tr>
<tr>
<td>I intend to continue using Mobile Banking application in the near future</td>
<td>214</td>
<td>4.196</td>
<td>0.502</td>
</tr>
</tbody>
</table>

*Source: Research Data 2014*

Table 13 provides a descriptive analysis of the data. The average number of respondents was 214. The table also shows the average responses and the corresponding standard deviations.

### 4.2 Factor Analysis

Factor analysis is a statistical analysis that can be used to analyze interrelationships among large number of variables and to explain those variables in terms of their common underlying dimensions (factors). Factor analysis involves condensing of information contained in original variables into smaller set of dimensions with minimum loss of information.

This research used principal component analysis with verimax rotation to analyze the data using the statistical package. The results comprised of tests carried out on quantitative data including Cronbach’s Alpha and Factor Analysis.
4.2.1 Statistical Assumptions of Factor Analysis and Preliminary Analysis

i. Linearity
Factor analysis is a linear process so there needs to be a careful examination of any departures from linearity. Small sample sizes are vulnerable to non-linearity.

ii. Multivariate Normality
The dependent variables should be normally distributed for each combination of independent variables. The smaller the sample size, the more important it is to screen data for normality.

iii. Homoscedasticity
This was checked by testing the residuals and assuring that they were dispersed randomly throughout the range of the estimated dependent variable.

iv. No outliers
This research used Mahalanobis distance to identify cases which were multivariate outliers.

v. Factorability of correlation matrix
The researcher must look for correlations that are great than 3. If several values in the correlation matrix exceed 0.3 then it is appropriate to use factor analysis. The anti-image correlation matrix was used to assess the sampling adequacy of each variable. Only variables with sampling adequacy of greater than 0.5 are included in the analysis. Both Bartlett’s test of sphericity and Kaiser Meyer-Olkin (KMO) measure of sampling adequacy was used to determine the factorability of the matrix as a whole. If Bartlett’s test of sphericity is significantly large among some of the variables, and Kaiser Meyer-Olkin index is greater than 0.6 then factorability is assumed.

vi. Absence of high Multicollinearity
Multicollinearity increases the standard error of factor loadings, making them less reliable and thereby making more difficult the process of inferring labels for factors. To detect Multicollinearity in factor analysis, KMO statistics may be used, or data first screened in regression analysis using variance inflation factor (VIF) or tolerance. KMO and correlation matrix were used to detect Multicollinearity and collinear terms were eliminated prior to factor analysis.
vii. **Adequate sample size**
At a minimum there must be more cases than factors. The sample size of this research is 214 thus it meets the minimum cut off.

4.2.1.1 **Reliability Analysis**
Prior to conducting factor analysis it was necessary to check reliability of the scale used to confirm that the scale used consistently reflected being measured. Cronbach’s Alpha was used to measure the scale of reliability.

Cronbach’s Alpha value varies from 0-1, with higher values being desirable. The average Cronbach’s Alpha for the scale used in this research was 0.601. The threshold for the Cronbach’s Alpha value is any value above 0.500 thus from the reliability results above, the Cronbach’s Alpha value of 0.601 is statistically acceptable.

4.2.1.2 **Kaiser Meyer Olkin (KMO) and Bartlett’s Test of Sphericity**
Kaiser Meyer Olkin (KMO) measures sampling adequacy while Bartlett’s is a test of sphericity. Bartlett’s Test examines the hypothesis that the group of variances is the same and dependent variables are uncorrelated in the population. The KMO statistic varies between 0-1. Values nearest 1 are desirable for factor analysis. It is also desirable that Bartlett’s value $p<0.05$.

<table>
<thead>
<tr>
<th>Table 13: KMO and Bartlett's Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</td>
</tr>
<tr>
<td>Bartlett's Test of Sphericity</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*Source: Research Data 2014*

Table 14 presents the KMO and Bartlett test results. The KMO value from the above table is 0.576. The above results are acceptable the basis on which factor analysis was done.
4.2.2 Factor Extraction

Factor analysis was run on the sample. The extraction method used was principal component analysis (PCA) with varimax rotation method.

Table 14: Factor Extraction by Principal Component Analysis

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative %</td>
</tr>
<tr>
<td>3</td>
<td>1.503</td>
<td>15.032</td>
<td>1.503</td>
</tr>
<tr>
<td>5</td>
<td>0.843</td>
<td>8.435</td>
<td>0.843</td>
</tr>
<tr>
<td>6</td>
<td>0.673</td>
<td>6.731</td>
<td>0.673</td>
</tr>
<tr>
<td>7</td>
<td>0.493</td>
<td>4.934</td>
<td>0.493</td>
</tr>
<tr>
<td>8</td>
<td>0.377</td>
<td>3.771</td>
<td>0.377</td>
</tr>
<tr>
<td>9</td>
<td>0.266</td>
<td>2.659</td>
<td>0.266</td>
</tr>
<tr>
<td>10</td>
<td>0.041</td>
<td>0.410</td>
<td>0.041</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

Source: Research Data 2014

In running factor analysis not all factors are retained in the analysis. The eigenvalues associated with each factor represent the variance explained by that particular linear component and SPSS also displays the eigenvalues in terms of variance e.g. factor 1 explains 25.786 % of variance. SPSS extracts all factors with eigenvalues greater than 1 thus leaving 4 factors which are displayed in the columns labeled Extraction Sums of Squared Loadings. The values which are not moved to the above column are discarded. The factors after rotation are displayed in the columns Rotation Sums of Squared Loadings. Rotation optimizes the factor structure thus the relative importance of the four factors is equalized.

This preliminary analysis therefore resulted in a solution of 4 factors selected for further analysis.
4.2.3 Factor Rotation

The rotated component matrix was examined for items and the factors further tested with varimax rotation method. This resulted in the table 16.

Table 15: Rotated Component Matrix

<table>
<thead>
<tr>
<th></th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>0.697</td>
<td>-0.002</td>
<td>0.197</td>
<td>-0.141</td>
</tr>
<tr>
<td>EE1</td>
<td>0.772</td>
<td>0.033</td>
<td>0.14</td>
<td>0.205</td>
</tr>
<tr>
<td>EE2</td>
<td>0.739</td>
<td>-0.253</td>
<td>0.036</td>
<td>0.157</td>
</tr>
<tr>
<td>PT1</td>
<td>0.189</td>
<td>0.038</td>
<td>0.902</td>
<td>0.044</td>
</tr>
<tr>
<td>PT2</td>
<td>0.054</td>
<td>0.01</td>
<td>0.927</td>
<td>-0.081</td>
</tr>
<tr>
<td>FC1</td>
<td>0.036</td>
<td>0.161</td>
<td>-0.046</td>
<td>0.932</td>
</tr>
<tr>
<td>FC2</td>
<td>-0.021</td>
<td>0.971</td>
<td>0.027</td>
<td>0.096</td>
</tr>
<tr>
<td>TD</td>
<td>-0.005</td>
<td>0.97</td>
<td>0.029</td>
<td>0.079</td>
</tr>
<tr>
<td>BI</td>
<td>0.672</td>
<td>0.313</td>
<td>-0.078</td>
<td>-0.323</td>
</tr>
</tbody>
</table>

Source: Research Data 2014

Normally researchers accept a loading of an absolute value of more than 0.3 to be important. Where the scale has an acceptable loading on more than one component, one of these loadings can be reduced to the component with the highest value. E.g. B1 is loaded on component 1 (0.672) and 2 (0.313), therefore the loading on component 2 is eliminated since it is less than component 1.

Table 16: Scale for factor analysis

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>Mobile Banking application is necessary in the Kenyan banks</td>
</tr>
<tr>
<td>EE1</td>
<td>Mobile Banking application is easy to learn</td>
</tr>
<tr>
<td>EE2</td>
<td>Mobile Banking application is easy to use</td>
</tr>
<tr>
<td>PT1</td>
<td>I believe that adoption of Mobile Banking applications will solve the banks’ transaction needs</td>
</tr>
<tr>
<td>PT2</td>
<td>Using Mobile Banking application makes me feel better than those who do not use it</td>
</tr>
<tr>
<td>FC1</td>
<td>Bank officials are available to offer help on Mobile Banking application use when I need it</td>
</tr>
<tr>
<td>FC2</td>
<td>I know how to use the Mobile Banking application well</td>
</tr>
<tr>
<td>TD</td>
<td>I mind transaction duration during a mobile banking transaction</td>
</tr>
<tr>
<td>BI</td>
<td>I intend to continue using Mobile Banking application mobile banking in the near future</td>
</tr>
</tbody>
</table>

Source: Research Data 2014

Table 17 above provides a description of the initials used in the rotated component matrix results presented in table 15.
4.2.4 Validation of Factor Analysis Results

The research examined if the factor model is stable and generalizable and if the factor solution is impacted by outliers. Stability was examined by splitting the sample into two in order to see if factor structure and commonalities remain the same. The data file had 214 respondents thus splitting the sample into two halves resulted to more than 50 cases each which is the minimum.

4.2.4.1 Comparison of the Communalities of the two Validation Samples

A comparison was made on the two splits created above. While the communalities differed for the two models, in all cases they were above 0.3, indicating the factor model is explaining more than half of the variance in all the original variables.

Table 17: Component Matrix (a) SPLIT 1

<table>
<thead>
<tr>
<th>Component</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Banking application is necessary in the Kenyan Banks</td>
<td>0.704</td>
</tr>
<tr>
<td>Mobile Banking application is easy to learn</td>
<td>0.711</td>
</tr>
<tr>
<td>Mobile Banking application is easy to use</td>
<td>0.667</td>
</tr>
<tr>
<td>I believe that adoption of Mobile Banking applications will solve the banks’ transaction needs</td>
<td>0.569</td>
</tr>
<tr>
<td>Using Mobile Banking applications makes me feel better than those who do not use it</td>
<td>0.506</td>
</tr>
<tr>
<td>Bank officials are available to offer help on Mobile Banking application use when I need it</td>
<td>0.393</td>
</tr>
<tr>
<td>I know how to use Mobile Banking application well</td>
<td>0.964</td>
</tr>
<tr>
<td>I mind transaction duration when doing a Mobile banking transaction</td>
<td>0.961</td>
</tr>
<tr>
<td>I intend to continue using Mobile Banking application in the near future</td>
<td>0.445</td>
</tr>
</tbody>
</table>

Source: Research Data 2014

Table 18 provides the factor rotation results for the first half of the split sample. All cases in this table are above 0.30 thus confirming the results in table 16.

Table 18: Rotated Component Matrix (a) - SPLIT 2

<table>
<thead>
<tr>
<th>Component</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Banking application is necessary in the Kenyan Banks</td>
<td>0.577</td>
</tr>
<tr>
<td>Mobile Banking application is easy to learn</td>
<td>0.864</td>
</tr>
<tr>
<td>Mobile Banking application is easy to use</td>
<td>0.665</td>
</tr>
<tr>
<td>I believe that adoption of Mobile Banking applications will solve the banks’ transaction needs</td>
<td>0.986</td>
</tr>
<tr>
<td>Using Mobile Banking applications makes me feel better than those who do not use it</td>
<td>0.988</td>
</tr>
<tr>
<td>Bank officials are available to offer help on Mobile Banking application use when I need it</td>
<td>0.462</td>
</tr>
<tr>
<td>I know how to use Mobile Banking application well</td>
<td>0.97</td>
</tr>
<tr>
<td>I mind transaction duration when doing a Mobile banking transaction</td>
<td>0.969</td>
</tr>
<tr>
<td>I intend to continue using Mobile Banking application in the near future</td>
<td>0.709</td>
</tr>
</tbody>
</table>

Source: Research Data 2014
Table 19 provides the factor rotation results for the first half of the split sample. Just like in table 18, all cases in this table are above 0.30 thus confirming the results in table 16.

The two rotated factor matrices for each split of the sample produced the same pattern of loadings for both validation analysis of the complete sample. The pattern factor loadings for both validation analyses show the same pattern of variables, though the components switched places. This result validates the factor solution obtained.

**4.2.5 Interpretation of the Factors**

Five of the conceptual framework variables are supported by results of factor analysis. These variables include:

- Performance expectancy
- Effort expectancy
- Perceived trust
- Facilitating conditions
- Transaction duration

**4.3 Multiple Regression Analysis**

Regression analysis is a statistic technique used to investigate the relationships between a dependent variable and one or more independent variables. Multiple linear regression is used in this study to investigate the relationship between the behavioral intention and the five dependent variables.

Regression coefficients can be used to evaluate the strength of the relationship between the independent variable and the dependent variable. $R^2$ value provides a measure of the predictive ability of the model. The close the $R^2$ value to 1 the better the regression equation fit to the data.

The F test is used to test the significance of the regression model as a whole. $F$ is a function of $R^2$, the number of independent variables and the number of cases. $F$ is computed with $k$ and $(n-1)$ degrees of freedom, where $k =$ number of terms in the equation not counting the constant (Garson, 2008). The decision rule for F-ratio is to reject the null hypothesis if $F$ is greater than
the critical value of an appropriate level of significance, and not to reject the null hypothesis when F value is smaller or equal to the critical value of an appropriate level of significance.

Multiple regression analysis was used in this study to test the research hypothesis. The regression model can be presented as follows;

\[ BI=a+b_1PE+b_2EE+b_3PT+b_4FC+b_5TD+e \]

Where

- \( BI = \) behavioral intention
- \( PE = \) performance expectancy
- \( EE = \) effort expectancy
- \( PT = \) perceived trust
- \( FC = \) facilitating conditions
- \( TD = \) transaction duration
- \( a = \) the constant where regression intercepts the y axis
- \( b = \) regression coefficients
- \( e = \) random error

4.4 Assumptions for Regression Analysis and Analysis of Variance (ANOVA)

Analysis of variance, ANOVA, was used because it is suitable for analyzing more than two conditions. The fact than ANOVA can test more than one treatment is a major advantage over other statistical analysis methods such as t-test.

Before applying regression analysis and ANOVA, the following assumptions were tested to make sure the properness of the analysis.
Absence of outliers

Generally an outlier whose standardized residual is greater than 3.3 should be dropped from all regression models. The data file had the 2.0 as the greatest standardized residual.

Linearity

Examining the residual scatter is the most common way to identify any nonlinear patterns in the data. The scatter plot of standardized residuals versus the fitted values was visually inspected. The plots did not reveal any non linear patterns in the data indicating a linear relationship in all the regression models in this study. The scatter plots are presented in appendix G.

Tolerance and Multicollinearity

Tolerance = $1 - R^2$

Where $R^2$ is the multiple R of a given dependent variable regressed on all other independent variables.

If the tolerance value is less than 0.20, the independent should be dropped from the analysis due to Multicollinearity

Variance Inflation Factor (VIF)

This is the reciprocal of tolerance. When VIF is greater than 4.0, Multicollinearity is the problem.

Condition Index

Many researchers suggest condition indexes over 15 indicate possible Multicollinearity and over 30 indicate serious Multicollinearity problems.

Table 19: Multicollinearity Test

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE</th>
<th>INDEPENDENT VARIABLES</th>
<th>TOLERANCE</th>
<th>VIF</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention</td>
<td>Performance expectancy</td>
<td>0.677</td>
<td>1.478</td>
<td>10.044</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>Effort expectancy</td>
<td>0.636</td>
<td>1.583</td>
<td>17.887</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>Effort expectancy and</td>
<td>0.720</td>
<td>1.457</td>
<td>18.669</td>
</tr>
<tr>
<td></td>
<td>Awareness</td>
<td>Behavioral Intention</td>
<td>Behavioral Intention</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>Effort expectancy and age</td>
<td>0.937</td>
<td>1.068</td>
<td>14.116</td>
<td></td>
</tr>
<tr>
<td>Perceives trust</td>
<td>0.350</td>
<td>2.856</td>
<td>15.814</td>
<td></td>
</tr>
<tr>
<td>Perceives trust and age</td>
<td>0.563</td>
<td>2.244</td>
<td>14.736</td>
<td></td>
</tr>
<tr>
<td>Perceives trust and gender</td>
<td>0.563</td>
<td>2.249</td>
<td>14.526</td>
<td></td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>1.000</td>
<td>1.000</td>
<td>6.509</td>
<td></td>
</tr>
<tr>
<td>Transaction duration</td>
<td>1.000</td>
<td>1.000</td>
<td>4.770</td>
<td></td>
</tr>
</tbody>
</table>

Source: Research Data 2014

Table 20 shows results for tolerance, variance inflation factor and condition index. All tolerance values are more than the accepted 0.200 with the minimum value being 0.350. The variance inflation factor values are less than 4.00 and the maximum condition index is 18.669

**Normally Distributed Error Term**

A histogram and a normal probability (P-P plot) are the methods to use to assess whether the error terms are normally distributed. This research tested normality using these two methods. The histograms and P-P plots are in appendix E and F respectively.

**Independent error terms (No autocorrelation)**

Uncorrelated error term in a data set means the current values should not be correlated with previous values. I.e. for any two observations within the data series, it’s assumed that knowing one observation treatment tells nothing about the other observation. Dubin-Watson coefficient tests auto-correlation.

Dubin-Watson values range from 0-4, close to 0 indicates extreme positive autocorrelation; close to 4 indicates extreme negative autocorrelation and close to 3 indicates no serious autocorrelation (Garson, 2008) Durbin-Watson values should range between 1.5 and 2.5 to indicate independence of observations. Positive autocorrelation means standard errors of the beta coefficients are too small while negative autocorrelation means standard errors are too large. (Garson, 2008)

The tested Dubin-Watson values are summarized in table 21.
Table 20: Dubin-Watson values

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE</th>
<th>INDEPENDENT VARIABLES</th>
<th>DURBIN-WATSON VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention</td>
<td>Performance Expectancy</td>
<td>1.899</td>
</tr>
<tr>
<td></td>
<td>Effort Expectancy</td>
<td>1.543</td>
</tr>
<tr>
<td></td>
<td>Perceives trust</td>
<td>1.754</td>
</tr>
<tr>
<td></td>
<td>Facilitating Conditions</td>
<td>2.049</td>
</tr>
<tr>
<td></td>
<td>Transaction duration</td>
<td>1.583</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>Performance expectancy and age</td>
<td>1.928</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>Effort expectancy and age</td>
<td>1.7935</td>
</tr>
<tr>
<td></td>
<td>Effort expectancy and awareness</td>
<td>1.175</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>Perceives trust and age</td>
<td>1.92</td>
</tr>
<tr>
<td></td>
<td>Perceives trust and gender</td>
<td>1.9875</td>
</tr>
<tr>
<td></td>
<td>Perceives trust and awareness</td>
<td>1.501</td>
</tr>
<tr>
<td></td>
<td>Transaction duration and gender</td>
<td>2.0665</td>
</tr>
<tr>
<td></td>
<td>Transaction duration and age</td>
<td>1.98895</td>
</tr>
</tbody>
</table>

*Source: Research Data 2014*

Table 21 presents Durbin-Watson values for the data. All the variables meet have values within the accepted range of between 1.5 and 2.5.

### 4.4.1 Hypotheses Testing

In this section the researcher tested the following hypotheses:

H1: Performance expectancy has a direct relationship with behavioral intention to adopt Mobile Banking applications.

H2a: Effort expectancy has direct effect on behavioral intention to adopt Mobile Banking applications.

H2b: Effort expectancy and age have a direct effect on behavioral intention to adopt mobile banking applications

H2C: Effort expectancy and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3a: Perceived trust has a direct effect on behavioral intention to adopt Mobile Banking applications.
H3b: Perceived trust and gender have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3c: Perceived trust and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3d: Perceived trust and age have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H4: Facilitating conditions have a direct relationship with behavioral intention to adopt Mobile Banking applications in M-banking.

H5: Transaction duration has a direct effect on behavioral intention to adopt M-banking.

**4.4.1.1 Testing for Direct Effects**

There are five independent variables, Performance expectancy, effort expectancy, perceived trust, facilitating conditions and transaction duration in the regression model. These factors were regressed against behavioral intention and provided the results in the table 22.

**Table 21: Direct Effects Test**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Performance Expectancy</td>
<td>0.609</td>
<td>0.06</td>
<td>0.608</td>
<td>10.21</td>
</tr>
<tr>
<td>Effort Expectancy</td>
<td>0.14</td>
<td>0.048</td>
<td>0.13</td>
<td>2.862</td>
</tr>
<tr>
<td>Perceived Trust</td>
<td>0.012</td>
<td>0.054</td>
<td>0.011</td>
<td>0.246</td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>0.031</td>
<td>0.086</td>
<td>0.024</td>
<td>0.602</td>
</tr>
<tr>
<td>Transaction Duration</td>
<td>0.117</td>
<td>0.137</td>
<td>0.071</td>
<td>0.854</td>
</tr>
</tbody>
</table>

Dependent Variable: I intend to continue using Mobile Banking application in the near future

*Source: Research Data 2014*

**Explanation:**

*H1: Performance expectancy has a direct relationship with behavioral intention to adopt Mobile banking applications.*
The test results for this hypothesis produced a $\beta$ value of 0.608 with a standard error of 0.06 and 0.001 significance. Only positive beta values indicate a direct relationship. Testing this hypothesis obtained positive beta weight hence the hypothesis was not rejected.

\textit{H2a: Effort expectancy has direct effect on behavioral intention to adopt Mobile banking applications.}

The test results for this hypothesis produced a $\beta$ value of 0.14 with a standard error of 0.48 and 0.109 significance. Only positive beta values indicate a direct relationship. Testing this hypothesis obtained positive beta weight hence the hypothesis was not rejected.

\textit{H3a: Perceived trust has a direct effect on behavioral intention to adopt Mobile banking applications.}

The test results for this hypothesis produced a $\beta$ value of 0.012 with a standard error of 0.054 and 0.443 significance. Only positive beta values indicate a direct relationship. Testing this hypothesis obtained positive beta weight hence the hypothesis was not rejected.

\textit{H4: Facilitating conditions have a direct relationship with behavioral intention to adopt Mobile banking applications in M-banking.}

The test results for this hypothesis produced a $\beta$ value of 0.031 with a standard error of 0.086 and 0.58 significance. Only positive beta values indicate a direct relationship. Testing this hypothesis obtained positive beta weight hence the hypothesis was not rejected.

\textit{H5: Transaction duration has a direct effect on behavioral intention to adopt M-banking.}

The test results for this hypothesis produced a $\beta$ value of 0.117 with a standard error of 0.137 and 0.394 significance. Only positive beta values indicate a direct relationship. Testing this hypothesis obtained positive beta weight hence the hypothesis was not rejected.

\textbf{4.4.1.2 Testing Moderating Effects.}

The statistics that describe the moderating effect include beta weights and multiple R-square. These values are presented for each product term that represents a moderating effect.
With respect to interaction variables, the relationships are measured by Beta values, which represent the strength of the relationship. The Beta for the interaction of the moderator with the variable provides information regarding the interaction effect.

The Beta values should not be less than 0.1 and if they go beyond 1, there is a sign of Multicollinearity. The scale for Beta values is as follows:

- If the Beta value is between 0.1 and 0.3, there is small effect
- If the value is 0.3 and 0.50 there is a medium effect
- Above 0.50 denotes a large effect
- Less than 0.1 denotes lack of effect on the variable

Table 22: The moderating effect of gender

<table>
<thead>
<tr>
<th>PT*GENDER</th>
<th>( R^2 )</th>
<th>beta</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT*GENDER</td>
<td>0.876</td>
<td>0.310</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Source: Research Data 2014

Explanation

H3b: Perceived trust and gender have a direct effect on behavioral intention in the adoption of Mobile banking applications.

According to the results in table 24, regressing gender and perceived trust against behavioral intention produced a beta value of 0.310 with a level of significance of 0.001. The beta value was above the threshold value of 0.300 thus the hypothesis was not rejected.

Table 23: The moderating effect of age

<table>
<thead>
<tr>
<th>EE*AGE</th>
<th>( R^2 )</th>
<th>beta</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE*AGE</td>
<td>0.859</td>
<td>0.181</td>
<td>0.001</td>
</tr>
<tr>
<td>PT*AGE</td>
<td>0.866</td>
<td>0.305</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Source: Research Data 2014
H2b: Effort expectancy and age have a direct effect on behavioral intention to adopt mobile banking applications

According to the results in table 25, regressing age and effort expectancy against behavioral intention produced a beta value of 0.181 with a level of significance of 0.001. The value of 0.181 is not statistically significant since it is less than the critical value of 0.300 thus this hypothesis was rejected.

H3d: Perceived trust and age have a direct effect on behavioral intention in the adoption of Mobile banking applications.

According to the results in table 25, regressing age and perceived trust against behavioral intention produced a beta value of 0.305 with a level of significance of 0.001. The beta value was above the threshold value of 0.30 thus the hypothesis was not rejected.

Table 24: The moderating effect of awareness

<table>
<thead>
<tr>
<th></th>
<th>R²</th>
<th>Beta</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE*AWARENESS</td>
<td>0.193</td>
<td>0.130</td>
<td>0.087</td>
</tr>
<tr>
<td>PT*AWARENESS</td>
<td>0.971</td>
<td>0.467</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Source: Research Data 2014

H2c: Effort expectancy and awareness have a direct effect on behavioral intention in the adoption of Mobile banking applications.

According to the results in table 26, regressing awareness and effort expectancy against behavioral intention produced a beta value of 0.130 with a level of significance of 0.087. The beta value was below the threshold value of 0.30 thus the hypothesis was rejected.

H3c: Perceived trust and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

According to the results in table 26, regressing awareness and perceived trust against behavioral intention produced a beta value of 0.467 with a level of significance of 0.002. The beta value was above the threshold value of 0.30 thus the hypothesis was not rejected.
The above analysis therefore led to rejection of hypothesis H2b and H2c while the hypotheses below were not rejected:

H1: Performance expectancy has a direct relationship with behavioral intention to adopt Mobile Banking applications.

H2a: Effort expectancy has direct effect on behavioral intention to adopt Mobile Banking applications.

H3a: Perceived trust has a direct effect on behavioral intention to adopt Mobile Banking applications.

H3b: Perceived trust and gender have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3c: Perceived trust and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H3d: Perceived trust and age have a direct effect on behavioral intention in the adoption of Mobile Banking applications.

H4: Facilitating conditions have a direct relationship with behavioral intention to adopt Mobile Banking applications in M-banking.

H5: Transaction duration has a direct effect on behavioral intention to adopt M-banking.

4.5 The Resulting Model

A model was derived that identified five factors that have a relationship with behavioral intention in the adoption of Mobile Banking applications. These variables were:

1. Performance expectancy
2. Effort expectancy
3. Perceived trust moderated by gender age and awareness
4. Facilitating conditions
5. Transaction duration
Figure 13: The Resulting Model  

Source: Research Data 2014
4.6 DISCUSSION

This research can be summarized as shown in table 25 below.

Table 25: Research Summary

<table>
<thead>
<tr>
<th>HYPOTHESIS</th>
<th>RESULTS</th>
<th>MEANING</th>
<th>OBJECTIVES ACHIEVED</th>
</tr>
</thead>
</table>
| H1a        | Not Rejected | There is a direct relationship between performance expectancy and behavioral intention | 1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.  
2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.  
3. To validate the conceptual framework. |
| H2a        | Not Rejected | There is a direct relationship between effort expectancy and behavioral intention | 1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.  
2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.  
3. To validate the conceptual framework. |
| H2b        | Rejected     | Age does not have a moderating effect on effort expectancy               | 1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.  
2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.  
3. To validate the conceptual framework. |
| H2c        | Rejected     | Awareness does not have a moderating effect                             | 1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.  
2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.  
3. To validate the conceptual framework. |
<table>
<thead>
<tr>
<th></th>
<th>H3a</th>
<th>Not Rejected</th>
<th>Effect on effort expectancy</th>
<th>Applications in the Kenyan banking sector.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Perceived trust has a direct effect on behavioral intention to adopt Mobile Banking applications.</td>
<td>To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. To validate the conceptual framework.</td>
</tr>
<tr>
<td>H3b</td>
<td>Not Rejected</td>
<td>Perceived trust and gender have a direct effect on behavioral intention in the adoption of Mobile Banking applications</td>
<td>1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. To validate the conceptual framework.</td>
</tr>
<tr>
<td>H3c</td>
<td>Not Rejected</td>
<td>Perceived trust and awareness have a direct effect on behavioral intention in the adoption of Mobile Banking applications.</td>
<td>1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. To validate the conceptual framework.</td>
</tr>
</tbody>
</table>
| H3d | Not Rejected | Perceived trust and age have a direct effect on behavioral intention in the adoption of Mobile Banking applications | 1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.  
2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.  
3. To validate the conceptual framework. |
|-----|--------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| H4  | Not Rejected | Facilitating conditions have a direct relationship with behavioral intention to adopt Mobile Banking applications in M-banking. | 1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.  
2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.  
3. To validate the conceptual framework. |
| H5  | Not Rejected | Transaction duration has a direct effect on behavioral intention to adopt M-banking. | 1. To develop a framework for the adoption of mobile-banking applications in the Kenyan banking sector.  
2. To apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial bank.  
3. To validate the conceptual framework. |
CHAPTER 4: RESEARCH CONCLUSIONS AND IMPLICATIONS

This project presented and discussed the findings of a study that focused on the factors affecting the adoption of mobile banking applications in the Kenyan banks. The background of the study providing the general introduction and definition of the research problem was presented in chapter one while chapter two focused on the literature related to the study. The research methodology detailing sampling procedures and data collection methods employed by the study was presented in the third chapter. The fourth chapter focused on the statistical procedures and their interpretation, presentation and discussion of the research findings.

5.1 Research Achievements

Here the researcher presents how the current research objectives have been achieved. The researcher intended to achieve the following objectives: To develop a framework for the adoption of mobile-banking applications in the in the Kenyan banking sector , to apply the developed framework to study factors influencing adoption of a mobile banking application for a Kenyan commercial banks and to validate the conceptual framework.

A research model was developed and validated. The developed framework was also used to study the factors that influence the adoption of mobile banking applications in Kenyan commercial banks.

The research also formulated hypotheses that were to be tested to establish whether they would be rejected or not. There were a total of ten hypotheses, H1, H2a, H2b, H2c, H3a, H3b, H3c, H3d, H4 and H5. From the results, H2b and H2c were rejected while the rest were not rejected.

Based on this research model, the study established that performance expectancy, effort expectancy, facilitating conditions, perceived trust and transaction duration were key determinants for Mobile Banking applications acceptance adoption and usage in Barclays bank. In an organizational setting, the management need to increase performance expectancy, reduce effort expectancy, make facilitating conditions conducive, increase perceived trust and reduce transaction duration.

The study further demonstrated that age, gender and awareness were moderating factors on perceived trust only.
5.2 Research Limitations

Venkatesh et al (2003), points out that acceptance models examine technology from the time of their initial introduction to stages of greater experience. The responses in this research have been collected and examined to measure perceptions and expectations after the participants’ acceptance or rejection decisions rather than during active adoption decision-making process.

5.3 Contributions to Knowledge

This research expands knowledge in the area of mobile banking applications’ adoption and usage. Identifying the adoption drivers of such applications helps researchers and stakeholders to design training, marketing and infrastructure support to encourage Mobile Banking application acceptance. Banks have invested heavily in the development of Mobile Banking software and if they are to recoup these investments, then these apps must be used by the customers. Only by understanding the barriers to user acceptance of these apps can the banks reduce those impediments.

This research identifies factors that are likely to affect the adoption of mobile banking apps in the Kenyan banking sector. A clear understanding of these determinants will enable mobile banking service providers to develop suitable marketing strategies, business models, processes, awareness programs and pilot projects.

In conclusion, this study has contributed to knowledge with respect to theoretical extension and practical implementations. The validated framework can be further developed and refined to benefit other banks, saccos and businesses that use Mobile Banking payments like the utility companies.

5.4 Further Work

Presently there are several mobile phone operating systems each with unique challenges, strengths and limitations. These factors may have different adoption factors. The scope of this research focused on the general adoption of mobile banking and did venture into the various mobile phone operations systems and specific applications. There is therefore need for future research to focus on these areas.
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APPENDIX A: QUESTIONNAIRE

Dear Respondent,

I am a student at University of Nairobi. I am carrying out a research project on the “Adoption of Mobile Banking applications for Kenyan Banks”. This research project is in partial fulfillment of the award of Master of Science in Information Systems. Your cooperation in completing this questionnaire as objectively and accurately as possible will be highly appreciated. This information will be kept in strict confidence and will only be used for this research.

Customer Mobile Banking Experience
Do you operate a bank account?

[ ] YES [ ] NO

What type of a bank account do you have?

[ ] Savings account [ ] Current account [ ] Both

Do you use your cell phone for any financial/ banking transactions?

[ ] YES [ ] NO

How long have you used M-Banking

[ ] < 6 months [ ] 6 months to ONE year

[ ] ONE year to TWO years [ ] TWO years to THREE years

[ ] THREE years to FOUR years

How often do you make transaction?

[ ] Daily-once [ ] Daily –Several times

[ ] Weekly-Once [ ] Weekly-several times

[ ] Monthly-once [ ] Monthly-several times

[ ] Occasionally (less than once a month)

Customer Mobile Banking Awareness
i. Are you experiencing any challenges with your mobile banking application?

[___] YES    [___] NO    [___] I Don’t Know

ii. If Yes to b (i) above, what are these challenges?

............................................................................................................................
............................................................................................................................

Who provides your mobile banking service?

[___] A bank

[___] A bank and a Mobile operator together

[___] A mobile operator

[___] Another company

[___] Don’t know / not sure

PERFORMANCE EXPECTANCY

1. Mobile Banking application is necessary in the Kenyan Banks

[___] Strongly disagree   [___] Disagree   [___] Neutral   [___] Agree   [___] Strongly agree

2. The Mobile Banking application offers better customer experience.

[___] Strongly disagree   [___] Disagree   [___] Neutral   [___] Agree   [___] Strongly agree

EFFORT EXPECTANCY

3. The Mobile Banking application is easy to learn

[___] Strongly disagree   [___] Disagree   [___] Neutral   [___] Agree   [___] Strongly agree

4. The Mobile Banking application is easy to use

[___] Strongly disagree   [___] Disagree   [___] Neutral   [___] Agree   [___] Strongly agree

5. Rolling out the mobile banking applications is easy.

[___] Strongly disagree   [___] Disagree   [___] Neutral   [___] Agree   [___] Strongly agree
PERCEIVED TRUST

6. I believe that the adoption of Mobile Banking applications increase customer trust in mobile banking activities.
   [     ] Strongly disagree  [     ] Disagree  [     ] Neutral  [     ] Agree  [     ] Strongly agree

7. Using The Mobile Banking application makes me feel better than those who do not use it.
   [     ] Strongly disagree  [     ] Disagree  [     ] Neutral  [     ] Agree  [     ] Strongly agree

8. Mobile banking application provides personalized service to me.
   [     ] Strongly disagree  [     ] Disagree  [     ] Neutral  [     ] Agree  [     ] Strongly agree

FACILITATING CONDITIONS

9. Bank officials are available to offer help on Mobile Banking application use when I need it
   [     ] Strongly disagree  [     ] Disagree  [     ] Neutral  [     ] Agree  [     ] Strongly agree

10. I know how to use Mobile Banking application well
    [     ] Strongly disagree  [     ] Disagree  [     ] Neutral  [     ] Agree  [     ] Strongly agree

TRANSACTION DURATION

11. I mind transaction duration when performing mobile banking activity.
    [     ] Strongly disagree  [     ] Disagree  [     ] Neutral  [     ] Agree  [     ] Strongly agree

BEHAVIORAL INTENTION

12. I intend to continue using Mobile Banking application in the near future
    [     ] Strongly disagree  [     ] Disagree  [     ] Neutral  [     ] Agree  [     ] Strongly agree

13. I recommend banks to adopt Mobile Banking application mobile banking
    [     ] Strongly disagree  [     ] Disagree  [     ] Neutral  [     ] Agree  [     ] Strongly agree
APPENDIX B: Histograms

Gender

Age

Frequency of M-Banking usage

Duration of Mobile Banking application usage

Frequency of M-Banking usage

Duration of Mobile Banking application usage

Gender

Mean = 1.46
Std. Dev. = 0.499
N = 214

Age

Mean = 2.76
Std. Dev. = 0.923
N = 214

Frequency of M-Banking usage

Mean = 4.27
Std. Dev. = 1.211
N = 214

Duration of Mobile Banking application usage

Mean = 5.2
Std. Dev. = 1.218
N = 214

Duration of Mobile Banking application usage

Frequency of M-Banking usage

Frequency of M-Banking usage
I have an understanding of mobile banking application

Mobile Banking application is necessary in the Kenyan

Mobile Banking application is easy to learn

Mobile Banking application is easy to use
I believe that adoption of Mobile Banking applications will solve the banks' transaction needs

Bank officials are available to offer help on Mobile Banking application use when I need it

Using Mobile Banking applications makes me feel better than those who do not use it

I know how to use Mobile Banking application well
I don't mind increased transaction duration when doing a Mobile banking transaction

I intend to continue using Secure SMS protocol mobile banking in the near future
APPENDIX C: P-P Plots

Duration of Mobile Banking application usage

Transforms: natural log, difference(1)

Normal P-P Plot of Gender

Transforms: natural log, difference(1)

Normal P-P Plot of Age

Transforms: natural log, difference(1)

Normal P-P Plot of Frequency of M-Banking usage

Transforms: natural log, difference(1)
I have an understanding of mobile banking application

Mobile Banking application is necessary in the Kenyan

Mobile Banking application is easy to learn

Mobile Banking application is easy to use
I believe that adoption of Mobile Banking applications will solve the banks’ transaction needs

Using Mobile Banking applications makes me feel better than those who do not use it

I mind transaction duration when doing a Mobile banking transaction

Bank officials are available to offer help on Mobile Banking application use when I need it

Transforms: natural log, difference(1)
I know how to use Mobile Banking application well
APPENDIX D: Scatter Plots

Partial Regression Plot

Dependent Variable: I intend to continue using Mobile Banking application in the near future

Partial Regression Plot

Dependent Variable: I intend to continue using Mobile Banking application in the near future

Partial Regression Plot

Dependent Variable: I intend to continue using Mobile Banking application in the near future

Partial Regression Plot

Dependent Variable: I intend to continue using Mobile Banking application in the near future

Partial Regression Plot

Dependent Variable: I intend to continue using Mobile Banking application in the near future

Partial Regression Plot

Dependent Variable: I intend to continue using Mobile Banking application in the near future

Partial Regression Plot
I have an understanding of mobile banking security mechanisms

I intend to continue using Mobile Banking application in the near future

Mobile Banking application is necessary in the Kenyan Banks

Mobile Banking application is easy to learn

Mobile Banking application is easy to use
I believe that adoption of Mobile Banking applications will solve the banks' transaction needs.

I intended to continue using Mobile Banking application in the near future.

Using Mobile Banking applications makes me feel better than those who do not use it.

I know how to use Mobile Banking application well.

Bank officials are available to offer help on Mobile Banking application use when I need it.
I mind transaction duration when doing a Mobile banking transaction

I intend to continue using Mobile Banking application in the near future

Partial Regression Plot

Dependent Variable: I intend to continue using Mobile Banking application in the near future