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MODELLING ADOPTION OF MOBILE MONEY BY THE POOR IN NAIROBI, KENYA

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Dedication

I dedicate this work to my wife Lydia and sons Joshua & Paul who play a key role in inspiring me in much of what I do.

Declaration

This dissertation is my original work. It has not been presented for a degree in any other university. No part of this dissertation may be reproduced without the prior permission of the author or the University of Nairobi

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ABSTRACT

The researcher set out to develop a model that has the power to explain adoption of mobile money among the poor in Kenya.

The researcher reviewed literature on technology adoption models, poverty, mobile telecommunication industry, access to financial services and mobile money services. From the review and a qualitative study, a framework, founded on the Unified Theory of Acceptance and Use of Technology model was then developed. The framework had seven exogenous constructs, two endogenous constructs and five moderating variables. Guided by literature, the researcher identified three measures for each construct. The conceptual framework was then translated into a five point likert scale questionnaire. The researcher tested the instrument and improved it several times before considering it reliable for use.

The researcher then developed a criterion that led to the choice of M-Pesa, Airtel Money and Orange money as the products for investigation. The researcher sampled seven areas from Nairobi that are considered poor. A random technique was used to sample 283 respondents, which was well above the minimum requirement.

Structural Equation Modelling (SEM) was used to conduct a confirmatory analysis and test the relationships between constructs. SEM has a series of steps provided in literature that the researcher followed very meticulously. Moderating variables were tested using multi-group analysis which is a technique used to investigate the impact of moderators on the influence of predictors toward dependent variables. Data analysis was done using SPSS and Analysis of Moment Structure (AMOS).

Some paths and constructs from the original conceptual framework were dropped. In the final analysis, five exogenous constructs, two endogenous constructs and four moderating variables were retained resulting to a proposed model for adoption of mobile money among the poor.

From a theoretical point of view, the mobile money adoption model provides a basis for understanding relationships of the determinants and usage behaviour of mobile money. The relationship between these constructs and variables has a significant theoretical power. Through the literature review and analysis, the research

strengthens the appreciation of these constructs and moderators of not only influencing the adoption of technology, but more specifically of mobile money. From a methodological point of view, the study does provide some guidelines for researchers interested in this or related areas. Specifically, researchers interested in mobile technologies, the use of technology by the poor, design of studies, questionnaire design, validity and reliability testing, use of AMOS, SEM, as well as research related to moderating effects would find this thesis useful. The results of this study have significant practical implications. Primarily, it demonstrates that deploying mobile money services because there is perceived demand is not good enough. Given the large investment associated with developing and deploying mobile money services, a good understanding of the drivers of adoption is useful so as to make the organizations allocate their resources appropriately.

The constructs that were retained show what is important to the poor as they choose what mobile money service to adopt. By understanding the need, management will be able to design and deploy valuable services. In the last chapter, the researcher discusses in detail the implication of each of the constructs that was retained in the model.

There were several research conclusions from the study. First, UTAUT is a useful framework for studying technology adoption in both western and non-western societies. Secondly, consistent with other researchers' findings, generic models need to be contextualised to areas of study. Thirdly, Performance Expectancy, Social Influence and Perceived Trust play an important role in determining Behavioural Intention to use mobile money among the poor and more so in developing countries. In addition, Facilitating Conditions and Transaction Costs influence actual usage. Fourthly, the users' age, gender, education and risk moderate the relationships between constructs that determine behavioural intention as well as actual usage. Finally, evaluating products and the market is critical before and during deployment of mobile money services.

Key words: *Adoption, Base of the Pyramid, Modelling, Mobile Money, UTAUT*

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List of abbreviations

AMOS	.....	Analysis of Moment Structures
ATB	.....	Attitude Toward Behaviour
AU	.....	Actual Usage
AVE	.....	Average Variance Extracted
BI	.....	Behavioural Intention
BoP	.....	Base of the Pyramid
CCK	.....	Communication Commission of Kenya
CDMA	.....	Code Division Multiple Access
CFA	.....	Confirmatory Factor Analysis
CFI	.....	Comparative Fit Index
C-TAM-TPB	.....	Combined TAM and TPB
CPI	.....	Consumer Price Index
CR	.....	Construct Reliability
DI	.....	Disruptive Innovations
DF	.....	Degrees of Freedom
DTPB	.....	Decomposed Theory of Planned Behaviour
EA	.....	Enumeration Area
EE	.....	Effort Expectancy
ERS	.....	Economic Recovery Strategy
FC	.....	Facilitating Conditions
FSD	.....	Financial Sector Deepening
GFI	.....	Goodness of Fit Index
GoF	.....	Goodness of Fit
GSM	.....	Global System for Mobile communication
IC	.....	Inter-construct Correlation
ICT	.....	Information and Communication Technologies
IDT	.....	Innovation Diffusion Theory
IS	.....	Information System
IT	.....	Information Technology
KCA	.....	Kenya Communications Act
PCK	.....	Postal Corporation of Kenya

PE	.....	Performance Expectancy
PR	.....	Perceived Risk
PT	.....	Perceived Trust
KPTC	.....	Kenya Posts and Telecommunications Corporation
KNBS	.....	Kenya National Bureau of Statistics
MGA	.....	Multi Group Analysis
MM	.....	Mobile Money
MNO	.....	Mobile Network Operator
NCS	.....	National Communications Secretariat
NFI	.....	Normed Fit Index
PBC	.....	Perceived Behaviour Control
PCK	.....	Postal Corporation of Kenya
PEoU	.....	Perceived Ease of Use
PLS	.....	Partial Least Squares
PU	.....	Perceived Usefulness
RMSEA	.....	Root Mean Square Error of Approximation
RNI	.....	Relative Noncentrality index
CSR	.....	Corporate Social Responsibility
SCT	.....	Social Cognitive Theory
SEM	.....	Structural Equation Modelling
SI	.....	Social Influence
SIC	.....	Squared Inter-construct Correlation
SMC	.....	Squared Multiple Correlations
SMS	.....	Short Message service
SN	.....	Subjective Norm
PPA	.....	Participatory Poverty Assessments
PT	.....	Perceived Trust
TAM	.....	Technology Acceptance Model
TLI	.....	Tucker – Lewis Index
TPB	.....	Theory of Planned Behaviour
TR	.....	Trialability
TRA	.....	Theory of Reasoned Action

UTAUT	.....	Unified Theory of Acceptance and Use of Technology
VSATs	.....	Very Small Aperture Terminals
VE	.....	Variance Extracted
WMS	.....	Welfare Monitoring Surveys

CHAPTER 1: INTRODUCTION

1.1 Background

According to the United Nations, more than half of the Kenya's 40 million people are poor, and 7.5 million of these live in extreme poverty. About 80 per cent of the population, including three out of four poor people, live in rural zones. Poor people are characterized by low education levels, low income, poor access to markets and low levels of capital accumulation. The Kenya 2006 integrated household budget survey revealed that 46 percent of the population lived in absolute poverty, surviving on less than $1.25 a day (GOK, 1998).

The uptake of mobile phones globally and more so in developing countries, has been rapid in the recent years. The Communications Commission of Kenya (CCK), which regulates mobile telephony in Kenya, revealed that as of February 2011, more than 50% of the population had mobile phones (CCK, 2012), while Financial Sector Deepening (FSD), a firm that specializes in research on financial access, revealed that as big as 80 percent of the population does have access to a family or friend's mobile phone (FSD, 2009).

Although access to financial services has grown tremendously in the last few decades, access to these services varies across countries (Beck, et al., 2007). The Financial Access Initiative estimates that 2.5 billion adults worldwide have no access to formal financial services (Omwansa & Sullivan, 2012). It was estimated that as of 2009, only a quarter of the adult population in Kenya had access to formal regulated financial services (FSD, 2009). The penetration of regulated financial services has been slow, mainly because of the cost of setting up brick and mortar branches. In a period of 115 years since 1897 when banking was established, the banks were to provide their customers with 43 commercial banks, 1045 bank branches and 1,500 ATMs (Omwansa & Sullivan, 2012).

Access to financial services has the potential impact to reduce poverty, a subject that has been widely studied (Ellis, et al., 2010); (Beck & Demirguc-Kunt, 2008); (Tejerina, et al., 2006). Mobile money is defined as a service in which the mobile phone is used to access financial services. It is so far the most convenient and cheapest way to get financial services to the poor which increases the power of the mobile phone to reduce poverty (Omwansa & Sullivan, 2012). This technological advancement has provided a path that enables

telecommunication companies and financial institutions to extend financial services to the low income communities at a much lower cost to the providers.

Between 2007 and 2009, over 60,000 mobile money agents have been set up, where people convert cash to e-money and vice versa, while over 19 million adults have signed up for mobile money. In 2011, $10 billion moved through M-Pesa ('M' for mobile and 'Pesa' is Kiswahili translation for money), according to World Bank and Safaricom projections (Omwansa & Sullivan, 2012). Financial institutions have turned to mobile money in form of branchless banking to lower the cost of serving the poor. In Kenya, the impact of mobile money has been felt at a national level. The World Bank estimates that 93% of Kenyans households use mobile phones (80% own, 10% use a phone within their household, 3% use a phone outside their households), 73% use at least one mobile money service and about 23% use a mobile money service at least once a day. Data from the Kenya Afrobarometer survey conducted November/December in 2011 revealed that 77% of people in the rural areas do own mobile phones and Kenyan households in general own approximately 2.4 mobile phones (Demombynes & Thegeya, 2012). Globally, 2.5 billion adults do not have bank accounts, but about half of these unbanked have mobile phones (Omwansa & Sullivan, 2012).

The four mobile operators in Kenya (Safaricom, Airtel-formally Zain, Yu and Orange) have launched mobile money services aimed at reducing churning, thus increasing loyalty and increasing revenue. Mobile money is not a service targeted to the unbanked or the poor for that matter, rather it is a service used by them. Just like in other innovations, the banked who are the more educated in society were the early adopters, but with time, those at the 'bottom of the pyramid' (BoP) have adopted. Beyond basic money transfer services, banks and mobile operators have launched many new services aimed at increasing sophistication of mobile based financial services as well as increase financial inclusion.

The success of M-Pesa cannot be compared with the other three (Airtel Money, Orange Money and YuCash) or any other mobile application. The products are technologically comparative, approved by the regulator and available to all Kenyans. Several factors can be used to explain the remarkable uptake of M-Pesa, though no elaborate empirical studies have been done specifically focusing on those at the BoP. Most of the literature available explores the factors contributing to success of M-Pesa from the supplier side (i.e. the

characteristics of the mobile operator) or from the environment perspective (i.e. the regulation, the demand for faster and safer money transfer services among others), but none focuses on the individual poor users. Mobile money services, especially those with more features such as savings like Orange Money and Jipange Kusave (under pilot during the study period) promise a lot for the poor, but have not recorded high adoption rates. The researcher could hardly find any comprehensive studies that can explain this low adoption of other mobile money services by the poor. Hardly any empirical literature is available to explain the drivers of adoption and usage of these services by the poor in Kenya.

Not only have the mobile money services in Kenya generated mixed results in terms of uptake, the global landscape is as well surprising. The Global Mobile Money Tracker that monitors deployments across the world, reported 129 live deployments and 91 planned as of September 2012 (GSMA, 2012). Other than few success stories, led by M-Pesa in Kenya, there have been no major successes globally. MTN in Uganda, M-Pesa in Tanzania and easypaisa in Pakistan are some of the promising deployments (Omwansa & Sullivan, 2012). Deployments in Phillipines have been in existence for longer than many others across the globe and have reported substantial uptake as well. Besides mobile money, other services such as M-Health, M-Education and M-Agriculture have been introduced with various levels of success, but none compared to the mobile money service M-Pesa.

The research on technology adoption is well established. A great amount of the research has been conducted in the U.S. and only a limited number of studies have focused on the adoption of technology outside North America (McCoy, 2000). Initially, researchers focused on information systems in general but for some time have focused on specific related areas like electronic commerce, mobile banking and internet banking. However the evolution of mobile financial services, introducing innovations like non-bank led mobile money and agency banking have brought forth new research domains that are few years old and have not been substantially studied. Minimal evidence has been found in the research literature relating to technology adoption being developed in the context of mobile money at the 'Base of the Pyramid' (BoP) by using individual users as subjects and mobile money as the technology context.

Mobile applications provide a lot of opportunities for transforming the lives of the poor given the ubiquity and cost of these technologies. Understanding the drivers of adoption of

the services that can run on mobile phones forms a very good basis for designing and successfully deploying such applications.

The promise of mobile money coupled by the mixed uptake raises interesting theoretical questions as to what the drivers of adoption are, particularly among the poor. This thesis presents a research that was done to develop a model to explain adoption of mobile based applications by those at the BoP, with specific focus on mobile money. The study focused on the consumer side, as opposed to the supplier side. It is important to note that the study did not make comparison between products, rather it aimed at answering the question of what drives BoP consumers to choose a mobile money service.

1.2 Research Problem

It can be noticed that among the well-known theories/models of technology adoption, there are some gaps or inconsistencies among their key determinants and moderators. The uptake of mobile applications and more particularly mobile money, which are both transformative and additive, has been very rapid in some countries and well pronounced in countries like India, Kenya, Phillipines, Uganda, South Africa and Tanzania. Out of all the deployments, Kenya's M-Pesa has performed very well. The other three deployments in Kenya are hardly anywhere close in terms of adoption.

Perhaps there are other determinants and moderators that also play important roles with respect to technology adoption especially in other technologies and country contexts. Mobile applications, particularly mobile money, provide a good platform for investigating the determinants and moderators for adoption and diffusion of technology among the poor.

In addition, other than the inconsistencies among these well-known theories/models, one wonders whether these theories/models of technology adoption that have been developed, modified, and extended in U.S. can be used in other cultures or countries. There has been no published model of technology adoption focused on the mobile money usage by individual poor Kenyans.

Developing a technology adoption model based upon Kenyan culture is important and necessary in order to promote usage of the technology in Kenya. It is therefore expected that the model being developed together with other key findings from this research will be

applicable to mobile money in the country and will benefit not only individuals, organizations, and the country as a whole but could also be adapted and validated for other countries as well.

1.3 Overall Research Question

This study was driven by the following overall research question:

"What is the technology adoption model that will have the power to explain adoption and usage behaviour of mobile money among the 'base of the pyramid' population?"

By answering this question through the development and validation of an appropriate adoption model, the researcher's aim was to contribute to the creation of a model that can predict adoption and assist in diagnosing poor adoption of mobile money and related technologies.

1.4 Objectives of the study

In order to answer the research question in section 1.3, the researcher developed the following objectives:

1. Establish relevant determining and moderating factors and use them to formulate a framework for technology adoption of mobile money by the poor in Kenya
2. Validate the model using primary data using Structural Equation Modelling (SEM)
3. Generate a research model that best describes Kenya's BoP behavioural intention to adopt and actual use of mobile money

1.5 Significance of the Research

The researcher believes that the outcome of this research should be beneficial to several categories of persons. Academic leaders, financial institutions, mobile network operators, government policy makers, regulators, consumer organizations, developers and development partners will find the outcome of this study useful.

Academic leaders and researchers exploring thematic areas such as technology adoption, BoP, mobile applications and mobile money as well as the financial landscape in Kenya will

find this study useful. A lot of theoretical foundation was laid and literature reviewed forming a strong basis for the conclusions made. Besides finding it stimulating and challenging, researchers will find it a strong foundation for further research. Not only has the study built a well documented review of the aspects mentioned above, the other sections on methodology and results will expand the readers' knowledge.

Financial institutions, money transfer companies and mobile network operators are the main practitioners who would be interested in this area of research. The study elaborates with empirical evidence the power of the overlap between financial services and telecommunication. Financial institutions, ranging from large international banks to micro-finance institutions, are keen to develop relevant mobile financial services in order to not only increase financial inclusion, but also to increase customer base and revenue streams without having to set up costly physical branches and ATMs. However, the fact that there are many financially excluded individuals does not mean that mobile financial services will automatically succeed. There is a lot of excitement about the power of the mobile phone, but there needs to be substantial knowledge of who the consumer is and what drives adoption. Telecommunication companies have ventured into mobile financial services particularly after the success of M-Pesa in Kenya. Investment levels in these products are huge but returns have not been as impressive for all players. Based on the responses, it is evident that not all providers have taken time to understand what the consumers, particularly at the BoP, are asking for. This study will not only inform a practitioner intending to introduce a product, but those who already have products and wish to diagnose why they may not be doing very well.

Another perspective is that this research will be of interest to those organizations involved in Corporate Social Responsibility (CSR) projects and are concerned whether those projects be economically sustainable. Mobile money initiatives do have a CSR perspective and do have the potential of being profitable. M-Pesa has been profitable to Safaricom, but there is no evidence that the other products have been, at least for companies operating in Kenya.

Regulators, in this case, financial sector regulators, like the Central Banks and telecommunication regulator have an elaborate role of enforcing policies. From a financial transaction point of view, regulators are particularly interested in the growth of financial inclusion. To achieve this effectively, they must appreciate the needs and views of

consumers. This means the regulators will push for the growth and development of appropriate financial products that are informed by proper market research and are innovative. This study sheds light on what constitutes some of the characteristics of potentially effective products which the regulator can support. In an effort to grow the financial sector, the regulator can generate actionable recommendations that practitioners can work with after appreciating what makes specific products or institutions succeed in these markets. For Kenya, Vision 2030, the national development blueprint, emphasises the growth of financial inclusion, therefore understanding what makes a consumer adopt a specific mobile financial service will go a long way in giving the regulator a more relevant direction.

Policy makers in the ministries of Information and Communication as well as Finance have the responsibility of creating policies relevant to the mobile money industry. Just like the regulators, the policy makers need empirical evidence and relevant information in order to craft appropriate policy frameworks. This study provides some evidence and recommendations as to what would work for a developing country. In allocating resources to various aspects of the economy, particularly in growing mobile money adoption, penetration, and impact, as well as related aspects; policy makers would be better informed as a result of such a study.

Consumer organizations would find this useful while developing and enforcing guidelines for consumer products, while the developers will be more in tune with what the consumers actually need.

Development partners such as foundations and non-governmental organizations interested in enhancing access to resources by the poor and improving their living conditions will find this study useful. Creating interventions that actually work to improve the quality of lives of the poor needs a coordinated effort, informed by reliable and empirically sound studies in order to increase their chances of success. This study demonstrates some of the ingredients of a financial sector intervention that would make it work or fail. By putting the interest of the consumer at heart, thinking through what would make a poor person adopt a technology; interventions by development partners are bound to succeed even more.

The first output from this study, in form of a book titled "Money, Real Quick: Kenya's Disruptive Mobile Money Innovation" (Omwansa & Sullivan, 2012), has been published and has been widely recommended by organizations like GSM Association, Bill and Melinda Gates Foundation, Rockefeller Foundation among similar organizations interested in understanding the potential and impact of mobile financial services particularly for the poor.

This research set out to make theoretical, practical and methodological contributions to knowledge in a number of ways. Section 5.4 provides a detailed description of the contributions made in this study, while section 5.8 provides an evaluation of the work done in this study. Below is a summary of the achievements based on the evaluation guidelines provided by Whetten (1989). In his paper, the author presents the argument that a complete theory must contain four elements namely *what, how, why* and a combination of *who, where and when* (Whetten, 1989). In addition 'Who', 'where' and 'when' provide the limitations of the proposition presented in the study.

The study is reported in this thesis in a logically developmental manner. In five chapters, the researcher builds the arguments to a climax making it easy to follow the thought process. Key aspects of the study are easily identifiable from the table of contents as well as the topics and subtopics in the document.

This study is also timely. The interest in aspects like addressing global poverty, encouraging savings, increasing efficiency, serving the poor, developing innovative and relevant applications and similar aspects is very high in modern times. All these aspects are relevant to mobile money.

1.6 Scope of the Study

This study targeted M-Pesa, Airtel Money and Orange Money users who are likely to be living at less than $1.25 a day, as per the Kenya's household budget survey's definition of absolute poverty, which is within the international threshold of less than $2.00 a day. The sampling exercise aimed to get a representative set of respondents from both urban (who mostly live in slums) and those in rural set ups.

The study focused on behavioural intention as well as actual usage of mobile money among these poor people.

YuCash is configured much like Orange Money but has a lower penetration level. For this reason, Orange money was preferred for the study.

M-Kesho, an m-banking service operated by Equity Bank, rides on the M-Pesa service. The income generated from the services is shared between Safaricom and Equity bank. The fact that M-Pesa is part and parcel of M-Kesho, makes it clear that adoption of M-Kesho is indirectly influenced by the adoption of M-Pesa. The researcher chose not to investigate M-Kesho and substituted it with Orange Money which is an authentic m-banking application.

There are several other bank led mobile money products like Pesa Pap by Family Bank LTD, Eassy 247 by Equity Bank, KCB Connect by Kenya Commercial Bank among others and independent providers like Tangaza mobile money transfer which links to all mobile operator led products. The researcher did not consider bank led products because they are targeted to only the customers of the specific bank, which is a small segment of the market. The motivation for signing up for a product that enables interoperability is in most cases different the one that drives one to sign up for other options. For scoping purposes, the researcher chose to focus on mobile operator led products only.

1.7 Key Concepts

In this section the researcher introduces some of the key concepts that formed the foundation for this study. A few choices were made and the justification for these decisions provided.

1.7.1 Mobile Money

The use of mobile phones to access financial services has been given many terminologies. M-Money, M-Transactions, M-Payments, M-Banking, e-wallet are descriptions sometimes used interchangeably. GSMA, an association of mobile operators using GSM technologies, Bill and Melinda Gates Foundation and the World Bank have been at the fore front of standardizing this sub sector. The GSMA uses the term mobile money and considers it as a sustainable, scalable approach to providing convenient and affordable financial services to the unbanked. The definition provided is "A service in which the mobile phone is used to access financial services". This definition was adopted for this study.

M-Pesa is an example of an M-Payment product. It is not tied to a bank account, but enables transfer of e-money through the mobile phone via the mobile network.

Orange Money, just like YuCash is by default linked to a bank account. They are true forms of M-Banking products, enabling users to access their core bank accounts.

Airtel Money falls in between these two categories, whereby users have access to an optional bank account.

By focusing on these three products, the researcher believes, this study covered the sector of mobile money reasonably.

1.7.2 Structural Equation Modelling

Modelling has become a popular way to simplify concepts and study them in great details. It is now being used in many fields and as such ended up with multiple definitions and usage (Hickman, 2008). The Oxford English dictionary defines a model as a representation of a designed or actual object. Researchers have also attempted to define modelling. Some definitions are provided below.

"A stylized representation or a generalized description used in analysing or explaining something" (Hilborn & Mangel, 1997).

Structural Equation Modelling (SEM) is an advanced statistical technique that has many layers and many complex concepts. It is used to test complex relationships between observed (measured) and unobserved (latent) variables. In addition, it tests relationships between two or more latent variables.

It is a confirmatory technique which is an umbrella of three processes: Path Analysis (Analysis of structural models of observed variables), Confirmatory Factor Analysis and Structural Regression Models (synthesis of path and measurement models). It is used to determine if a model is valid for the data in conjunction with prior research by testing if the hypothesized theoretical model can be confirmed.

The researcher chose to use SEM to design a model and test its fitness, and hence the validity and reliability of the data collected. In chapter three (methodology), the researcher

elaborates on the strengths and weaknesses of SEM. In addition, the researcher discusses the alternatives to SEM and the basis for choosing SEM.

1.7.3 Causal Relationships Analysis

The focus of causal relationship analysis is to establish what the causes of a scenario are, what the effects are and how the two are linked. There are many techniques used to analyse causal relationships. These techniques are in some cases dependent on the field of study. In the field of Information Systems, the causal analysis techniques have become common (Bento, 1990); (Chidambaram, 1996).

The argument behind causal analysis is that "correlation analysis cannot be directly used to establish causality, because of the fact that correlations merely measure covariation or the degree to which several variables vary together" (Blalock, 1964). Some of the techniques used in Information Systems research include regression analysis, causal loop analysis, systems dynamics, causal path analysis and structural equation modelling. These techniques vary in complexity and are best used in different contexts depending on the problem being investigated. There are also many theories that elaborate on causality, including Counterfactual theories, Probabilistic causation, Causal calculus, Structure learning, Derivation theories, Manipulation theories, Systemic causality, Process theories

Though this study addressed an aspect of causality, the main emphasis was on adoption drivers identification and verification of their potential impact on behavioural intention and actual usage. Therefore, a technique that puts more emphasis on the statistical data, without ignoring the qualitative causal assumptions was preferred. In this case SEM was most appropriate.

1.8 Glossary of terms

This glossary provides a brief definition of some of the terms as they are used in this study.

Base of the Pyramid (BoP)

This is an expression used in the development circles to mean poor. It is simply the largest, but poorest socio-economic class in society. The expression particularly refers to the 2.5 billion people across the world living on less than US$2.50 per day.

Endogenous Variable

A variable that is caused by one or more variables in a model and may cause another endogenous variable.

Effort Expectancy

The degree of ease associated with the use of the system.

Exogenous Variable

A variable that is not caused by another variable in a model, but tends to cause one or more variables in the model.

Facilitating Conditions

The degree to which an individual believes that an organizational and technical infrastructure exists to support use of a system.

Latent Variable

A variable that is not measured directly, but rather through one or more manifest variables.

Manifest Variable

Also called a measured or observed variable, comes from the responses to a specific question by the respondents, implying that a manifest variable become the indicator of a latent variable.

Moderating Factors

Moderating factors influence the effect of the determining factors. Examples of moderating factors include age, gender, education, experience and voluntariness.

Performance Expectancy

The degree to which an individual believes that using the system will help him or her to attain gains in job performance.

Structural Equation Modelling

A confirmatory technique which is an umbrella of three processes: Path Analysis (Analysis of structural models of observed variables), Confirmatory Factor Analysis and Structural Regression Models (synthesis of path and measurement models). It is used to determine if a model is valid for the data in conjunction with prior research by testing if the hypothesized theoretical model can be confirmed.

Trialability

The extent to which users are able to experiment with an innovation prior to committing to its usage. Trialability allows individuals to "test drive" an innovation before it is adopted.

1.9 Organization of the Thesis

This thesis uses simple language to make it understandable and easy to read. Whether the reader is technically inclined or not, it should be possible to follow the arguments developed in it.

The thesis has five chapters in total. There are no parts for grouping chapters.

Chapter one introduces the research project. The research study foundation is set, indicating what the context of the study was, the research problem, research question and objectives. In addition key words are defined and scope indicated.

Chapter two reviews literature, analysing various theoretical and empirical underpinnings of the study. Out of the review and qualitative work done earlier, the chapter lays out the conceptual framework and outlines the hypotheses.

Chapter three addresses the methodology. Starting from the population and sampling frame, the chapter elaborates how respondents were obtained, data collected and analysed. In addition, issues of formulation of the instrument, verification and validity of both the instrument and the data are presented.

Chapter four compiles the analysis and discussions. A very rigorous analysis was done following the steps provided for SEM. After every output of the analysis, a discussion is presented linking the findings from the study to the findings in literature.

Chapter five elaborates on the achievements, contributions, conclusions and recommendations. After providing concluding remarks based on the study, linking the framework, hypotheses and objectives to the findings, the researcher makes recommendations on how this research study can be utilized by relevant stakeholders. Research contributions, limitations and recommendations for further study are provided as well.

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

Investigating adoption models and theories is one of the areas of interest in IS and IT research. The primary objectives are to establish ways of improving adoption as well as to examine the hindering factors for usage. This chapter reviews literature of the nine main technology adoption models/theories. These models are: Innovation Diffusion Theory (IDT), Social Cognitive Theory, Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Decomposed Theory of Planned Behaviour (DTPB), Technology Acceptance Model (TAM), Technology Acceptance Model 2 (TAM2), Combined TAM and TPB (C-TAM-TPB), and The Unified Theory of Acceptance and Use of Technology (UTAUT).

The chapter also explores literature on poverty, more so in Kenya and the role of technology and financial inclusion in reducing poverty. Finally the chapter reviews the mobile money innovation deployment and development in Kenya with specific emphasis on M-Pesa, Airtel Money and Orange Money.

2.2 Poverty in Kenya

Overview on Poverty in Kenya

Poverty refers to the lack of basic necessities of life and opportunities for human development. It is multi-dimensional and manifests itself in various forms, making its definition using one criterion impossible (Nafula, 2005). It has several dimensions, is pervasive and widespread among many socio-economic groups (Ayako & Katumanga, 1997).

The World Bank reports that of the world's six billion people, 2.7 billion live on less than US$2 a day, and 1.2 billion, a fifth, live on less than US$1 a day (Wolfensohn, 2009).

Initiatives aimed at improving the measurement of poverty in Kenya include the Welfare Monitoring Surveys (WMS) that were done in 1992, 1994, 1997 and 2000, and the Kenya Integrated Household Budget Survey of 2005/06. These surveys have largely been used in analyzing poverty in Kenya based on the human consumption index (GOK, 1998) . Participatory approaches have also been used in Kenya, and they have helped provide more in-depth information about people's situations and about the inadequacies, indignities and

sufferings commonly experienced by poor people (Narayan & Nyamweya, 1996); (GOK, 1998).These have reinforced the idea that poverty is multifaceted and are viewed differently by different people (Kristjanson, 2009).

According to the United Nations, more than half of Kenya's 40 million people are poor, unable to meet their daily nutritional needs and 7.5 million of the poor live in extreme poverty. About 80 per cent of the population, including three out of four poor people, live in rural zones. Poor people are characterized by low education levels, low income, poor access to markets and low levels of capital accumulation. The Kenya's 2006 integrated household budget survey revealed that 46 percent of the population lived in absolute poverty, surviving on $1.25 a day.

Since the 1980s, Kenya's economy, on average has not performed very well. Economic indicators are low and unemployment generally high. According to the IMF, per capita income declined from US$271 in 1990 to US$239 in 2002 (IMF, 2005).

The number of the poor has been on the increase, rising from about 3.7 million in 1973 to 11.5 million in 1994, 12.5 million in 1997 and is currently estimated 56% of the total population.

A 2010 report by the United Nations ranked Kenya 167th out of a list of 194 countries, in terms of life expectancy, literacy levels and overall gross domestic product. Life expectancy fell to 46 years in 2006, but has since risen to over 54.

Around three quarters of Kenya's population is dependent on the agriculture industry, but with its erratic weather patterns and vast regions of arid desert, it is a very unstable sector. Periods of drought can be crippling, not only in terms of food supply, but in jobs as well.

Reasons for the persistence of poverty are various. Kenya has one of the world's fastest population growth rates. Over the past 30 years, the population has more than tripled, greatly increasing the pressure on the country's resources. Together with a widening income gap; this has eroded gains in education, health, food security, employment and income. Rural women are particularly vulnerable because they do not have equal access to social and economic assets. Subsistence farming is the primary source of livelihood for about 70 per cent of these women. The urban poor are not spared, where for example 63 % of Nairobi's slum residents fell below the poverty line in 2006 (WB, 2008).

The Participatory Poverty Assessments (PPAs) done by the World Bank uses parameters such as lack of land, lack of water, unemployment, inability to feed oneself and one's family, lack of proper housing, poor health and inability to educate children and pay medical bills . The findings reveal surprising gaps between various provinces. Most respondents felt their poverty situation had worsened over time. More interestingly, different ethnic groups and cultures have adopted different ways to solve their poverty problems. The underlying methods include Harambees and indigenous networks such as self help group and cost sharing (WB, 1996).

The Government has tried to initiate different programs hoping to reduce poverty over time. Since independence, programs such as economic growth promotion, rural development, land settlement schemes, district focus for rural development, pro-poor trade, and free education among others have been launched with varied levels of success (Nafula, 2005) .

Financial inclusion for poverty reduction

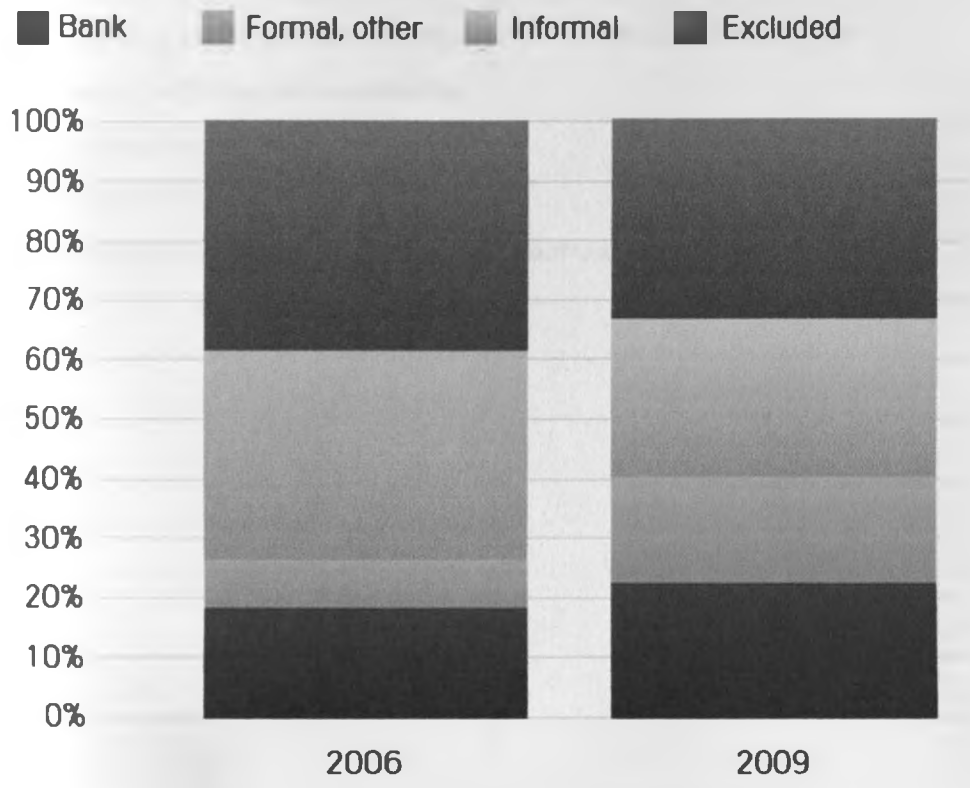
Following a long period of poor economic performance through the 1980s and 1990s, Kenya's economy started to show signs of a sustained recovery in the 2000s. In 2006 the growth rate reached 6.1%. This was disrupted by the 2007/2008 post election violence, but signs of positive growth were evident again into 2010 and 2011. Kenya remains strongly dependent on agriculture and these growth rates have been achieved despite adverse weather conditions and the global economic recession. The level of poverty started to reduce with 45.9% of the population below the national poverty line (2005/06), down from a peak of 52.3% in 1997 (Suri, et al., 2008).

The new government of 2002 inherited a weak financial system and a weak economy in December 2002. The Economic Recovery Strategy for Wealth and Employment Creation for 2003-07 (ERS) set out a clear commitment to a market economy and private sector led growth. The ERS, among other aspects, emphasized the importance improving access across the economy, especially in the agriculture sector and among micro and small enterprises.

In early 2007, 38% of Kenyans had no access to any form of financial services, according to a national survey (FSD, 2007), and only 19% had access to formally regulated financial institutions such as banks. In the entire country there were only 400 bank branches and

slightly over 600 ATMs—and over 10 million mobile subscribers. The same study revealed that 38.3 % of Kenyans were excluded, while another 35% used informal methods (FSD, 2007). Three years later, financial exclusion had significantly reduced as a result of mobile money (FSD, 2009). Figure 2-1 provides a summary of the change between 2006 and 2009 .

Figure 2-1: Change in financial landscape between 2006 and 2009



Financial inclusion is critical to achieve equitable growth and it is a prerequisite for sustainable economic growth and development. It plays a critical role in reducing poverty. It steers the ability of poor households to generate income and cash flows, and increases resilience to challenges. A number of studies have shown that people with access to credit have less incidence of poverty.

Harnessing the power of technology is one of the most effective ways of integrating the un-banked population into the financial mainstream. This has been shown by mobile money in Kenya.

With the belief that Credit was a human right, Professor Muhammad Yunus framed the Grameen Bank model in order to serve the poorest of the poor with microcredit to provide

them with opportunities to engage themselves in income generating activities. According to the Nobel Prize winner, a financial system for the poor should:

- only serve the poor to help them overcome poverty
- bring the disadvantaged people within the folds of some organizational format which they can understand and operate, and in which they can find socio-political and economic strength through mutual support.
- create opportunities for self-employment and income for the poor
- be cost-effective and sustainable
- be need based
- be flexible, and
- have positive impact on the lives of its borrowers.

2.3 Mobile technology and financial access

Telecoms trends in Kenya

Until 1998, the Kenya Posts and Telecommunications Corporation (KPTC) was a monopoly providing all telecommunication services. It was established after the East African Community broke up in 1977. In 1998, Kenya's Parliament enacted the Kenya Communications Act (KCA 1998) to regulate the communications sector (Omwansa, 2009). Based on the KCA, five companies were created from the KPTC:

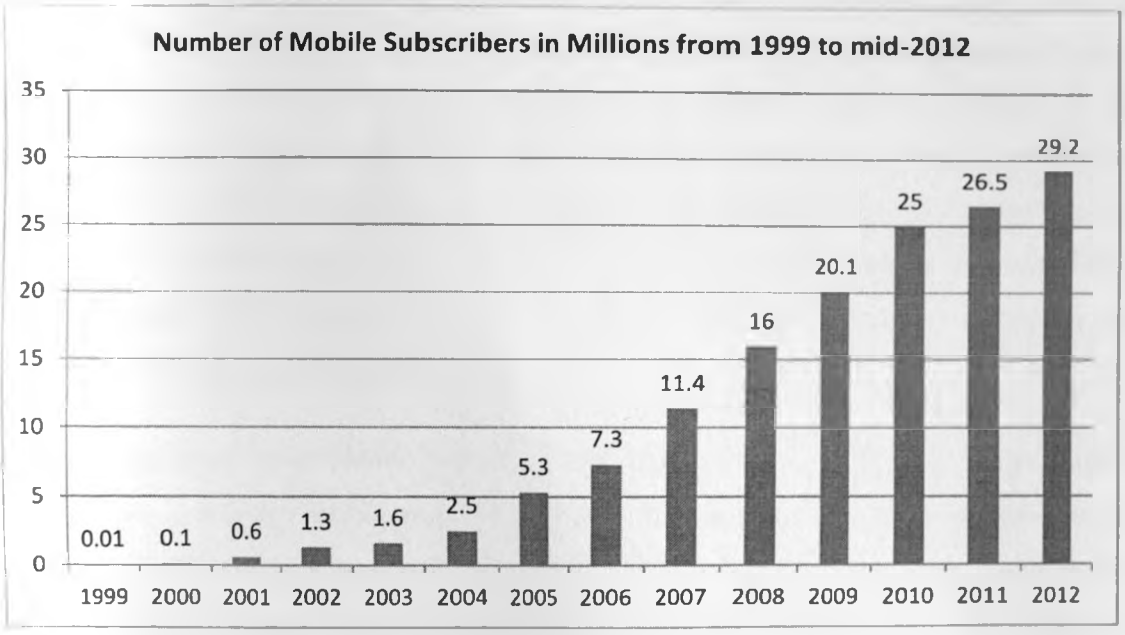
- The Postal Corporation of Kenya (PCK), established under the Postal Corporation Act of 1998
- Telkom Kenya Ltd (Telkom), incorporated in April 1999 under the Companies Act of 1948
- The Communications Commission of Kenya (CCK), an independent regulator of all communications services in the country
- The National Communications Secretariat (NCS), a communications policy advisory think-tank within the Ministry of Information and Communications responsible for communications services
- The Appeals Tribunal set up to resolve disputes between operators or between CCK and the operators. It has three members: a chair, who should be an experienced advocate at the High Court of Kenya, and two technical experts, one from telecommunications and the other in postal services.

Although the KCA did not allow a monopoly—or even a duopoly—on telecommunication operations, the government granted Telkom an exclusive license for five years up to June 2004, to allow Telkom to adjust to a competitive business environment. Telkom was responsible for all local access, national telephone services, Internet backbone networks, and Very Small Aperture Terminals (VSATs) as well as all international gateway services. Today, it is still the only national fixed telecommunications services operator. In September 2007, Telkom was also granted a mobile license and began offering those services using Code Division Multiple Access (CDMA) 2000 technology.

Mobile phone services in Kenya operated as a duopoly with Safaricom and Celtel (later Zain, then Airtel) taking the lead since 2000. The original intention of the KCA of liberalizing telecommunications in Kenya had largely been met. Growth was tremendous, from 17,000

mobile subscribers in 1999 to 22.5 million by February 2011 (ITU, 2008). In December 2007, France Telecom acquired 50% of Telkom Kenya and proceeded to launch its Orange brand in Kenya in September 2008. Now called Telkom Orange, it has rolled out and aggressively marketed its mobile services, which run on GSM (global system for mobile communication) technology. In November 2008, Econet was launched, bringing to four the total number of operators. Figure 2-2 shows how the number of mobile phones line users grew from 1999 to mid 2012 (CCK, 2012).

Figure 2-2: Mobile phone users since 1999



The growth in the mobile sector was primarily a result of the friendly regulatory environment the KCA created in 1998. However, KCA only regulates communications services; it does not address electronic commerce, mobile commerce, or mobile banking.

In 2006, the Kenya ICT Policy was published to promote electronic commerce and other electronic services such as mobile banking and mobile transactions (CCK, 2006). Later on the Kenya Communication (Amendment) Act 2009 was published "to facilitate the development of the information and communications sector (including broadcasting, multimedia, telecommunications and postal services) and electronic commerce" (GOK, 2009).

Mobile money innovation and uptake in Kenya

M-Pesa

Safaricom launched M-Pesa in 2007. This innovation was not Safaricom's idea. It began at Vodafone, Safaricom's parent company in the UK, which was awarded funding from the Department of International Development (DFID) to help develop a mobile phone-based system to improve access to financial services for people in East Africa. Safaricom only agreed to partner on the project. The pilot implementation began on October 11, 2005; other partners were Faulu Kenya, a leading microfinance institution in Kenya, and the Commercial Bank of Africa, which provided the traditional banking infrastructure. Late in 2007, Celtel launched Sokotele, a competitor to M-Pesa. Celtel's partners in the development are Packet Stream, a public data network operator, and K-Rep, one of Kenya's leading micro-finance institutions. K-Rep provides the banking expertise, Packet Stream supplies the vending software, and Celtel Kenya's cellular network makes the connectivity possible. Later, in 2009 this service was replaced by Zap (Airtel Money), a service that operates across the country (Omwansa, 2009).

After the launch of these mobile money services, several banks embraced mobile banking technologies, enabling customers to access their bank accounts via their mobile phones. Leading microfinance institutions in Kenya, including Jamii Bora, K-Rep and Faulu Kenya, have introduced services based on SMS (short message service) that let their clients view their balances, request account statements, and transfer money (Omwansa & Sullivan, 2012).

Technology and innovation often move on ahead of regulation. M-Pesa's growth is a classic example. Within the first eight months after its launch in March 2007, M-Pesa announced a subscription base of 900,000 users and 1,200 agents operating nationwide. Meanwhile, a total of KShs. 4 billion (approx US $57 million) had been transmitted, with an average transaction value under KShs. 5,000 (approx US $71). In April 2008, M-Pesa had well over two million active subscribers, transmitting over 100 million KShs. (approx. US$ 1,428,571) a day. In just the month of July 2008, people transferred KShs. 21 billion (approx US $300 million). By February 2011 the mobile operator had signed up 13.5 Million M-Pesa users (Omwansa & Sullivan, 2012) (Safaricom, 2012).

The other two mobile operators Telkom Orange and Yu Essar launched their mobile money services, Orange Money and YuCash respectively. It is worth noting that the uptake of Airtel Money, Orange Money and YuCash combined was far below the uptake and usage of M-Pesa (CCK, 2012).

Airtel Money

Airtel Money, a product of Bharti Airtel was the second MNO led service to be launched in Kenya. The then Zap service started off with multiple services. Zain reasoned that P2P transfers alone, which typically end with a recipient converting e-money back to cash, were not enough to deliver on their vision of a cash-free ecosystem. Instead, Zain positioned Zap as "Much more than Money Transfer" and typically promoted some combination of money transfer, airtime top-up, bill payments, and merchant payments. By doing so, Zain provided consumers with options to use their electronic money rather than instantly convert it back into cash. Zain was the first deployment to enable users to link e-wallets to bank accounts to further facilitate their vision of a cash-free ecosystem. The link to the bank account is optional for the customer, but the need to convert e-money back to cash, was minimized since they could seamlessly transfer it to the bank account. Kenya is predominantly a cash society and getting a platform to operate on a purely cashless society might sound real attractive. This could be the case for the poor whose money is at risk, when they have no access to formal financial services. However, the uptake of Zap within Kenya has not been anywhere close to that of M-Pesa (Airtel, 2012); (CCK, 2012).

Orange Money

Orange Money in Kenya was launched as a partnership between Equity Bank Group, the leading bank in terms of customer accounts and Orange Telkom, one of the mobile operators in Kenya. Orange Telkom was the fourth MNO to launch its mobile money service in Kenya. The launch took place in November, 2010. It is considered one of the most sophisticated mobile money services in Kenya. The service is a mobile phone-based payment system that allows customers to carry out simple banking operations and transactions in total security.

By accessing bank accounts, the customers are able to save money, pay bills and run their businesses. It is an example of pure mobile banking service enabling users to access the core banking system. Orange Money accounts are based on the Equity mobile banking platform and are mapped onto Equity Accounts meaning that Orange Money customers can perform normal bank transactions on their mobile phones.

Transactions possible on Orange Money include bank-to-bank transfers, bank-to-mobile transfers and access to SWIFT inter-bank transfers. Orange Money platform is governed by banking rules unlike its counterparts in the mobile money transfer. Transactions can also be of much higher value (initially set at KShs. 100,000) than other services. In addition, it is possible to transfer money across all four mobile networks in Kenya and pay for goods and services through an integrated e-commerce platform.

Orange money has pretty much the most comprehensive mobile banking services feature. The partners expected rapid uptake of the services, but the numbers are not yet impressive. The researcher considered this case ideal for investigation considering its sophistication and appeal to the BoP yet low uptake (CCK, 2012); (Orange, 2012).

Analyzing the mobile money success factors

The success of mobile money in Kenya, particularly the pioneering M-Pesa can be viewed from two dimensions; namely the capabilities of the mobile operator and the environment (Omwansa, 2009); (Mas & Morawczynski, 2009). Research, particularly that conducted by the GSM Association, revealed that the mobile operator characteristics significantly determined the success of its product. Safaricom was a dominant operator and invested substantial amount of money in advertising its product. In addition, the environment which included a supportive regulator and a huge demand for the service among others, contributed to significant uptake.

Out of review of literature and qualitative work done during this study, the researcher idenfied a number of specific factors that have contributed to M-Pesa's success (Omwansa, 2009); (Morawczynski & Miscione, 2008) (Mas & Morawczynski, 2009) (Omwansa & Sullivan, 2012). Some of the factors are described below:

Diffusion of mobile phones

The growth of Kenya's mobile subscribers has been tremendous. By February 2011 there were 22 million, while land lines were hardly 400,000 (CCK, 2010). In the first quarter of 2006 there were 147.4 million mobile subscribers in Africa; two years later the number had more than doubled, to 301.7 million, representing a penetration rate of 30.4%. Kenya's penetration rate rose from 2% in 2001 to 39% as of the second quarter of 2008. Kenya is the most developed mobile market in East Africa and its penetration rate is forecast to reach 67.5% in 2012 (ITU, 2010). The fact that Safaricom controls such a large percentage of the subscription base gave M-Pesa the advantage it needed to penetrate quickly. Only Safaricom subscribers can operate an M-Pesa accounts, though other network subscribers can receive alerts from an M-Pesa subscribers that funds have been sent to them (Mas & Morawczynski, 2009).

The need for access to financial services

Low penetration of banking services created a huge demand for mobile money. The service has been beneficial to both banked and un-banked. Features such as convenience, speed, and low transaction fees attract significant numbers of those already using banks. Small businesses are among the greatest beneficiaries; using M-Pesa lets them go to the bank less often, and spend more time running their businesses. Many un-banked Kenyans receive and send money via their mobile phones, wherever they are in the country (FSD, 2007); (FSD, 2009); (Omwansa & Sullivan, 2012).

Low transaction costs

According to the 2007 survey by FSD (FSD, 2009) mentioned above, over 70% of Kenyans preferred informal methods to remit funds to their loved ones within the country. Out of those interviewed, 55% sent money to friends or family members who would be travelling and 22% used public transport companies. Though such methods are not safe, people preferred them because the transaction fees are lower than those of banks and money transfer companies. The transaction cost offered by mobile money is very competitive compared to banks and other formal money transfer services. In 2009, to send KShs. 35,000 (approx US$ 500) using a money transfer company such as Western Union would cost KShs.

1,200 (approx US$ 17) within the country. Though the prices have come down, they cannot in any way compare with M-Pesa which charges KShs. 35 to send the same amount (See Appendix 3)

From a technological point of view, the various mobile money services are comparative. They have various strengths and weaknesses. Some, such as Orange Money, offer a direct connection to a physical bank account, while others, such as M-Pesa, only offer money transfer. It is worth studying adoption with the user perspectives in mind. This subject is even more relevant considering that the various operators have provided attractive features, yet the penetration of these mobile money services cannot be compared.

The transaction costs associated with transacting with mobile money have evolved over the five or so years that the innovation has existed in Kenya.

Table 1-1 summarizes the Transaction Costs as of the first quarter of 2012 (See Appendix 3 for more details). Deposits to mobile money accounts are free for all the products. All the mobile money services have adopted a tariff format for Transaction Costs in the case of withdrawing and sending. M-Pesa and YuCash enable sending of less than KShs 50.

Airtel Money adopted a flat rate for sending within the network, YuCash does not charge while M-Pesa and Orange Money have a tariff. Sending to other networks or to non-registered users is cheapest with Airtel money with a flat rate of KShs 25. YuCash does not offer the service while M-Pesa and Orange Money have a tariff which is more-or-less similar. Only Orange money facilitates transfer of over KShs. 70,000 (maximum of KShs. 100,000). Withdrawing from an agent in the network attracts a fee that is based on a tariff which is relatively similar for all the four products.

Table 1-1: **MNO Led mobile money services transaction costs as of Q1 2012**

Amount	Transaction Cost			
Sending within networks				
	M-Pesa	Airtel Money	YuCash	Orange Money
10 to 49	3	NA	0	NA
50 to 100	5	5	0	NA
101 to 5,000	30	25	0	30 (100 inclusive)
5,001 to 20,000	50	25	0	30
20,001 to 35,000	75	25	0	30
35,001 to 45,500	75	25	0	40
45,501 to 50,000	100	25	0	40
50,001 to 70,000	100	25	0	50
70,001 to 100,000	NA	NA	NA	50
Sending to Un-Registered Users/ Non-Registered-Users				
101 to 2,500	60	25	NA	70 (100 inclusive)
2,501 to 3,500	80	25	NA	90
3,501 to 5,000	95	25	NA	90
5,001 to 7,500	130	25	NA	155
7,501 to 10,000	155	25	NA	155
10,001 to 15,000	200	25	NA	305
15,001 to 20,000	215	25	NA	305
20,001 to 35,000	215	25	NA	355
35,001 to 50,000	NA	NA	NA	390
50,001 to 100,000	NA	NA	NA	450
Withdrawing from network agent				
10 to 49	NA	NA	5	NA
50 to 100	10	15	5	NA
101 to 250	25	25	5	25 (100 inclusive)
251 to 2,500	25	25	20	25
2,501 to 5,000	45	45	40	45
5,001 to 7,500	75	75	65	75
7,501 to 10,000	100	75	65	75
10,001 to 15,000	145	145	120	145
15,001 to 20,000	160	145	120	145
20,001 to 35,000	170	170	140	170
35,001 to 50,000	250	250	200	195
50,001 to 70,000	300	300	200	225
70,001 to 100,000	NA	NA	NA	225

Source: Mobile Operator websites

2.4 Mobile Money at BoP theoretical studies

The study of mobile money at the 'base of the pyramid' has generated interest in the recent past, particularly because of the uptake of the product in developing countries where financial services access is limited. One recent publication on the adoption of mobile

financial services (MFS) among the poor attempts to analyse previous studies on mobile banking and map them to MFS (Das & Pal, 2011). The review of literature by Dass and Pal forms a very good basis for establishing the constructs for mobile money adoption. In the study, the researchers reviewed 29 research papers that they found relevant in the area of MFS. From these papers, they identified 34 factors that influenced adoption of MFS.

Other studies have utilised TAM to investigate aspects of mobile banking adoption. Some A number have extended TAM to investigate adoption of mobile banking applications (Chung & Kwon, 2009) and (Yu & Fang, 2009). Others used the diffusion of innovation theory by Rogers to study mobile banking (Luarn & Lin, 2005) and (Mallat, 2007).

To demonstrate the effect of additional constructs, some researchers have extended TAM to account for new factors. Perceived transaction cost, system quality and social influence were investigated by extending TAM (Kleijnen, et al., 2004). Trust in mobile banking was investigated by other researchers as an extension of TAM such as (Gu, et al., 2009) and (Luarn & Lin, 2005).

Other researchers have explored moderating variables and found them to have an influence on mobile banking. Age, education and gender are reported in studies like (Sourata, 2003) and (Laukkanen & Pasanen, 2007).

2.5 Conducting adoption studies

Adoption studies have been done using different approaches depending on what aspects the researchers want to focus on. The three notable approaches are briefly described below, with a justification for the choice made.

Time-Series approach

This approach leans towards investigating diffusion of technology over time. One way to execute the technique is to capture the percentage of adopters at a unit time. This is useful when the adopter characteristics are likely to change over time.

Cross-sectional approach

This approach is used where emphasis is to establish the impact of specific constructs or variables on adoption. This technique will not effectively address the dynamic structure of adoption.

Panel data approach

Another approach for adoption studies would be panel data. In this case, adopter characteristics and adoption choices made over time must be available, making it useful in understanding behavioral changes.

The researcher considered the options and settled for the cross-sectional approach. This was mainly because; the emphasis of the study was to establish the impact of specific constructs and variables on adoption and not diffusion the diffusion of the innovations. In addition the adopter characteristics were not expected to change much over a short period. There were cases of multiple SIM cards ownership, but users generally maintained one SIM card for money transfer.

2.6 Technology adoption theories/models

The following section discusses some of the relevant models for mobile money adoption. A number of these models have been used in the study of related technologies such as internet banking and mobile banking.

Innovation Diffusion Theory (IDT)

IDT has been used since the 1950s to describe the innovation-decision process. It evolved a few time (Rogers, 1962), (Rogers, 1983), (Rogers, 1995), (Rogers & Shoemaker, 1971). According to the innovation-decision process, an individual or decision making unit, passes from first the knowledge of an innovation, then to forming an attitude toward the innovation to a decision to adopt or reject to implementation of the new idea and to confirmation of this decision.

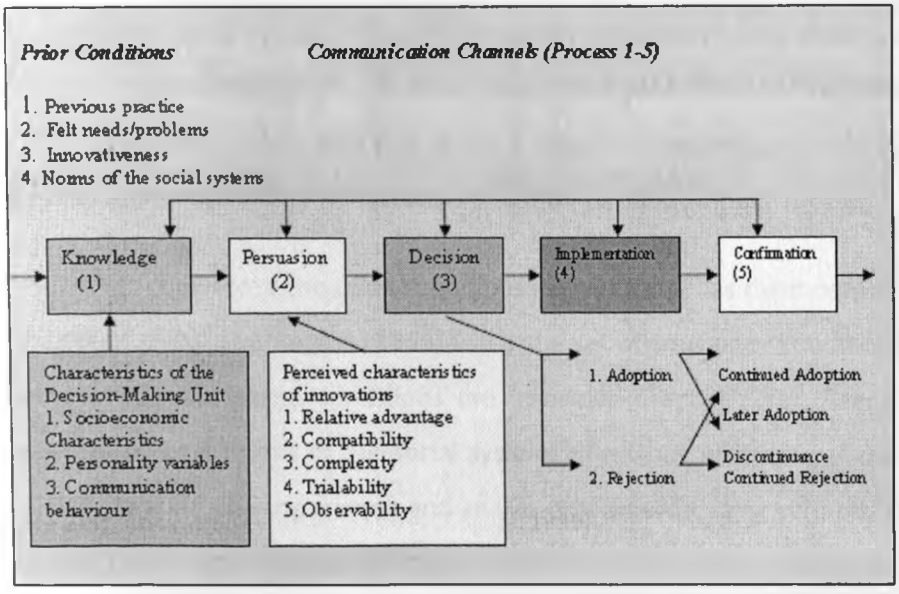
Das & Pal (2011) shows that the IDT is one of the most well known theories related to adoption of new technologies. Rogers transformed the model into five specific stages as follows (Rogers, 1995):

1) Knowledge occurs when an individual is exposed to an innovation's existence and gains some understanding of how it functions.
2) Persuasion occurs when an individual forms a favourable or unfavourable attitude toward the innovation.
3) Decision occurs when an individual becomes involved in activities that lead to a decision to adopt or reject the innovation.
4) Implementation occurs when an individual puts an innovation into use.
5) Confirmation occurs when an individual seeks reinforcement for an innovation-decision already made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation.

In the persuasion stage, five attributes that persuade an individual to adopt the innovation are:

1) Relative advantage
2) Compatibility
3) Complexity
4) Trialability
5) Observability

Figure 2-3: Innovation Diffusion Model (Rogers, 1995)



Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes. The degree of relative advantage is often expressed in economic profitability but the relative advantage dimension may be measured in other ways (e.g. social). Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the receivers. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use. The complexity of an innovation is negatively related to its rate of adoption. Trialability is the degree to which an innovation may be experimented with on a limited basis. Observability is the degree to which the results of an innovation are visible to others.

These aspects in the persuasion stage get mapped into other constructs of the technology adoption models. For example 'relative advantage' evolves into a more comprehensive Perceived Usefulness and later into Performance Expectancy. Complexity evolves to Ease of Use and later into Effort Expectancy and so on.

The entire model focused more on the process of diffusion and less on the adoption. Aspects of adoption were addressed, as a decision, either for rejection, immediate adoption, later or continuous adoption or for continued rejection. The model, though not very comprehensive for studying adoption, has a valuable basis, particularly the persuasion characteristics and prior conditions. The researcher chose to explore these constructs as presented in later more comprehensive adoption models as opposed to their form in this model. However, in the case of persuasion, the researcher extracted the construct of trialability. This was mainly because it was substantially mentioned during qualitative studies. In this model, trialability is used to achieve persuasion, which leads to a decision. The researcher later explored this construct as a determinant of behavioural intention to adopt mobile money.

The researcher considered the prior conditions for this model as the most valuable aspect in the context of this study. Rogers (1995) listed the set of four prior conditions necessary for technology diffusion. These conditions are 'previous practice', 'felt needs or problems', 'innovativeness' and 'norms of the social systems'. Previous practice was considered in this study, later mapped into experience and analysed as a moderating variable. Feeling need or having faced problems influences adoption. Later, this aspect is mapped into Perceived Usefulness in other models or Facilitating Conditions in UTAUT and the eventual research framework. Innovativeness appears in research conducted on mobile money related areas.

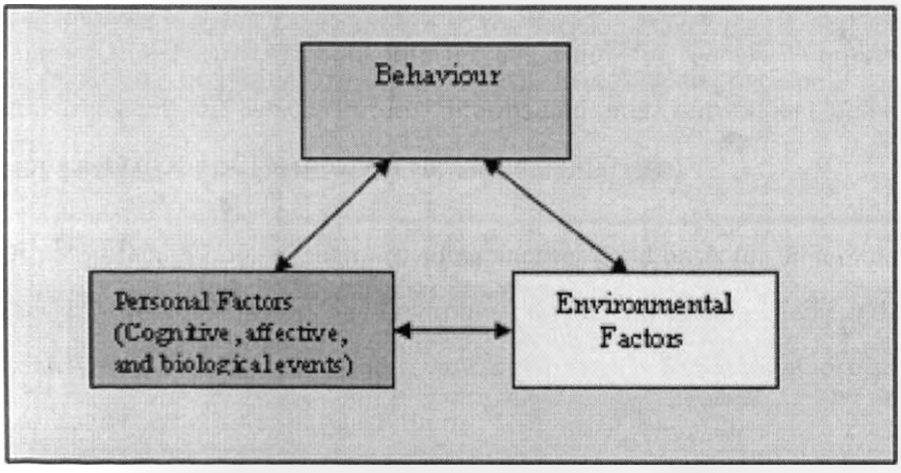
Norms of the social systems later becomes Social Norms in other models or Social Influence in UTAUT and in the eventual research framework.

Social Cognitive Theory (SCT)

Bandura (1986) published the SCT. The theory suggests that human functioning is a dynamic interplay of personal, behaviour, and environmental influences. How people interpret the results of their own behaviour informs and alters their environments and the personal factors they possess which, in turn, informs and alters subsequent behaviour. The triadic reciprocality of the SCT is shown in Figure 2-4.

This theoretical model, though providing another good basis for understanding what drives behaviour (personal factors and environmental factors) is too general and lacks details. The researcher chose to proceed and review other models to identify more specific constructs, factors and relationships between them.

Figure 2-4: Social Cognitive Theory (Bandura, 1986)

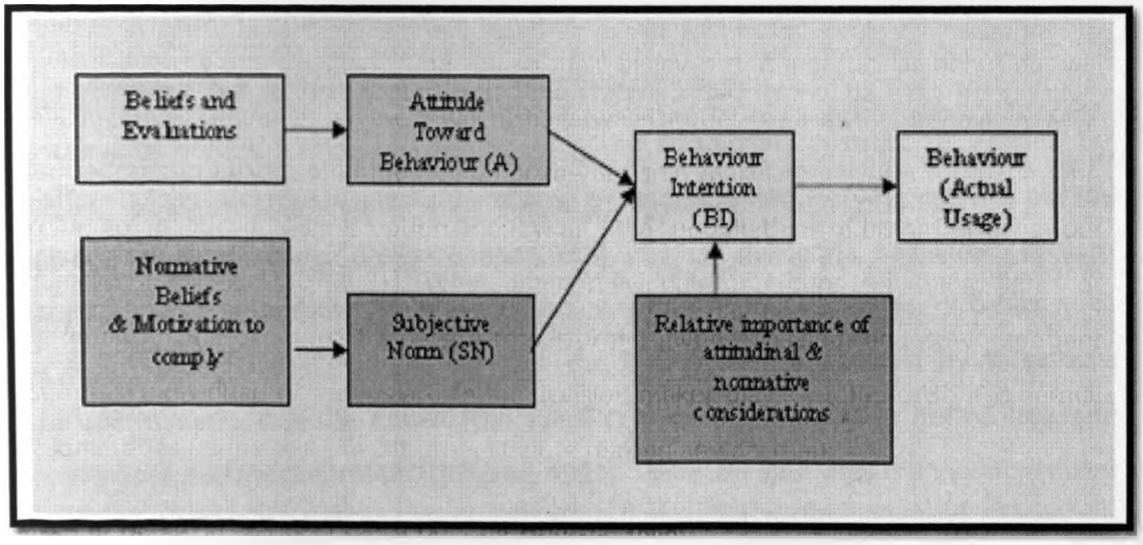


Theory of Reasoned Action (TRA)

Ajzen and Fishbein developed the TRA in 1980, a versatile behavioural theory and model (TCW, 2004). This model is the basis for attitude-behaviour relationships studies. The TRA suggests that beliefs influence attitude and social norms which in turn shape a behavioural intention guiding or even dictating an individual's behaviour. Intention is the cognitive representation of a person's readiness to perform a given behaviour, and it is considered to be the immediate antecedent of behaviour.

TRA shown on Figure 2-5 has two core constructs/determinants of intention: first, attitude toward behaviour (ATB) and secondly subjective norm (SN) associated with that behaviour. ATB is the previous attitude of a person toward performing that behaviour. It suggests that people think about their decisions and the possible outcomes of their actions before making any decision to be involved or not involved in a given behaviour. This theory views the intention of an individual whether to perform a given behaviour or not as the immediate determinant of action, and attitude is determined by the person's beliefs and evaluation of behavioural outcomes. So an individual, who strongly believes that positive outcomes will result from performing a particular behaviour, will have positive attitudes towards that behaviour. On the other hand, if a person strongly believes that a particular behaviour will have a negative outcome, then there will be negative attitudes towards that behaviour. SN is the social pressure exerted on the person or the decision maker to perform the behaviour. SN refers to an individual's perception about what other people think of his or her behaviour in question (Leach, et al., 2001). What other individuals or groups will think, agree or disagree about the decision of a person to perform a given behaviour and how important these other individuals or groups are to the decision maker play a vital role. So it is normal that sometimes people will consult others before making any decisions.

Figure 2-5: Theory of reasoned action (Ajzen & Fishbein, 1980)



TRA is a general well-researched intention model that has been applied extensively in predicting and explaining behaviour across many domains and virtually any human

behaviour (Ajzen & Fishbein, 1980) and many modern technology adoption models have their roots pegged on TRA.

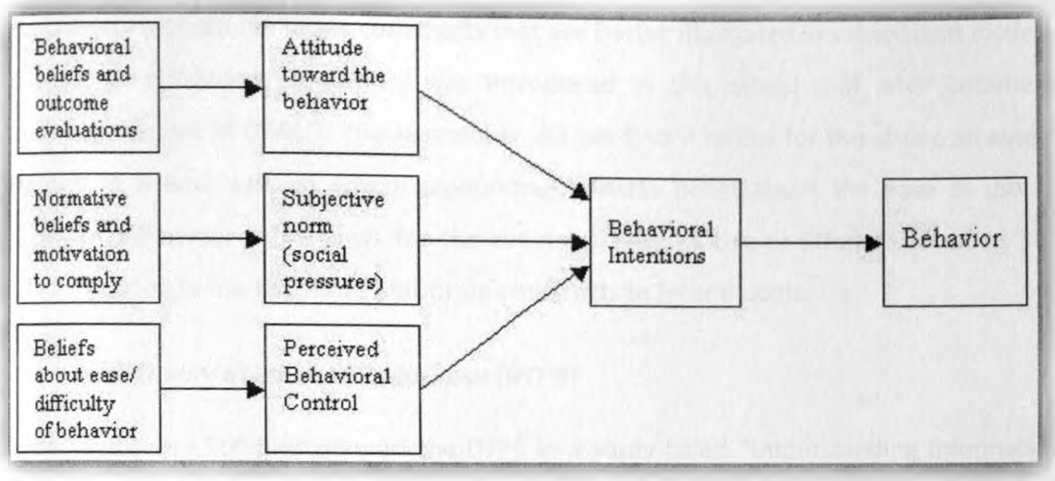
The researcher considered this as a significant improvement from the previous models studied in terms of specifics and relationship between these specifics. Compared to the previous models, it would be much easier to domesticate this model to the adoption of mobile money compared. The constructs Behavioural Intention and Actual Use were carried on to later models and the researcher retained them as well. The construct of Subjective Norm, which later becomes Social Influence featured in other mobile money related studies as well as in qualitative work. However, this model did not exhaust constructs considered relevant for mobile money adoption. For example, the environmental factors mentioned in the SCT model earlier were dropped, yet the researcher considered them critical in this study. At the same time, moderating variables were missing. At this stage, the researcher extracted Subjective Norm, Behavioural Intention and Actual Usage as the key most useful constructs from this model.

Theory of planned behaviour (TPB)

TPB is proposed as an extension of the TRA because of its limitations in dealing with behaviours over which people have incomplete volitional control. TPB introduced a third independent determinant of intention, perceived behaviour control (PBC).

Ajzen extended TRA to introduce TPB in 1985 (Ajzen, 1985) by adding the construct PBC. According to (Ajzen, 1991), TPB incorporates the additional construct to account for situations where an individual lacks the control or resources necessary for carrying out the targeted behaviour freely. TPB is a theory that predicts deliberate behaviour, because behaviour can be deliberative and planned. Similar to TRA, the best predictor of behaviour in TPB is intention (TCW, 2004). As for TPB, the intention is determined by three core constructs namely, attitude toward the specific behaviour, subjective norms (SN) and perceived behavioural control (PCB) (Ajzen, 1991). Figure 2-6 illustrates the components of TPB.

Figure 2-6: Theory of Planned Behaviour (Ajzen, 2002)



It can be noticed that when given a sufficient degree of actual control over their behaviour, people are expected to carry out their intentions when the opportunity arises. In addition, according to the TPB, human behaviour is guided by three kinds of beliefs (Ajzen, 2002):

1) Behavioural beliefs are about the likely outcomes of the behaviour and the evaluations of these outcomes. They produce a favourable or unfavourable attitude toward the behaviour.
2) Normative beliefs refer to the perceived behavioural expectations of such important referent individuals or groups as the person's spouse, family, friends, and teacher, doctor, supervisor, and co-workers, depending on the population and behaviour studied. These beliefs result in perceived social pressure or subjective norm.
3) Control beliefs - beliefs about the presence of factors that may facilitate performance of the behaviour and the perceived power of these factors. These beliefs indicate whether the person feels in control of the action in question and they give rise to perceived behavioural control.

By changing these three predictors (attitude, subject norm and perceived behaviour control), the chance that the person will intend to do a desired action can be increased and thus increase the chance of the person actually doing it.

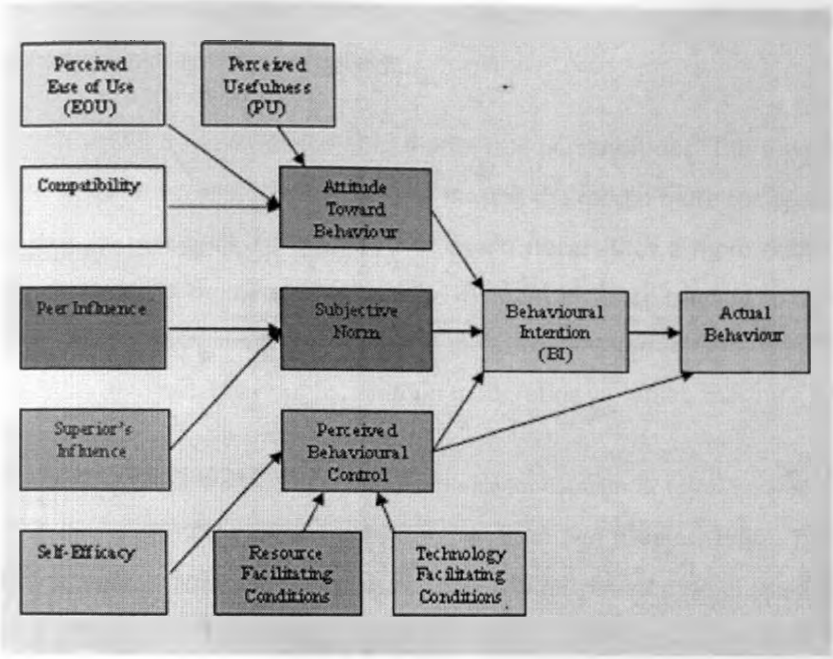
This model is not very different from TRA discussed in the previous section. Just like in TRA, the researcher picked Subjective Norm, Behavioural Intention and Actual Usage. Behavioural

Beliefs would be a reflection of Perceived Usefulness or Performance Expectancy. The researcher considered the latter constructs that are better illustrated in subsequent models. An aspect of obligation to comply was introduced in this model that later became a moderating variable in UTAUT. The researcher did not find it crucial for this study, an aspect presented in a later section when expounding UTAUT. Belief about the ease of use or difficulty of behaviour is the basis for the construct Ease of Use or Effort Expectancy. The researcher opted to use the more elaborate constructs in later models.

Decomposed Theory of Planned Behaviour (DTPB)

In 1995 Taylor and Todd introduced the DTPB in a study titled "Understanding Information Technology usage: a test of competing models". This model more completely explores the dimensions of attitude belief, subjective norm (i.e., social influence) and perceived behavioural control by decomposing them into specific belief dimensions (Taylor & Todd, 1995). DTPB suggests that behavioural intention is the primary direct determinant of behaviour, nevertheless, the original three core constructs still exist: attitude toward behaviour (ATB), subjective norm (SN), and perceived behaviour control (PBC) as first introduced in TPB (See Figure 2-7).

Figure 2-7: **Decomposed Theory of Planned Behaviour (Taylor & Todd, 1995)**



The key to DTPB is the decomposition of the variables. Attitudinal belief is decomposed into three factors: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and compatibility. Normative belief was decomposed into peer influence and superior's influence, because each may have different views on IT usage.

Perceived behaviour control (PBC) was decomposed into three constructs: Self Efficacy, Resource Facilitating Conditions, and Technology Facilitating Conditions. Self Efficacy (Bandura, 1977) is related to perceived ability, and it is anticipated that higher levels of self-efficacy will lead to higher levels of behavioural intention and IT usage (Compeau, 1991). The Facilitating Conditions construct provides two dimensions for control beliefs: one relating to resource factors (resource facilitating conditions) such as time and money and the other relating to technology compatibility issues (technology facilitating conditions) that may constrain usage. The absence of facilitating resources represents barriers to usage and may inhibit the formation of intention and usage. However the presence of facilitating resources may not encourage usage (Taylor & Todd, 1995). This model seemed to have more capability in explaining usage behaviour.

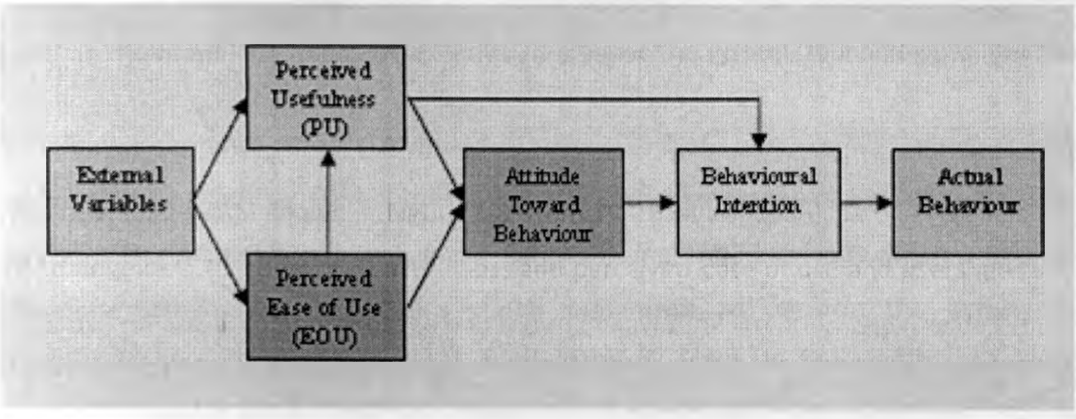
This model unpacks or decomposes the TPB. Constructs such as Perceived Usefulness and Ease of Use were not clearer. This was considered the most elaborate model that could fit in the study of mobile money adoption.

The researcher however found this model less parsimonious. There were variables in the model which are considered constructs, making the model more complex. In addition, there are multiple mediating constructs that would necessitate a more rigorous analysis and a larger data set. In the researcher's view, it would be more prudent to collapse some of the constructs and then aim to have several measurement variables for these constructs. At the same time the model has not focused on moderating variables, making it less complete.

Technology acceptance model (TAM)

Davies developed TAM shown in Figure 2-8 from TRA (Davies, 1986). Two key beliefs were used to develop TAM: perceived usefulness and perceived ease of use and users' attitudes, intentions and actual computer usage behaviour. Behavioural intention is jointly determined by attitude and perceived usefulness. Attitude is determined by perceived usefulness (PU) and perceived ease of use (PEOU).

Figure 2-8: Technology Acceptance Model (Davis, et al., 1989)



TAM replaces determinants of attitude of TRA by perceived ease of use and perceived usefulness. Generally, TAM specifies general determinants of individual technology adoption and therefore can be and has been applied to explain or predict individual behaviours across a broad range of end user computing technologies and user groups (Davis, 1989).

The goal of TAM is to provide an explanation for the determinants of computer acceptance that are in general capable of explaining user behaviour across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified. However, since it incorporates findings accumulated from over a decade of IS research, it may be especially well suited for modelling computer Information Systems (Davis, 1989).

TAM has become a robust, powerful, and parsimonious model for predicting user acceptance. Davis developed and validated better measures for predicting and explaining use which focused on two theoretical constructs: perceived usefulness and perceived ease of use, which were theorized to be fundamental determinants of system use (Davis, 1989).

Aside from their theoretical values, better measures for predicting and explaining system use would have great practical value, both for vendors who would like to assess user demand for new design ideas, and for information systems managers within user organizations who would like to evaluate these vendor offerings.

TAM theorized that the effects of external variables (e.g., system characteristics, development process, and training) on intention to use are mediated by perceived usefulness and perceive ease of use. Perceived usefulness is also influenced by perceived ease of use because if other things are equal, the easier the system (technology) is, the more useful it can be (Venkatesh & Davies, 2000).

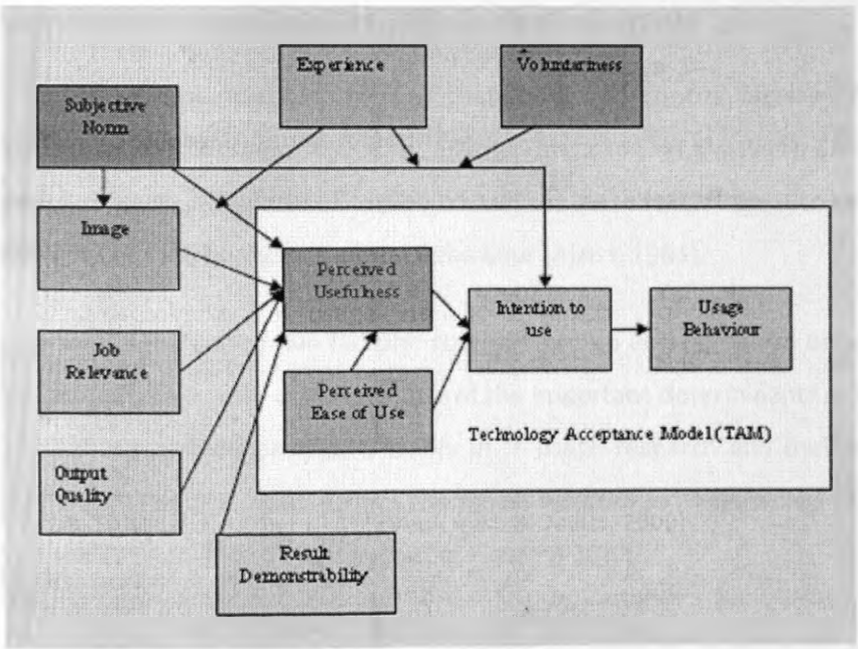
One assumption made by TAM is that usage of a particular technology is voluntary (Davis, 1989). Another assumption is that, given sufficient time and knowledge about a particular behavioural activity, an individual's stated preference to perform the activity (i.e. behavioural intention) will in fact closely resemble the way they do behave. This assumption only applies when the behaviour is voluntary (Ajzen & Fishbein, 1980). Moreover, TAM has strong behavioural elements; it assumes that when someone forms an intention to act, they will be free to act without limitation. In the real world there will be many constraints, such as limited ability, time constraints, environmental or organizational limits, or unconscious habits which will limit the freedom to act (Bagozzi, 1992).

The researcher found this model more parsimonous than DTPB, thus making it more appropriate for the study on mobile money adoption. It was a lot simpler, yet comprehensive. However, some important constructs like Subjective Norm, Trialability and environmental factors were missing. In addition, TAM does not address moderating variables. This made the model less comprehensive.

Technology acceptance model 2 (TAM2)

Venkatesh and Davis (2000) developed TAM2, shown in Figure 2-9 as a theoretical extension of TAM. TAM2 extends TAM to include additional key determinants of TAM that explain perceived usefulness and usage intensions in terms of social influence and cognitive instrumental processes and to understand how the effects of these determinants change with increasing user experience over time with the target system.

Figure 2-9: TAM2, extension of TAM (Venkatesh & Davies, 2000)



A better understanding of the determinants of perceived usefulness would enable us to design organizational interventions that would increase user adoption and usage of new systems.

This model made an attempt to add details to the TAM, making it more elaborate but less parsimonious. Some of the additions to the model were perceived confusing to the

. For example, Subjective Norm is considered a determinant of Perceived
, Image and Intention to Use. Image is ideally an element of Subjective Norm. At
time, it was clear that some of the added constructs were indeed variables that
used to operationalise the TAM constructs. For example, output quality and
monstrability are aspects that would be used to measure Perceived Usefulness.
of parsimony in the model made it complex to use to test mobile money adoption.

positive thing about the model is that, moderating variables like voluntariness and
ce were introduced. But yet others like age and gender were missing. Besides, an
al construct about the environment was missing.

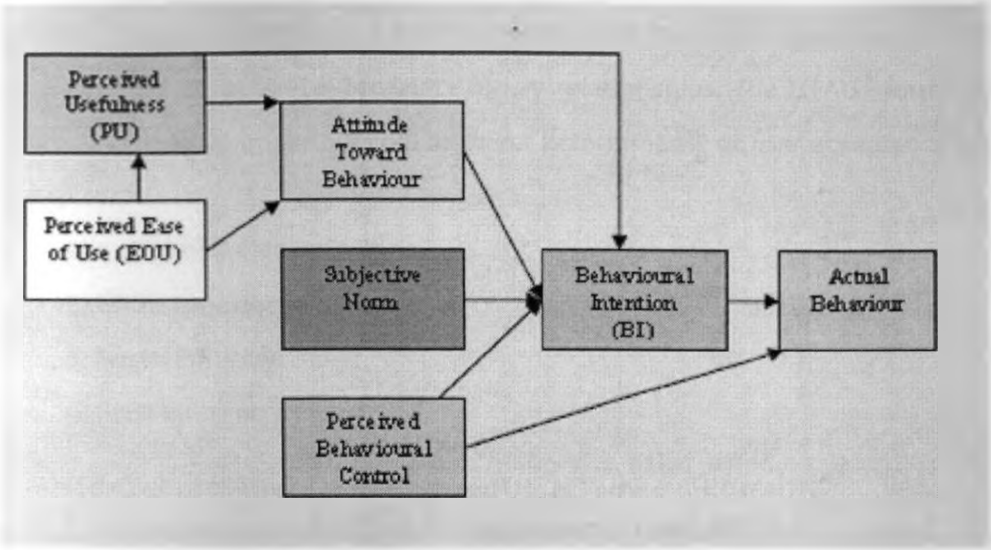
oint, the researcher had a great collection of constructs and options of models to
h, but argued that there was an element of incompleteness on the part of the
o study mobile money adoption.

ted TAM or Combined TAM and TPB (C-TAMTPB)

er of researchers confirmed that social and control factors influence behaviour
son, 1991). (Taylor & Davies, 1995), (Thompson, et al., 1991). TAM does not include
ctors on behaviour. It can be noted that these factors are also key determinants of
ur in the Theory of Planned Behaviour (Ajzen, 1991).

nd Todd added two factors: subjective norm and perceived behavioural control to
provide a more complete test of the important determinants of IT usage. They did
ause of their predictive utility in IT usage research and their wide use in social
gy (Taylor & Todd, 1995). The model referred to "Augmented TAM" or "Combined
d TPB" (C-TAM-TPB) is shown in Figure 2-10.

Figure 2-10: Augmented TAM (C-TAM-TPB) (Taylor & Todd, 1995)



The augmented TAM provides an adequate model of IT usage for both experienced and inexperienced users, accounting for a reasonable proportion of the variance in intention and behaviour. For both groups, all direct determinants of intention, except attitude, were significant. Therefore, the augmented TAM can be used to predict subsequent usage behaviour prior to users having any experience with a technology. This suggests that this model can be used to predict usage for people who have never used the technology before as well as the capacity to predict usage for people who have used the technology or for people who are familiar with the technology. So IT usage models may be employed diagnostically prior to implementation or after implementation both with inexperienced and experienced users.

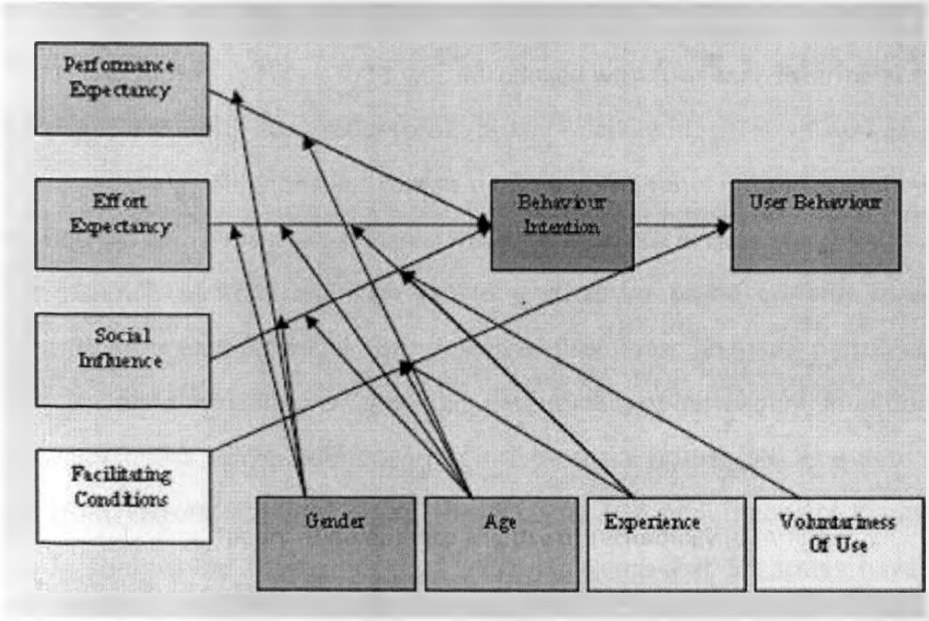
Augmented TAM, though more parsimonious, was weak in a number of ways. Some constructs were missing and moderating variables were absent. The researcher felt that the model was not significantly different from TAM.

Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT, shown on Figure 2-11 was introduced with four core determinants of intention and usage, and up to four moderators of key relationships. The UTAUT formulated four constructs to play an important role as direct determinants of user acceptance and usage behaviour:

1) Performance expectance
2) Effort expectancy
3) Social influence
4) Facilitating conditions

Figure 2-11: Unified Theory of Acceptance and Use of Technology (UTAUT)



The key moderators in the model are gender, age, voluntariness, and experience. UTAUT provides a refined view of how the determinants of intention and behaviour evolve over time (Venkatesh, et al., 2003). In addition, it is important to emphasize that most of the key relationships in the model are moderated.

For example, age has received very little attention in the technology acceptance research literature, but the findings from the study of UTAUT indicate that it moderates all of the key relationships in the model. In addition, gender, which has received some recent attention, is also a key moderating influence, which is consistent with the findings in the sociology and social psychology literature (Levy, 1988).

Though appearing complex in terms of relationships, UTAUT was considered parsimonous. It was more comprehensive in terms of constructs than any other model. At the same time, moderating variables were well laid out, making it easy to understand. Though missing on some constructs like innovativeness and trialability, the researcher felt that the model would form a good basis for study upon which to build the research framework.

The following section provides a comparative analysis of the models with arguments as to what models or components of models would be most useful for the study on mobile money adoption.

2.7 Comparing the Acceptance theories/models

Several researchers have done comparative studies of the various adoption models discussed above.

TAM vs. TRA

Davis, Bagozzi and Warshaw compared the TAM with TRA in their study (Davis, et al., 1989). The confluence of TAM and TRA led to a structure based on only three theoretical constructs: behaviour intention (BI), perceived usefulness (PU) and perceived ease of use (PEOU). Social norms (SN) as an important determinant of behavioural intention, were found to be weak in this study. TAM does not include social norms (SN) as a determinant of BI, which is an important determinant, theorized by TRA and Theory of Planned Behaviour (TPB). In their study Davies, et al., (1989) explained that SN scales have a very poor psychometric standpoint, and may not exert any influence on BI, especially when IS applications are fairly personal while individual usage is voluntary. Generally, the comparisons confirmed that TAM is parsimonious and easy to apply across different research settings; nevertheless, it has to pay the trade-off of losing information richness derived from the studies. However, TAM compared favourably with TRA and TPB in parsimonious capability (Han, 2003).

TAM, TPB, and DTPB

Mathieson compared the TAM with TPB and established that TAM and TPB explained intention very well (Mathieson, 1991). The information TPB derived was probably more

useful during system development and post-implementation evaluation than the information TAM provided. TPB delivers more specific information, giving more insight into why an individual or group might not use a particular technology. However, TAM was easier to use than TPB, and provides a quick and inexpensive way to gather general information about an individual's perception of a technology.

Taylor and Todd compared the TAM to a traditional version of Theory of Planned Behaviour (TPB) and a decomposed version of TPB (DTPB) to assess which model best helps to understand usage of information technology in their study (Taylor, et al., 1995). The DTPB should have more advantages than TAM in that it does not only identify specific salient beliefs (perceived usefulness, and perceived ease of use) that may influence IT usage as TAM does, but also incorporates additional factors (subjective norm and perceived behaviour control) that are not presented in TAM. These additional factors have been found to be important determinants of behaviour (Ajzen, 1991).

From these studies, it possible to conclude that, DTPB provides a relatively more complete understanding of technology usage (Taylor & Davies, 1995).

According to Taylor and Todd, DTPB takes the inclusion of seven more constructs in the DTPB model to increase the predictive power of behaviour 2% over TAM (Taylor & Todd, 1995). However, it helps to better understand subjective norm and perceived behavioral control and their roles as determinants of behavioural intention. As a result, it provides a better understanding of behavioural intention. If the central goal is to predict IT usage, it can be argued that TAM is preferable. However, the DTPB model provides a more complete understanding of the determinants of intention. Both TAM and DTPB provide some very useful and direct indicators of behavioural intention and usage behaviour and the DTPB provides the richest understanding of these factors. While TAM focuses on system design characteristics and is of particular use as a guide to design efforts, the DTPB model includes these design factors, but also draws attention to normative and control factors that an organization can work with to facilitate implementation.

Each model has clear strengths (TAM, TPB and DTPB). All of them provided comparable fit to the data. In terms of the ability to explain IT usage behaviour, the results show that the TAM and the two TPB models are comparable. However, when behavioural intention is

considered, the results show improvement in explanatory power for both the original TPB and DTPB over the TAM. In other words, while the TAM is useful in predicting IT usage behaviour, the DTPB provides a more complete understanding of behaviour and behavioural intention by accounting for the effects of normative and control beliefs. This should help to better manage the system implementation process by focusing attention on social influences and control factors in the organization that influence IT usage (Taylor & Todd, 1995).

Chau and Hu compared TAM, TPB and DTPB in understanding individual physicians' usage of telemedicine technology (Chau & Hu, 2001). The results illustrated that TAM explained 40% of the variances, TPB explained 32% and DTPB explained 42% in physicians' acceptance of telemedicine technology. PU was a significant determinant of attitude and BI in both TAM and DTPB models, PEOU did not have any effects on PU or attitude in all models. The findings suggested that instruments that have been developed and repeatedly tested in studies involving end-users and business managers in ordinary business settings may not be equally valid in a professional setting such as that of physicians.

Typically, among the models, fit statistics and explanatory power being equivalent, the best model is the one which is the most parsimonious (Bagozzi, 1992). Because of this, a model that provides good prediction while using the fewest predictors is preferable. Nevertheless, other researchers have argued that parsimony is not desirable by itself, but rather is desirable only to the extent that it facilitates understanding (Venkatesh, et al., 2003).

2.8 Choice and justification of model for the study

In their study, Venkatesh, et al. (2003) compared eight models in association with core constructs, beliefs, moderators and percentage of explained variance including TRA, TAM, a motivational model (MM), TPB, C-TAM-TPB, a model of PC utilization (MPCU), IDT and SCT. They found that the eight models explained between 17% and 53% of the variance in user intention to use information technology. After comparing these models, they formulated the UTAUT and tested using the original data as for the eight models, and it was found that the result outperformed the eight individual models (69% adjusted R_2). From these results, UTAUT seemed to be the best theory that could provide a useful tool for management in assessing the likelihood of success for technology introduction.

Moreover, UTAUT helps to understand the drivers of adoption in order to proactively design interventions including training targeted at populations of users that may be less inclined to adopt and use new technology.

UTAUT contributes to better understanding about the drivers of behaviour. With this rationale, the researcher proposed to base this research on this model as the foundation theoretical framework. However, consideration of other theories to form the theoretical framework for this research, were also made because of the interesting premises and significant benefits they provide in enabling description of usage behaviour. Figure 2-12 and Table 2-2 demonstrate that the researcher considered aspects of previous models to develop the conceptual framework for the study, by borrowing from all other models. Further justification for adding new constructs is provided in the sections that follow.

Figure 2-12: Development of the research framework

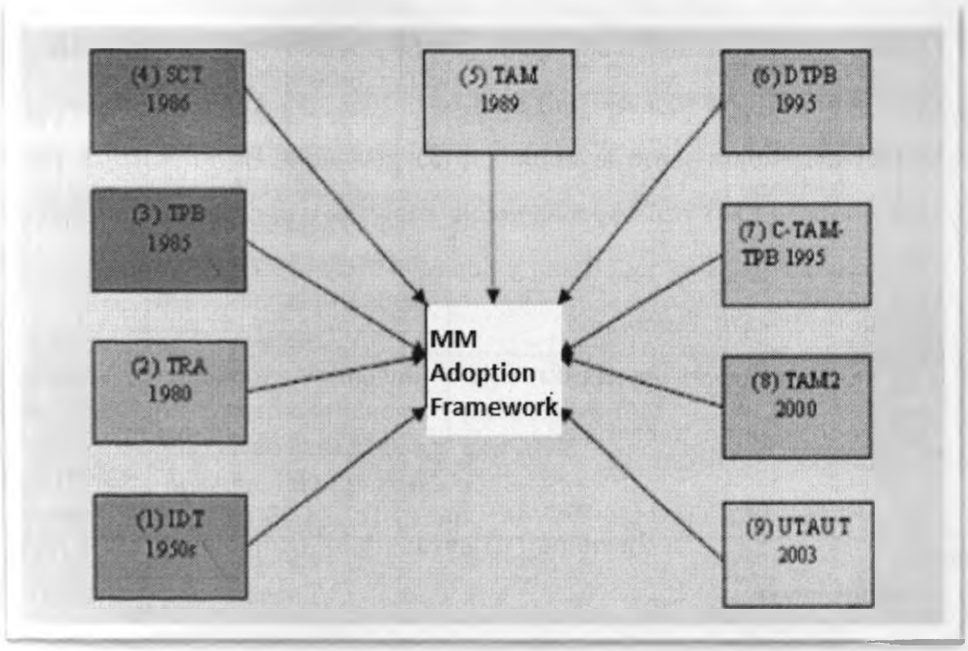


Table 2-2: **Extraction of constructs from adoption models in literature**

Framework from literature	Construct Extracted	New Construct considered	Factored in UTAUT?	Final name to use
Innovation Diffusion Theory (IDT)	Trialability	Trialability	No	Trialability
Theory of Reasoned Action (TRA)	Subjective Norm, Behavioural Intention, Actual Usage	Subjective Norm	Yes	Social Influence
		Behavioural Intention	Yes	Behavioural Intention
		Actual Usage	Yes	Actual Usage
Decomposed Theory of Planned Behaviour (DTPB)	Perceived Usefulness, Perceived Ease of Use, Subjective Norm, Resource facilitating conditions, Behavioural intention, Actual Usage	Perceived Usefulness	Yes	Performance Expectancy
		Perceived Ease of Use	Yes	Effort Expectancy
		Self Efficacy	Yes	Facilitating Conditions
		Resource facilitating conditions	Yes	Facilitating Conditions
Technology acceptance model (TAM)	External Variables, Perceived Ease of Use, Perceived Usefulness, Behavioural intention, Actual Behaviour	External Variables	Yes	Facilitating Conditions
Extended TAM (TAM2)	Experience, Voluntariness, Subjective Norm, Perceived Usefulness, Perceived Ease of Use, Behavioural Intention, Actual Usage.	Experience	Yes *(moderating variable)*	Experience
Augmented TAM or Combined TAM and TPB (C-TAMTPB)	Subjective Norm, Perceived Usefulness, Perceived Ease of Use, Behavioural Intention, Actual Usage.	Constructs already picked from TAM and DTPB		
Unified Theory of Acceptance and Use of Technology (UTAUT)	Performance expectance, Effort expectancy, Social influence, Facilitating conditions, Gender, Age, Experience, Voluntariness, Behavioural Intention, Actual Usage	Gender	Yes *(moderating variable)*	Gender
		Age	Yes *(moderating variable)*	Age
		Voluntariness	Yes *(moderating variable)*	Voluntariness

2.9 Analysing the constructs

Having settled on the UTAUT framework (with the addition of trialability) as the basis for this study, the researcher proceeded to elaborate on the constructs of the framework. There are four direct determinants and four moderating variables. In the following section, the researcher provides a discussion of these constructs.

2.9.1 Direct Determinants

There are a number of determinants pertaining to user adoption that have been identified from previous research. Inconsistencies in using major determinants in the theories/models in previous research have been found. For this study, the researcher proposed to focus on the major determinants based on the prominent model UTAUT in combination with the findings from previous research.

The major determinants in the proposed research model in this study are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC) and Trialability (TR).

Next, is a justification and explanation for proposing these determinants in the research model.

Performance Expectancy

Performance Expectancy (PE) is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance (Venkatesh, et al., 2003). The PE construct is considered the strongest predictor of intention for both voluntary and mandatory settings (Venkatesh & Davies, 2000); (Agarwal & Prasad, 1998). Acceptance models were developed and tested in organizational settings, exploring the information systems and therefore the evaluation of PE is biased. The researcher focused on mobile money adoption and use by the poor who are driven by other motives other than job performance. Mobile money is primarily for personal use and even though some usage could be associated to job performance, it is likely minimal and considered beyond the scope of this study. The researcher chose to explore PE in the context of how mobile money will positively impact the user's life as well as improve an individual's life. To operationalise PE in

mobile money, while borrowing from other research in internet banking and mobile banking the researcher explored usefulness, increased speed, increased productivity and convenience that potentially result from the use of mobile money.

It was theorized that PE directly influences behavioural intention to use mobile money.

Social Influence

Social Influence (SI) is defined as the degree to which an individual perceives that important others believe he or she should use the new system (Venkatesh, et al., 2003).

SI is also referred to as subjective norm (SN) in the TRA (Fishbein & Ajzen, 1975). It is also considered as the Social Factor by (Thompson, et al., 1991) and in some cases Image such as the case for (Moore and Izak 1991). It is mentioned as SN in other models like TPB, DTPB, TAM2, and C-TAM-TPB (Venkatesh, et al., 2003). Subjective Norm is defined as the person's perception that most people who are important to a user think that he should or should not perform a behaviour in question. In the case of Social Factor, it is considered as the individual's internalization of the reference group's subjective culture and specific interpersonal agreements that the individual has made with others, in specific social situations. In the case of Image, Moore and Benbasat (1991) define it as the degree to which use of an innovation is perceived to enhance one's image or status in social system. All these aspects are integrated together in UTAUT as the SI, which encompasses the social pressure exerted on the individual by the opinions of other individuals or groups (Venkatesh, et al. 2003).

Other interesting findings in research indicate that a number of researchers found that SI has no significant effect on behaviour intention (Chau & Hu, 2001); (Davis, 1989); (Dishaw & Strong, 1999); (Mathieson, 1991); (Venkatesh & Davies, 2000); (Venkatesh, et al., 2003). Some articles suggested both non-significant and significant effects of SI toward intention because they studied in different conditions and generated inconsistent results of the effect of SI on behaviour intention. More importantly, it has been found that SI has significant effects on usage (Igbaria, et al., 1996); (Thompson, et al., 1991).

These inconsistencies associated with SI effect on usage or behaviour intention lead to an interesting question: Will SI have a significant effect on usage behaviour in the context of mobile money by the poor in Kenya?

It was therefore considered critical to include SI as a determinant of behavioural intention to adopt mobile money. To operationalise SI, the researcher explored how people who are important to the user influence their adoption behaviour.

It was theorized that SI directly influences behavioural intention to use mobile money.

Effort Expectancy

Effort Expectancy (EE) is defined as the degree of ease associated with the use of the system (Venkatesh, et al., 2003). In other models, it is referred to as perceived ease of use – PEOU, (TAM and TAM2), complexity (MPCU) or ease of use (IDT) (Thompson, et al., 1991); (Plouffe, et al., 2001). PEOU is defined as the degree to which a person believes that using a particular system would be free of effort (Davis, 1989).

Though EE is significant both for voluntary and mandatory usage it has been established only to be significant during the first time period and then becomes insignificant as the users continue using the technology (Thompson, et al., 1991); (Davis, et al., 1989).

In the case of mobile money, it includes registration procedures, ease of use of the payment procedure, easy access to customer services, minimal steps required to make a payment, appropriate screen size and input capabilities. The availability of the mobile money agents will increase the PEOU. Furthermore, it should be accessible on the most basic mobile phones.

It was therefore proposed that EE should be investigated as originally set out under UTAUT but contextualized to mobile money.

To operationalise EE in the context of mobile money, the researcher proposed to explore ease of use, ease of mastering mobile money applications, clarity and understability of the mobile money applications.

It was theorized that EE directly influences behavioural intention to use mobile money.

Facilitating Conditions

Facilitating Conditions (FC) was modelled as a direct antecedent of behaviour intention and usage in the Decomposed Theory of Planned Behaviour (DTPB) which expected that the impact of FC should alert management to possible barriers to usage (Taylor & Todd, 1995). FC is defined as "The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system (Venkatesh, et al., 2003). The FC was found non-significant in predicting intention but significant in determining usage (Venkatesh, et al., 2003). It has been suggested that the absence of facilitating resources represents barriers to usage and may inhibit the formation of intention and usage. However the presence of facilitating resources may not encourage usage (Taylor & Todd, 1995). Although, FC is the least studied construct in the existing theories/models, it is very important to investigate whether this construct is a direct determinant of usage behaviour in the poor mobile money users. In the context of mobile money, consistent with other related studies, FC can be operationalised by aspects like knowledge of how to use mobile money, ability to get assistance when having difficulties, availability of networks and agents, as well as accessibility.

It was theorized that FC directly determines and is expected to influence usage behaviour of mobile money.

2.9.2 Additional Direct Determinants

There were three sources from which the researcher could obtain relevant constructs.

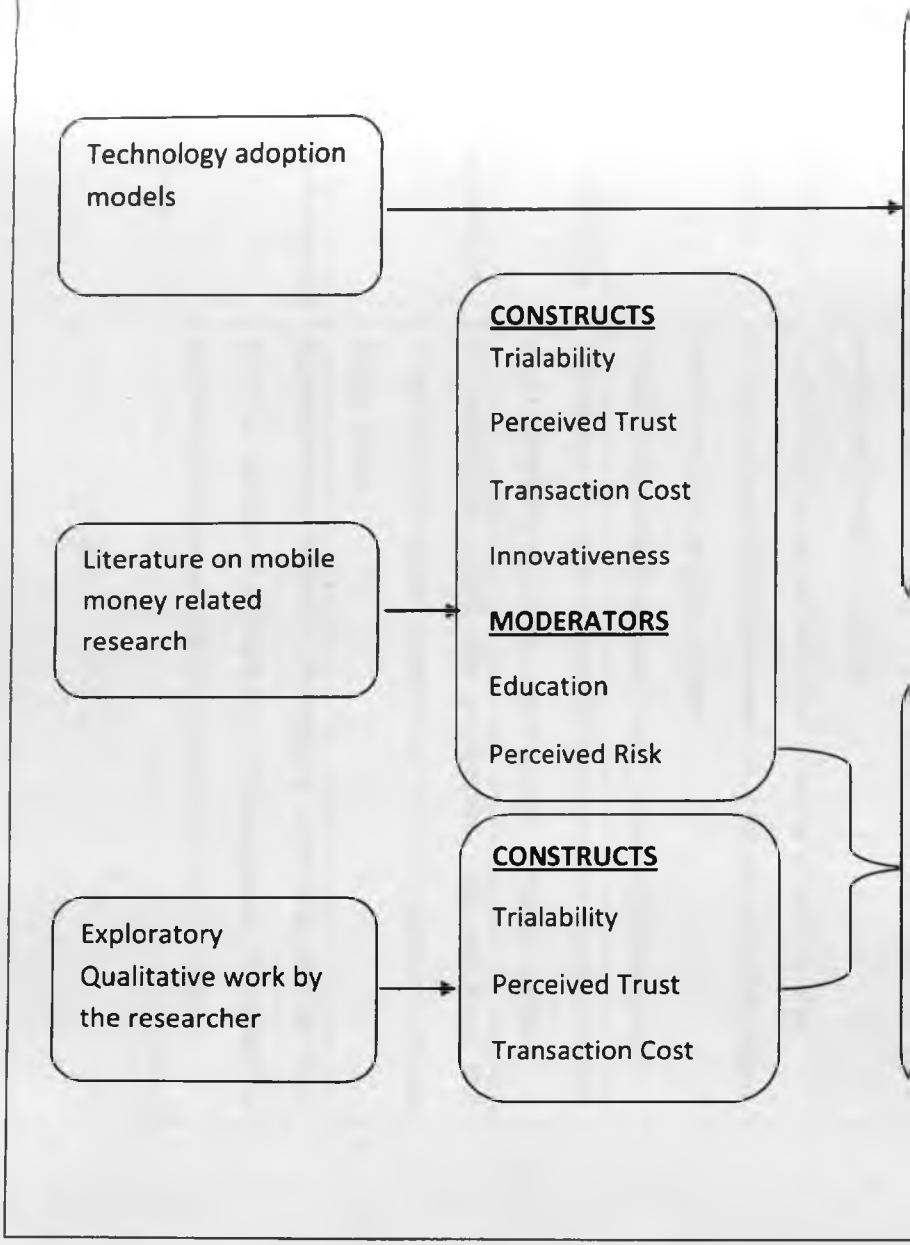
a. Technology adoption models
b. Literature on mobile money related research
c. Qualitative work by the researcher

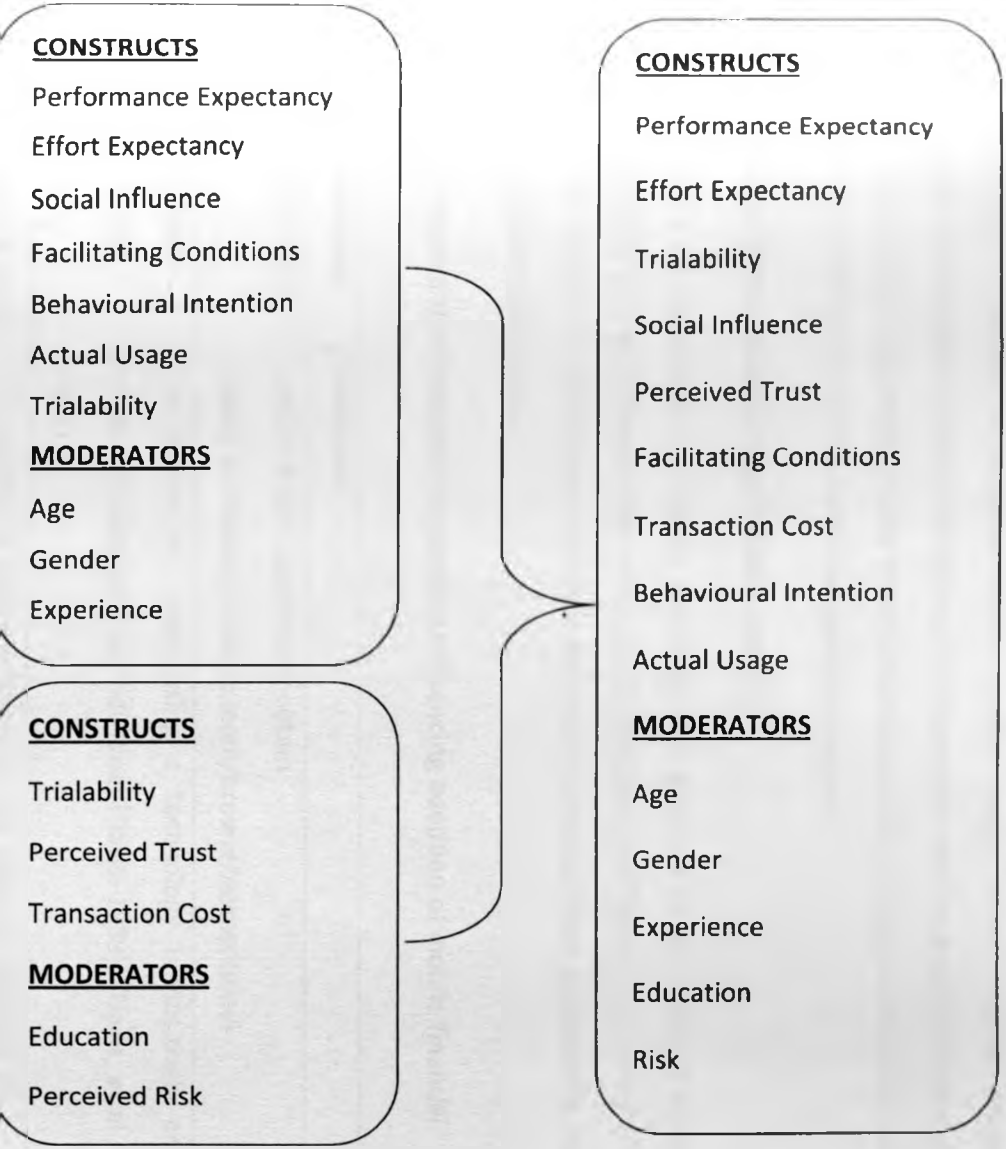
Technology adoption models generated several of the constructs used in the study framework, as discussed earlier. Next the researcher focused on the literature on mobile money related areas such as electronic commerce, internet banking and mobile banking. Considering the limited research work in mobile money among the poor, the researcher conducted an elaborate qualitative work generating a set of constructs. These constructs were evaluated in relation to those from literature on mobile money related areas in order

to generate the new set of constructs to add to the final conceptual framework for the study.

To illustrate the generation of the constructs and moderators, the researcher uses the diagram in Figure 2-13 to give an overview. The three sources are shown and the filtering is provided at the second level while the final list is shown at the end.

Figure 2-13: Layout of constructs generation




CONSTRUCTS
Performance Expectancy
Effort Expectancy
Social Influence
Facilitating Conditions
Behavioural Intention
Actual Usage
Trialability
MODERATORS
Age
Gender
Experience
CONSTRUCTS
Trialability
Perceived Trust
Transaction Cost
MODERATORS
Education
Perceived Risk
CONSTRUCTS
Performance Expectancy
Effort Expectancy
Trialability
Social Influence
Perceived Trust
Facilitating Conditions
Transaction Cost
Behavioural Intention
Actual Usage
MODERATORS
Age
Gender
Experience
Education
Risk

Having reviewed a number of adoption models, studied mobile money adoption related research and conducted exploratory interviews, the researcher was convinced that there are additional constructs that needed to be investigated. Below the researcher describes how constructs were obtained from the other two possible sources.

2.9.2.1 *Constructs from mobile money related research*

In their effort to summarize the factors that influence adoption of all forms of mobile financial services among the poor, (Das & Pal, 2011) generated the Table 2-3 showing a list of what they termed as dimensions and their definitions obtained from publications that investigated these dimensions.

Table 2-3: Factors that have been researched influencing adoption of mobile financial services

	Dimension	Definition
1	Accessibility	Easy to reach, approach or obtain (http://dictionary.reference.com/browse/Accessibility)
2	Attitude towards MFS	The degree to which using a technology is positively or negatively valued by an individual (Davis, 1989); (Davis, et al., 1989).
3	Banking needs	The variety of banking products and services required by an individual (Tan & Teo, 2000).
4	Behavioural Intention	A cognitive plan to perform a behaviour or action, created through a choice/decision process that focuses on beliefs about the consequences of the action. (http://www.marketingpower.com/_layouts/dictionary.aspx)
5	Compatibility	The degree to which an innovation is viewed as being consistent with the existing values of users (Agarwal & Prasad, 1998).
6	Convenience	The extent to which the prospective user perceives that mPayment increases convenience in the payment process (Chen, 2006).
7	Expressiveness	Expressiveness defined as the degree to which a user perceives a mobile service as suitable for expressing his or her emotions and social or personal identity (Goeke & Pousttchi, 2010).

8	Facilitating conditions	The extent of technology and other external support (e.g. government support) in the environment (Tan & Teo, 2000).
9	Firm reputation / Familiarity with the Bank	A firm's reputation reflects its reliability in business engagements. It increases customers' recognition, plays a role in forming their initial confidence and helps to maintain their confidence in future transactions (Kim & Prabhakar, 2004).
10	Initial trust	People's initial trust reflects their willingness to take risks in order to fulfil their needs (Kim & Prabhakar, 2004).
11	Innovativeness	Inclination of an individual to try out any new information systems (Kim, et al., 2010).
12	Interpersonal Relationship	Interpersonal relationship refers to the strength of personal bonds that develop between customers and their service provider (Cheong, et al., 2004).
13	Mobile experience	Prior experience of using a similar class or type of technology (Tan & Teo, 2000).
14	Mobility	Mobility refers to the system being available anytime, anywhere (Zmijewska, 2005).).
15	Network Externalities	Payment systems exhibit network externalities as the value of a payment system to a single user increases when more users begin to use it (Mallat, 2007).
16	Perceived Credibility	Perceived credibility is defined as the extent to which a person believes that the use of mobile banking will have no security or privacy threats. (Luarn & Lin, 2005); (Wang, et al., 2003).
17	Perceived ease of use / Complexity	Perceived ease of use refers to the degree to which a person believes that using a particularly stem would be free of effort (Davis, 1989). Complexity refers to the degree to which an innovation is considered relatively difficult to understand and use (Taylor & Todd, 1995) .
18	Perceived financial Cost	Perceived financial cost is defined as the extent to which a person believes that using mobile banking will cost money (Luarn & Lin, 2005).

19	Perceived risk	The perceived sense of risk concerning disclosure of personal and financial information (Tan & Teo, 2000).
20	Perceived self efficacy	An individual's self-confidence in his or her ability to perform behaviour (Taylor & Todd, 1995).
21	Perceived Usefulness	Perceived usefulness is defined here as the degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1989)
22	Privacy	The extent to which the prospective user is concerned about the following privacy aspects relevant to m-payment (Chen, 2006).
23	Relative benefits/advantage	Relative benefits are realized when a new service offers greater value to customers than existing ones in such ways as improvements in economic benefits, personal image, convenience and satisfaction (Rogers, 1995); (Taylor & Todd, 1995).
24	Security	The extent to which the prospective user is concerned about the authentication, confidentiality, Non-Repudiation and data integrity relevant to m-payment (Chen, 2006).
25	Situational Normality	Situational normality is referred to "how normal or customary the situation appears to be" (Baier, 1986); (Gefen et al., 2003a); (Lewis & Weigert, 1985).
26	Speed of Transaction	The extent to which the prospective user perceives that m-payment improves the speed of transaction (Chen, 2006).
27	Structural assurance	Structural assurances refer to "safety nets such as legal resource, guarantees, and regulations existed in a specific context" (Gefen et al., 2003a); (McKnight et al., 1998); (Shapiro, 1987).
28	Subjective norm / Social influence	Social influence is defined as "a person's perception that most people who are import to him think he should or should not perform the behaviour in question" (Fishbein & Ajzen, 1975).
29	System quality	System quality is defined as the degree to which individuals perceive that the system is satisfying, in terms of transfer speed

		and reliability (Kleijnen, et al., 2004).
30	Technology anxiety	An individual's tendency to be uneasy, apprehensive, or fearful about the current or future use of a technology (Lee, et al., 2004).
31	Trialability	The extent to which users would like an opportunity to experiment with the innovation prior to committing to its usage (Agarwal & Prasad, 1998).
32	Trust	Trust is a psychological expectation that a trusted party will not behave opportunistically (Bunduchi, 2005); (Rousseau, et al., 1998).

Having decided on the UTAUT (with an addition of Trailability) framework as the basis for this study, the researcher mapped the dimensions in Table 2-3 to the UTAUT framework as shown in Table 2-4 in order to see if there were new constructs missing in UTAUT. There was evidence that a number of researchers have investigated new constructs that are not in UTAUT.

Table 2-4: Mapping of dimensions in research to UTAUT framework

	Dimension	**Mapping to UTAUT**
1	Accessibility	Facilitating Conditions
2	Attitude towards MFS	Behavioural Intention
3	Banking needs	Performance Expectancy
4	Behavioural Intention	Behavioural Intention
5	Compatibility	Not in UTAUT
6	Convenience	Performance Expectancy
7	Expressiveness	Not in UTAUT
8	Facilitating conditions	Facilitating Conditions
9	Firm reputation /Familiarity with bank	Not in UTAUT
10	Initial trust	Not in UTAUT
11	Innovativeness	Not in UTAUT
12	Interpersonal Relationship	Social Influence
13	Mobile experience	Moderating factor

14	Mobility	Facilitating Condition
15	Network Externalities	Not in UTAUT
16	Perceived Credibility	Not in UTAUT
17	Perceived ease of use / Complexity	Effort Expectancy
18	Perceived financial Cost	Not in UTAUT
19	Perceived risk	Not in UTAUT
20	Perceived self efficacy	Facilitating Conditions
21	Perceived Usefulness	Performance Expectancy
22	Privacy	Not in UTAUT
23	Relative benefits/advantage	Performance Expectancy
24	Security	Not in UTAUT
25	Situational Normality	Not in UTAUT
26	Speed of Transaction	Facilitating Conditions/Performance Expectancy
27	Structural assurance	Facilitating Conditions
28	Subjective norm / Social influence	Social Influence
29	System quality	Not in UTAUT
30	Technology anxiety	Not in UTAUT
31	Trialability	Not in UTAUT
32	Trust	Not in UTAUT

Table 2-5 lists the constructs extracted from Table 2-4 that have been studied, yet are not available in UTAUT. The first column lists the dimensions inherited from Table 2-4 while the second column displays a close interpretation. Some of the constructs, according to the researcher, were not considered significantly relevant to mobile money adoption among BoP. In particular, compatibility was dropped because these consumers would not be linking systems like a sophisticated user would be linking a debit card to multiple accounts. It is a level of convenience that would not matter to most poor users. Expressiveness defined as the degree to which a user perceives a mobile service as suitable for expressing his or her emotions and social or personal identity did not seem relevant for mobile money. It would apply for subscribing to a mobile network for communication but not money transfer. The researcher chose to drop it at this point.

The exercise resulted in five possible constructs, namely **Perceived Risk, Perceived Trust, Innovativeness, Transaction Cost and Trialability** that have been studied, yet not in UTAUT.

Table 2-5: Deciding on the constructs that have been studied but are not in UTAUT

	Dimension	Analysed and Reworded
1	Compatibility	Not Relevant
2	Expressiveness	Not Relevant
3	**Firm reputation /Familiarity with bank**	**Perceived Trust**
4	**Initial trust**	**Perceived Trust**
5	**Innovativeness**	**Innovativeness**
6	Network Externalities	Performance Expectancy/Social Influence
7	**Perceived credibility**	**Perceived Trust**
8	**Perceived financial cost**	**Transaction Cost**
9	**Perceived risk**	**Perceived risk**
10	**Privacy**	**Perceived Trust**
11	**Security**	**Perceived Risk**
12	**Situational Normality**	**Perceived risk**
13	**System quality**	**Perceived Trust**
14	Technology anxiety	Facilitating Conditions
15	**Trialability**	**Trialability**
16	**Trust**	**Perceived Trust**

2.9.2.2 *Constructs from qualitative work done by the researcher*

Starting with this list of five constructs generated in the previous section, the researcher had to decide on which constructs to consider for this study over and above the primary constructs from UTAUT. The researcher used qualitative exploratory analysis to determine the constructs that would be investigated.

Qualitative work described

The researcher conducted a total of 89 in-depth qualitative interviews from a variety of respondents between January 2011 and August 2011. These interviews were purely

exploratory with an aim of understanding the history, conceptualization, piloting, deployment, adoption and impact of mobile money in Kenya. The nature of respondents ranged from CEOs of telecommunication companies and financial institutions, government officers, management officers from regulators and development partner organizations, entrepreneurs, owners and workers in small to medium size enterprises and numerous users from a variety of socio-economic classes. At the BoP, the researcher interviewed farmers, small business owners, *Jua Kali* (informal business) artisans, fishermen, industry workers, house helps, just to name a few. These interviews were domesticated for different respondents with the aim of understanding their version of experiences.

All the interviews were recorded, transcribed and used to generate various outputs. First, the researcher co-authored the book "Money, Real Quick: Kenya's Disruptive Mobile Money Innovation" (Omwansa & Sullivan, 2012) in February 2012. This piece of work was supported by the GSM Association and the Rockefeller Foundation. This book illustrates the entire process of the development, deployment and impact of mobile money, with more emphasis on M-Pesa in Kenya. The book targeted a variety of readers; academics, mobile money managers, financial institutions, telecommunications, development partners and policy makers. Secondly, the researcher used the data to write a number of academic papers. One paper had been officially published by the time this thesis was being written (Lule, et al., 2012). Thirdly, the researcher used the data to make presentations in a number of workshops and conferences. Fourthly, the researcher used the information and network created as the basis for organizing a conference on mobile money research held in Nairobi, Kenya in April 2012. Finally, the researcher used the data to extract constructs that could be determining adoption of mobile money by the poor.

From the qualitative work (Omwansa & Sullivan, 2012), a number of factors were identified as influencers of adoption. Though the wording by the users was specific to mobile money, these factors were consistent with what a number of researchers who have attempted to investigate in related areas (Das & Pal, 2011); (Omwansa, 2009); (Wang, et al., 2003). These factors were also consistent with constructs in technology adoption models. Using the qualitative work, the researcher extracted the top 10 factors determining adoption and then proceeded to map these factors to the original UTAUT framework. Table 2-6 summarises the

listing and mapping of these factors. Through this mapping, new constructs were established which are discussed further in the section that follows.

Table 2-6: Mapping of factors from qualitative work (Omwansa & Sullivan, 2012) to UTAUT

	Factor	Mapping to UTAUT framework
1	Testing a mobile money application before adopting	Does not exist **(Trialability)**
2	Ease of use	Effort Expectancy
3	Lack of banking or financial services	Facilitating Condition
4	Hardship while trying to use existing channels (barriers)	Facilitating Condition/Effort Expectance
5	Demand for formal financial services	Performance Expectancy
6	Usefulness of existing service	Performance Expectancy
7	Readiness (and knowledge) to use technology	Facilitating Condition
8	Cost of transacting	Does not exist **(Transaction Cost)**
9	I exchange money a lot with my family members	Social Influence
10	Trustworthiness	Does not exist **(Perceived Trust)**

The researcher then proceeded to assess the constructs as per Table 2-5 in relation to constructs identified during the exploratory qualitative study. Out of the five constructs identified in section 2.8.2.1 namely **perceived risk, perceived trust, transaction cost, trialability and innovativeness**, three were identified during qualitative work (Omwansa & Sullivan, 2012) namely **perceived trust, transaction cost and trialability** as shown in Table 2-6. Perceived Risk is discussed later as a moderating variable and not a determining construct. Innovativeness was dropped because it did not appear in the exploratory study, in as much as it featured in the literature review. In addition, it did not seem to influence BoP mobile money users who apparently were driven more by the convenience as opposed to innovativeness. This may not apply to urban and sophisticated users.

The researcher therefore decided to proceed with these three constructs which appeared significantly in previous literature as well as in the exploratory study. Below the researcher discusses further the new constructs.

Perceived Trust

Mobile money, just like any money transaction technology, requires trust. A mobile money service must overcome distrust among users (Siau & Shen, 2003). Trust is defined as a measure of consumers' level of assurance that the service will be provided with minimum possible hindrance (Siau & Shen, 2003). It is important to note that trust can relate to the vendor or the product. In the case of mobile money, the vendors are the service providers and agents, both of whom can be perceived differently from the mobile money service. The existence of local agents who are well integrated into the communities would be necessary for this level of trust to be obtained. Users would expect some level of privacy from the agents. In addition, overall network and service-perceived reliability affect consumers' perceived trust in the service. Consumers need to have a belief that the network is reliable. Previous studies have found perceived trust as a significant determinant influencing consumers' behavioural intention towards conducting electronic commerce transactions (Mallat, 2007). A study conducted by Khalil and Pearson applied theory of diffusion of innovation (IDT) by Rogers that focused on five key beliefs (relative advantage, compatibility, complexity, trialability and observability) and trust (Mayer, et al., 1995) to explore the intention to use internet banking among university students (Khalil & Pearson, 2007) The results of structural equation modelling showed that trust, relative advantage and trialability significantly influence attitude.

A similar study, using IDT theory, was conducted by Ndubisi & Sinti (2006) using an online survey method. The study found that four factors namely: importance of internet to banking needs, compatibility, complexity, trialability and risk explained 38.0% for the variance of internet banking adoption.

Another study done by Huam, et al (2008) attempted to investigate the determinants of the intention to use internet banking among users with at least one experience in Klang Valley. Results of multiple linear regressions showed that three significant predictors including trust; compatibility and ease of use accounted for 56.0% of variance of intention to use internet banking.

In the case of mobile money services, users could choose services from different operators possibly in light of their perceived trust of the product/technology or the provider. Possibly, users can consider the agents when evaluating their trust. Observations indicate that the

trust individuals have in banks, mobile operators or partners can affect their likelihood of adopting their services. In addition, there was evidence that users were interested in the products. In a way, there is a connection between the product and the provider.

The researcher therefore proposed to explore Perceived Trust (PT) on the product as a determinant of intention to use mobile money by individuals. For purposes of scoping and focus, the researcher chose to focus on the trust in the product and not in the service provider.

It was theorized that PT directly influences behavioural intention to use mobile money.

Perceived Risk and Perceived Trust

Wherever money transactions are involved, risk is always a concern. From secondary sources, the researcher observed that perceived risk is a significant barrier for mobile money transactions. Perceived risk has been defined as "the consumer's perceptions of the uncertainty and the possible undesirable consequences of buying a product or service" (Littler, et al., 2006).

Trust and risk are linked factors in the literature such that it is understood that risk gives rise to the need for trust when engaging in an activity whereby actions cannot be taken with complete certainty (Yousafzai, et al., 2003); (Chen, et al., 2003). Two different types of risk have been identified in relation to trust. The first type of risk is associated with a partner (Büttner, et al., 2008) which is perceptions that a particular interaction partner in a transaction will not perform their end of the bargain, and are formed from perceptions of the attributes of that interaction partner. This type of risk should be inversely related to trust of that partner (Jarvenpaa, et al., 2000). Essentially, the higher the trust one has in a partner, the less perceived risk in dealing with that partner. The second type of risk is associated with the nature of transaction (Büttner, et al., 2008) and has a different association with trust. The more risky a type of transaction is perceived to be, the more trust is required in order to engage in an interaction with that partner (Mayer, et al., 1995).

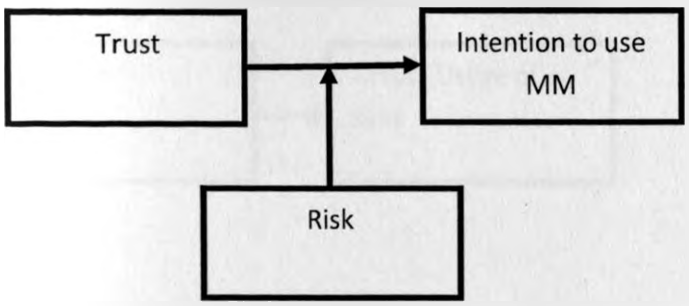
Consumers' desire to minimize risk supersedes their willingness to maximize utility and thus their subjective risk perception strongly determines their behaviour (Bauer, et al., 2005). Thus, reducing uncertainty has been found to have a positive influence on consumers' intention to adopt electronic transactional systems (Chen, 2008).

The relationship between risk and trust is a complex one (Wong, et al., 2009). Existing studies have produced mixed results on the role of perceived risk in transacting online and in trust of the online service provider. Trust is essential in situations where risk, uncertainty and interdependence exist (Mayer, et al., 1995), and the online environment encapsulates these factors.

Risks are mitigated by enforcing security and controls. If users believe that there is substantial security in a system, their perceived risk is reduced. Perception of risk depends on an individual. It is a personal characteristic, influenced by many aspects. This introduces a moderating effect of perceived risk to the relationship between perceived trust and intention to use technology, a view investigated by (Kollock, 1994) and (Grazioli & Wang, 2001). The researcher proposed to explore risk as a moderator to trust as shown in Figure 2-14.

It was theorized that PT directly influences behavioural intention to use mobile money. In addition it was theorized that risk moderates the relationship between PT and BI.

Figure 2-14: Risk as a moderator of Trust



Transactional Cost:

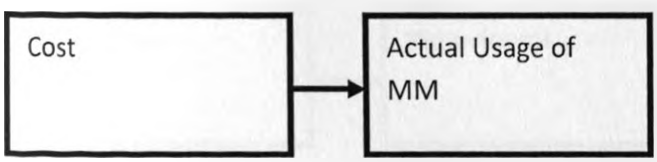
Tornatzky and Klein (1982) defined cost as the degree to which the use of an innovation is perceived to be relatively expensive. The Transaction Costs (TC) of sending money through the mobile payment technology are lower than those of banks and money transfer companies (Omwansa, 2009). The cost of a payment transaction has a direct effect on consumer adoption if the cost is passed on to customers (Mallat, 2007). Poor people are naturally sensitive to transaction costs. TC includes transaction price, registration fee, or cost of a new device if one is needed to use the service. The existing models were designed for

organizational contexts and therefore transactional costs of using technology were not considered relevant since the consumer was not responsible for the payment of the technology. In their study, (Moore & Benbasat, 1991) extended the TAM, but excluded Cost from their model arguing that individuals in an organization have no control over the cost of the information technology in question. Use of mobile money is Transaction Cost based. Most of the transactions attract a fee, such as sending, withdrawing, paying for a good or service and the consumers are responsible for paying the fees.

According to behavioral decision theory, the cost-benefit pattern is significant to both perceived usefulness and ease of use. Cost has been explored in other technology adoption studies (Gilham, C. & Belle J. V. 2008); (Das & Pal, 2011) and the researcher proposed to explore it. Other researchers such as (Qingfei, M. et al 2008) argue that cost is a user's assessment of the object world or reality and not his/her perception. Cost factor should therefore directly affect the user's adoption behaviour. The researcher proposed to investigate Cost as determinant of adoption behaviour as shown in Figure 2-15.

It was theorized that TC directly determines and influences actual usage of mobile money.

Figure 2-15: Cost as a determinant of actual usage



Trialability

Trialability is defined as "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 1995). Trialability allows individuals to "test drive" an innovation before it is being adopted.

In their study (Khalil & Pearson, 2007) investigated trialability as a determinant of intention to use internet banking. They established that trialability has a significant positive effect on the attitude toward using Internet banking. This led to their recommendation that a positive attitude towards Internet banking can be formed if potential users have the opportunity to test-drive the technology. Several other researchers have explored trialability and established that it is a significant determinant of attitude (Moore & Benbasat, 1991); (Karahanna, et al., 1999); (Tan & Teo, 2000) and (Plouffe, et al., 2001).

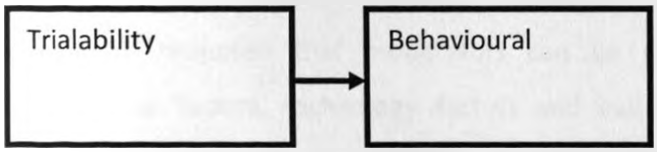
The researcher suggests that poor people are likely to be more sensitive to technology that would impact on their use of money. When test driven, particularly for free, chances of wanting to adopt the technology could be increased. Potentially, trialability positively affects an individual's attitude toward using mobile money and consequently, attitude affects the intention to actually use the technology positively.

In later models, trialability is not explicitly explored, most likely because most of the models are designed to study information systems that organizations adopt and offer training for. Mobile money on the other hand, especially for the poor, is a service that users are most likely to adopt by choice.

The researcher therefore proposed to investigate the impact of trialability on the intention to use mobile money by the poor in Kenya, as shown in Figure 2-16.

It was theorized that trialability directly influences behavioural intention to use mobile money.

Figure 2-16: Trialability as a determinant of Intentions to use



2.9.3 Moderating Factors

Moderating factors influence the effect of the determining factors. For example, a person may find mobile money useful and easy to use, but age (moderating factor) may inhibit the adoption and use due to an inability to effectively use technology. Technology adoption models have identified and tested several moderating factors.

Several models and theories have been developed to explain user technology adoption behaviour. However, these models have some limitations. The first limitation concerns the explanatory power of the models. Most of the existing studies account for less than 60% of variance explained mainly because there are some complex contextual factors in the real world that should be taken into account e.g. role of institutional cultures (Sun & Zhang,

2006). The second limitation of these models is the inconsistent relationships among constructs, making researchers question the generalizability of these models across differing contexts (e.g., (Lee, Kozar and Larsen 2003) (Legris, Ingham and Collerette 2003)). Moderating factors may account for both the limited explanatory power and the inconsistencies between studies (Sun & Zhang, 2006). Several recent studies continue to call for the inclusion of some moderating factors (e.g. (Lucas, et al., 1999); (Venkatesh, et al., 2003).

Moderating variables have been identified to significantly increase predictive validity after their inclusion (Venkatesh, et al., 2003). Furthermore, they argued, "it is clear that the extensions (moderators) to the various models identified in previous research mostly enhance the predictive validity of the various models beyond the original specifications". While stating that "the extensive prior empirical work has suggested a large number of moderators", they included only four in their study: experience, voluntariness, gender and age. The researcher believes that other moderating factors are important in technology adoption, particularly depending on the context in which the technology is being adopted.

One group of researchers investigated moderating variables in depth and confirmed that adding moderators enhances exploratory power of a model (Siau & Shen, 2003). In their study, they proposed that moderators can be grouped into three categories i.e. organizational factors, technology factors and individual factors. Under organizational factors, they proposed two attributes; voluntariness and the nature of task, under technology factors; they proposed purpose, complexity and whether the technology would be used by an individual or group while under the individual factors; they proposed intellectual capability, cultural background, gender, age and experience as moderating factors.

Though prominent models like UTAUT have a limited number of moderators, a number of researchers agree that there is empirical evidence that there are more moderating variables that could influence technology adoption (Venkatesh, et al., 2003); (Sun & Zhang, 2006). Consistent with the UTAUT model, the researcher proposed to retain gender, age and experience but drop voluntariness. The researcher then proposed to investigate the moderating effect of education.

Voluntariness

Voluntariness is defined as the extent to which potential adopters perceive the adoption decision to be non-mandatory (Moore & Benbasat, 1991); (Venkatesh & Davies, 2000). Though there are cases where users may adopt mobile money because they were required to, the likelihood is minimal. Non-voluntary cases include employers or senders requiring users to sign up. Due to the limited possibilities of non-mandatory adoption and usage, the researcher therefore proposed not to investigate this parameter in this study.

Gender

Research has shown that decision-making processes by women and men are different including information processing and using different socially constructed cognitive structures (Venkatesh & Davies, 2000). The researchers argued that men are more driven by Perceived Usefulness while women are more motivated by Perceived Ease of Use and Social Norms. Venkatesh with his team argued that gender might moderate the relationship between (1) PU and BI; (2) PEOU and BI; and (3) SN and BI (Venkatesh, et al. 2003). After including gender as a moderator, the explanatory power of TAM significantly increased to 52%. These findings suggest that gender moderates the effects of PU=>BI, PEOU=>BI and SN=>BI. Later the researchers confirmed that this moderator affected SI, EE and PE. Therefore, the researcher proposed to investigate the moderating effect of gender as suggested by UTAUT in the context of mobile money. In addition, the researcher wished to investigate the moderating effect of gender on Trust, Trialability and Transaction Cost.

It was theorized that gender moderates all direct paths between constructs, except the path between FC and AU as per the original UTAUT model.

Experience

Experience is measured by the number of years a user has with computers in general (Venkatesh and Davis 2000) and a dummy variable that employs ordinal values (i.e., 0, 1, 2) to capture the increasing levels of user experience with the technology (Venkatesh, et al., 2003). Users may employ the knowledge gained from their prior experience to form their intentions (Fishbein & Ajzen, 1975). Mobile money applications are relatively simple and could be mastered very fast. However, continuous usage may improve the perception of ease of use of the applications and hence have a bearing on adoption.

Generally speaking, existing models work well for both experienced and inexperienced users. However, prior studies confirmed that the effects of PU, PEOU and SN on BI differ between experienced and inexperienced users. Several prior studies suggested that experience influences relationships between (1) BI and Usage, (2) PU and BI, (3) PEOU and AT (Taylor 1995) and (4) SN and PU (Venkatesh & Davies, 2000) (Venkatesh, et al., 2003). When developing UTAUT, Venkatesh et. al (2003) indicated that experience moderates FC, SI and EE. The researcher proposed to explore the moderating effect as proposed in the UTAUT in the context of mobile money. Trialability is only relevant at the initial stages of using a technology, therefore experience cannot be considered as a moderating factor. However, trust, could be moderated by experience. As such the researcher proposed to explore the impact of Experience as a moderator to Trust.

It was theorized that experience moderates all direct paths between constructs except the path between FC and AU and the one between PE and BI as per the original UTAUT model.

Age

Compared to other potential moderating factors, age received less attention in prior studies. Venkatesh, et al. (2003) found young users placed more importance on extrinsic reward (equivalent to PU). Similarly, (Morris and Venkatesh 2002) found the same moderating effects of age. In addition, "increased age has been shown to be associated with difficulty in processing complex stimuli and allocating attention to information on the job" (Venkatesh, et al. 2003), implying that PEOU is a stronger determinant of BI for old users. Because affiliation needs increase with age, it may be that older users are more influenced by social factors (Venkatesh, et al. 2003). Psychological research suggests that older workers are more likely to conform to others opinions and have a relatively lower need for autonomy than younger workers (Cook and Wall 1980). In the UTAUT model, (Venkatesh and Davis 2000) established that Age moderates all the determining factors for behavioral intention, i.e. PE, EE, SI and FC. The researcher proposed to retain moderating factors but in addition explore the effect of Age on Trialability', Trust and Transaction Cost

It was theorized that age moderates all direct paths between constructs.

Education

Education is not explored as a moderator of the variables in the adoption models. Possibly, there are certain assumptions made about the users of the technologies that were being investigated. Employees working in an organization are assumed to have been trained and have a required level of education. In the context of Kenya or a developing country for that matter, education is likely to be a significant factor in technology adoption studies. Agarwal and Prasad provide that education level is an antecedents of PU or PEOU (Agarwal & Prasad, 1998). Bina and Giaglis investigated the moderating effect of education (Bina and Giaglis 2005). Another study established that parental education moderated the genetic and environmental contributions to variation in verbal IQ (Rowe, et al. 1999). Zakaria indicated that only highest educational level was a significant predictor and contributed significantly to the variance of Information Technology Implementation (Zakaria 2001). Mahmood suggested that the factor of education level had a substantial effect on IT usage but the magnitude of the effect was lower than other factors which were the perceptions of the user (perceived usefulness and perceived ease of use) and organizational support (Mahmood 2001).

The researcher proposed to investigate the moderating effect of Education. In a number of cases of mobile and internet banking research, education was ignored because most of the users of these services were educated and employed. Mobile money was initially designed for unbanked, who would most likely be characterized by low level of education. However, mobile money is used by the banked as well. The researcher considered education as a potential moderator of a number of determining factors and therefore proposed to explore it's effect on all the determining factors in order to establish if and where it is significant.

It was theorized that education moderates all direct paths between constructs.

2.10 Conceptual Framework

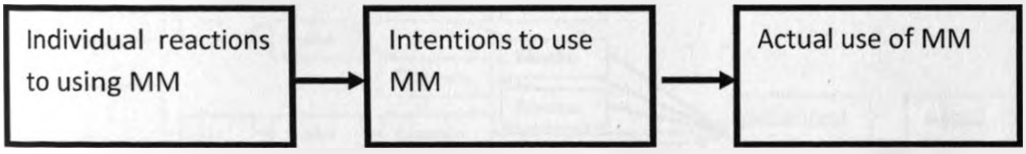
The review of models in chapter 2, concentrated on the existing prominent models, forming the basis for developing the theoretical framework for this study. These theories/models have been used by many researchers over the past two decades, especially in the area of Information Systems. Other relevant areas where these adoption models have been used include e-commerce, e-banking and m-banking. In addition to the models, new constructs

were introduced that have been studied in relation to mobile money adoption. Further, the findings from exploratory qualitative work were included to inform the formulation of an appropriate framework for conducting this study.

Taylor and Todd suggest that models should be evaluated in terms of both parsimony and their contribution to understanding. For predictive, practical applications of the model, parsimony may be more heavily weighted, on the other hand, if trying to obtain the most complete understanding of a phenomenon, a degree of parsimony may be sacrificed (Taylor & Davies, 1995). This research is aimed at generating a model that could contribute to a practical application and a prediction together with an understanding about the phenomenon.

The basic concept underlying the user adoption for mobile money is adapted from (Venkatesh, et al., 2003) who suggests that individual reactions to the use of technology may influence the intention to use the technology and consequently determine the actual usage as shown in Figure 2-17.

Figure 2-17: Basic Concept of the Research Model Adapted from Venkatesh et al (2003)



A theoretical framework is defined as a collection of theories and models from the literature which underpins a positivistic research study (Hussey & Hussey, 1997).The theoretical framework discusses the interrelationships among the variables that are considered important to the study.

The researcher proceeded to construct a modified UTAUT, comprised of three important types of constructs: exogenous, endogenous and moderator variables. These constructs are described further below:

- The seven core constructs (independent variables) are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Trialability (TR), Transaction Cost (TC) and Perceived Trust (PT). These core constructs are

expected to influence either Intention to use mobile money or the actual usage of mobile money.

- Intention (BI) to use mobile money is expected to influence Actual Usage (AU) of mobile money.
- Five moderating factors: gender, age, education, experience and perceived risk. These moderators are expected to impact on the influence of core constructs toward behaviour intention and actual usage.

All these constructs and moderating variables were put together in diagrammatic form shown in Figure 2-18. In addition Figure 2-18B shows the hypothesis identifiers on the paths of the conceptual framework.

Figure 2-18: Proposed Conceptual Framework

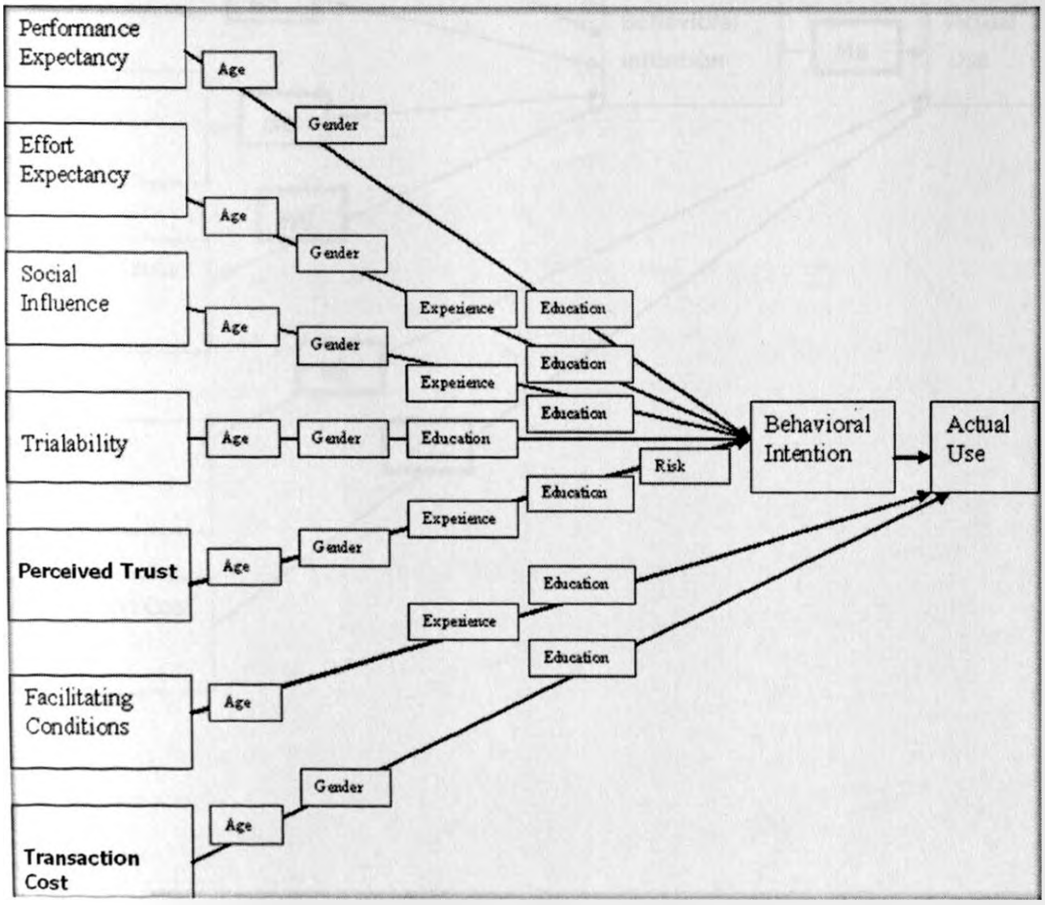
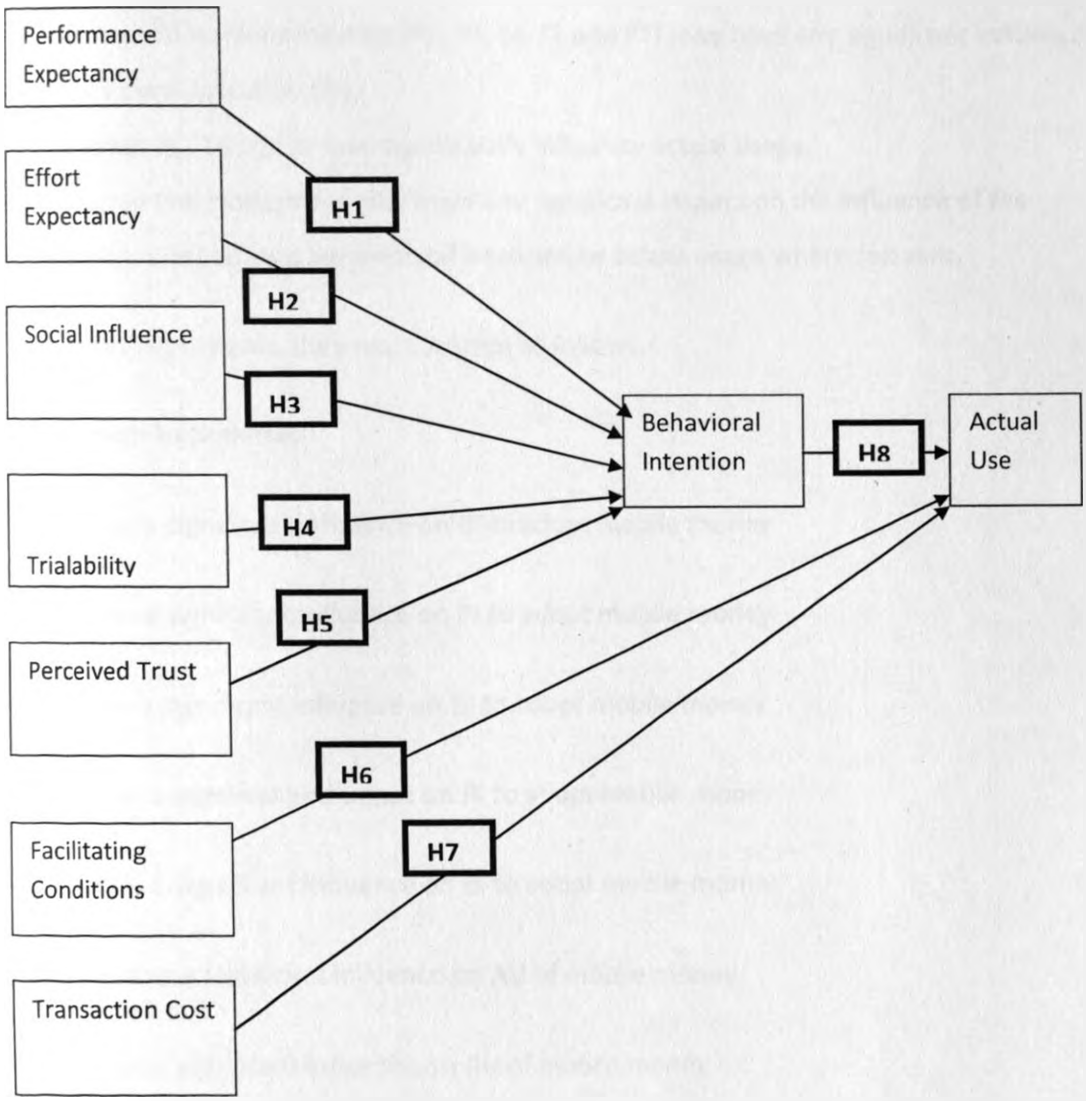


Figure 2-18B: Hypothesis identifiers on the conceptual framework.



2.11 Hypotheses Formulation

Based on the proposed conceptual framework above and the theoretical arguments developed in the entire chapter, hypotheses were formulated.

- Whether these determinants (PE, EE, SI, TT and PT) may have any significant influence on behavioural intention (BI).
- Whether FC, TC and BI may significantly influence actual usage.
- Whether the moderators may have any significant impact on the influence of the determinants toward behavioural intention or actual usage where relevant.

In form of hypotheses, they were written as follows:

Direct Path Hypotheses

H1: PE has a significant influence on BI to adopt mobile money

H2: EE has a significant influence on BI to adopt mobile money

H3: SI has a significant influence on BI to adopt mobile money

H4: TR has a significant influence on BI to adopt mobile money

H5: PT has a significant influence on BI to adopt mobile money

H6: FCs have a significant influence on AU of mobile money

H7: TC has a significant influence on AU of mobile money

H8: BI has a significant influence on AU of mobile money

Moderator Hypotheses

H1a: The effect of PE on BI is moderated by age, gender and education

H2a: The effect of EE on BI is moderated by age, gender, experience and education

H3a: The effect of SI on BI is moderated by age, gender, experience and education

H4a: The effect of TR on BI is moderated by age, gender and education

H5a: The effect of PT on BI is moderated by age, gender, experience, education and risk

H6a: The effect of FC on AU is moderated by age, experience and education

H7a: The effect of TC on AU is moderated by age, gender and education

Moderator Sub-Hypotheses

In order to be sure that all aspects of the hypotheses are tested, the researcher broke down the moderator hypotheses into sub-hypotheses as follows:

H1a1: The effect of PE on BI is moderated by age

H1a2: The effect of PE on BI is moderated by gender

H1a3: The effect of PE on BI is moderated by education

H2a1: The effect of EE on BI is moderated by age

H2a2: The effect of EE on BI is moderated by gender

H2a3: The effect of EE on BI is moderated by experience

H2a4: The effect of EE on BI is moderated by education

H3a1: The effect of SI on BI is moderated by age

H3a2: The effect of SI on BI is moderated by gender

H3a3: The effect of SI on BI is moderated by experience

H3a4: The effect of SI on BI is moderated by education

H4a1: The effect of TR on BI is moderated by age

H4a2: The effect of TR on BI is moderated by gender

H4a3: The effect of TR on BI is moderated by education

H5a1: The effect of PT on BI is moderated by age

H5a2: The effect of PT on BI is moderated by gender

H5a3: The effect of PT on BI is moderated by experience

H5a4: The effect of PT on BI is moderated by education

H5a5: The effect of PT on BI is moderated by risk

H6a1: The effect of FC on AU is moderated by age

H6a2: The effect of FC on AU is moderated by experience

H6a3: The effect of FC on AU is moderated by education

H7a1: The effect of TC on AU is moderated by age

H7a2: The effect of TC on AU is moderated by gender

H7a3: The effect of TC on AU is moderated by education

2.12 Conclusion

The literature review in this chapter discussed the many well-known theories and models which are, in one way or another, useful for the theoretical background of this research. The researcher went further to investigate related aspects around poverty, mobile money uptake and studies around adoption of mobile money. Gaps and inconsistencies that necessitated this study were highlighted. Further, the rationale and justification for developing an appropriate theoretical framework was provided. The framework, presented in this chapter, was developed out of constructs identified in UTAUT, literature and preliminary qualitative work. The key determinants in the theoretical framework are expected to influence behavioural intention and actual usage of mobile money by the poor. Furthermore, the moderators are expected to moderate the influence of the key determinants.

Most of the studies conducted in the area of mobile money have focused on the supply side and hardly any detailed academic publications exist detailing the consumer side of adoption.

In the recent past a number of studies have mainly extended TAM to investigate mobile banking. The experience of mobile money in Kenya sets an interesting environment for such a study. M-Pesa started off as a money transfer system but has evolved into a complex ecosystem linking to business partners and financial institutions among other kinds of organizations. Other mobile money services have hardly penetrated the market even when they are considered potentially more useful to the poor than M-Pesa. As has been expounded in the literature review, the researcher proposed to build a model that would be used to explain adoption of mobile money among the poor in Kenya and make it available for use in other markets and contexts.

The researcher decided to explore three different mobile money services M-Pesa, Airtel Money and Orange Money. The choice of these three services was driven by the uniqueness of the features offered by these three services. M-Pesa primarily offers money transfer services, Airtel Money offers an additional, optional bank account service and is available across East Africa while Orange Money offers a savings account with interest and credit rating services that can lead to access to micro-loans. By exploring this mix, the researcher believed it would give a good indication of the adoption patterns by the poor.

The researcher provides a step by step justification of how the conceptual framework for the study was developed. In addition, the hypotheses guiding the study are developed.

CHAPTER 3: METHODOLOGY

3.1 Introduction

The previous chapter reviewed related literature and elaborated how the UTAUT framework was extended to generate a new framework to be used for this study. This chapter describes how the actual study was conducted.

The chapter elaborates on how the data was collected and prepared for analysis. To begin with, the researcher elaborates on how the data analysis was anticipated, by giving a discussion of the SEM technique as well as a summarized review of the stages for SEM analysis.

Next, the researcher expounds on how the extended UTAUT was transformed into instruments and how the data was collected. In addition, the chapter discusses specific issues of sampling, data collection, validity and reliability of the instruments and the data analysis method used in this research.

3.2 Modelling

"A model is a set of verifiable mathematical relationships or logical procedures which is used to represent observed, measurable real-world phenomena, to communicate alternative hypotheses about the cause of the phenomena, and to predict future behaviour of the phenomena for the purpose of decision making" (Jewel, 1980).

Despite the multiple differences in definition and applications; selection, estimation and verification of models remain core to science (Hickman, 2008). Models are approximations or abstractions from reality used to help understand the object or system being modelled.

Models can be characterized in many ways. Some categories include physical models, mathematical models and simulation models among others. Physical models are small scale representations of the same physical entities they represent. These are primarily used in physical sciences such as engineering to examine a limited set of behavioural characteristics in the system. Mathematical models are abstract models that use mathematical language to describe the behaviour of a system. Such models are used in social sciences (such as sociology, economics and political science) and in the natural sciences and engineering

disciplines (such as physics, biology, and electrical engineering). Physicists, engineers, computer scientists, and economists use mathematical models most extensively (Bride, et al., 2003).

In information systems circles, models are used to explore systems, communicate systems, validate systems as well as implement systems (McNeile & Simons, 2004).

Objective of modelling

Modelling can be used for a number of different reasons. Some of the reasons for modelling include (Otto & Day, 2007); (Bender, 1978):

1. Developing scientific understanding through quantitative expression of current knowledge of a system (as well as displaying what we know, this may also show up what we do not know);
2. Test the effect of changes in a system;
3. Aid decision making, including
    i. Tactical decisions by managers;
    ii. Strategic decisions by planners.

This research is driven by the need to develop a scientific understanding as well as aid in decision making.

According to Davis, practitioners evaluate systems for two purposes, one is to predict acceptability and the other is to diagnose the reasons resulting in lack of adoption and to take proper measures to improve user adoption (Davis, 1989).

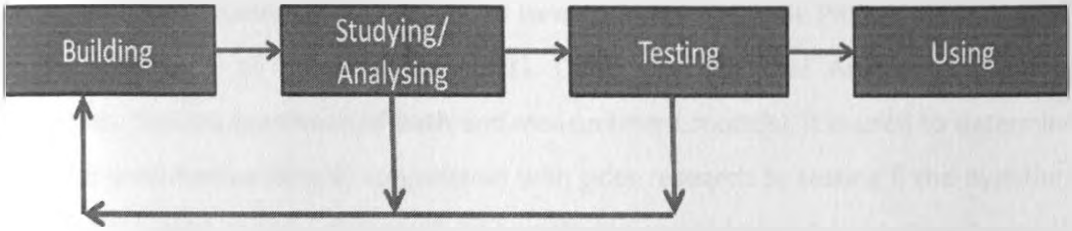
How well any particular objective is achieved depends on both the state of knowledge about a system and how well the modelling is done.

Stages of model development

A number of researchers have tried to demonstrate the stages of developing models that can be adopted and used. There is a general agreement about the critical stages of building, studying/analysing, testing and finally using. It is also critical to appreciate the need to iterate between the earlier stages before a model is finally accepted for use (Otto & Day,

2007); (Bender, 1978) (Hair, et al., 2010). Figure 3-1 summarizes the stages. The stages and iteration make modeling a powerful tool for improving our understanding of systems.

Figure 3-1: Stages of model development (adapted from Mathematical Modelling, 2001)



The process of developing models, whether abstract, graphical, conceptual or mathematical is called scientific modelling. A Scientific model is a conceptual representation whose purpose is to explain and predict observed phenomena. In other words, it is a set of ideas that describes a natural process (Cartier, et al., 2001). There are numerous scientific modelling techniques available. Examples include data modelling, mathematical modelling, simulation, software modelling, statistics, enterprise modelling, economic modelling, just to list a few. The decision as to which techniques to use is determined by the purpose, skills and resources available.

Evaluating a model

Evaluating models is vital for the development of sound models. A number of aspects have been proposed in literature to guide the model evaluation process (Hair, et al., 2010). Below are some of the aspects that can be used to evaluate a model (Bollen, 1989).

i. Soundness of the theoretical foundation of the model. Theory forms the foundation for any conclusions to be made.
ii. Simplicity or parsimony. Simpler models are considered better than complex models
iii. Statistical significance. The model should be consistent with empirical data;
iv. Robustness in the ability to consistently explain past observations.
v. Ability to predict future observations. This is manifested in the forecasting power of the sample
vi. Exploratory power to estimate the degree of confidence in the model

Model Fitness

As discussed in chapter two on the conceptual framework, the best way to analyze causal relationships is by using Structural Equation Modelling (SEM) (Hair, et al., 2006). SEM, a confirmatory technique, is an umbrella of three processes namely Path Analysis (Analysis of structural models of observed variables), Confirmatory Factor Analysis and Structural Regression Models (synthesis of path and measurement models). It is used to determine if a model is valid for the data in conjunction with prior research by testing if the hypothesized theoretical model can be confirmed. To test the theoretical model, SEM uses three criteria: Goodness of Fit i.e. if the estimated covariance matrix is equal to the observed covariance matrix; validity and reliability of the measurement model; the significance and meaningfulness of the structural relationships.

To test model fitness, is to establish the similarity between reproduced correlation and observed correlations. It is argued that the larger the discrepancy between the two correlations, the larger the chi-square value expected (Hair, et al., 2006). It therefore means that to obtain a zero chi-square value, then the reproduced correlations must be the same or similar to observed correlations.

To test Goodness-of-fit, one needs to use the measurement tests provided by the SEM software. In which case, the model is drawn or entered in the software and the data loaded into it then a comparison done by computing the fit indices.

Researchers normally begin with the overall Chi-Square test. Other measures include Goodness-of-fit index (GFI), Adjusted goodness of fit index (AGFI), Comparative Fit Index (CFI), Root Mean Square Error of Approx (RMSEA) among others. The guidelines for these measures are provided in chapter 4.

3.2.1 Statistical techniques for theory development and testing

There are a number of techniques that could be used to test theoretical arguments as presented in this study. Particularly, Structural Equation Modelling (SEM) and Partial Least Squares (PLS) regression are the most established.

PLS is an extension of the multiple linear regression models. Just like SEM, this technique can handle multiple descriptor variables. However unlike SEM, it is used when theory is weak or where variables are not likely to conform to a specified model. This research was based on sound theory, whereby the foundational models have been developed and tested over a period of time (Chin, 1998).

PLS does not focus on overall optimization in parameter estimates through maximum likelihood, (also called full information estimation technique). Instead, it focuses on limited information methods, which end up providing lower estimates and make lower demands on data compared to SEM. At the same time, PLS was designed to lay more emphasis on prediction as opposed to fit. SEM, on the other hand was designed to maximize and then test the degree of consistency between a model and the corresponding data. It is therefore considered that, PLS is more pragmatic while SEM is more rigorous (Rigdon, 1996).

Another alternative is latent class analysis which is useful when the dependent variable is categorical. The outcome is Boolean and the researcher would be interested in distinguishing between respondents who take an action and those who do not. SEM handles ordinal values because in many cases, one wishes to reflect the continuous nature of latent variables (Marcoulides, 1998).

SEM was preferred for this study and the section 3.2.2 provides a detailed description of the technique.

3.2.2 Structural Equation Modelling (SEM)

SEM combines aspects of multiple regression (examining dependence relationships) and factor analysis (representing unmeasured concepts factors with multiple variables) to estimate a series of interrelated dependence relationships simultaneously (Hair, et al., 2006); (Schumacker, et al., 1996). SEM also integrates other techniques such as recursive path analysis, non-recursive econometric modelling, ANOVA, ANACOVA, principal component analysis and classical test theory (Holmes-Smith, 2000). In addition, SEM is also known as path analysis with latent variables and is now a regularly used method for representing dependency (arguably "causal") relations in multivariate data in behavioural and social sciences (McDonald, et al., 2002).

The main strength of SEM over other methods is that, being a collection of statistical techniques, it allows a set of relationships between one or more independent variables and one or more dependent variables to be examined.

A structural equation model or path model depicts the structural relationships among constructs (Sharma, 1996). In other words, it is a model of relationships among variables (Hayduk, 1987), and is a statistical methodology that takes a confirmatory (i.e. hypothesis-testing) approach to the analysis of a structural theory relating to some phenomenon with two important aspects (1) the causal processes under study are represented by a series of structural equations, and (2) these structural relations can be modelled pictorially to enable a clearer conceptualization of the theory under study (Byrne, 2001). When compared to other multivariate techniques, it has four significant benefits over those techniques (Byrne, 2006).

i. SEM takes a confirmatory approach rather than an exploratory approach to the data analysis, although SEM can also address the latter approach. SEM lends itself well to the analysis of data for the purposes of inferential statistics. On the other hand, most other multivariate techniques are essentially descriptive by nature (e.g. exploratory factor analysis) so that hypothesis testing is possible but is rather difficult to do.

ii. SEM can provide explicit estimates of error variance parameters, but traditional multivariate techniques are not capable of either assessing or correcting for measurement error.

iii. Data analysis using SEM procedures can incorporate both unobserved (i.e. latent) and observed variables, but the former data analysis methods are based on observed measurements only.

iv. SEM methodology has many important features including modelling multivariate relations, and for estimating point and/or interval indirect effects whilst there are no widely and easily applied alternative methods for these kinds of features.

Because of these outstanding features, SEM is considered to test the research model against the data in order to help to generate the model in this study.

There are three important general strategic frameworks for testing structural equation models (Jöreskog, 1993):

- Strictly confirmatory
- Alternative model
- Model generating

This research is based on the third strategy, which is model generating. Model generating is the most common of the three scenarios because the researcher can postulate and reject a theoretically derived model on the basis of its poor fit to the sample data, and can proceed in an exploratory (rather than confirmatory) fashion to modify and re-estimate the model. The primary focus is to locate the source of misfit in the model and to determine a model that better describes the sample data.

For a strictly confirmatory approach, the researcher postulates a single model based on theory, collects the appropriate data, and then tests the fit of the hypothesized model to the sample data. The researcher either rejects or fails to reject the model based on the results of the test; no further modifications to the model are made. This is not commonly found in practice because with the many costs associated with the collection of data, it would be a rare researcher indeed who could afford to terminate his or her research on the basis of a rejected hypothesized model.

An alternative model approach has been relatively uncommon in practice, since, after proposing several alternative (i.e., competing) models, all of which are grounded in theory following analysis of a single set of empirical data, the researcher selects one model as most appropriate in representing the sample data.

By using SEM, the hypothesized model can be tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data. If the goodness of fit is adequate, the model argues for the plausibility of the postulated relations among variables; if it is inadequate, the tenability of such relations is rejected. However, despite the fact that a model is tested in each round, the whole approach is model generation rather than model testing (Byrne, 2006).

Weaknesses of Structural Equation Modelling

Despite the strengths of SEM, the technique has a number of weaknesses (Bollen, 1989) (Hair, et al., 2010); (Anon., n.d.):

- Requires a lot more formal training in statistics to use SEM software programs.
- Requires a relatively large sample size (150 or better still 200 and above).
- The theory driving the model must be well specified. The measurement and conceptual models must be based on well-developed a priori models.
- SEM is not appropriate for time variant studies.
- Requires skills in using the relevant software to conduct the analysis.
- Measurement model and conceptual model must be very well specified.
- Focus on the error terms is limited which appears as under-estimating the significance of error terms.
- Not much emphasis is laid on distribution, besides being a pre-analysis requirement.

Comparing SEM with traditional statistical techniques

SEM is similar to traditional techniques like regression and correlation in many ways. All these techniques, SEM inclusive, are based on the linear statistical models. They all have a set of prerequisites or assumptions that must be met. SEM assumes multivariate normality tests have passed while traditional techniques assume normal distribution (Hair, et al., 2010).

Despite these similarities, there are multiple differences between SEM and the traditional techniques. SEM is very flexible and more comprehensive making it more applicable in multiple situations. At the same time, SEM allows for multivariate analysis accommodating observed and unobserved variables while traditional techniques analyze only measured variables. This multivariate analysis accommodates for related equations to be solved simultaneously. SEM also allows researchers to recognize the fact that measures are imperfect through the error terms especially indicated in the models (Anderson & Gerbing, 1988); (Hair, et al., 2006).

3.2.3 Uses of SEM

There are four main uses of SEM, namely: a) Exploratory factor analysis, b) Path analysis/regression, c) Confirmatory factor analysis and d) Causal modelling. The researcher discusses two of the forms of usage that are utilized in this study: path analysis and confirmatory factor analysis.

3.2.3.1 Path Analysis/regression

Path analysis requires the same assumptions as those of regression. Path analysis can be seen as an extension of the regression model used for testing the fit of a correlation matrix. By doing path analysis, a researcher is able to describe the directed dependencies among a set of variables. Path analysis could be seen as a special kind of SEM, whereby it is SEM with a structural model without a measurement model (Hair, et al., 2006).

The testing is done by evaluating the matrix against causal models which are being compared. Using regression done for each variable in the model, the regression weights produced are compared with the observed correlation matrix for the variables so that a goodness-of-fit statistic is calculated. After this, the best-fitting of two models is selected as the best model for advancement of theory.

3.2.3.2 Confirmatory Factor Analysis (CFA)

Factor analysis is a statistical method used to find a small set of unobserved variables which can account for the covariance among a larger set of observed variables (Albright & Park, 2009).

CFA is a special form of Factor Analysis. It is a theoretical way of doing factor analysis. It is mainly used for hypothesis testing (Kline, 2010). The aim of CFA is to test if the data fits the hypothesised measurement model (Hair, et al., 2010). Starting with a structure the researcher, using path analysis establishes if the structure fits the data well. It is then used to test if measures of a construct are consistent with the understanding of the construct or factors. CFA is run using the various software programs designed for SEM.

3.2.4 Moderating and mediating effects

Baron and Kenny (1986) are famous at defining the two kinds of variables. They define the moderator variables as "a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable. Specifically within a correlational analysis framework, a moderator is a third variable that affects the zero-order correlation between two other variables. In the more familiar analysis of variance (ANOVA) terms, a basic moderator effect can be represented as an interaction between a focal independent variable and a factor that specifies the appropriate conditions for its operation." *p. 1174*

Baron and Kenny (1986) also define the mediator variable as follows: "a given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion. Mediators explain how external physical events take on internal psychological significance. Whereas moderator variables specify when certain effects will hold, mediators speak to how or why such effects occur." *p. 1176*

A moderator variable influences the strength of a relationship between two variables or constructs. A mediator variable explains the relationship between the two variables or constructs (Baron & Kenny, 1986).

The test is in the relation between the independent and dependent variables (predictor and the mediator variables) as well as between the mediator and criterion variables.

In the case of mediation, the strength of the relationship (correlation) should be reduced to zero in the case of total mediation.

Multi Group Analysis

Multi Group Analysis (MGA) is a technique used to investigate the impact of moderators on the influence of predictors toward dependent variables. There are other techniques available for doing this test depending on the kind of analysis being done. Arbuckle (2005) suggests that this MGA approach is advantageous because it performs a single analysis of several groups (simultaneous multiple-group analysis).

The process begins by visualizing the data in groups, which are determined by the specific moderator under study. The main purpose of an MGA is to find out the extent to which groups differ:

- Whether the groups all have the same path diagram with the same (or different) parameter values. The path diagram being the graphical representation of the constructs joined together by paths that show which constructs are related. In this case, each path would have weights showing the strengths of the relationships. If the separate groups result in different path weights, then the moderating variables do have an effect.
- Whether each group needs a different path diagram. In this case, the variables do have a mediating effect since it is the existence of these variables that makes the paths to exist.

3.3 Conducting a SEM analysis

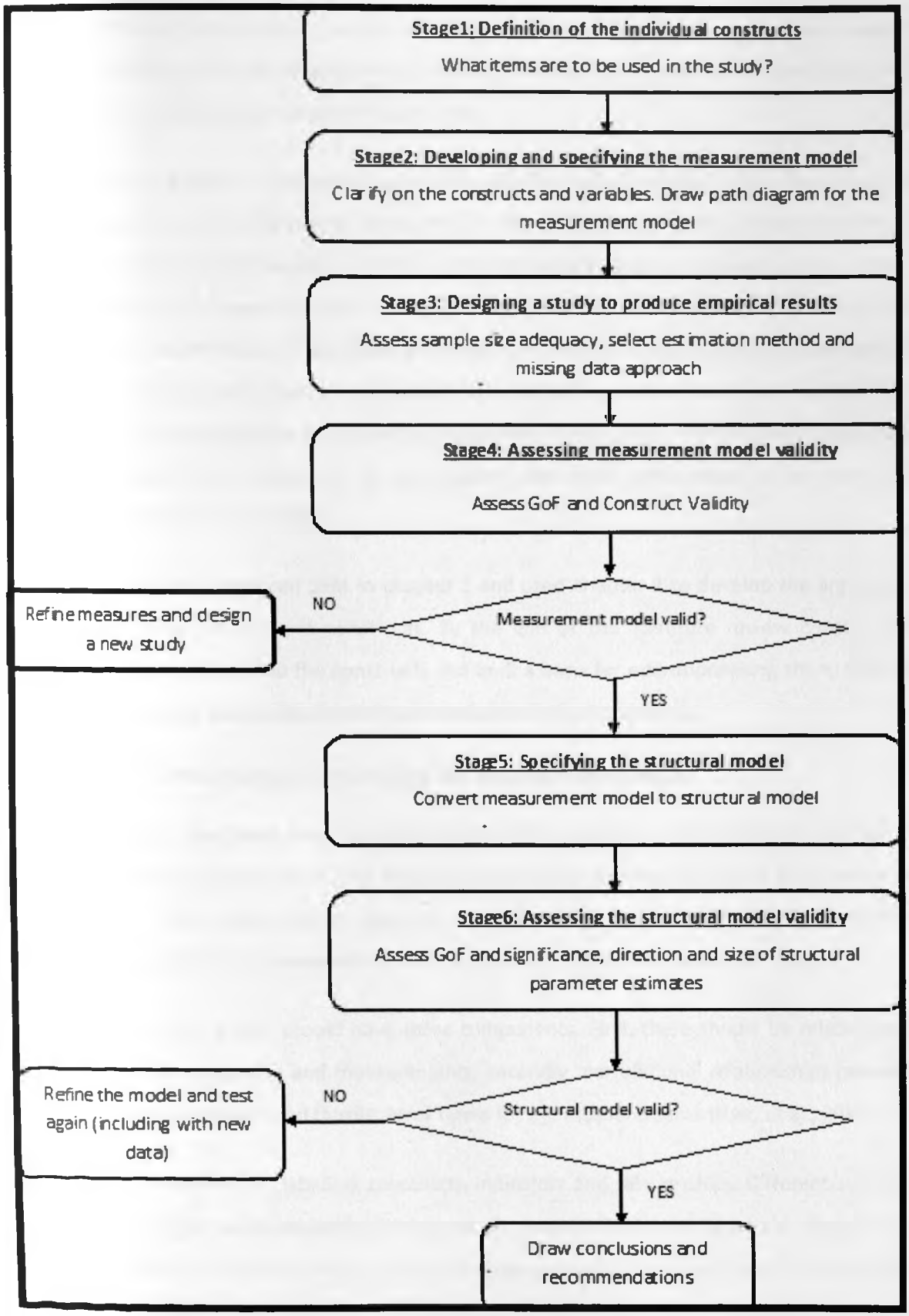
SEM is a systematic and strict process. The wording of these stages might vary from one author to another, including an overlap of what is to be done in every stage, but the principle remains the same. Conducting SEM to test a measurement theory involves six main steps which must be followed meticulously. These steps are listed below:

i. Definition of the individual constructs
ii. Developing and specifying the measurement model
iii. Designing a study to produce empirical results
iv. Assessing measurement model validity
v. Specifying the structural model
vi. Assessing the structural model validity

Each of the stages is described below. The description is guided by the detailed presentation provided by Hair, et al. (2010) in their seventh edition of the book on multivariate data analysis as well as the AMOS guide (Arbuckle, 2005).

Besides the description of each of the stages and choices that need to be made, the researcher includes Figure 3-2 to give a pictorial representation that would simplify the understanding of the complex process.

Figure 3-2: SEM stages adapted from Hair et al (2010)



3.3.1 Stage 1: Definition of the individual constructs

This is the first step where concepts are organized and arranged. Using available relevant theory, primary research and other information, a researcher establishes the constructs that will be used to generate the theoretical model.

The process begins by providing theoretical definition of constructs, which then leads to identification of the indicator or measurement items. The identification of the indicators is the basis for operationalization of the constructs which must be relevant to the subject under study. The researcher also makes choices about the measurement scale items and types. The identification of the scale and types can either be purely guided by literature or be mixed with development of new scales. By investigating similar studies, a researcher can pick scales that have been developed and apply them to the study. Alternatively a new scale can be developed particularly in cases where the area under study is not very well developed (Hair, et al., 2010).

The researcher introduced SEM in chapter 1 and used chapter 2 to develop the arguments for identifying the relevant constructs. By the end of the literature review chapter, the researcher had identified the constructs and built a basis for operationalising them, forming the basis for the data collection instrument shown in the Appendix 1.

3.3.2 Stage 2: Developing and specifying the measurement model

At this stage, the latent constructs and measurement indicators are combined together to give a coherent presentation. The model can either be presented as a set of equations or as a diagram. The model should have the relationships between constructs and variables specified so that the phenomenon of interest is easily understood (Arbuckle, 2005).

A measurement model should have three components. First, there should be relationships between the constructs and measurements; secondly, correlational relationships between constructs if necessary and thirdly, error terms for the measurements (Hair, et al., 2010).

SEM has a notation for labelling constructs, indicators and relationships. Different software may have slight variations but in most cases, constructs whether endogenous or exogenous are presented using oval shapes, while measurements for these constructs are presented using rectangles. This therefore differentiates latent variables from measured variables.

Error terms are introduced in the model using the software. All endogenous constructs must have error terms, while exogenous constructs should not. The error terms for the exogenous constructs are captured in the measurement variables. Arrows from the error terms point to the measurement variables while the arrows between the constructs and their measurement variables originate from the constructs. Covariances are shown using bi-directional arrows (Arbuckle, 2005).

This stage emphasises a good measurement theory in order for results to be meaningful. Substantial time must be spent at this stage to ensure that the measurement quality will enable valuable conclusions to be made (Hair, et al., 2010).

The researcher contextualized this step and translated the research framework shown in Figure 2-18 to develop the measurement model shown in Figure 4-1.

3.3.3 Stage 3: Designing a study to produce empirical results

At this stage the researcher turns attention to issues of research design and estimation. Issues focusing on sample size, the impact and remedies of missing data are addressed in this section. In addition the researcher plans for the model estimation, where issues of model structure, estimation techniques and software options are articulated.

It is recommended that covariance matrices be chosen over correlation matrices given the flexibility and information power provided in each case, where covariance matrices are superior (Hair, et al., 2010). Though the researcher does not need to develop these matrices manually (they are provided by the software), it is important to understand that the options exist. Regarding missing data, the researcher must decide as to what the impact could be and if any remedy is to be done, what the best approach should be.

The discussions on sample size and missing values are presented in the sections that follow.

There are multiple software tools available for SEM analysis. LISREL (LInear Structural RELations) is the traditionally most widely used (Byrne, 1998). EQS (an abbreviation for equations) is also widely available and good for performing regression, factor analysis and structural models testing (Bentler, 1992). AMOS (Analysis of Moment Structures) is a program that gained popularity because it was made to be a module within SPSS (Arbuckle,

2005) and was the first to introduce a graphical interface for all functions, meaning that researchers do not need to learn syntax (Hair, et al., 2006). The researcher chose this tool mainly because of the superior graphical interface and integration with SPSS which was needed for the preliminary analysis. Data was loaded once into SPSS and analysed with the two tools from one data source. Other tools available are Mplus and CALIS.

3.3.4 Stage 4: Assessing measurement model validity

Once the measurement model is specified, data collected and decisions on estimation already made, the researcher focuses on the most critical decision of the validity of the measurement model. Two requirements are necessary for testing validity; first is the establishment of acceptable levels of Goodness-of-Fit for the model and secondly, finding specific evidence for construct validity.

Measures including chi-square, degrees of freedom, statistical significance, absolute fit indices and incremental fit indices as well as parsimony fit indices are available for evaluating GoF.

Hair et al. (2010) recommend that aiming to achieve a perfect fit should not be at the expense of testing a true model. This means that the researcher should aim to best approximate the theory to be tested rather than excessively focus on increasing the model fit.

The discussion on how the researcher went about this process is presented in section 4.3.2. In addition, the discussion on validity is presented in section 4.3.2.2.

3.3.5 Stage 5: Specifying the structural model

This step focuses on assigning relationships between constructs based on the proposed theoretical model. Using the dependence relationships existing in the theoretical model, the researcher is able to test the hypotheses. The researcher focuses on identifying what dependence relationships exist among the constructs. Each hypothesis represents a specific relationship.

The discussion on structural model estimation is done in section 4.4.

3.3.6 Stage 6: Assessing the structural model validity

This is the final stage where the validity of the structural model is tested and the corresponding hypotheses tested. It is important to note that step 4, 5 and 6 cannot be done if the earlier measurement model validity tests do not pass.

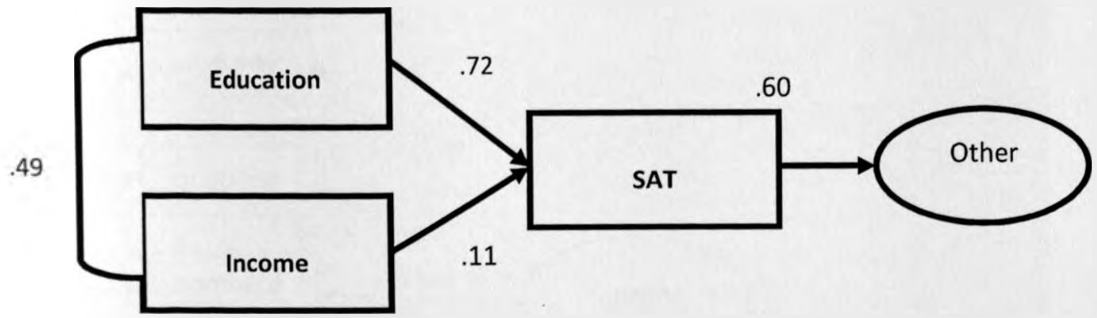
At this stage, GoF are done for the structural model. Testing structural relationships is done by evaluating the individual parameter estimates representing specific hypotheses. Two conditions are used in conducting this evaluation. First, the parameter estimates must be statistically significant and in the predicated direction and secondly, they must be nontrivial.

This discussion is presented in section 4.4 and section 4.5.

3.4 Understanding AMOS output

Having decided on AMOS as the tool for analysis, the researcher briefly describes the capabilities and outputs generated by the tool in this section. This section is adapted from the AMOS 18 user guide (Arbuckle, 2005). Figure 3-3, Figure 3-4 and Figure 3-5 provide illustrations of the outputs from AMOS followed by explanations of key measurements being captured.

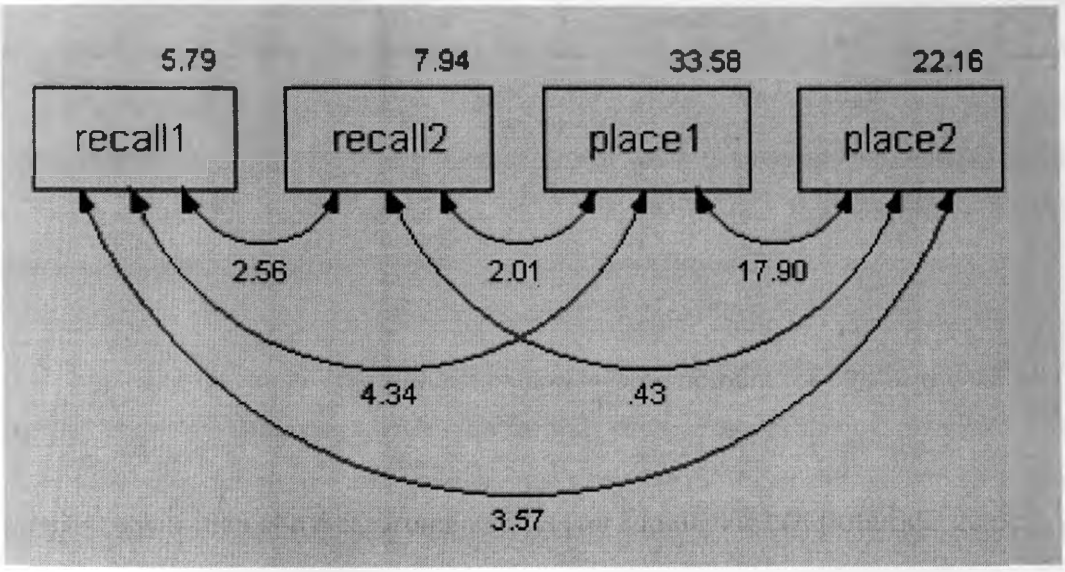
Figure 3-3: Path diagram adapted from AMOS 18 user guide (Arbuckle, 2005)



The value 0.49 is the **correlation** between Education and Income constructs, while the values 0.72 and 0.11 are **standardized regression weights (also called the factor loadings)**. Simply presented, each 1 standard deviation increase in education produces a 0.72 standard deviation increase in SAT. The value 0.6 is the **squared multiple correlation coefficient (R^2)**, for SAT with education and income. Other, seen as a latent variable is the error term for SAT.

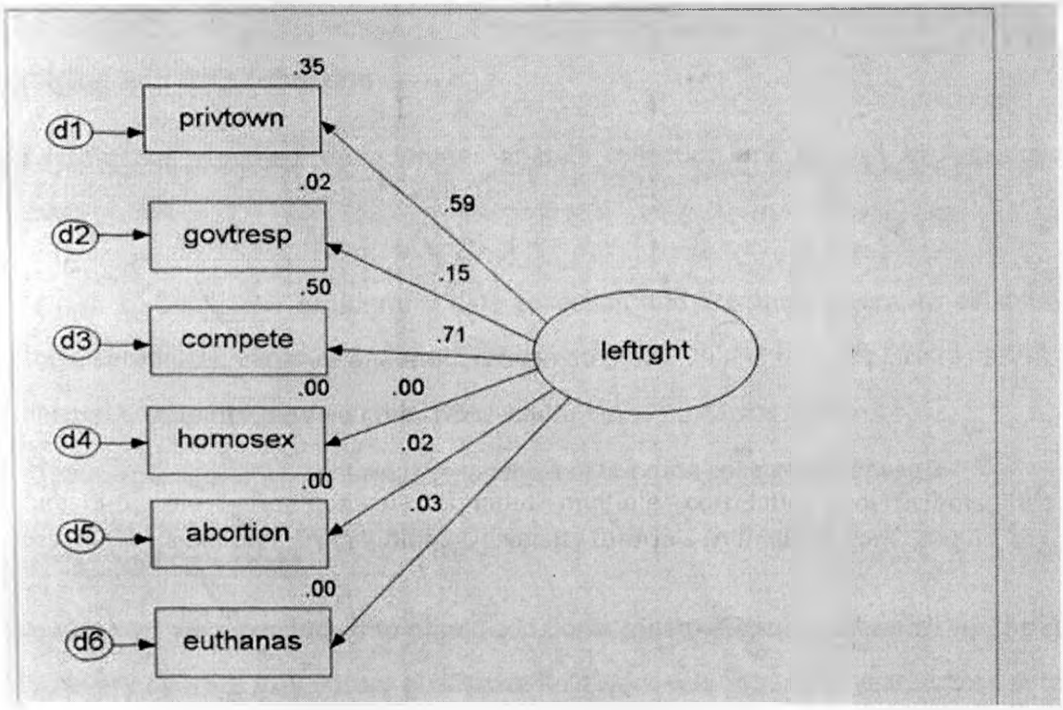
This in simpler terms, means that Education and Income account for 60% of the variance of SAT.

Figure 3-4: Illustration of a measurement model for conducting CFA (Arbuckle, 2005)



In the diagram, the **variance** of recall1 is estimated at 5.79 and that of place1 is 33.58. The estimated **covariance** between the two is 4.34.

Figure 3-5: Illustration of the squared multiple correlation coefficients (R^2) for measurements adapted from Indiana University tutorials (Albright & Park, 2006)



In the path diagram (Figure 3-5) the standardized regression weights (factor loadings) and the squared multiple correlation coefficients (R^2) are provided.

This diagram can be explained as follows: The measures 'privtown' (standardized regresson weight/factor loading = 0.59) and 'compete' (standardized regresson weight/factor loading = 0.71) are the best indicators of 'leftrght'. Considering the direction of the arrows, it means that 'leftrght' explains approximately 35% of the variance in 'privtown' and 50% of the variance in 'compete'. All the other measures do not seem to have any relationship with the hypothesized 'leftrght' factor. When the R^2 is 0, it means that the 'leftrght' explains no variance in these measures.

3.5 Deriving the questions

Structural Equation Modelling (SEM) requires that each of the exogenous variables should have at least three questions. The endogenous variables can have one question if it clearly generates the information desired. Considering the number of exogenous variables and the literacy level of the respondents, the researcher chose to limit the number of questions to three.

Previous research using SEM and studies extending adoption models provide guidance on the nature of questions to be used for each of the variables. The researcher generated and grouped the questions as shown in the Appendix 1.

3.6 Sampling and data collection

The researcher proposed three phases of data collection and analysis broken down as follows:

- Phase 1: Qualitative exploratory data collection and literature review to establish the core constructs, variables and moderators
- Phase 2: Quantitative data collection from sampled BoP areas in Nairobi
- Phase 3: Quantitative confirmatory analysis of the data collected in Phase 2

Phase 1: Qualitative data

Two exercises were conducted to obtain additional constructs and moderators for the study. First, a very rigorous exploratory qualitative field work was done for a year, whose outcome

was a published book (Omwansa & Sullivan, 2012). From this exploratory study, a set of constructs were identified, feeding into the formulation of the framework. Secondly, literature review was conducted on the adoption models and other published work. The outcome was the conceptual framework discussed in chapter 2.

Phase 2: Quantitative Data

In 2008, the Kenya National Bureau of Statistics (KNBS) modified the income classifications to 5 levels, namely 1-Upper Class, 2-Upper Middle Class, 3- Middle Class, 4-Lower Middle Class, and the 5-Lower Class.

Level 4 and 5 are considered as poor by KNBS. The researcher proposed to explore these classes in the capital city of Nairobi. This choice was primarily based on the practicality of accessing data.

Sampling Frame

Nairobi has eight administrative divisions, each with a number of locations as shown in Table 3-1. A map of these divisions is provided in appendix 6.

Table 3-1: Divisions and locations in Nairobi

Division	Locations
Central	Huruma · Kariokor · Mathare · Ngara · Starehe
Dagoreti	Kawangware · Kenyatta/Golf Club · Mutuini · Riruta · Uthiru/Ruthmitu · Waithaka
Embakasi	Dandora · Embakasi · Kariobangi South · Kayole · Mukuru kwa Njenga · Njiru · Ruai · Umoja
Kasarani	Githurai · Kahawa · Kariobangi North · Kasarani · Korogocho · Roysambu · Ruaraka
Kibera	Karen · Kibera · Laini Saba · Langata · Mugumoini · Nairobi West · Sera Ngombe
Makadara	Makadara · Makongeni · Maringo · Mukuru Nyayo · Viwandani
Pumwani	Bahati · Eastleigh North · Eastleigh South · Kamukunji · Pumwani
Westlands	Highridge · Kangemi · Kilimani · Kitisuru · Lavington · Parklands

Nairobi area has 108 enumeration areas within the sub locations, ranging from level 1 to 5 in terms of social economic status as per the KNBS classification. Table 3-2 provides a summary of the divisions, locations, sub locations, and study area. Of the 108 areas, 52 of them (48%) are regarded poor. A more detailed table is provided in appendix 4. Table 3-3 shows the 52 regions.

Table 3-2: Nairobi areas ranging from level 1 to 5

NUM	DIVISION	LOCATIONS	SUB_LOCS	EAS
1	WESTLANDS	9	16	21
2	KIBERA	9	12	15
3	MAKADARA	6	5	65
4	KASARANI	12	14	17
5	EMBAKASI	11	13	15
6	PUMWANI	5	6	6
7	DAGORETTI	4	7	7
8	CENTRAL	6	6	6

Table 3-3: Sampling Frame (the 52 poor areas in Nairobi)

NUM	LOCATION	EANAME	STRATA
1	KARIOKOR	CHAI ROAD	4
2	MATHARE	KAMWINGI	4
3	HURUMA	HURUMA	4
4	HURUMA	HURUMA	4
5	MATHARE	VILLAGE 2	5
6	HURUMA	KIA MAIKO	5
7	MUTUINI	SAIGONI 'A'	4
8	RIRUTA	RIRUTA SATELITE	4
9	RIRUTA	DAGORETTI	4
10	UTHIRU/RUTHMITU	UTHIRU 87/MUTHWA }	5
11	KAWANGWARE	CENTRE/CIUGUINI	5
12	KAWANGWARE	KAMITHA	5
13	MUKURU KWA NJEN	MUKURU KWA NJENGA	4
14	UMOJA	UMOJA II	4
15	UMOJA	MUTHAIGA	4
16	KAYOLE	KAYOLE	4
17	KAYOLE	KAYOLE	4
18	KAYOLE	KAYOLE	4
19	DANDORA	DANDORA PHASE I	4
20	DANDORA	DANDORA PHASE II	4
21	DANDORA	PHASE III	4

NUM	LOCATION	EANAME	STRATA
22	DANDORA	PHASE IV	4
23	KARIOBANGI S.	JUA KALI	4
24	MUKURU KWA NJEN	MUKURU KWA NJENGA	5
25	NJIRU	MAILI SABA	5
26	KARIOBANGI	MARURA	4
27	KARIOBANGI	KASABUNI	4
28	KOROGOCHO	NGUNYUMU VILLAGE	4
29	GITHURAI	GITHURAI	4
30	RUARAKA	UTALII	4
31	RUARAKA	MATHARE NORTH	4
32	RUARAKA	MATHARE NORTH	4
33	KARIOBANGI	BABA DOGO I	5
34	KOROGOCHO	HIGH-RIDGE	5
35	KIBERA	KAMBI MURU	5
36	KIBERA	SILANGA	5
37	MUGUMOINI	QUARRY VILL	5
38	LAINI SABA	KIBERA	5
39	SERA NGOMBE	SOWETO	5
40	LAINI SABA	HIGHRISE	4
41	MAKONGENI	MAKONGENI	4
42	MAKADARA	JERICHO	4
43	MARINGO	OFAFA I	4
44	VIWANDANI	LUNGA LUNGA	5
45	EASTLEIGH SOUTH	EASTLEIGH SOUTH	4
46	BAHATI	OUTER RING ESTATE	4
47	PUMWANI	MAJENGO	5
48	EASTLEIGH NORTH	SECTION II	4
49	EASTLEIGH NORTH	EASTLEIGH NORTH	4
50	KANGEMI	GICHAGI	4
51	KANGEMI	MARENGA	4
52	KANGEMI	WARUKU	4

Table 3-4: Analyzing the sample frame

Division	Number of areas	Percentage
CENTRAL	6	12
DAGORETTI	6	12
EMBAKASI	13	25
KASARANI	9	17
KIBERA	6	12
MAKADARA	4	8
PUMWANI	5	10
WESTLANDS	3	6
TOTAL	52	100

Considering the uneven distribution of poor people in the divisions, the researcher proposed a random selection mechanism that considered this distribution. It was a variant of probability proportional to size (PPS) cluster sampling. The following steps were used:

Step 1:

For each of the eight divisions, the researcher considered the EANames as a **stratum**, arranged in incremental order of the EANumbers. This generated eight strata in Table 3-5.

Step 2:

The researcher chose a random starting point (***fifth*** was proposed) and picked every ***fifth*** EANumber and Name in the list. This produced the sample list in Table 3-6.

Table 3-5: Strata from the sample frame

DIVISION	CLUSTER NO.	EANUMBER	EANAME	STRATA
Strata 1				
CENTRAL	1261	101010201032	CHAI ROAD	4
CENTRAL	1263	101010301024	VILLAGE 2	5
CENTRAL	1264	101010303055	KAMWINGI	4
CENTRAL	1265	101010401044	KIA MAIKO	5
CENTRAL	1266	101010402017	HURUMA	4
CENTRAL	1267	101010402059	HURUMA	4
Strata 2				
DAGORETTI	1345	101070202012	SAIGONI 'A'	4
DAGORETTI	1346	101070302008	UTHIRU 87/MUTHWA }	5
DAGORETTI	1347	101070401096	CENTRE/CIUGUINI	5
DAGORETTI	1348	101070402074	KAMITHA	5
DAGORETTI	1349	101070501028	RIRUTA SATELITE	4
DAGORETTI	1350	101070502007	DAGORETTI	4
Strata 3				
EMBAKASI	1291	101040201012	MUKURU KWA NJENGA	4
EMBAKASI	1293	101040201068	MUKURU KWA NJENGA	5
EMBAKASI	1294	101040301008	UMOJA II	4

EMBAKASI	1296	101040302009	MUTHAIGA	4
EMBAKASI	1297	101040401006	KAYOLE	4
EMBAKASI	1298	101040401038	KAYOLE	4
EMBAKASI	1299	101040401060	KAYOLE	4
EMBAKASI	1301	101040502005	MAILI SABA	5
EMBAKASI	1302	101040601022	DANDORA PHASE I	4
EMBAKASI	1303	101040601109	DANDORA PHASE II	4
EMBAKASI	1304	101040602045	PHASE III	4
EMBAKASI	1305	101040602160	PHASE IV	4
EMBAKASI	1306	101040701004	JUA KALI	4
Strata 4				
KASARANI	1274	101030101029	MARURA	4
KASARANI	1275	101030102024	KASABUNI	4
KASARANI	1276	101030102062	BABA DOGO I	5
KASARANI	1277	101030201046	NGUNYUMU VILLAGE	4
KASARANI	1278	101030202061	HIGH-RIDGE	5
KASARANI	1280	101030401022	GITHURAI	4
KASARANI	1282	101030502012	UTALII	4
KASARANI	1283	101030503051	MATHARE NORTH	4
KASARANI	1284	101030503122	MATHARE NORTH	4
Strata 5				
KIBERA	1352	101080101009	KAMBI MURU	5
KIBERA	1353	101080103002	SILANGA	5
KIBERA	1364	101080402014	QUARRY VILL	5
KIBERA	1366	101080602011	KIBERA	5
KIBERA	1367	101080602044	HIGHRISE	4
KIBERA	1368	101080702003	SOWETO	5
Strata 6				
MAKADARA	1268	101020101009	MAKONGENI	4
MAKADARA	1270	101020202049	JERICHO	4
MAKADARA	1271	101020302031	OFAFA I	4

MAKADARA	1272	101020402020	LUNGA LUNGA	5
Strata 7				
PUMWANI	1308	101050101047	SECTION II	4
PUMWANI	1309	101050102034	EASTLEIGH NORTH	4
PUMWANI	1310	101050201028	EASTLEIGH SOUTH	4
PUMWANI	1311	101050301019	MAJENGO	5
PUMWANI	1312	101050402014	OUTER RING ESTATE	4
Strata 8				
WESTLANDS	1329	101060401002	GICHAGI	4
WESTLANDS	1331	101060403012	MARENGA	4
WESTLANDS	1332	101060403077	WARUKU	4

Table 3-6: Sample of seven areas generated

	Division	EANumber	EAName
1	CENTRAL	101010402017	HURUMA
2	DAGORETTI	101070501028	RIRUTA SATELITE
3	EMBAKASI	101040401006	KAYOLE
		101040601109	DANDORA PHASE II
4	KASARANI	101030202061	HIGH-RIDGE
5	KIBERA	101080602044	HIGHRISE
6	MAKADARA	None Sampled	
7	PUMWANI	101050402014	OUTER RING ESTATE
8	WESTLANDS	None Sampled	

3.7 Sample size

SEM requires at least 200 respondents to test a model. The researcher proposed to collect data from 300 respondents, which would be at least 50% above the required number. Spreading out this number to the areas above, each area would generate 50 respondents.

Over time, the market share of the three mobile money services has evolved as the effort to reach out to the consumers has increased. As of June, 2012 when the market had been considered to have reached a plateau, M-Pesa dominated with a share of 82%. Airtel Money

had a share of 15%, YuCash had 2% while Orange Money had a share of 1% (CCK, 2012). This CCK report was based on the existing subscription of over 17 million users. In 2007 when M-Pesa operated as the only provider, it controlled 100% of the market share. As the other products launched, the percentages began to fluctuate. The same happened as the providers extended their marketing campaigns. Prior to the data collection exercise for this study, it was estimated that M-Pesa had a market share of 79%, Airtel Money with 11%, Orange Money had 5% while YuCash had 5%.

M-Pesa had also signed up over 500 business partners who operated M-Pesa accounts as well as launched the M-Kesho account in partnership with Equity Bank (the largest bank in Kenya in terms of account holders) Airtel Money had some business partners as well but not as many as M-Pesa. This business partners certainly raised the market share of M-Pesa and a little bit for Airtel Money. Orange Money had established partnership with Equity Bank. The researcher factored this in determining the final sampling distribution.

There was a word of caution regarding the data provided by mobile operators about their subscription numbers. Some reported registered numbers, while others claimed they had reported active numbers. From multiple sources, including consultations with the regulators while collecting data for the exploratory study, the researcher approximated and extrapolated for only the three mobile money services under study. The researcher proposed a ratio of 84% to 10% to 6% for the three products as a basis for collecting data. The targeted breakdown of respondents turned out as shown in Table 3-7.

However, in the final analysis, the distribution of the data collected is shown in Table 3-8. In three EAs, the researcher got a slightly lower number for M-Pesa users because the collection was done in the afternoon and by end of day had to stop and discontinue to avoid distorting the sampling and data collection. Airtel Money and Orange Money users were very limited, such that when a few more were obtained in one EA, the researcher interviewed all of them. At the end of the process the distribution was as follows: M-Pesa was 80%, Airtel Money was 13% and Orange Money 7%. This distribution was not far from the market distribution. In addition, the total of 283 was far above the minimum required.

Table 3-7: Respondents per EA for each mobile money service

Study area	M-Pesa	Airtel Money	Iko-Pesa	Total
HURUMA	42	5	3	50
RIRUTA SATELITE	42	5	3	50
KAYOLE	42	5	3	50
DANDORA PHASE II	42	5	3	50
HIGH-RIDGE	42	5	3	50
OUTER RING ESTATE	42	5	3	50
Total	252	30	18	300

Table 3-8: Final distribution of respondents per EA for each mobile money service

Study area	M-Pesa	Airtel Money	Iko-Pesa	Total
HURUMA	42	5	3	50
RIRUTA SATELITE	42	8	2	53
KAYOLE	34	5	3	42
DANDORA PHASE II	37	8	5	49
HIGH-RIDGE	36	5	3	44
OUTER RING ESTATE	35	6	4	45
Total	226	37	20	283

3.8 Data collection process

The instrument was guided by the SEM requirements and was tested prior to actual roll out.

Filter Question

Though the respondents were interviewed in areas where they reside, it was necessary to assess their income level as a qualification for interview. The researcher included a filter question as a measure that ensures the respondents were within the desired income range.

According to the urban Consumer Price Index (CPI), the upper threshold for low income group was KShs. 23,671 per month at the then exchange rate of KShs.77 for a dollar (KNBS, 2011). This translated to USD 307.4 per month per household.

The researcher proposed a question that would exclude respondents who were likely to earn more than KShs. 23,671 per month per household. Respondents were assisted to estimate their monthly income in case it was not obvious to them. Income is not considered as the best means of establishing poverty levels. Expenditure is more reliable. However, for this study, the intention was not to establish the actual poverty levels, rather to gauge and confirm that indeed a respondent was reasonably within the poverty range.

Identifying and Interviewing Respondents

The following steps were used in identifying and interviewing the respondents:

- Upon demarcating the enumeration area, the researcher listed and enumerated all the M-Pesa agents in the area.
- The researcher then randomly picked a starting point. Position 6, was randomly chosen.
- The researcher then picked every agent shop based on a chosen interval. Every 3rd agent was randomly chosen.
- The researcher picked ***six*** M-Pesa shops from each of the sampled enumeration areas.
- After creating contact with the agent, the researcher interviewed the first *seven* customers to the shop who met the economic status requirements. This disproportionate (or non-proportional) stratified sampling was not concerned about any ratios e.g. women to men. Rather, any customer who arrived was interviewed. Once ***seven*** respondents had been interviewed, the researcher moved to the next agent. The choice of the seven respondents was to ensure that each of the enumeration area generates 42 respondents.
- Given the low literacy levels, the researcher directly interviewed the respondents as opposed to asking them to fill the questionnaire.
- The researcher stopped once 42 M-Pesa respondents had been interviewed in one area
- The researcher then moved to an Airtel Money agent randomly within the area and interviewed the first **five** customers who met the economic status requirement. The reason for this simple purposive approach for Airtel money was because of the limited number of Airtel money agents and users.

- The researcher then proceeded to an Orange Money agent randomly within the area and interviewed the first **three** customers who met the economic status requirement. The reason for this simple purposive approach for Orange money was because of the limited number of Orange money agents and users.
- At this stage, the researcher moved to the next area and repeated the steps above.

3.9 Data collected

The researcher set out to collect data from 300 respondents, which was 50% above the desirable figure of 200 for SEM analysis. Due to the challenges of obtaining Airtel Money and Orange Money respondents, the researcher was able to obtain data from 283, which was well above the recommended number.

3.10 Data analysis strategy

A data analysis strategy is a plan of how a researcher plans to analyze the data that has been collected. This study had five stages of analysis. The first stage was the data management, mainly done using SPSS, where cleaning and quality were ensured. Specifically, missing data, outliers and normality tests were done. Next, the researcher focused on analysing the demographic information done using SPSS. This was followed by reliability and validity of the data, partly done using SPSS and partly using AMOS. The fourth stage, also carried out using AMOS, focused on establishing how well the model fits the data. The final stage, done using AMOS, focused on hypotheses testing using path coefficients and P-values (Hair et al., 2010).

3.11 Data Management

Data was entered into SPSS with rows making entries for each respondent and columns capturing responses for each question asked.

Before conducting the analysis, the research instrument items and data were scrutinized for a number of aspects including incorrect entries, missing values and possible outliers. Pre-analysis assessment of multivariate assumptions was conducted, particularly multivariate normality and Multicollinearity. These underlying statistical assumptions are necessary for conducting multivariate analysis (Hair, et al., 2006). The findings and adjustments are presented in this section.

1.1 Data Screening

The objective of this task was to establish the accuracy of the data. The guiding question was if the data was entered correctly. The data was proofread against the original in the questionnaires to check that items had been entered correctly. There were no incorrect values but there were missing values.

1.2 Missing values

Missing data analysis was carried out using SPSS by analysing each variable in the entire data set. Missing data can have significant impact on the outcome of analysis, if not well addressed. There are multiple ways of dealing with missing values (Carter, 2006); (Hair, et al., 2010). Some of these techniques are highlighted below.

Ignore the missing data

In cases where missing data is part of the research design, the researcher can ignore the missing values. In this case it is assumed that the missing data is not needed because the gaps were inherent in the design (Schafer, 1997).

List wise deletion

This is an ad hoc method done before any substantive analyses are done. It is considered easy and straightforward (Brown, 1983). The researcher removes all records that have a missing value in them. If there are many variables missing values, then the dataset can be substantially affected.

Imputation by using replacement values

This technique involves replacing missing values with estimated ones based on the nature of data and information available. Specific options include "hot or cold deck imputation "where the researcher uses values from other sources to fill the gaps with missing values. In some cases, a researcher may use "case substitution "where the entire observation with a missing value is replaced with a record from another non sampled observation (Hair, et al., 2010). The assumption made in this cases, is that alternative data sources are available from where to obtain the new values.

-cher could also calculate the replacement values. For example, a "mean ' can be done. This is one of the most commonly used techniques for dealing with ues. A mean of all valid responses is calculated and used to fill the missing values. ent is that the mean is the best single replacement for a missing value. However, use this technique, the missing values must not be more than five percent of the chumacker & Lomax, 2004); (Tabachnick & Fidell, 2007); (Hair, et al., 2006).

83 records, across 33 variables, there were 10 values missing distributed t the variables. In each case, the missing values were below 5 percent of the likert s and were replaced by the mean/average value.

utlier analysis

se of outlier analysis is to ensure that any extreme answers of respondents on any ables do not distort the overall results (Tabachnick & Fidell, 2007).

r is defined as an observation that "appears" to be inconsistent with other ons in the data set (Lewis & Barnett, 1985). The procedure for identifying te outliers is by computing Mahalanobis distances (Hair, et al., 2010). It calculates ice of particular scores from the centre cluster of remaining cases. In this regard, lanobis distance (D^2) is the distance of one observation from the mean of the rest ations. The Mahalanobis distances score for each subject is considered an outlier if s a "critical value" based on the probability level and the degrees of freedom.

SS, the Mahalanobis distance was calculated for each case (respondent entry). It compared with chi-square value (see guide in Appendix 2). The chi-square value for riables $X^2(29, 0.001) = 58.30$, computed as per (Hair, et al., 2010). Outliers can be ised as either beneficial or problematic but should be evaluated within the context nalysis and should be evaluated by the types of information they may provide. atic outliers are not representative of the population, easily introduce biases, the research objectives, can seriously distort statistical tests like p-values and can faulty conclusions. Beneficial outliers may give indication of some important ristics of the population that would not be otherwise discovered (Hair et al. 2010).

Table 3-9 displays the results of Mahalanobis distance analysis for each case considered an outlier by AMOS sorted in decreasing Mahalanobis distance. The observation number is the unique identifier of the case as picked form the data. The cases are listed in descending order of the Mahalanobis distance (d^2) from the centroid under assumptions of normality. Considering that a cut-off for each case should be 58.30, it was concluded that there was no outlier.

Table 3-9: Observations farthest from the centroid (Mahalanobis distance)

Case	Observation number	Mahalanobis (d-squared)	Case	Observation number	Mahalanobis (d-squared)
1	243	52.9948	51	24	34.6925
2	127	52.9021	52	278	34.6778
3	72	51.7410	53	244	34.2149
4	81	50.7839	54	261	34.1848
5	241	49.1890	55	132	33.9957
6	267	48.2930	56	179	33.4365
7	214	47.7024	57	14	33.4253
8	22	47.2111	58	133	33.3643
9	33	45.4236	59	161	33.2403
10	139	45.1591	60	237	32.9804
11	180	44.1295	61	279	32.9226
12	228	44.0968	62	266	32.6578
13	240	43.8590	63	207	32.6265
14	125	43.3513	64	265	31.8956
15	35	42.2960	65	204	31.8764
16	12	42.2627	66	131	31.8712
17	159	42.1454	67	239	31.8456
18	247	42.0106	68	223	31.8295
19	27	41.3959	69	270	31.4646
20	26	41.3645	70	178	31.0967
21	262	41.0034	51	11	31.0453

22	226	40.9939	52	268	30.9873
23	212	40.5297	53	30	30.8423
24	246	40.1621	54	29	30.1283
25	83	39.5998	55	138	30.1119
26	16	39.5227	56	257	29.6996
27	274	38.9622	57	210	29.6589
28	110	38.7016	58	151	29.5583
29	215	38.2400	59	177	29.4616
30	282	38.2158	60	119	29.4602
31	206	37.9826	61	194	29.3343
32	216	37.8352	62	209	29.2702
33	135	37.7536	63	281	28.9653
34	136	37.6435	64	200	28.8323
35	8	37.3067	65	219	28.5829
36	15	37.0910	66	7	28.2763
37	208	36.9291	67	118	28.2454
38	213	36.4826	68	129	28.1629
39	108	36.4475	69	143	28.1273
40	198	36.1954	70	205	28.0245
41	185	35.7782	71	13	27.9798
42	280	35.7129	72	107	27.9747
43	249	35.4705	73	252	27.8741
44	124	35.4309	74	230	27.7234
45	184	35.4171	75	258	27.6798
46	283	35.3310	76	51	27.5995
47	263	35.0684	77	211	27.5331
48	6	35.0319	78	32	27.3548
49	245	34.8547	79	260	27.3283
50	276	34.8413	80	134	27.1242

3.11.4 Data Coding

The data collected using a five point likert scale was organized for entry into SPSS as follows:

i) Gender was entered as 1 for male and 2 for female

ii) Age was computed from the year of birth by subtracting from year 2012 and entered as a number.

iii) Years in school was computed from the highest class attended, working with the assumption that the respondent would take eight years in primary school, four years in high school, two years in a tertiary college and four years in university. The entry made was a number representing years in school.

iv) Duration for usage of mobile money service was entered as 1 for less than six months, 2 for six months to one year, 3 for one year to two years, 4 for two years to three years and 5 for three years to four years.

v) For each of the constructs, a number between 1 and 5 was used for each of the likert scale choice (Strongly disagree, Disagree, Neutral, Agree, Strongly agree). In case where it was necessary to reverse the entries in order to make sense, the researcher used 5 down to 1 for the likert scale. This was applicable for Effort Expectancy and Transaction Cost. It is important to note that whether the data was coded in reverse or not, it would have shown the strong relationship, except that the correlation would potentially be in the negative direction. The constructs were numbered from Q6 to Q34 in SPSS.

vi) The moderator Perceived Risk was captured as a construct for purposes of analysis. It was operationalised with three measures. The researcher was interested in evaluating if Perceived Trust could be considered the moderating variable between Perceived Risk and Behavioural Intention. This made the entries 29 and not 27.

To demonstrate how the data looked in SPSS, the researcher uses the partial screen of Appendix 5.

3.11.5 Multivariate Normality

Normality is the most fundamental assumption, focusing on the shape of the distribution. If single variables are normal, their multivariate normality can be assumed (Hair et al., 2010), though not guaranteed. The researcher determined the skewness and kurtosis as measures of normality (Hair et al, 1998). Skewness measures the degree of symmetry of a distribution. A negative skewness value shows that the left side of the histogram is longer compared to the right side, a positive value indicates the opposite while a value of zero indicates that the distribution is balanced (Newbold, et al., 2007). Kurtosis measures the relative peak of the mean in a distribution. Data distribution with high kurtosis has a high peak near the mean with a heavy tail in one direction while low kurtosis would have a flat top near the mean. Negative kurtosis indicates platykurtic (flatter) distribution while positive values are deplokurtic (peaked) distribution.

If a variation from the normal distribution is significantly large, all resulting statistical tests are invalid (Hair et al, 2010). Table 3-10 summarizes the mean, standard deviation, skewness and kurtosis of the variables.

The descriptive analysis revealed that the data skewness and kurtosis were all within the acceptable value of ±1. In such a case, there was no need to consider data transformation to remedy the data set (Hair, et al., 2006). Besides, it is argued that for sample sizes of 50 and below, significant departure from normality can have significant impact on results. For sizes of 200 and above, these effects may be negligible. The dataset of 283 for this study increased the confidence that minor deviations would not have much bearing.

Many scales and measures used in social sciences have scores which are either positively or negatively skewed. This reflects the underlying nature of the construct that are being measured (Pallant, 2005). For example in this study, several variables were negatively skewed because most of the respondents agreed/strongly agreed more than they disagreed/strongly disagreed about the issue they were responding to. This was expected and though it may have an effect on the measurement model tests e.g. the chi-square, the effect would be handled by exploring other fitness tests.

Table 3-10: Statistical analysis of the variables

VARIABLES	MEAN	STANDARD DEVIATION	SKEWNESS	KURTOSIS
PE1	3.52	1.24	-0.623	-0.754
PE2	3.58	1.26	-0.640	-0.796
PE3	3.68	1.26	-0.682	-0.790
EE1	3.99	1.03	-0.953	-0.134
EE2	3.99	1.07	-0.940	-0.157
EE3	3.95	1.05	-0.940	-0.113
SI1	3.96	1.12	-0.863	-0.192
SI2	3.81	1.12	-0.772	-0.284
SI3	3.81	1.07	-0.615	-0.446
FC1	3.79	1.31	-0.736	-0.856
FC2	3.83	1.24	-0.941	-0.214
FC3	3.72	1.21	-0.754	-0.395
PT1	3.74	1.16	-0.781	-0.393
PT2	3.69	1.15	-0.805	-0.093
PT3	3.60	1.07	-0.762	+0.110
TC1	3.79	1.12	-0.776	-0.265
TC2	3.52	1.16	-0.494	-0.625
TC3	3.58	1.12	-0.675	-0.409
TR1	3.58	1.08	-0.547	-0.587
TR2	3.49	1.06	-0.622	-0.382
TR3	3.47	1.86	-0.354	-0.795
PR1	2.36	1.11	+0.734	-0.274
PR2	2.24	0.96	+0.691	+0.082
PR3	2.58	1.06	+0.533	-0.270
BI1	3.69	1.32	-0.749	-0.737

BI2	3.70	1.29	-0.641	-0.876
Use1	3.91	1.010	-0.980	+0.407
Use2	3.75	1.097	-0.772	-0.384
Use3	3.70	1.142	-0.807	-0.311

3.11.6 Multicollinearity

Multicollinearity has to do with correlations among variables. If there is a correlation between two measurement variables being greater than 0.90 then the two variables are multicollinear. It could be indicating that the variables are identical and as such one of them is not necessary. The only way to deal with this is to delete one of the variables.

Running a bivariate correlation between all the variables generates the necessary correlations for investigation. Table 3-11 displays the correlations between variables indicating that there was no Multicollinearity between variables.

Table 3-11: Correlations between all the variables

	PE1	PE2	PE3	EE1	EE2	EE3	SI1	SI2	SI3	FC1	FC2	FC3	PT1	PT2
PE1	1													
PE2	.855**	1												
PE3	.847**	.853**	1											
EE1	.548**	.584**	.593**	1										
EE2	.606**	.614**	.632**	.852**	1									
EE3	.543**	.543**	.556**	.776**	.785**	1								
SI1	.534**	.488**	.508**	.582**	.633**	.518**	1							
SI2	.550**	.514**	.564**	.596**	.653**	.534**	.737**	1						
SI3	.513**	.466**	.488**	.509**	.606**	.512**	.697**	.731**	1					
FC1	.413**	.413**	.365**	.433**	.475**	.423**	.473**	.488**	.480**	1				
FC2	.339**	.335**	.326**	.437**	.483**	.411**	.514**	.472**	.478**	.717**	1			
FC3	.360**	.350**	.349**	.400**	.466**	.387**	.496**	.491**	.492**	.781**	.776**	1		
PT1	.483**	.434**	.488**	.442**	.524**	.388**	.534**	.558**	.519**	.388**	.414**	.466**	1	
PT2	.477**	.458**	.405**	.426**	.477**	.375**	.517**	.498**	.484**	.393**	.371**	.379**	.650**	1
PT3	.426**	.412**	.378**	.417**	.454**	.455**	.432**	.407**	.408**	.318**	.321**	.391**	.544**	.554**
TC1	.396**	.362**	.361**	.480**	.520**	.461**	.512**	.529**	.486**	.540**	.525**	.513**	.468**	.444**
TC2	.321**	.291**	.301**	.377**	.406**	.350**	.455**	.450**	.391**	.383**	.431**	.391**	.454**	.394**
TC3	.367**	.333**	.341**	.334**	.352**	.280**	.436**	.445**	.381**	.348**	.384**	.366**	.496**	.417**
TR1	.468**	.455**	.459**	.480**	.539**	.467**	.559**	.498**	.477**	.361**	.395**	.404**	.451**	.446**
TR2	.441**	.429**	.430**	.402**	.453**	.391**	.474**	.481**	.392**	.336**	.388**	.343**	.397**	.444**
TR3	.326**	.405**	.388**	.332**	.350**	.308**	.388**	.418**	.388**	.278**	.327**	.340**	.278**	.242**
PR1	0.068	.144*	0.075	0.104	.123*	0.092	0.108	0.073	0.04	-0.01	0.094	0.009	-0.1	0.026
PR2	0.007	0.07	0.022	0.077	0.078	0.093	0.065	0.043	0.014	-0	-0	0.018	-.135*	-0.04
PR3	0.018	0.075	0.015	0.004	-0.01	-0.04	0.026	-0.05	-0.06	-0.09	0.014	-0.06	-0.07	0.022
BI1	611**	.554**	.556**	.556**	.589**	.548**	.637**	.654**	.578**	.434**	.444**	.472**	.561**	.563**
BI2	556**	.499**	.501**	.517**	.556**	.495**	.600**	.581**	.525**	.424**	.413**	.446**	.501**	.558**
Use1	452**	.445**	.450**	.488**	.501**	.420**	.464**	.462**	.441**	.594**	.511**	.608**	.438**	.438**
Use2	509**	.479**	.469**	.505**	.542**	.443**	.488**	.521**	.531**	.585**	.453**	.593**	.482**	.491**
Use3	.504**	.516**	.473**	.505**	.540**	.459**	.475**	.445**	.473**	.533**	.416**	.521**	.447**	.464**

** Correlation is significant at the .01 level (2-tailed).

* Correlation is significant at the .05 level (2-tailed).

	PT3	TC1	TC2	TC3	TR1	TR2	TR3	PR1	PR2	PR3	BI1	BI2	Use1	Use2	Use3
PE1															
PE2															
PE3															
EE1															
EE2															
EE3															
SI1															
SI2															
SI3															
FC1															
FC2															
FC3															
PT1															
PT2															
PT3	1														
TC1	.352**	1													
TC2	.227**	.650**	1												
TC3	.301**	.491**	.445**	1											
TR1	.354**	.455**	.443**	.375**	1										
TR2	.304**	.385**	.325**	.318**	.643**	1									
TR3	.196**	.347**	.344**	.260**	.495**	.455**	1								
PR1	-0 1	.137*	0.07	0.078	.152*	.133*	.219**	1							
PR2	-.129*	0.106	0.04	0.078	0.05	.120*	.168**	.622**	1						
PR3	-0.11	0.048	0.078	-0.06	0.056	0.052	0.101	.420**	.398**	1					
BI1	.409**	.501**	.471**	.475**	.560**	.479**	.420**	0.105	0	0.002	1				
BI2	.396**	.497**	.460**	.430**	.531**	.465**	.380**	.126*	0.005	0.027	.848**	1			
Use1	.314**	.583**	.433**	.415**	.349**	.305**	.214**	0.001	0.07	-0.01	.499**	.415**	1		
Use2	.427**	.593**	.400**	.402**	.380**	.291**	.283**	0.03	0	-0.05	.501**	.501**	.680**	1	
Use3	.354**	.514**	.414**	.341**	.376**	.316**	.243**	0.016	-0.01	-0.02	.513**	.482**	.621**	.743**	1

**. Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed).

3.12 Reliability and Validity

After passing the tests for data management, the focus shifted to reliability and validity of data. These are two different yet important aspects. A reliable measure will measure something consistently, correctly all the time, but not necessarily what it is supposed to be measuring.

3.12.1 Reliability

Reliability is how consistent a set of measurements are in measuring a construct. In simple terms, it can be seen as a way of establishing if an instrument is deployed to the same population it would generate the same result (test-retest). In subjective instruments, for example, where personality attributes are under study, reliability tests whether two

independent evaluations would give similar results (inter-rater reliability). Reliability is inversely related to random error.

The basis for reliability test (internal consistency) is that the individual variables which make up a construct, should be measuring the same construct and be highly inter-correlated (Churchill, 1979).

Trial instruments

Prior to measuring reliability, a pilot test of the instrument was run. This helped improve the reliability of the instrument. The first pilot involved 20 respondents from Mathare North area.

The emphasis of this first pilot was to assess the clarity of the questions, duration it would take to have a respondent respond to all the questions, and get an idea of the data collection process.

Identifying agents and respondents was straight forward considering that only 20 respondents were needed. However several issues came up regarding the instrument, particularly clarity of the questions. In some cases, the respondents were not able to clearly interpret the questions. In some cases, the questions appeared ambiguous or similar to others.

The researcher took several actions to improve the instrument:

- The wording was reduced per question to ease understanding
- Questions that appeared ambiguous were refined
- Questions that did not seem to make sense to respondents were substantially modified
- In cases where questions appeared to be asking the same thing, the wording was changed to differentiate them
- All questions were translated to Kiswahili to ease understanding. Every question had a corresponding Kiswahili translation as shown in the questionnaire in Appendix 1. Questions could be asked in Kiswahili depending on the English literacy level of a respondent and recording done on the five point likert scale.

After adjustments, the instrument was tested again with about 50 respondents and another iteration of improvement done. In this iteration, more work was done in improving the intra-construct validity and consistency.

The researcher tested the instrument in this second cycle in Dagoreti. After demarcating the EA, the researcher identified four M-Pesa agent shops and collected data from 10 respondents in each shop. There was one Airtel Money shop and one Orange Money shop in the area. These shops were both retail shops for other products besides offering mobile money services. Upon finishing the data collection from M-Pesa shop, the researcher considered purposive sampling in the two other shops. In the entire afternoon, only four users came to the two shops. It was clear that it would be difficult to obtain Airtel Money and Orange Money users. At this point the researcher identified another M-Pesa shop and interviewed six other users getting to a total of 50.

From the pilot, it was estimated that it would take about 15 minutes to fill one questionnaire. In most cases, the users would not fill by themselves, it would have to be read out to them and in some cases be interpreted.

To test the reliability of the instrument, the researcher used the Cronbach's Alpha value for each construct. The constructs PE, EE and FC had Cronbach's Alpha coefficient above 0.7, which was considered acceptable as discussed in the section that follow. SI, PT, TC, TR, BI and AU had Cronbach's Alpha coefficient between 0.6 and 0.7. These values are considered good (George & Mallery, 2003). At this point, the researcher could proceed with this as the final instrument, but chose to revise it some more with the aim of getting some values about 0.9 (considered excellent).

The researcher decided to split the instrument into three, for each mobile money service as opposed to one instrument and expecting the respondent to tick the one that they use. This was because it was realized that users sometimes had subscribed to more than one mobile money service and were getting confused. At the same time the researcher organised the questions in the order in which they appear in the research conceptual framework and include the titles of these constructs for each of the group of questions. This way, it was clear what the respondent was responding to. The researcher also recruited some assistants who understood the native languages in case users could not understand English or

Kiswahili. Though no respondent was unable to respond in Kiswahili, the assurance that no respondent could be skipped because of a language barrier increased the confidence of the researcher.

The researcher tested this instrument with a few respondents randomly selected at the convenience of the researcher and things seemed a lot clearer. The researcher then proceeded with this instrument as the final version, whose reliability test outcomes are discussed in the next section.

The final instrument

The first measure for reliability is how each variable relates to the others within the same construct, i.e. inter-item correlation as well as item-to-total correlation. Inter-item correlations should exceed 0.30 (Robinson, et al., 1991).

Table 3-12 illustrates that the condition was met in the data. Item-to-total correlation should exceed 0.50. Item-to-total correlation (r) between 0.10 and 0.29 is considered small correlation, between 0.30 and 0.49 is medium correlation, while between 0.50 and 1.00 is large correlation (Cohen, 1988).

Cronbach's alpha is the other measure for internal consistency/reliability. It shows how closely related a set of items are as a group. A high value of alpha is often used as evidence that the items measure an underlying (or latent) construct. A reliability coefficient of .700 or higher is considered "acceptable" in most social science research situations, indicating that there is a relatively high internal consistency or adequate convergence (Hair et al., 2006).

The Table 3-12 lists out the constructs in the study, their corresponding Cronbach's alpha as well as the inter-item correlation and item-total correlation. A scale to evaluate the goodness of the Cronbach's Alpha has been established. The breakdown is as follows: Excellent (>=0.9), good (>=0.8 and <0.9), acceptable (>=0.7 and <0.8), questionable (>=0.6 and <0.7), and poor (>=0.5 and <0.6) (George & Mallery, 2003). Since the Cronbach's alpha coefficients are greater than 0.8, with a few considered acceptable (within the 0.7 range), the researcher concluded that the items in each construct are positively correlated with one another (Sekaran, 2003). Ferketich (1991) recommends that corrected item-total

correlations should range between .30 and .70 for a good scale. Values above 0.7 indicate that the individual variables could be measuring the whole construct and there may be elements of redundancy. However, such high values can occur in cases where there are strong views from respondents. This happened to be the case in this study.

The tests of reliability (Cronbach's alpha coefficient and the item correlations) confirmed that the instrument used for the final survey was reliable.

Table 3-12: Cronbach's alpha reliability results for the pooled data file

Construct	Cronbach's Alpha coefficient	Reliability Level	Variables	Inter-Item Correlation	Item-Total Correlation
Performance Expectancy (PE)	0.945	Excellent	PE1 PE2 PE3	0.847-0.855	0.883-0.888
Effort Expectancy (EE)	0.925	Excellent	EE1 EE2 EE3	0.776-0.852	0.811-0.868
Social Influence (SI)	0.885	Good	SI1 SI2 SI3	0.697-0.721	0.771-0.797
Facilitating Conditions (FC)	0.904	Excellent	FC1 FC2 FC3	0.717-0.781	0.791-0.840
Perceived Trust (PT)	0.797	Acceptable	PT1 PT2 PT3	0.514-0.650	0.577-0.863
Transaction Cost (TC)	0.771	Acceptable	TC1 TC2 TC3	0.445-0.650	0.515-0.673
Trialability (TR)	0.769	Acceptable	TR1 TR2 TR3	0.455-0.642	0.524-0.662
Perceived Risk (PR)	0.732	Acceptable	PR1 PR2 PR3	0.398-0.622	0.455-0.617
Behavioural Intention (BI)	0.918	Excellent	BI1 BI2	0.848	0.848
Actual Usage (AU)	0.865	Good	Use1 Use2 Use3	0.621-0.743	0.696-0.792

3.12.2 Validity

Validity has two areas of application. First it is the degree to which a test measures what it was intended to measure while the second involves research design where the term refers to the degree to which a specific research work supports the intended conclusions that are drawn from the results.

Validity analysis is used to determine how consistently the selected variables measure some construct. For example, PE is operationalized using three variables, whose consistency needed to me measured. It is a way of establishing if a questionnaire measures an item in a useful way. It is the goodness of the data that was collected. Researchers have indicated that it is much easier to define validity than to demonstrate it conclusively, mainly because validity is more a relative than an absolute concept (Hair, et al., 2010).

There are two popular forms of validity in related research, namely content validity and construct validity.

Content Validity

Content validity is "the systematic examination of the test content to determine whether it covers a representative sample of the behaviour domain to be measured" (Anastasi & Urbina, 1997). This refers to the correspondence between the instrument items and the concept. This validity test was factored in when the constructs were being conceptualized and constructed. The emphasis was to show that the constructs were consistent with the current body of knowledge on mobile money.

Content validity was tested by the use of expert judgment and pre-test as per guidance from literature (Hair, et al., 2006). Right from the first draft of the instrument to the final one, consultation and review by a number of experts in the area of mobile money was sought. The comments they gave were used to improve the instrument.

After trying out the instrument in the field during trials, it was established that it was necessary to include Kiswahili translation for each of the questions. A Kiswahili expert was consulted to establish if the translations were correct and the feedback was used to improve the instrument. Feedback from respondents was also used to modify, merge and even re-organize questions.

Construct Validity

Construct validity refers to the degree to which measurement variables represent its intended constructs. This also shows the extent to which a construct is truly distinct from other constructs. There are two forms of construct validity that were utilized, namely convergent validity and discriminant validity (Hair, et al., 2006). Variables or measures of constructs that are related to each other show a correspondence or convergence while measures that theoretically should not be related to each other discriminate. Correlations, which are used to estimate this kind of validity, should either be high for items that are theoretically similar or low for items that are theoretically dissimilar.

Convergent Validity

Convergent validity (sometimes called correlational or criterion analysis) assesses the degree to which measures of the same construct are correlated. To establish convergent validity, a researcher needs to demonstrate that measures that should be related are in reality related. It indicates that items that are indicators of a specific construct should converge or share a high proportion of variance in common. In testing, the measures should indicate the construct is measuring the intended aspect (Hair, et al., 2006). Inter-item correlations are a good measure of the convergent validity. Since correlation analysis is used to test reliability, then reliability is also an indicator of convergent validity (Hair, et al., 2006).

The Table 3-12 indicates that the constructs were generally valid, indicating that construct validity requirement was met at this stage. Item-to-total correlations did exceed 0.50 and the inter-item correlations exceeded 0.30 (Robinson, et al., 1991). These values were higher than what the pilot study revealed, showing significant improvement.

Discriminant validity

Discriminant validity is the condition where a construct or variable that is truly distinct from other constructs or variables can be shown to be so (Hair, et al., 2010). To establish discriminant validity, researchers need to demonstrate that measures that should not be related are in reality not related. A construct has discriminant validity if it has a low correlation with measures of dissimilar concepts (Zikmund, 2003). Another way is by

calculating Average Variance Extracted (AVE) for each pair of constructs then comparing the result with square of correlation between such constructs. This latter process is done during the measurement model analysis in section 4.3.2, showing that the discriminant validity test passed.

3.13 Research Process

This section summarizes the research process, highlighting the experience of collecting the actual data. The researcher reports the various aspects starting with the research question.

The research question

The first aspect the researcher had to carefully address was the filter question. It was first assumed that the people living in areas were poor and earned less than USD. 307.4 per household. In as much it was desirable to get an accurate value from the respondents; the researcher was more concerned about getting an indicative income level. Not all respondents were able to clearly give an indication of their household income and were therefore assisted to compute. The researcher first asked the respondents to indicate what their revenue streams are and how much they approximately earn from each of them. In some cases, the figures went above the threshold of USD. 307.4. The researcher used judgement to decide if to drop these respondents. One of the ways used was to find out if these respondents were receiving other forms of income that they could not recall. If this was the case, and it would appear that the income would go way above the threshold, the respondent would be skipped. A total of 23 respondents were skipped during the entire data collection process. In some cases, respondents did have an estimated income slightly above the threshold, but were included in the study. This was mainly because the researcher could judge that the respondent was probably inaccurate in estimating the income. Caution was taken in these cases not to prejudge and jump into conclusions. The researcher probed the respondents a few times to establish consistency in what they said and counterchecked some of the responses already given.

Identifying and interviewing respondents

The researcher used maps from KNBS and Google maps to identify the EAs. Some of the maps from KNBS were unclear and needed strengthening with alternative ones. Once the EA

had been demarcated, the researcher focused on identifying all the mobile money agents in the area.

M-Pesa agents were many, while Airtel and Orange money were very few. Identifying agents within the EA was straight forward. The individual agents were helpful in pointing to where the other agents were within the area. It was confirmed, as it had been anticipated during the piloting, that Airtel Money and Orange Money users were limited. This is why purposive sampling was used for these two categories of respondents.

Other than some agents who expect to be compensated for allowing their customers to be interviewed, the researcher did not find it difficult working with agents. Not all customers were cooperative. The researcher had to interest the respondents that ultimately it was worth participating in the study, since the outcome would inform policy makers and mobile money providers who would later improve the products. Some customers thought that the researcher was working for the mobile money providers or was at least paid to collect this data and therefore should have compensated them.

The researcher declined to give any compensation in order not to influence respondents, but in a number of occasions gave a token of appreciation to the agents in form of airtime for assisting with identifying other agents in the area. Given the low literacy levels, the researcher directly interviewed the respondents as opposed to asking them to fill the questionnaire. This was very useful particularly in identifying Airtel Money and Orange Money agents. Another instance was when the Airtel Money and Orange Money respondents could not be identified. The agents volunteered to give mobile phone numbers of respondents who were personally known to the agents. The researcher gave a token of appreciation for the same.

The researcher ensured that data collection in one area was done on one day and completed. The demarcation of the area was done in the morning and data collection conducted soon after. This was mainly to avoid coming back to trace the locations and possibly end up interviewing a respondent more than once.

Communicating the questions to respondents

This was probably one of the most challenging aspects of the interview process. A number of respondents struggled with differentiating between 'strongly disagree' and 'disagree' or

'strongly agree' and 'agree'. In this case, the researcher designed the interview process in a manner to allow respondents to answer to the questions in two levels. First, respondents would answer if they agree or not. Secondly they would express themselves as to how much they either agree or disagree. Body language and facial expressions were helpful in figuring out the strength of the view of the respondent.

One way researchers can deal with such situations is by use of imagery or objects to differentiate the levels of disagreement or agreement. This technique was not used in this study, but recommended for other researchers intending to do similar studies.

Though all questions were translated into Kiswahili, in very few cases, the researcher had to clarify issues using the respondent's native language. The researcher worked with a number of assistants who could speak specific native languages. In two cases where no assistant could speak the language, another respondent was asked to explain the question that was not clear to the respondent.

Working with research assistants

It was vital to train the assistants to ensure that they understood what the study was about and what each of the questions meant. This included an explanation of the conceptual framework and the questionnaire. The researcher picked assistants from the University who could be reached easily and had worked with the researcher in other similar assignments. Prior to going to the field, the assistants were asked to test the instruments among themselves and ask questions about what was unclear or what they thought about the process.

During the field work, the researcher worked with the assistants from one EA to another. This was necessary because the researcher could not be sure that if the assistants were on their own, they would do a reliable job. The researcher monitored the process from one agent to another requiring that all assistants be positioned at one agent shop and interview the required block of users as they come. This made it possible to focus on all the users who came after one another. No user who was supposed to be interviewed left. At one point in time, it was possible to have five respondents participating in the interview process, responding to questions from five assistants.

3.14 Conclusion

The chapter has elaborated on how the extended UTAUT model was transformed into instruments and how the data was collected. In addition the chapter discusses specific issues of sampling, stratification, data collection, validity and reliability of the instruments, data analysis method and SEM in general as used in this research.

pTER 4: RESULTS AND DISCUSSION

Introduction

This chapter presents the results of data analysis that was carried out using SPSS 20.0 (Bollen, 1989) and AMOS 16.0.1 (Arbuckle, 2005). The ultimate goal of the analysis was to establish the statistical significance of the relationships between the various constructs.

The first section addresses the descriptive statistics followed by an analysis of respondent's profiles. The next section addresses the results of the test of the proposed research model including the extent to which the model fits the data. The last section discusses hypotheses testing as well as the moderator effects.

Descriptive statistics

Mobile money service distribution

Table 4-1 summarizes the distribution of the respondents using the three mobile money services the researcher explored. M-Pesa had 226 respondents (79.9%), Airtel Money 37 respondents (13.1%) and Orange Money 20 (7.1%). The original aim was to get a ratio of 84% to 10% to 6% which is not too far off the achieved distribution as discussed in section 3.7. The ratio of obtained data was considered acceptable considering the fluctuations of market share earlier reported.

Table 4-1: Mobile money service usage distribution

	Frequency	Percent
M-Pesa	226	79.9
Airtel Money	37	13.1
Orange Money	20	7.1
Total	**283**	**100**

Gender

There were slightly more male respondents than female: 162 male responded against 121 female. This indicated that usage of mobile money is not dominated by any gender.

A cross-tabulation of gender and duration of usage showed that male respondents were generally early adopters. Table 4-2 shows that there were a lot more men who have used mobile money for more than two years than the female counterparts. This could be partly because the researcher over sampled the male.

Table 4-2: Cross tabulation of gender and duration of usage

		How long have you used M-Pesa					Total
		< 6 Months	6 Months to ONE year	ONE year to TWO years	TWO years to THREE years	THREE years to FOUR years	
Gender	male	3	14	44	32	69	162
	female	3	16	34	31	37	121
Total		6	30	78	63	106	283

Age

Majority of the respondents were between 18 and 40 years old, accounting for 83%. Further, a total of 150 respondents (53%) were below 30 years of age. The general distribution per age block is shown in Table 4-3.

Table 4-3: Number of users according to age blocks

Age bracket	Number of respondents
< 30	142
30 to 40	86
40 to 50	38
> 50	17
	283

Education level

The researcher used the years spent in school as a measure of level of education. The question focused on what the last year of schooling. Table 4-4 summarizes the distribution. As many as 131 respondents (46%) had finished high school while 116 respondents (41%) had finished primary education.

Table 4-4: Education Levels

Education Level	Number of respondents
Primary (up to 9 years of schooling)	116
High School (up to 13 years of schooling)	131
Beyond High School (Above 13 years of schooling)	36

Duration of mobile money usage

Table 4-5 shows that there was a reasonably even distribution among respondents on the duration of usage of the mobile money services. The 37%, who had used for over three years, are early adopters given that mobile money had not existed for five years at the time of the data collection.

Table 4-5: Length of time users had used mobile money services

Duration	Percentage of respondents
< 6 Months	2
6 Months to ONE year	11
ONE year to TWO years	28
TWO years to THREE years	22
THREE years to FOUR years	37
Total	100

Saving time

The total time a user spends when sending mobile money is an accumulation of the time to:

- get access to the funds e.g. from a bank account or from someone
- get access to an agent and depositing the funds before sending

- have the receiver access the funds (most likely converted back to cash through another agent)

Some users send most of their money to recipients far from where they are, others send nearby, yet others have a mix of both. This may be time-saving for receivers who are far from the user, but not necessarily for receivers who are within a short distance from the sender. For receivers who are nearby, mobile money is therefore considered time-wasting. For those with a mix of near and far transactions, they aggregate and conclude that saving time is neither here nor there. Overall, the number of those who felt mobile money saves them time was by far greater.

4.3 Model Fitness

This section discusses the testing, modification and verification of the proposed research model. The goodness of fit of the model to the data is very critical and is explored meticulously resulting in a model for mobile money technology adoption that fits the data. To begin with, an analysis of the significant determinants for the intention and use of mobile financial services is presented. After the determinants, an investigation of the impact of the moderating variables on the predictors is summarized.

Analysis of Moment Structures (AMOS) version 16.0.1 was used for this analysis.

4.3.1 The model under study

Table 4-6 summarizes the nine latent constructs in the research model. Seven of them are exogenous, while two are endogenous. In total, exogenous variables were measured using 21 manifest variables and the endogenous with five manifest variables. An exogenous variable is one that is not caused by another variable in the model, but tends to cause one or more variables in the model. An endogenous variable is one that is caused by one or more variables in the model and may cause another endogenous variable. Exogenous variables are equivalents of independent variables while endogenous variables are equivalents of dependent variables (Hair, et al., 2006).

A latent variable or construct is not measured directly, but rather through one or more manifest variables. Measured variables, commonly called the observed variables, come from the responses by the respondents to a specific question, implying that observed

variables become the indicators of latent variables. These indicators associated with the latent variables are specified by the researcher (Hair, et al., 2006).

Within SEM, there are two models, namely the measurement model and the structural model. The measurement model comes out as a visual representation specifying the model's constructs, indicator variables, and interrelationships. The structural model is a set of dependence relationships that link the hypothesized model's constructs, forming the basis of establishing if relationships exist between the constructs and hence enables one to accept or reject a theory. The measurement model deals with latent variables and indicators, while the structural model is the set of structural equations depicted by symbols of exogenous and endogenous variables in the model with arrows and disturbance terms.

In the first step (the measurement model), items used to measure every construct are evaluated for adequacy. In the second step (the structural model), which is carried out only if the first step is successful, involves the assessment of the relationships between the constructs (Anderson & Gerbing, 1988).

Table 4-6: The latent variables in the research model

Count	Construct	Variables	Exogenous/Endogenous
1	Performance Expectancy (PE)	(PE1, PE2,PE3)	Exogenous
2	Effort Expectancy (EE)	(EE1, EE2,EE3)	Exogenous
3	Social Influence (SE)	(SI1, SI2,SI3)	Exogenous
4	Facilitating Conditions (FC)	(FC1, FC2,FC3)	Exogenous
5	Perceived Trust (PT)	(PT1, PT2,PT3)	Exogenous
6	Transaction Cost (TC)	(TC1, TC2,TC3)	Exogenous
7	Trialability (TR)	(TR1, TR2,TR3)	Exogenous
8	Behavioural Intention (BI)	(BI1, BI2)	Endogenous
9	Actual Usage (AU)	(Use1, Use2, Use3)	Endogenous

4.3.2 Measurement model assessment and Confirmatory Factor Analysis (CFA)

To assess a model, the researcher used CFA as introduced in chapter 3 (Hair, et al., 2006). Starting off with a theory, CFA enables a researcher to prove or disapprove the theoretical concept (Ahire & Devaraj, 2001). Assessing model validity depends on:

1) Establishing adoption levels of goodness of fit

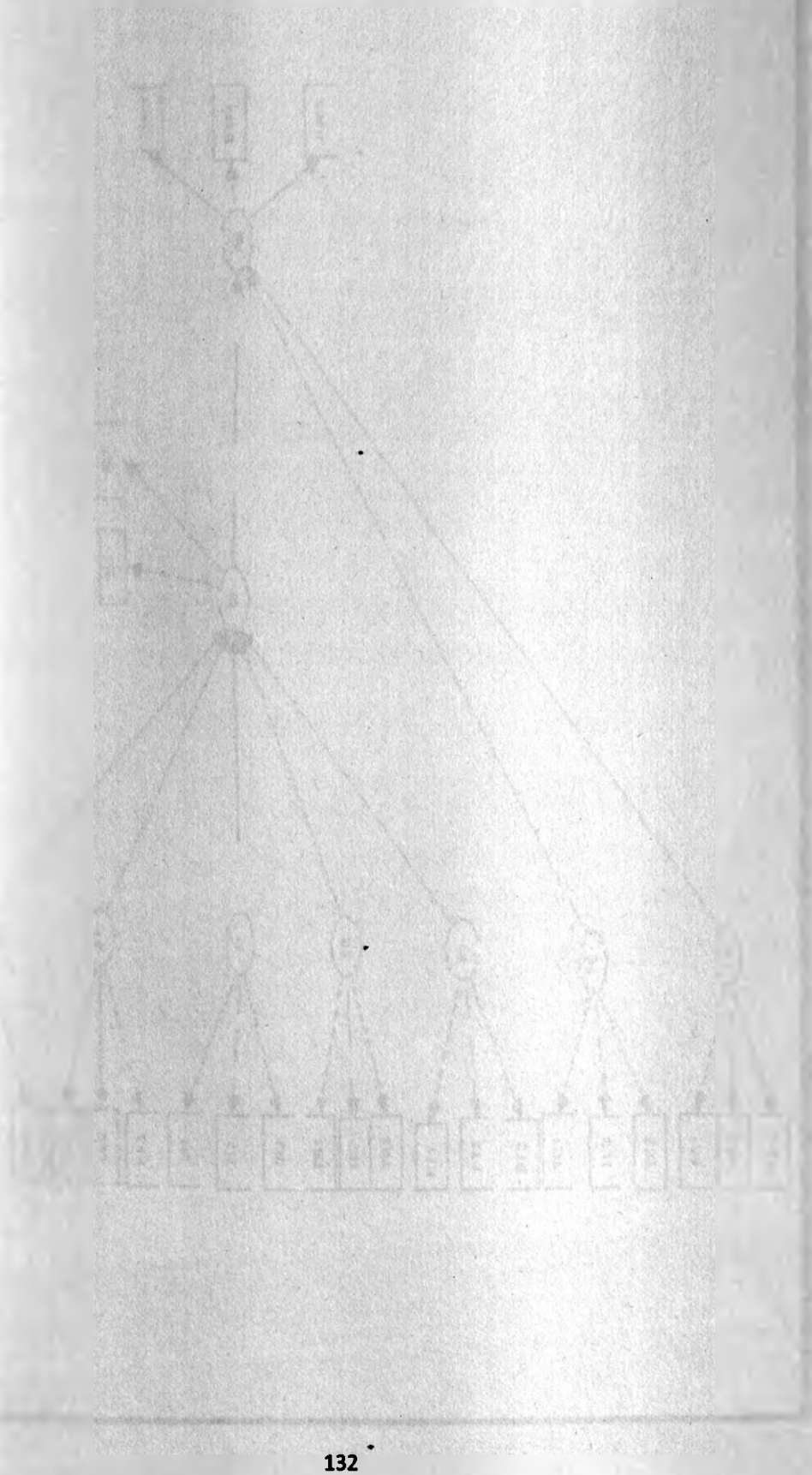
2) Finding specific evidence for construct validity (Hair, et al., 2010).

CFA was applied in assessing the model drawn in AMOS 16.0.1. All the manifest variables are shown using rectangles while the latent variables are shown in ovals. Exogenous variables are not influenced by other variables while endogenous variables are influenced by either exogenous or other endogenous variables.

To conduct CFA, it is recommended that the measurement model and not the structural model be used (Hair, et al., 2010). The measurement model shows no relationships among the constructs, rather shows the specific measurements that make up the constructs. While conducting CFA, all constructs are to be considered exogenous and correlated with one another (also called the CFA model) (Hair, et al., 2010). This way the emphasis of analysis shifts from which constructs determine which other constructs to how different constructs are from each other. Each construct was set up to correlate with all other constructs as shown in the AMOS model of Figure 4-2. In the figure, the factor loadings and error terms are set to default values of one and zero.

Upon running the measurement model in AMOS, the researcher obtained the correlations between all the constructs, in addition to the covariances and regression weights as shown in Figure 4-3. The covariances between constructs were all below 0.80 indicating that no construct was measuring the same aspect as another (Hair, et al., 2010). The standardized loadings (also called standardized regression weights or factor loadings) generated by AMOS are used to give an indication of how the various measures/variables are reliably measuring the constructs they are pegged to. These are the values on the paths from a construct to a manifest variable. These measures should result in score above 0.70 to be meaningful (Arbuckle, 2005). A few of the standardized loadings were below the threshold, an issue that was dealt with in the section 4.3.2.2 on construct validity.

At this stage, the researcher went further to discuss the measurement model assessment including establishing a reasonable level of fitness and finding evidence for construct validity.



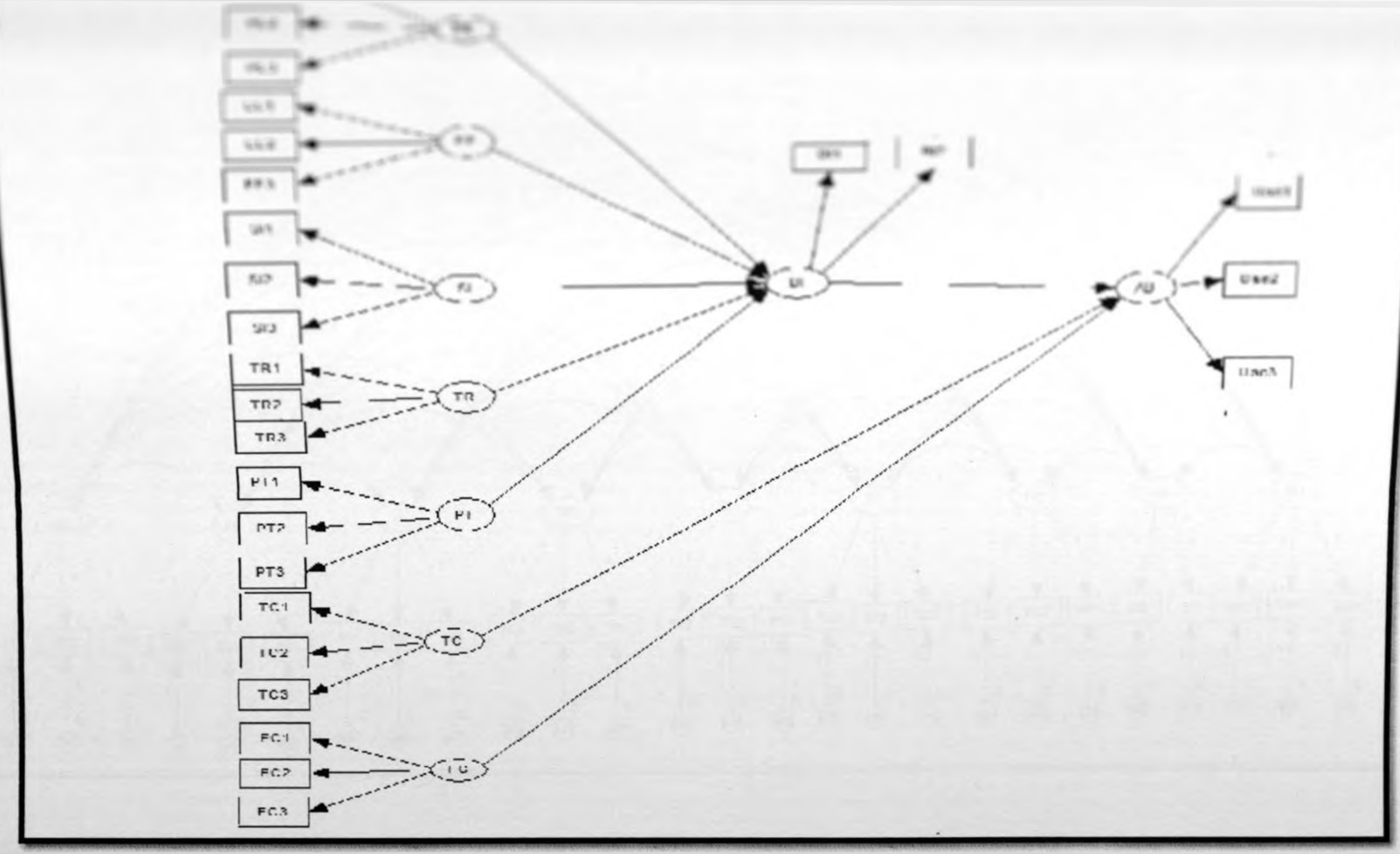
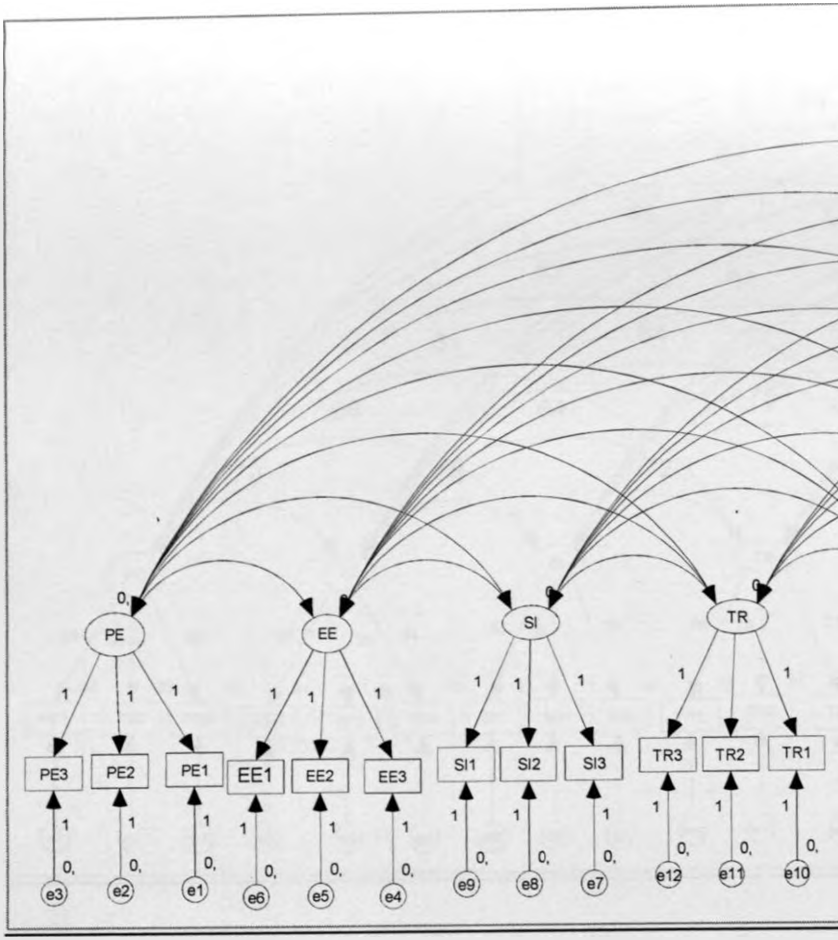
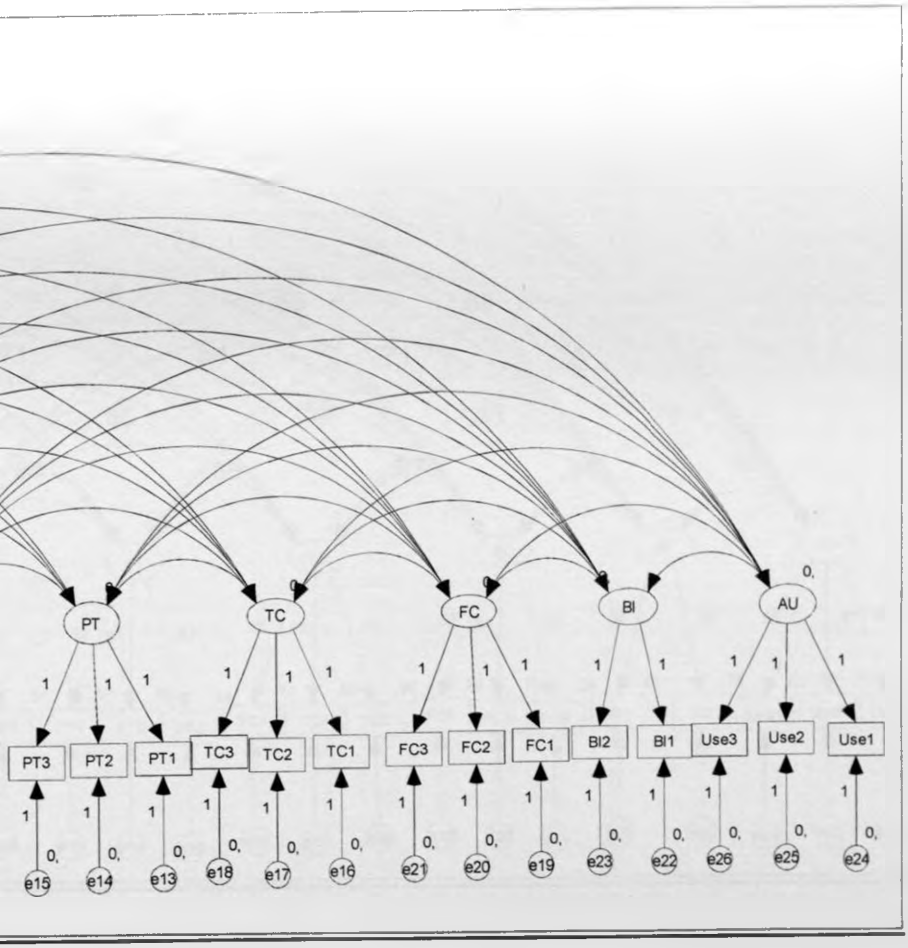

TR1
TR2
TR3
PT1
PT2
PT3
TC1
TC2
TC3
FC1
FC2
FC3
TR
PT
TC
FC

Figure 4-2: Measurement Model




PT
TC
FC
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Use1
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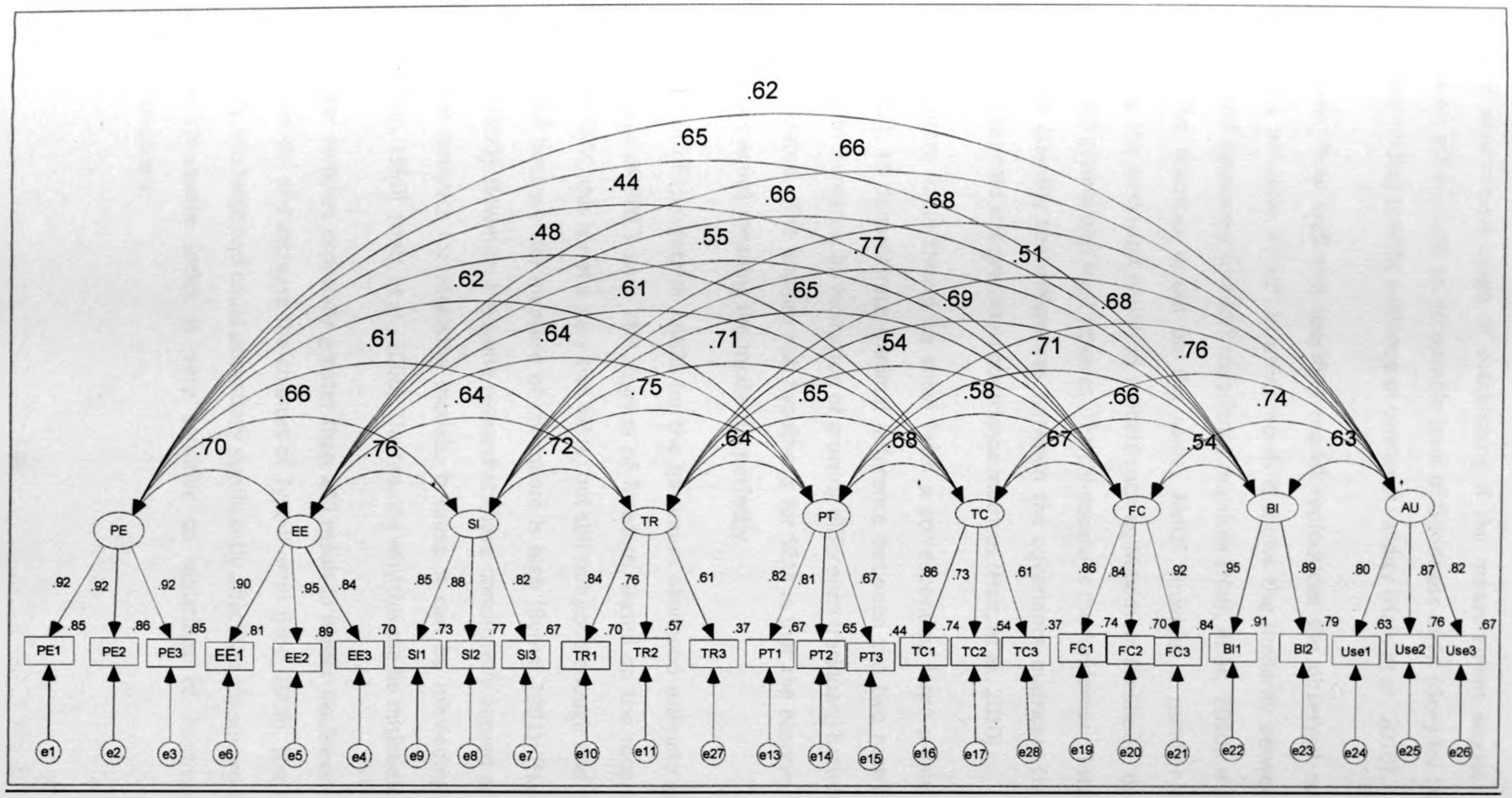
Figure 4-3: Regression, covariance and correlation weights of the CFA



4.3.2.1 Measurement model assessment

This is a very critical stage of establishing if the measurement model is valid. Validity depends on establishing an acceptable level of Goodness-of-Fit (GoF) for the measurement model and finding specific evidence of construct validity (Hair, et al., 2010).

GoF shows "how well the specified model reproduces the observed covariance matrix among the indicator items". In other words it shows the similarity between the observed (reality) and estimated (theory) covariance matrices (Hair, et al., 2010). If the theory were perfect, the matrices would be the same. AMOS provides a number of methods for estimating the structural equation models such as Maximum likelihood, un-weighted least squares and generalized least squares. The chi-square is the fundamental statistical measure in SEM to quantify the differences between the covariance matrices. The comparison is between observed and predicted covariance matrices (Hair, et al., 2010).

The chi-square value should be small (with a corresponding large p-value, for statistical significance), to demonstrate minimal difference between the two matrices. As the chi-square value increases, an indication of growing difference (residuals) between the matrices is demonstrated. The implied null hypothesis for SEM is that *the observed and estimated matrices are equal,* meaning the model fits perfectly.

The first run of the data in AMOS for the maximum likelihood estimate generated a chi-square value of 380.3 with 263 degrees of freedom. Based on the recommendations by experts in SEM, this is not a very bad value, but still not good enough and the model could be rejected because the measure of chi-square is high (Byrne, 2001); (Hair, et al., 2006); (Bentler, 1990). However, the same researchers have conclusively argued against relying on chi-square statistics for assessing models, because it can be misleading (Byrne, 2001); (MacCallum, 1990); (Hair, et al., 2006). The reasons why this can be misleading include:

a) Larger samples especially greater than 200 result in higher likelihoods of rejection of the model and increase the chances of Type II error (Hoe, 2008). The data set for this study was large and could potentially significantly affect the chi-square value.
b) The chi-square index is very sensitive to violations of multivariate normality assumptions.

During the pre-analysis stage, discussed in section 3.11, the data demonstrated some deviations from normality assumptions which were ignored for other reasons. For example, most of the variables had skewness to the right, since most users either agreed or strongly agreed about most of the constructs.

c) When samples are very large, any slight differences between the observed model and the perfect fit model can be found to be very significant.

d) A large number of indicators make it difficult to use chi-square to assess model fit. The mobile money model started off with 26 indicators, which is substantially large.

The solution recommended is to consider other parameters to measure fitness of the model. Researchers have developed many alternative measures of fit. These were particularly designed to correct the bias against large samples and model complexity (Hair, et al., 2010). At minimum a researcher should consider the chi-square test, at least one absolute index and one incremental index.

Table 4-8 summarises some of the recognized fit indices that can be used in SEM. Absolute fit indices give direct measures of how well a model reproduces the observed data without comparing the GOF with any other model, while the incremental fit indices assess the fitness relative to some baseline model. In AMOS, the commonly used baseline model is the "null model" which assumes that all the observed variables are uncorrelated. The argument is that there is no other model that could possibly improve it because no relationships exist between the constructs. In this study, the researcher considered chi-square statistic, RMSEA, Normed chi-square, NFI, TLI, CFI. The choice of these measurement options was based on the parameters available in AMOS 16.0.1 output. Table 4-7 displays the fit indices from the estimated model.

Table 4-7: Fit indices from the estimated model

Index used	Value obtained	Comment
chi-square statistic	380.3 with 263 df	Moderately good
RMSEA	0.0398	Good depending on the confidence level
Normed chi-square	4:3	Good since its lower than 3:1
NFI	0.9364	Good
TLI	0.9744	Good
CFI	0.9793	Good

In addition to GoF statistics, path estimates were evaluated (called standardized regression weights in AMOS). Most of them were above 7.0 indicating good fit. The few which were below, were considered for deletion (Hair, et al., 2010), an aspect dealt with in more detail in the construct validity section below.

Table 4-8: Absolute and incremental fit indices

Name	Category	Description	Good measures
Chi-square statistic	Absolute	A statistically based SEM fit. Aims at showing no difference between the matrices. When sample sizes are large or when observed variables are many, it is not reliable in measuring fitness	A low value demonstrates minimal difference between the matrices.
Goodness of fit index (GFI)	Absolute	This is less sensitive to sample size. Value ranges between 0 and 1.	A high value of 0.90 and above shows good fit. Above 0.95 is even more desirable (Sekaran, 2003); (Tabachnick & Fidell, 2007)

Root Mean Square Error of Approximation (RMSEA)	Absolute	A very commonly used means of measuring fitness. It factors in sample size and model complexity in its computation. A low value indicates better fit.	A value of 0.05 or 0.08 has been considered a good cut-off. Recent research argues against this cutting off and instead proposes a confidence level be included for even lower RMSEA values. Therefore, values of 0.03 to 0.08 with a confidence of 95% are considered acceptable (Schumacker & Lomax, 2004); (Browne & Cudeck, 1993)
Normed chi-square	Absolute	This is a ratio of chi-square to the degrees of freedom. A small chi-square value relative to its degree of freedom is indicative of good fit.	Ratios in the order of 3 to 1 or less are considered good for fitness (Kline, 1998).
Normed Fit Index (NFI)	Incremental	Also known as the Bentler-Bonett normed fit index, it is a ratio of the difference in the chi-square value of the estimated model and a null model divided by the chi-square value for the null model.	The value should be between 0 and 1. The closer it is to 1, the better the fit (Ullman, 2001).
Tucker Lewis Index (TLI)	Incremental	Similar to NFI, but instead of the chi-square value, it utilizes the normed chi-	Since TLI is not normed, its value can be less than 0 or greater than 1. Overall,

		square value for both the estimated model and the null model. By using the normed chi-square, it takes care of complexity.	the higher the TLI value is, the better the fit Reference. The TFI is usually lower than is the GFI--but values over .90 or over .95 are considered acceptable (Hu & Bentler, 1995).
Comparative Fit Index (CFI)	Incremental	An improved version of NFI. It is normed, to ensure values range between 0 and 1. It is commonly used as a measure of fit. It is also known as the Bentler Comparative Fit Index.	A value above 0.90 is considered a good fit (Kline, 1998).
Relative noncentrality index (RNI)	RNI	This also compares with the null model.	A value above 0.90 is considered a good fit (Bentler, 1990).

4.3.2.2 Construct validity

This is the extent to which the manifest variables reflect the theoretical latent construct they are designed to measure (Hair, et al., 2010). Before a model is run, validity is measured using basic forms like theoretical arguments from previous research as well as pilot studies. The aim at this stage is to empirically estimate validity using more rigorous approaches. This way, confidence is increased about the sample data being a representative of the population.

There are four components of construct validity namely convergent validity, discriminant validity, nomological validity and face validity.

Convergent validity is the extent to which indicators of a specific construct "converge" or share a high proportion of variance in common (Hair, et al., 2006). To assess we examine construct loadings and Average Variance Extracted (AVE). Discriminant validity is the extent to which a construct is truly distinct from other constructs (i.e., unidimensional). Nomological validity establishes if the correlations between the constructs in the

measurement theory make sense. Face validity focuses on the extent to which the content of the items is consistent with the construct definition, based solely on the researcher's judgment.

Convergent validity

The following rule of thumb applies: Standardized loadings estimates should be ideally 0.7 or higher (Nunnall, 1978). Three variables (TR3, PT3 and TC3) in the model did not meet this threshold. A process for verification and elimination based on Squared Multiple Correlations (SMC) described was initiated as described below.

In the context of AMOS, the SMC for the observed variables is a good measure for construct validity (Bollen, 1989). Another technique used for the same purpose is the variance extracted estimate. SMC measures the correlation between a measurement/indicator variable and the construct it measures. To obtain the SMC for an observed variable, AMOS computes the indicator's standardised loading and all that is needed is to compute the SMC as the square of the indicator loading.

From Figure 4-3, the researcher obtained the measurement values and used them to generate Table 4-9 which summarizes the SMC values. Though an SMC of 0.30 does indicate an acceptable indicator variable, a good SMC measure should be over 0.50 (Holmes-Smith, et al., 2006) .

Except for three, all other SMCs for the 23 observed variables of the exogenous latent constructs were more than 0.50. The three indicators, TR3, PT3 and TC3 with a lower than 0.5 SMC value were deleted from the model so as to improve its fit on the data. The SMC values for all the observed variables associated with the endogenous latent constructs exceeded 0.50.

After deleting the three variables, the model was run again in AMOS. Figure 4-4 is the illustration of the final outcome of the measurement model showing the improvement on the fitness of the model after construct validity.

Table 4-9: SMC values from the estimated measurement model

Indicator variable	Standardized loading	SMC Estimate	Significant?
PE1	0.92	0.8464	Yes
PE2	0.92	0.8464	Yes
PE3	0.92	0.8464	Yes
EE1	0.90	0.8100	Yes
EE2	0.95	0.9025	Yes
EE3	0.84	0.7056	Yes
SI1	0.85	0.7225	Yes
SI2	0.88	0.7744	Yes
SI3	0.82	0.6724	Yes
TR1	0.84	0.7056	Yes
TR2	0.76	0.5776	Yes
TR3	0.61	0.3721	No
PT1	0.82	0.6724	Yes
PT2	0.81	0.6561	Yes
PT3	0.67	0.4489	No
TC1	0.86	0.7396	Yes
TC2	0.73	0.5329	Yes
TC3	0.61	0.3721	No
FC1	0.86	0.7396	Yes
FC2	0.84	0.7056	Yes
FC3	0.92	0.8464	Yes
BI1	0.95	0.9025	Yes
BI2	0.89	0.7921	Yes
Use1	0.80	0.6400	Yes
Use2	0.87	0.7569	Yes
Use3	0.82	0.6724	Yes

Figure 4-4: Estimated measurement model after construct validity

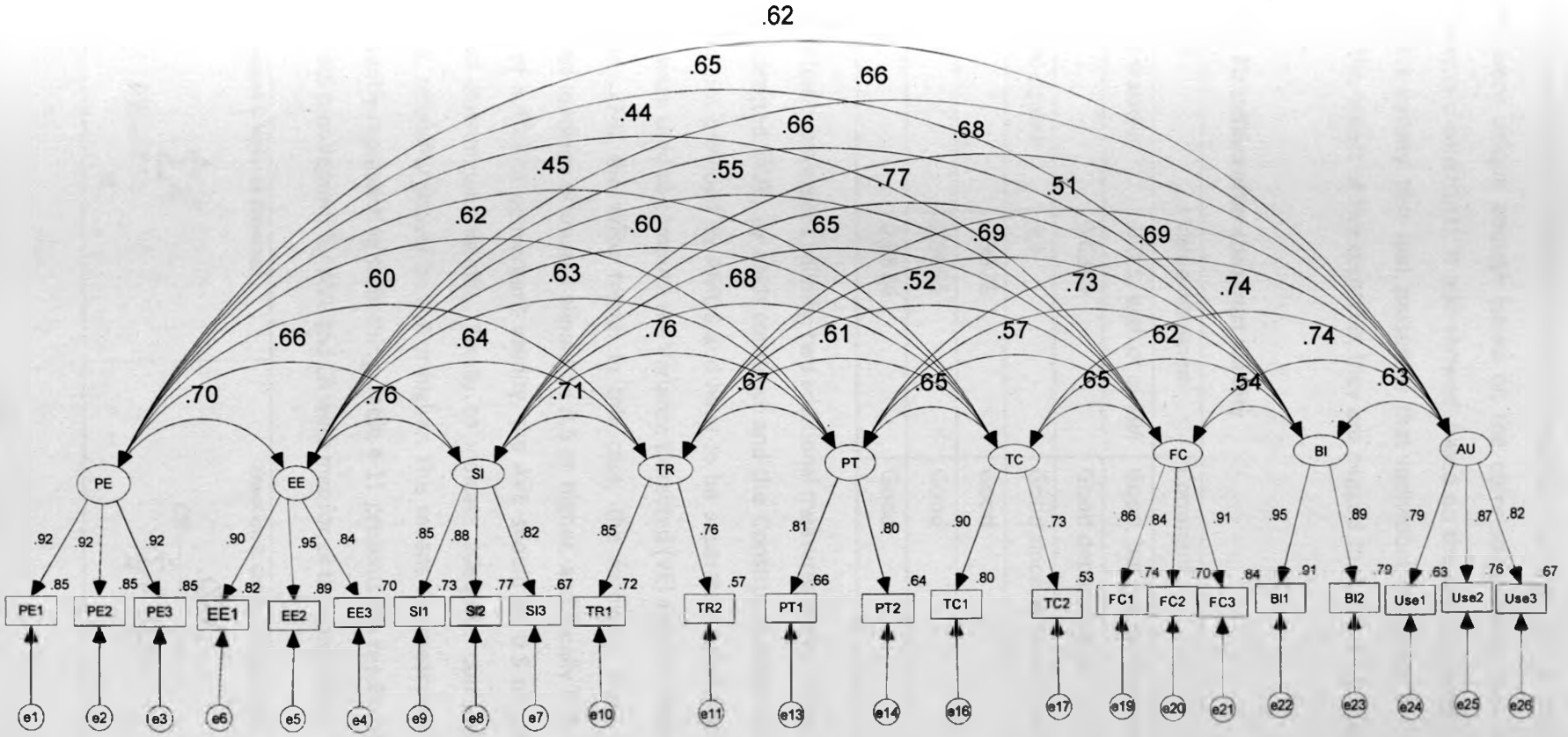


Figure 4-4 provided the evidence that the analysis could go on. It established that the constructs were unique enough based on the correlation values that were below 0.80 between any two constructs. It also showed, based on the values shown in Table 4-10 that the construct validity test had passed in that individual measures in a construct were measuring the aspect of the construct they are pegged to. Table 4-10 shows the improved GoF indices.

Table 4-10: Fit indices after construct validity

Index used	Value obtained	Comment
chi-square statistic	260.5, with df of 194	Good, but not minimal enough
RMSEA	0.0349	Good depending on confidence level
Normed chi-square	4:3	Good since its lower than 3:1
NFI	0.9528	Good
TLI	0.9835	Good
CFI	0.9874	Good

To countercheck convergent validity, two additional measures were studied, namely Average Variance Extracted (AVE) by each construct and the Construct Reliabilities (CR). Both AVE and CR and not provided by AMOS and have to be separately calculated. Equation 1 and Equation 2 were used to compute the Variance Extracted (VE) and CR (where λ is the factor loading and δ is the error term). In this case, the following rules of thumb apply: Standardized loadings estimates should be 0.5 or higher, and ideally 0.7 or higher; to give indication of sufficient convergent validity, the AVE should be 0.5 or greater; to provide evidence of discriminant validity. Finally to indicate adequate convergence or internal consistency, reliability should be 0.7 or higher. This means the measures for the construct are consistently representing something. Table 4-11 presents the results of the AVE and CR. The threshold requirement for AVE and CR were met for all the constructs.

Equation 1: Variance Extracted	Equation 2: Construct Reliability
$VE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$	$CR = \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum_{i=1}^{n} \delta_i)}$

Table 4-11: AVE and CR of the refined estimated measurement model

	STANDARDIZED LOADING	STANDARDIZED LOADING SQUARED (ITEM RELIABILITY)	ERROR	AVE	CR
PE	0.92	0.8464	0.1536		
	0.92	0.8464	0.1536		
	0.92	0.8464	0.1536		
	2.79	2.5400	0.46	0.85	0.94
EE	0.90	0.8100	0.1900		
	0.95	0.9025	0.0975		
	0.84	0.7056	0.2944		
	2.70	2.4200	0.5800	0.81	0.93
SI	0.85	0.7225	0.2775		
	0.88	0.7744	0.2256		
	0.82	0.6724	0.3276		
	2.55	2.1700	0.8300	0.72	0.89
TR	0.85	0.7225	0.2775		
	0.76	0.5776	0.4224		
	1.61	1.30	0.7000	0.65	0.79
PT	0.81	0.6561	0.3439		
	0.8	0.6400	0.3600		
	1.61	1.3000	0.7000	0.65	0.79
TC	0.90	0.8100	0.1900		
	0.73	0.5329	0.4671		
	1.63	1.3400	0.6600	0.67	0.80
FC	0.86	0.7396	0.2604		
	0.84	0.7056	0.2944		
	0.91	0.8281	0.1719		
	2.61	2.2700	0.7300	0.76	0.90
BI	0.95	0.9025	0.0975		
	0.89	0.7921	0.2079		
	1.84	1.6900	0.3100	0.85	0.92

AU	0.79	0.6241	0.3759		
	0.87	0.7569	0.2431		
	0.82	0.6724	0.3276		
	2.48	2.0500	0.9500	0.68	0.87

Discriminant validity

Discriminant validity measures the extent to which a construct is truly distinct from other constructs (i.e., unidimensional). This is a measure of how each of the constructs in the model is different. The constructs should be empirically distinguishable. When the construct inter-correlation is greater than 0.80 or 0.90, it suggests that there is lack of discriminant validity (Holmes-Smith, et al., 2006). It becomes necessary to conduct some form of discriminant validity assessment on those constructs so as to give greater confidence to later interpretation of findings.

If discriminant validity test fails, then it implies that some of the conclusions made later concerning the relationships between constructs could be incorrect. Strength of relationships could be overestimated or underestimated (Farrell, 2010)

There are two ways to establish discriminant validity. The first and easier one is to compare correlations between the latent variables. Where there is high correlation then one of the variables should be considered for deletion. However, this approach has its weaknesses, because though two constructs can be correlated, it does not necessarily mean that they cannot be measuring different aspects (Hair, et al., 2010). A more rigorous approach is to compare the AVE for one of two constructs with the square of the correlation between the two constructs. If the squared correlation is less than either of the construct's AVE's, then the latent variables have higher internal variance than the variance shared between them (Hair, et al., 2010). In other words, the latent construct should explain more of the variance in its item measures. The rule of thumb therefore is that the constructs' AVE values should be greater than the corresponding squared inter-construct correlation estimates (SIC). This will be an indication that the measured variables have a lot more in common with the construct they are associated with than they do with the other constructs (Hair, et al., 2010).

All AVE estimates should be larger than the corresponding SIC to indicate that the manifest variables have more in common with the construct they are associated with than they do

with the other constructs. Discriminant validity was tested using AVE and square of correlation. First the SIC value was computed from the AMOS output of correlations. Table 4-12 shows the SIC values computed. A comparison of AVE and SIC was done as per Table 4-13. Though the entire test for discriminant validity passed, some construct relationships were close to the border lines as shown in Table 4-14.

Two arguments can be advanced. First, the kinds of respondents interviewed were poor, with low levels of education and exposure. Their ability to conceptualize, differentiate and appreciate what the constructs mean to them at personal level could have influenced their responses. Secondly, the discriminant validity was close to borderline in the case of BI and SI as well as BI and PT, which could indicate that respondents felt they needed to conform by answering that they intend to adopt the technology because they were socially influenced and trusted the technology. Since none passed the borderlines, this closeness is ignored.

Table 4-12: IC and SIC

CONSTRUCTS			INNERCONSTRUCT CORRELATION (IC)	SIC
PE	<-->	SI	0.773	0.598
PE	<-->	PT	0.660	0.435
PE	<-->	TC	0.517	0.267
PE	<-->	FC	0.540	0.291
PE	<-->	AU	0.569	0.324
EE	<-->	PE	0.748	0.560
EE	<-->	SI	0.733	0.538
EE	<-->	PT	0.548	0.300
EE	<-->	BI	0.771	0.594
EE	<-->	TC	0.562	0.316
EE	<-->	FC	0.548	0.300
EE	<-->	AU	0.495	0.245
SI	<-->	PT	0.732	0.536

SI	<-->	TC	0.698	0.487
SI	<-->	AU	0.559	0.313
TR	<-->	PE	0.631	0.398
TR	<-->	EE	0.553	0.305
TR	<-->	SI	0.671	0.451
TR	<-->	PT	0.576	0.332
TR	<-->	BI	0.796	0.634
TR	<-->	TC	0.559	0.313
TR	<-->	FC	0.513	0.263
TR	<-->	AU	0.375	0.140
PT	<-->	TC	0.612	0.375
PT	<-->	AU	0.518	0.268
FC	<-->	SI	0.713	0.508
FC	<-->	PT	0.573	0.328
FC	<-->	TC	0.697	0.486
FC	<-->	AU	0.632	0.399
BI	<-->	PE	0.930	0.828
BI	<-->	SI	0.996	0.714
BI	<-->	PT	0.866	0.640
BI	<-->	TC	0.776	0.602
BI	<-->	FC	0.729	0.531
BI	<-->	AU	0.639	0.408
AU	<-->	TC	0.594	0.352

Table 4-13: **Comparing AVE and SIC**

Construct	AVE	SIC
PE	0.85	0.598, 0.435, 0.267, 0.291, 0.324, 0.560, 0.398, 0.828
EE	0.81	0.560, 0.538, 0.300, 0.594, 0.316, 0.300, 0.245, 0.305
SI	0.72	0.598, 0.538, 0.536, 0.487, 0.313, 0.451, 0.508, 0.714
TR	0.65	0.398, 0.305, 0.451, 0.332, 0.634, 0.313, 0.263, 0.140
PT	0.65	0.435, 0.300, 0.536, 0.332, 0.375, 0.268, 0.328, 0.640
TC	0.67	0.267, 0.316, 0.487, 0.313, 0.375, 0.486, 0.602, 0.352
FC	0.76	0.291, 0.300, 0.263, 0.508, 0.328, 0.486, 0.399, 0.531
BI	0.85	0.594, 0.634, 0.828, 0.714, 0.640, 0.602, 0.531, 0.408
AU	0.68	0.324, 0.245, 0.313, 0.140, 0.268, 0.399, 0.408, 0.352

Nomological validity

Nomological validity examines if correlations between the constructs in the measurement model make theoretical sense (Hair, et al., 2010). Construct correlations are used to assess this validity. Based on the theory behind the mobile money model, the constructs must be positively related.

The P values for the covariance between the constructs had asterisks, indicating the correlations were significant. The inter-construct correlations generated by AMOS (as shown in Table 4-12 where all positive and significant.

Face validity

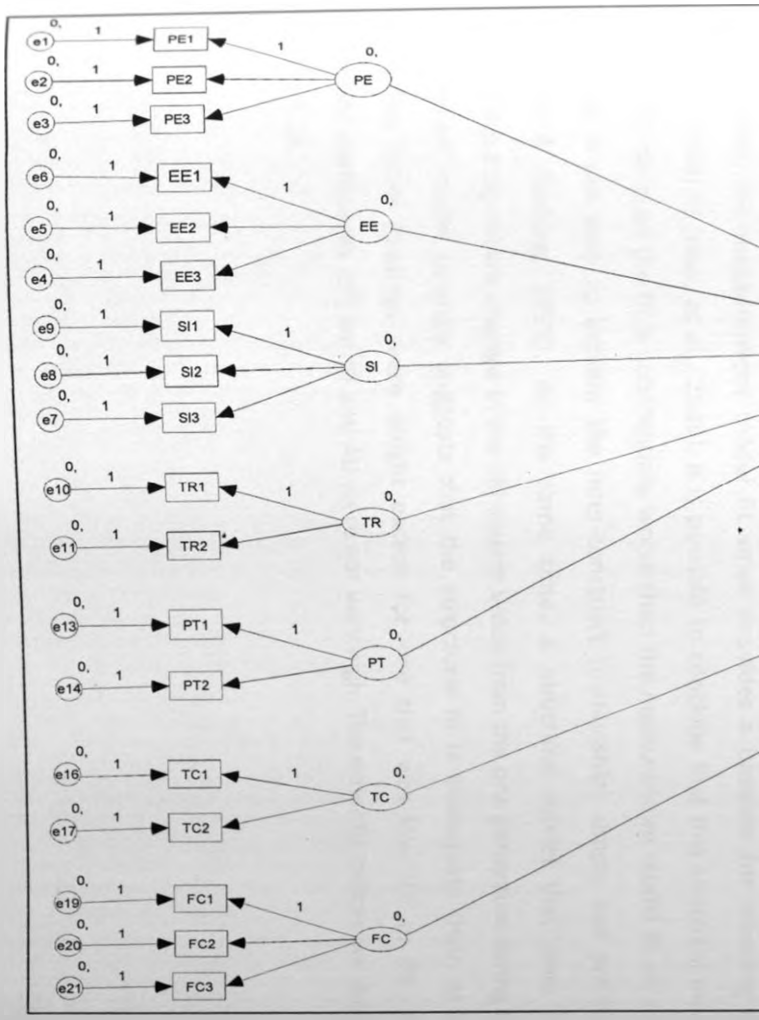
Face validity is the extent to which the content of the variables is consistent with the construct definition, based solely on the researcher's judgment. This means the variables should look like they will measure what they are supposed to measure. Though simple, it is considered the most important validity test (Hair, et al., 2010). Without proper understanding of the items and their meanings, one is not able to develop a good measurement model. To strengthen the face validity, the researcher consulted with a number of authorities in the area of mobile money. The consultations mostly resulted in

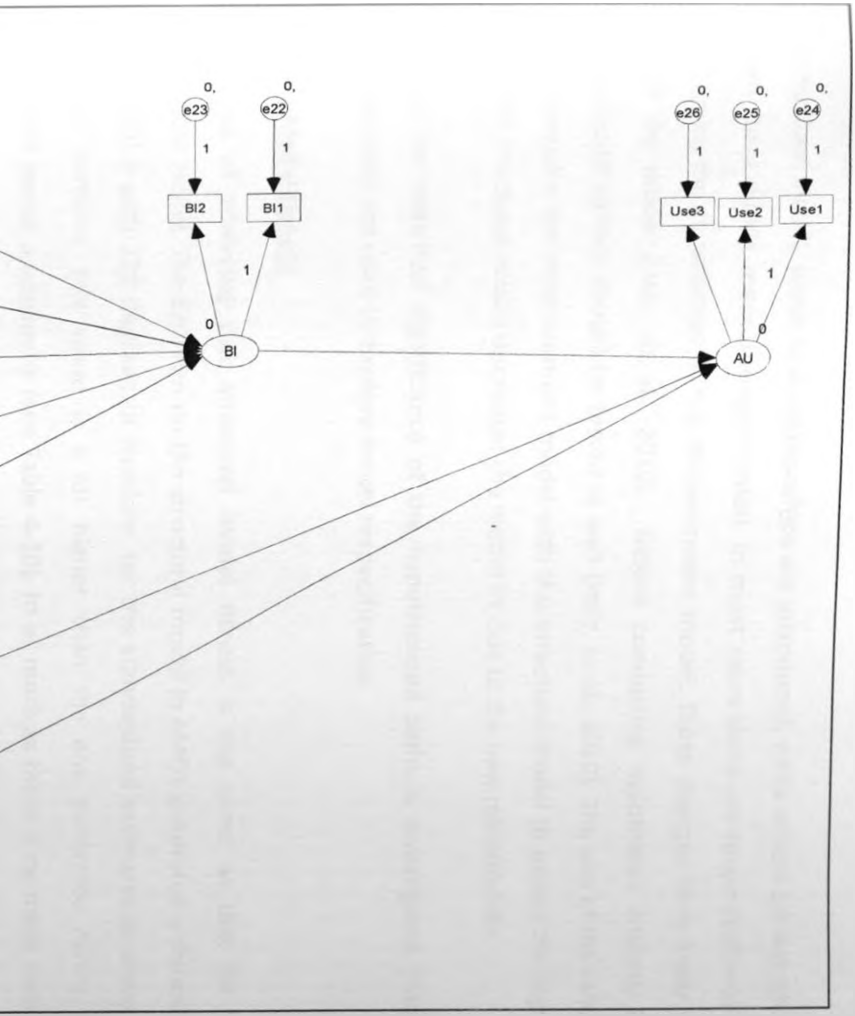
confirmations of the measurements as well as minimal rewording of the questions in the instrument.

4.4 Model Estimation

Upon establishing that the measurement model was valid, the researcher proceeded to test the structural model. If acceptable fit was not achieved at the measurement model stage, there would be no point proceeding to evaluate the structural model (Hair, et al., 2010). The first step is to assign relationship from one construct to another based on the theoretical arguments earlier developed. The dependence relationships represent the structural hypotheses that will be tested. These relationships are represented using one directional arrows. The mobile money adoption structural model is shown in Figure 4-5.

Figure 4-5: Mobile Money Adoption Structural Model




0,
e23
0,
e22
1
1
BI2
BI1
1
0
BI
0,
e26
0,
e25
0,
e24
1
1
1
Use3
Use2
Use1
1
0
AU

In the structural model, some new relationships are introduced, while others are lost (those that were there during measurement model). In most cases there are fewer relationships after dropping the covariances in the measurement model. These changes likely lower the fitness of the model (Hair, et al., 2010). Before conducting hypotheses analysis, the structural model validity should be tested as well (Hair, et al., 2010). The aim of the validity test is to compare the measurement model with the structural model to assess the degree to which the structural model decreases the model fit due to the new relationships.

In addition the statistical significance of the hypothesized paths is investigated. Finally, model diagnostics are used to explore model respecification.

Structural Model Fitness

The process of analysing the structural model fitness is the same as that for the measurement model. The first run on the structural model in AMOS generated a chi-square value of 1301.6 with 222 degrees of freedom, for the standardized estimates as shown in Table 4-14. Certainly this value is a lot higher than the one generated during the measurement model assessment (see Table 4-10). In as much as there is no magic number recommended, the measurement model fit value provides a baseline for assessing the structural model fit (Hair, et al., 2010). It is possible to conclude that this structural model lacks validity because the fit is substantially worse than the measurement model fit. As such the model is not able to explain the inter-construct relationships simply and precisely (Anderson & Gerbing, 1992). At the same time, a structural model that does not demonstrate a significant change in the chi-square value from the one generated during the measurement model strongly suggests that the structural fit is inadequate (Hair, et al., 2010). The factor loadings were alright except for one that was low (EE to BI). The correlation coefficients (R^2) for BI and AU were not very high. The other fit indices are shown in Table 4-14.

Figure 4-6: **Standardized estimates for the structural before modifications**

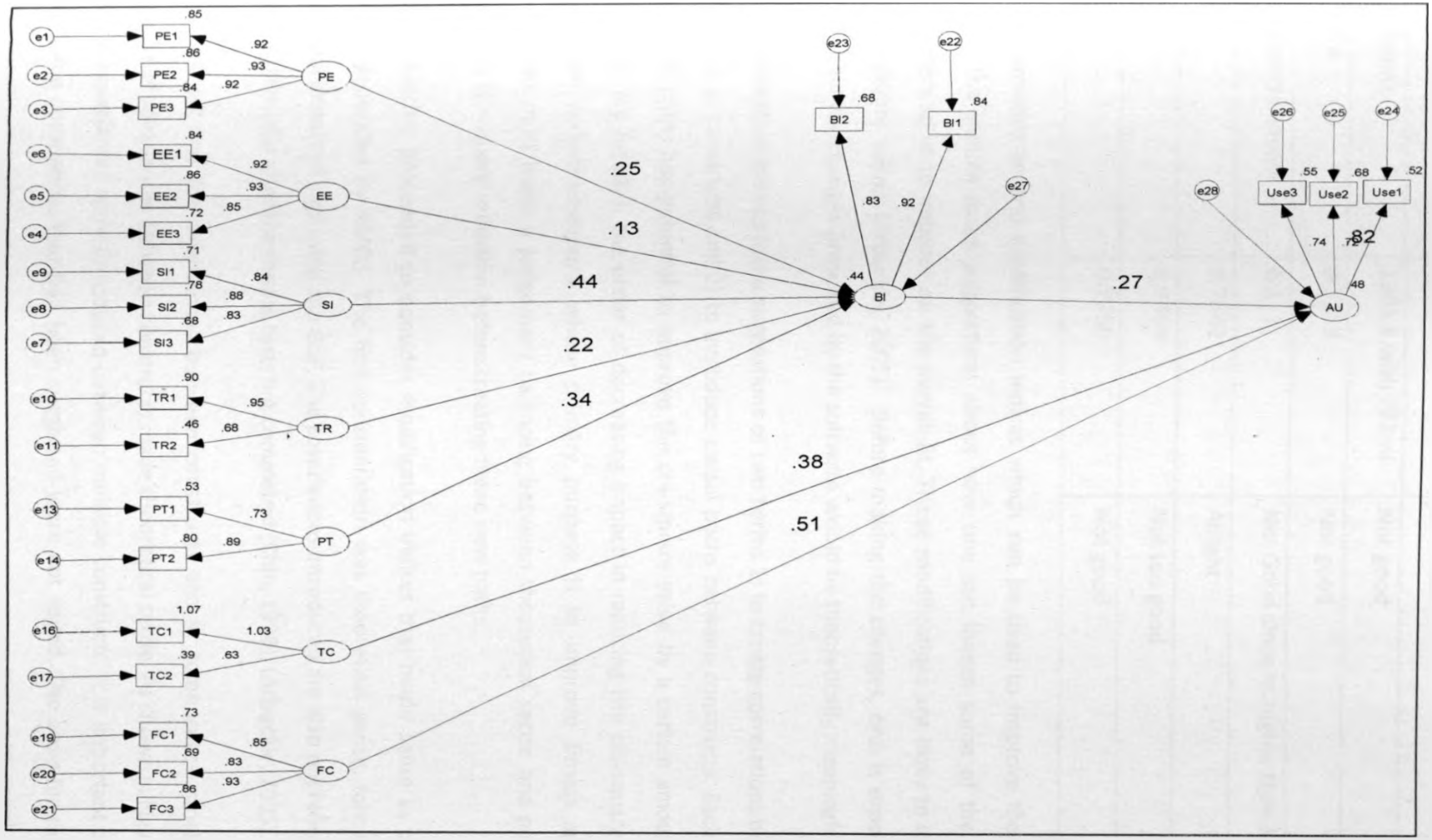


Table 4-14: Fit indices for the un-modified model

Index used	Value obtained	Comment
Chi-Square	1301.6 with 222 df	Not good
RMSEA	0.1313	Not good
Normed chi-square	6:1	Not Good since its higher than 3:1
NFI	0.7642	Alright
TLI	0.7664	Not too good
CFI	0.7950	Not good

AMOS provides several modification indices which can be used to improve the model fitness. The indices make suggestions about how one can loosen some of the model parameters so as to improve on the overall fit. These modifications are likely to improve the chi-square values (Arbuckle, 2005). Before making the changes, one is expected to ensure that the changes proposed by the software would be theoretically meaningful.

The modification indices make suggestions of two forms 1) to create correlations between measures or constructs and 2) to introduce causal paths between constructs. Each of the proposed paths has potential to improve the chi-square value by a certain amount. The proposals are listed in the order of decreasing impact in reducing the chi-square value. These are recommendations whose primary purpose is to improve fitness and the researcher must make a judgement balancing between theoretical sense and potential impact in chi-square reduction before creating these new paths.

The researcher proceeded to consider modification indices that made sense as per the output generated by AMOS. The first consideration was theoretical sense, followed by potential impact of improving the GoF. The covariances introduced are also not reflected in the actual model after the fitness tests are completed (Chin, 1998); (Arbuckle, 2005).

The first set was for covariances between constructs and in some cases variables. A number of covariances between constructs made theoretical sense. As shown in Figure 4-7, several covariances were introduced between multiple constructs. It is important to note that some covariances that had been suggested were not added. The basis for choosing

was twofold. First was theoretical sense, in which the researcher assessed a proposal and decided to include or not to. For example a covariance between TR and TC did not make sense. Secondly, how substantial the improvement on the fitness would be. A proposed correlation that resulted in minimal change in the chi-square was not added. No covariances between variables made theoretical sense, mainly because the proposals were for variables from different constructs. In the case where a proposal was based on variables from the same construct, the potential improvement on the GoF was very minimal that it would take very many correlations to end up with a good GoF, which will then negate the principal of simplicity and parsimony.

The second set was for regression weights based on single headed arrows between constructs or variables. None of them made theoretical sense. This modification resulted in a better fit, with a chi-square value of 498.4 with 210 degrees of freedom. Figure 4-7 shows the outcome of the first set of recommendations. This value was still high, but a significant improvement from the earlier one. The factor loadings were alright except for three that were low (PE to BI, EE to BI and TR to BI). The correlation coefficients (R Squared) for BI and AU were better than the first run. Table 4-15 shows the other fit indices corresponding to the improved model.

Figure 4-7 has covariances drawn between constructs. To make the values more readable, Figure 4-7B provides a reorganized version of Figure 4-7. These relationships were recommendations by AMOS that made theoretical sense and increased the fitness of the model to the data. Practically, building on the theoretical sense, it implies that there is a relationship between these constructs, as indicated by the data. However, these relationships are not to be drawn in the final model. They are purposely included to improve the model fit.

Figure 4-7: Structural Model after covariance modification indices consideration

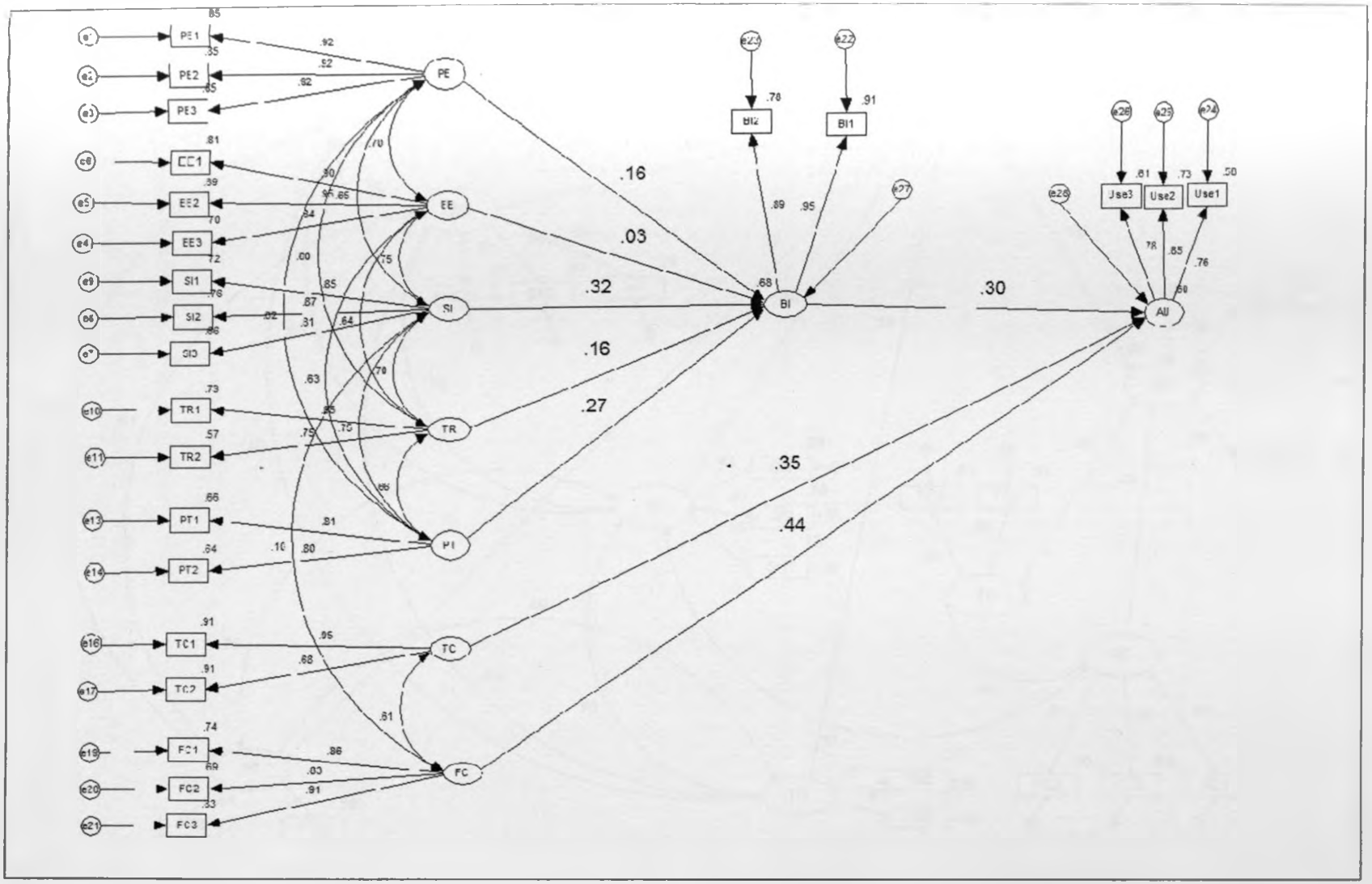
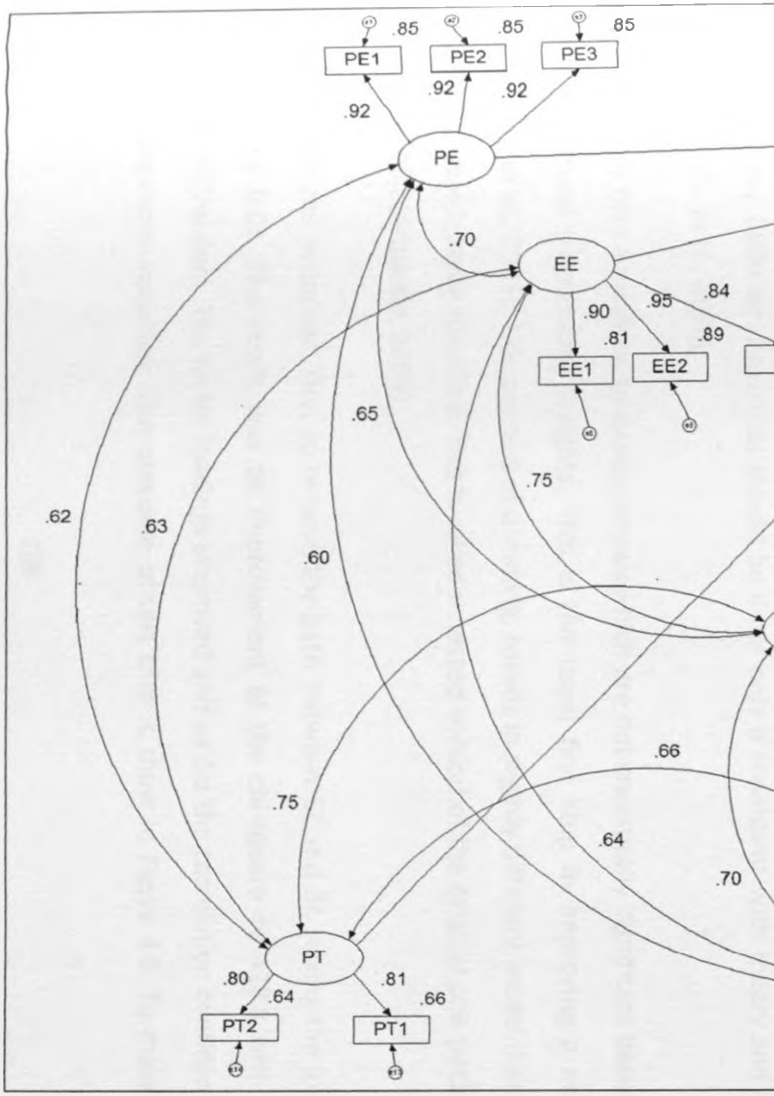


Figure 4-7B: Reorganization of figure 4-7



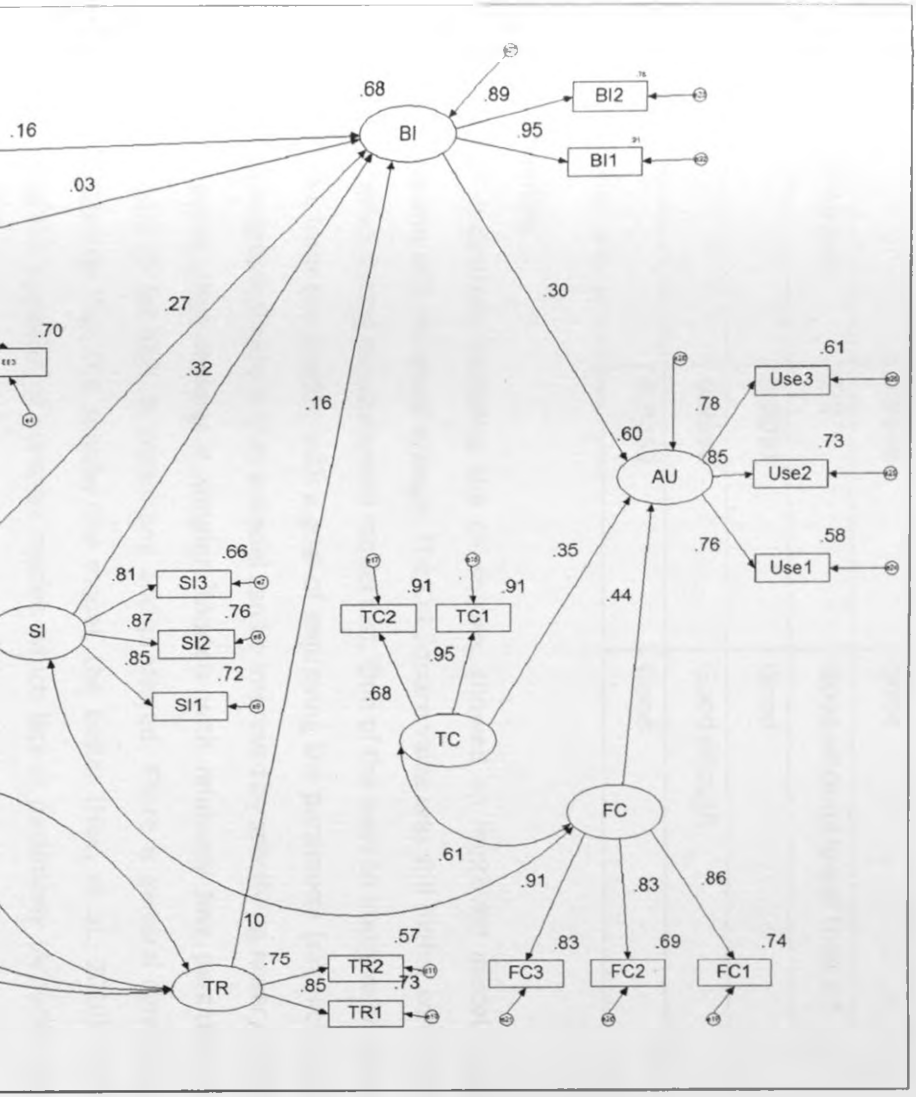

.68
.89
BI2
.16
BI
.95
BI1
.03
.27
.30
.70
.32
.16
.61
Use3
.78
.60
.73
AU
.85
Use2
.66
.35
.58
.76
Use1
.81
SI3
.91
.91
.87
.76
SI
SI2
TC2
TC1
.44
.85
.72
.95
SI1
.68
TC
FC
.61
.91
.83
.86
.10
.57
.83
.69
.74
.75
TR2
FC3
FC2
FC1
TR
.85
.73
TR1

Table 4-15: Fit indices for the improved model

Index used	Value obtained	Comment
Chi-Square	498.4 with 210 df	Not good, but much better
RMSEA	0.0698	Good
Normed chi-square	5:2	Good since its lower than 3:1
NFI	0.9097	Good
TLI	0.9340	Good enough
CFI	0.9452	Good

Model trimming

Though GoF indicators, including the chi-square, showed an improved model, the chi-square value was still not good enough. The Chi-Square value was still higher compared to the one obtained during measurement model test. One of the ways to improve on fitness is to drop paths from the model, with a goal of improving the parsimony (simplicity) of the model. The suggestion here is that a model can be improved by specifying fewer estimated parameter paths, thus making it simpler. Models with relatively few parameters are sometimes said to be high in parsimony and preferred. There is general agreement in modelling research that the simpler the model, the better (Hair, et al., 2010); (Mulaik, 1990). This is the opposite of complex models which lack in parsimony (Arbuckle, 2005). Dropping any paths or constructs should be done only if consistent with theory and face validity (Hair, et al., 2010).

One way to trim a model is to delete arrows which are not statistically significant based on the structural (regression) weights. This is the usual first step in improving a model (Jackson, et al., 2005). This process of trimming, results in slightly different model than the one that was initially specified. This is called a nested version of the original one (Jackson, et al., 2005); (Arbuckle, 2005).

The researcher proposed, first to remove the path between EE and BI, having the lowest loading of 0.03. The result was an improvement of the chi-square to 428.8 with 155 degrees of freedom. The factor loadings improved and so did the correlation confident for the endogenous variables. The outcome of this trim is show in Figure 4-8. To make the

values more readable, Figure 4-8B provides a reorganized version of Figure 4-8. The fit indices are also shown in Table 4-16.

The removal was based on the evidence from data, which is more of a theoretical argument. From a practical point of view, it can be argued that mobile money technology from the users' point of view is not complex at all. It does not take much to learn how to use it making it a non-issue in deciding if to adopt or not. At the same time, the users easily pick up information from friends or family members on how to use mobile money, making the construct irrelevant in the context of determinants of mobile money adoption. Reviewing the original context of effort expectancy, information systems were procured for organizations and were deemed complex for ordinary users. As such, training programs could be organized; a process that took time and effort (Venkatesh, et al., 2003).

Figure 4-8: Measurement model first trimming

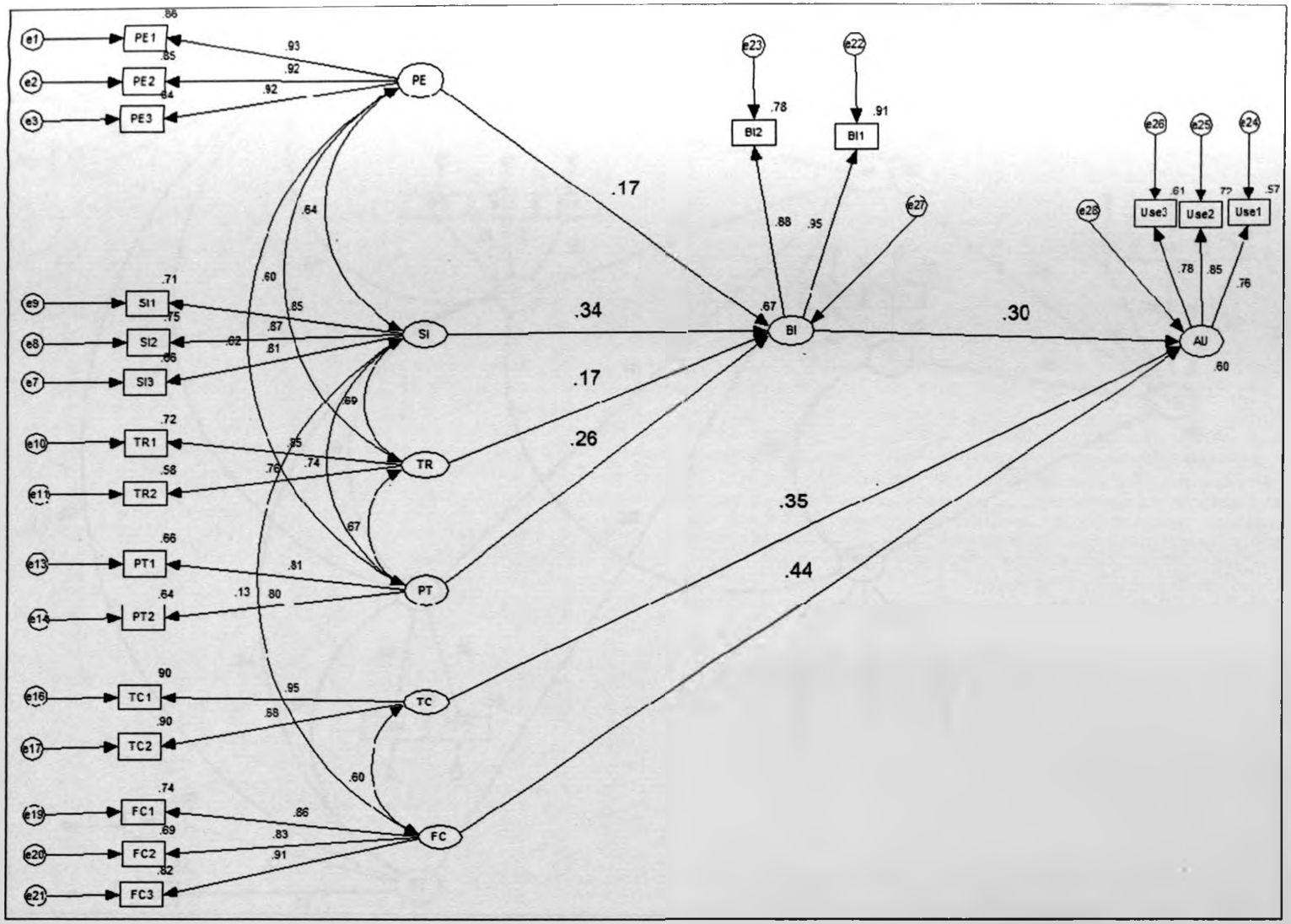


Figure 4-12B: Reorganization of figure 4-12

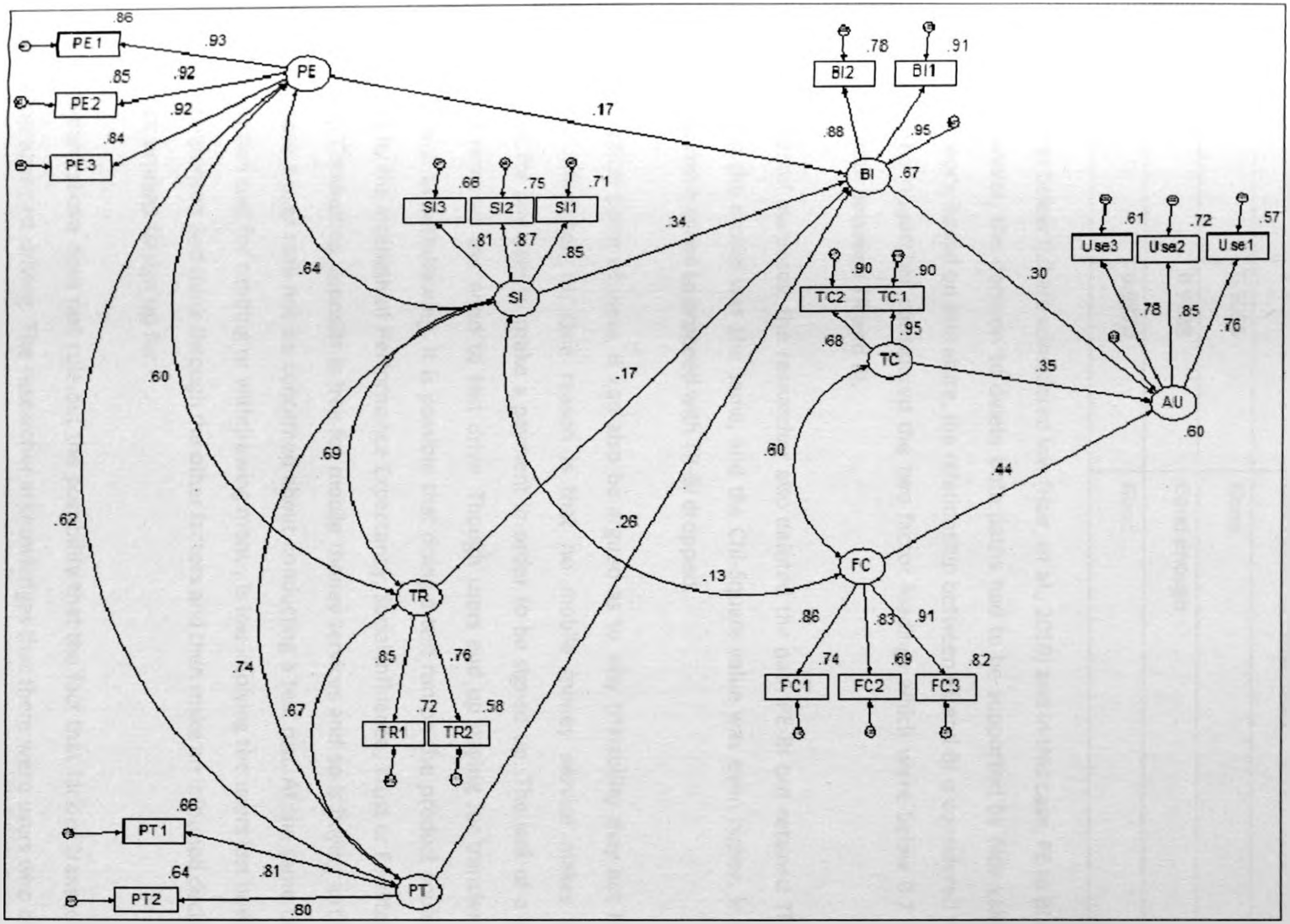


Table 4-16: Fit indices after first trimming

Index used	Value obtained	Comment
Chi-Square	428.8 with 155 df	Not good, but much closer to 380.3 with 263 df
RMSEA	0.0791	Good
Normed chi-square	3:1	Good since its equal to 3:1
NFI	0.9055	Good
TLI	0.9228	Good enough
CFI	0.9370	Good

Factor loadings below 0.2 are considered low (Hair, et al., 2010) and in this case, PE to BI and TR to BI. However, the decision to delete both paths had to be supported by face validity and sound theory. Based on literature, the relationship between PE and BI is considered very important. The researcher considered the two factor loadings which were below 0.2 and deleted the path between TR and BI.

For experimental purposes, the researcher also deleted the path PE-BI but retained TR-BI. The effect on the model was the same, and the Chi-Square value was even higher. In this case it made more sense to proceed with TR-BI dropped.

From a practical point of view, it can also be argued as to why trialability may not have significantly influenced BI. One reason is that no mobile money service makes it a requirement for any user to make a payment in order to be signed up. The lack of a cost implication removes the need to test drive. Though users end up paying for transferring money as well as withdrawing, it is possible that doing a test run on the product could be overridden by the strength of Performance Expectancy, Social Influence, Trust or Facilitating Conditions. Conducting deposits is free for mobile money services and so is buying airtime, in which case a user may not be concerned about conducting a test run. At the same time, the transaction cost for sending or withdrawing money is low implying the users just need to make a comparison and think through the other factors and then make an informed decision as to which product to sign up for.

The argument above does not rule out the possibility that the fact that lack of transaction cost encourages test driving. The researcher acknowledges that there were users who did a

lot of test driving of the products before they proceeded to adopt. It however appears that the number of users who did this was not substantial enough to sway the direction of the model.

The fit indices are shown in Table 4-17 while Figure 4-9 shows the measurement model. To make the values more readable, Figure 4-9B provides a reorganized version of Figure 4-9. The factor loading for PE to BI improved to a desired .20 while the correlation coefficients for the endogenous variables remained 0.6 and above.

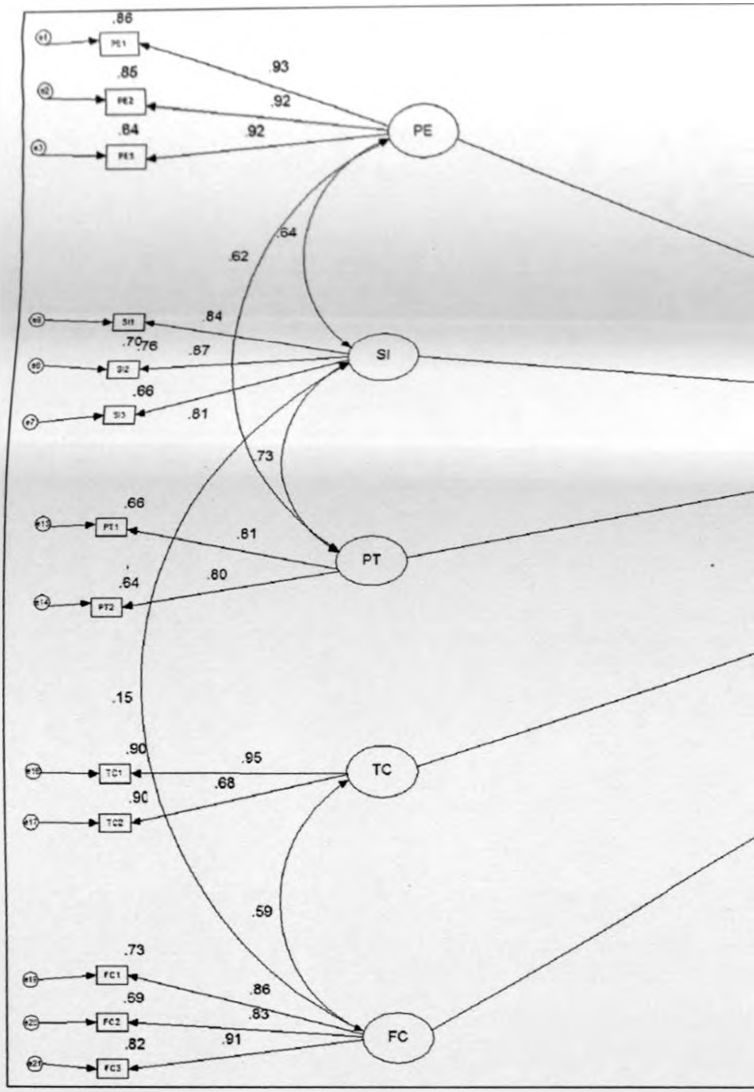
Table 4-17: Fit indices for final model

Index used	Value obtained	Comment
Chi-Square	387.1 with 124 df	Better and close enough to 380.3
RMSEA	0.0791	Good
Normed chi-square	3:1	Good since its equal to 3:1
NFI	0.9074	Good
TLI	0.9194	Good enough
CFI	0.9347	Good

At this point the researcher decided not to trim the model any further because basic requirements for fitness had been met. Figure 4-9 was considered the final measurement model. The constructs PE, SI and PT were the determinants of BI while TC and FC were direct determinants of AU. BI remained an endogenous construct determining AU.

The measurement model was then translated into a structural model to be used for hypotheses testing. Figure 4-10 shows the structural model.

Figure 4-9: Final Measurement Model



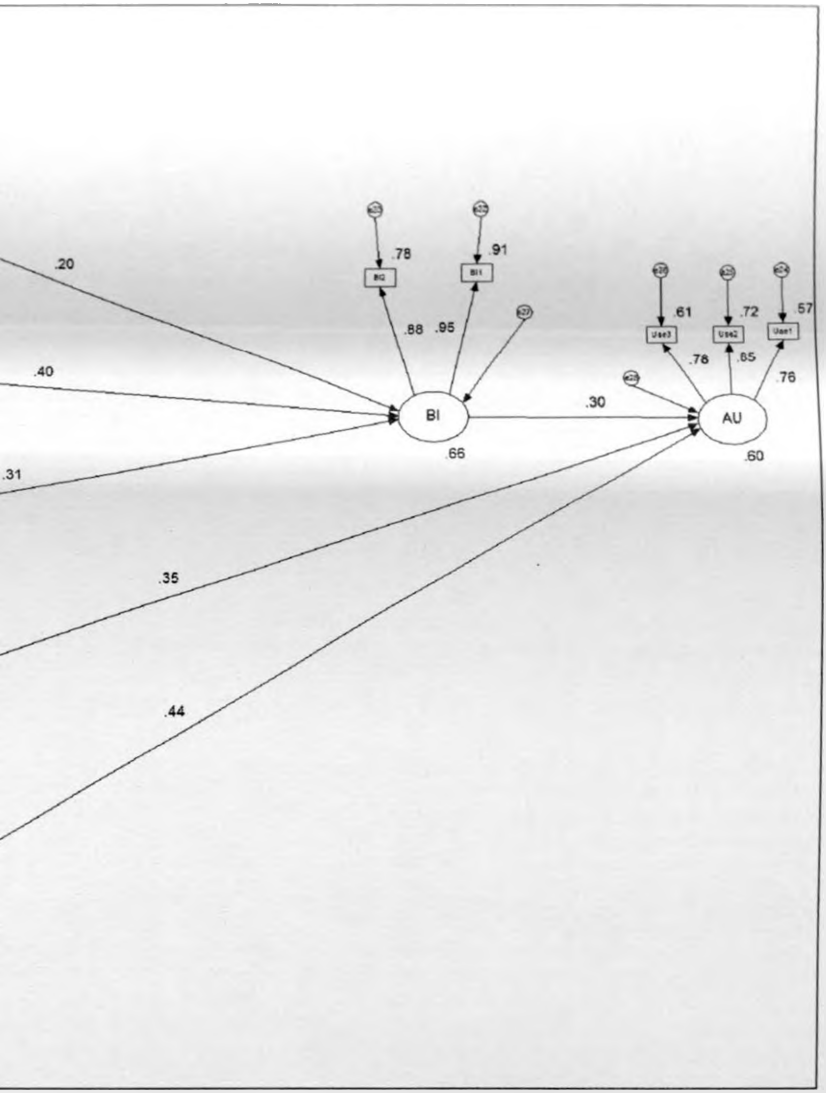
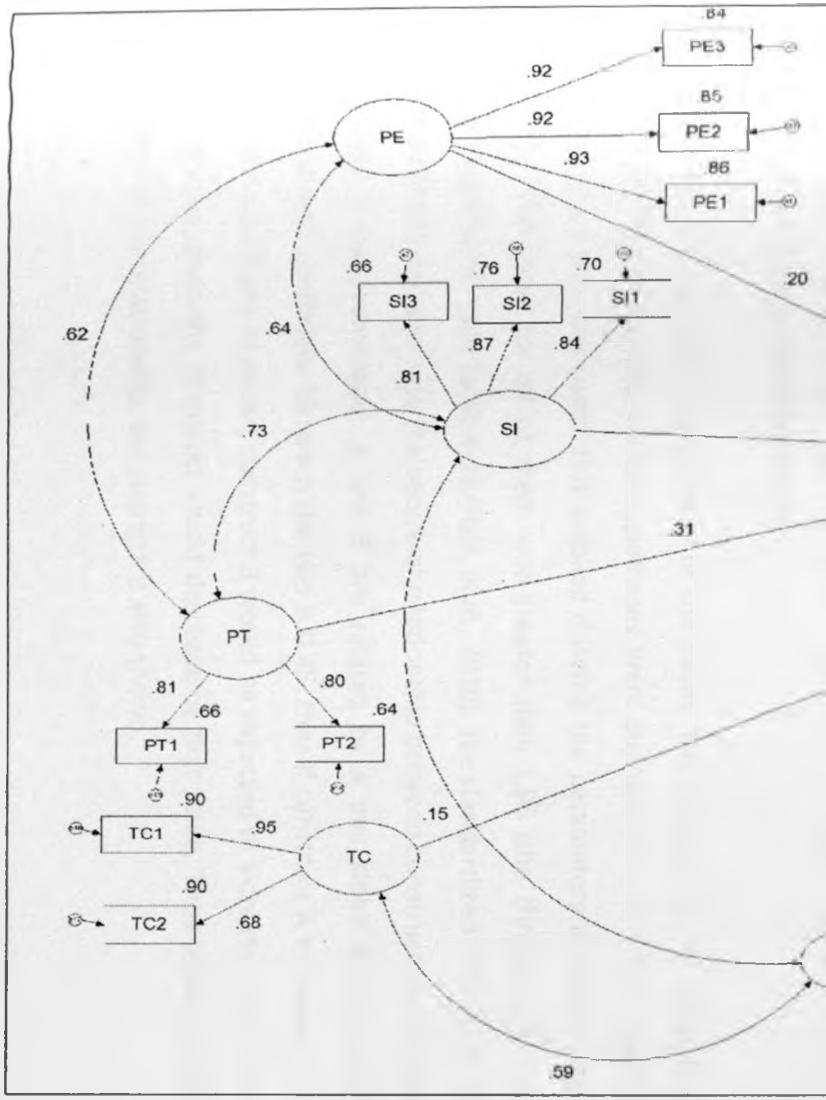

.20
.40
.31
.35
.44
.78
.91
.88
.95
BI
.66
.30
AU
.60
.61
.72
.57
.78
.85
.76

Figure 4-9B: Reorganization of figure 4-9



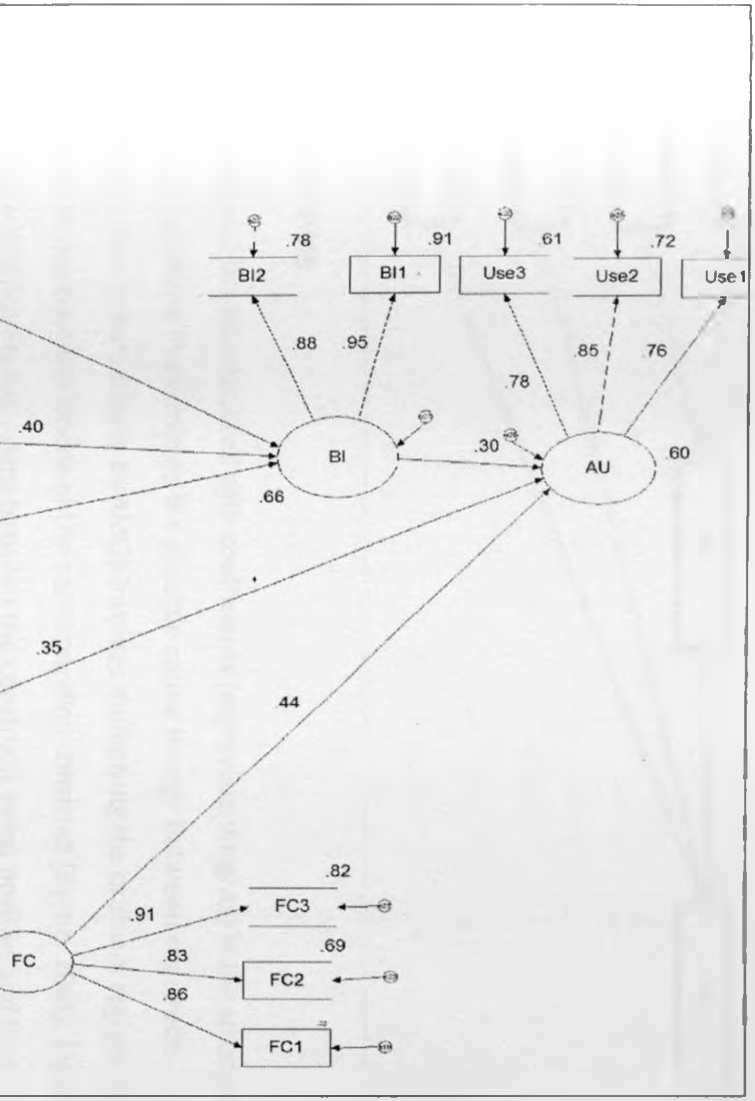
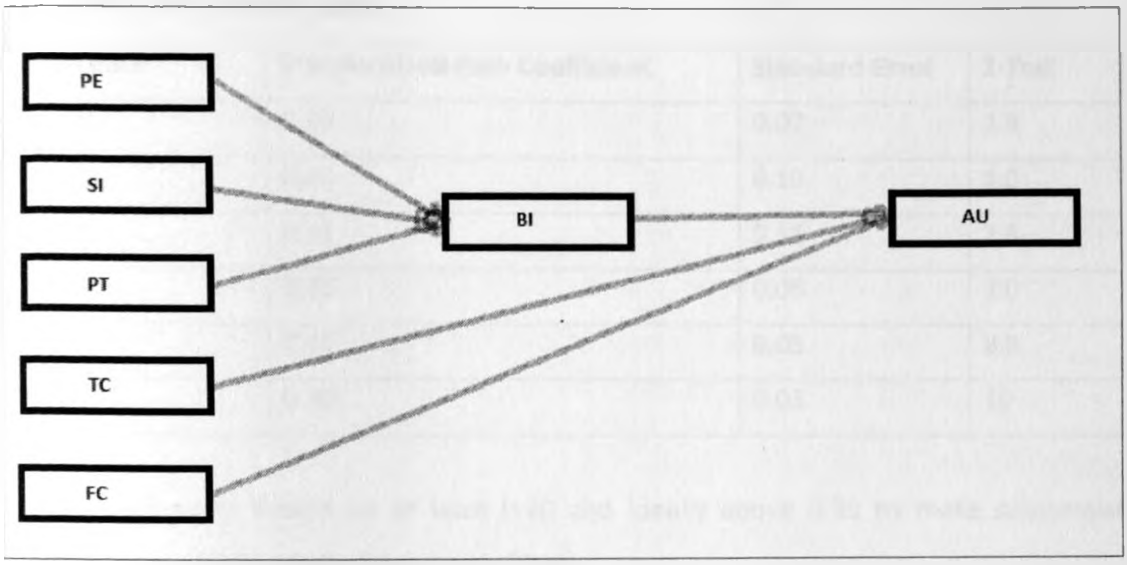

.78
.91
.61
.72
BI2
BI1
Use3
Use2
Use1
.88
.95
.85
.76
.78
.40
BI
.30
AU
.60
.66
.35
.44
.82
FC3
.91
FC
.83
.69
FC2
.86
FC1

Figure 4-10: Structural model extracted from the final measurement model



4.5 Hypotheses testing

To test hypotheses, the standardized path coefficients (regression weights) in the structural model provided guidance in examining the possible causal linkage between constructs. The standardization, done automatically by AMOS involves multiplying the ordinary regression coefficient by the standard deviations of the corresponding construct (Byrne, 2001). Figure 4-9 provided the coefficients with signs between the constructs being positive and thus in the predicted direction of the relationship.

After reviewing the statistical significance of the paths, the strength of the relationships among the constructs showed which hypotheses were supported. To establish statistical significance, the z-test was used. This entailed dividing the parameters by their standard errors (SE). The value for all of them was greater than 1.96 (the threshold for being statistically significant – see Table 4-18 (Hair, et al., 2010). The standardized path coefficients provided by AMOS demonstrate the nature of relationship between constructs in the model. For example if two constructs, A and B are related by a one sided arrow, and the standardized path coefficient between the two is 0.45, then if construct A increases by one standard deviation from its mean, construct B would be expected to increase by 0.45. If the value is negative, then the construct would decrease by that value. Thus besides showing the direction of the relationship, the strength is also shown.

Table 4-18: Z-Test for causal paths

Causal Path	Standardized Path Coefficient	Standard Error	Z-Test
PE -> BI	0.20	0.07	2.9
SI -> BI	0.40	0.10	4.0
PT -> BI	0.31	0.11	2.8
TC -> AU	0.35	0.05	7.0
FC -> AU	0.44	0.05	8.8
BI -> AU	0.30	0.03	10

Standardized paths should be at least 0.20 and ideally above 0.30 to make substantial statistical sense (Chin, 1998); (Hair, et al., 2010).

Table 4-19 shows the hypotheses in the measurement model and their corresponding standardized path coefficients generated by AMOS. As per the results, six hypotheses were statistically significant. For example, the coefficient 0.20 suggests that PE is positively associated with BI (H1). The hypotheses H2 and H4 were dropped during the model fitness analysis. Though their coefficients may have been statistically significant, their values were below 0.20, their contribution towards the model was immaterial. In other words, the specific paths added minimal value to the understanding of the relationship between the specific latent variables.

Table 4-19: Regression weights of the hypothesised model

Hypothesis	Causal Path	Standardized path coefficients & level of significance
H1	PE -> BI	0.20 ***
H3	SI -> BI	0.40 ***
H5	PT -> BI	0.31 ***
H6	TC -> AU	0.35 ***
H7	FC -> AU	0.44 ***
H8	BI -> AU	0.30 ***

Below the researcher discusses these findings while reviewing research publications that have investigated these specific paths and constructs.

4.6 Discussion on the direct hypotheses and corresponding constructs

Performance Expectancy

The fact that H1 (PE has a positive influence on BI) was supported is consistent with literature. The original UTAUT model confirmed the existence of this relationship (Venkatesh, et al., 2003). It was considered a critical relationship in behavioural intention. In a number of studies, PE is considered a critical component in technology adoption (Venkatesh & Davies, 2000); (Agarwal & Prasad, 1998). In the earlier studies, it was termed as Perceived Usefulness, such as in TAM, TAM2 and DTPB (Ajzen, 1991); (Davis, et al., 1989).

A publication on the Australian consumers, ranked convenience high in the list of the factors that influence adoption of internet banking (Munene, et al., 2002).

This construct matters in the context of mobile money adoption. For most of the respondents interviewed, there may be lack of alternative forms of financial services for them. For example, small traders would not find a bank account very attractive considering the amount of money and frequencies of transactions. The prospect of helping manage finances, store, conveniently transfer, easily access make mobile money significantly attractive to those at the BoP.

In their study on the adoption drivers of internet banking in India, researchers found that perceived usefulness had a positive influence on the behavioural intention to adopt the services. The clients interviewed were already banked and were considering an alternative channel (Safeena, et al., 2011).

Mobile money has a transformative benefit for users who did not have any formal mechanism of handling their money. It is also additive to users who already had other channels. The use of mobile money has evolved substantially over the last few years. It started off as a money transfer tool, but evolved into a sophisticated financial ecosystem linking multiple organizations. According to the FSD study done in 2009 (FSD, 2009), mobile money was being used for several functions, including saving, purchasing, paying bills among others. This study, the latest so far, is over three years old and certainly, the forms of usage have evolved and extended. Not all the forms of usage identified and recorded were originally intended by the mobile money providers. Rather, some of them evolved out of

consumer needs, providing incredible evidence that mobile money providers should be needs driven

Social Influence

H3 (SI has a positive influence on BI) was supported. Not only did the original UTAUT model confirm the existence of this relationship (Venkatesh, et al., 2003), there is substantial evidence in literature to support this argument. As Subjective Norm, it was studied and confirmed in TRA (Ajzen & Fishbein, 1980) as well as in TAM2 (Venkatesh & Davies, 2000). Similarly, the construct was studied as Image in IDT (Rogers, 1995).

Social Influence turned out to be very significant. Defined as the degree to which an individual perceives that important others believe he or she should use the new system, it is very possible that the poor who are characterized by low literacy level would depend a lot on what their significant others believe is good for them. The tendency to have family dependants in the rural homes makes mobile money a very important tool for them. In addition the pressure from their significant others, whom they are most certainly in touch with using the mobile phones make mobile money an indispensable tool. The ubiquity of the mobile phone and the ease of transacting create pressure for the user to adopt. The closely knit social structures also make mobile money an ideal tool that cements relationships.

Though it is a substantially supported construct and hypotheses, some researchers have chosen to disagree with the finding. They have as well provided a basis for their arguments. Davies (1989) and Davies, et al (1989) in their study of information systems, decided to remove SN arguing that it had insignificant impact on BI.

However, in later studies, the construct was restored with a caution of time and experience (Venkatesh & Davies, 2000). The argument presented later was that the effect of SN on BI became weaker as time passed and users became more experienced. Early adopters, who lacked much information and were less familiar with the technology, relied on the opinions of others. As they acquired more knowledge and experience, they shaped their own intentions, relying less and less on others. This is an argument that could be true in the case of mobile money adoption but could not be substantiated given the limited resources in the study as well as scope. This is an opportunity for further research considering the incremental changes on the features of mobile money services.

H5 stating that PT has a positive influence on BI was supported. Perceived Trust, a construct that was not originally in the UTAUT framework appears to be a key determent for mobile money adoption. This measure of consumer's level of assurance that the service will be provided with minimum possible hindrance (Siau & Shen, 2003) has been investigated broadly by other researchers. One researcher, while studying the effect of trust in e-governance adoption, established that increasing e-trust enhances the intention to use e-government services (Colesca, 2009).

Trust plays a critical role in social interactions where uncertainties and dependencies exist and tends to influence people's lives a great deal. Building Trust takes time and is a gradual process (Stamoulis, 2010)

Using electronic means to transfer money has a characteristic of uncertainty and therefore requires an element of Trust. In 1996, Quelch and Klein (1996) indicated that Trust is a critical factor in order to motivate buying through the Internet and concluded that lack of Trust is a barrier to internet commerce. According to Disabatino many Dot.com companies failed mainly because the sellers were unable to create a strong relationship of Trust with their customers (Disabatino, 2000). A high level of Trust encourages customers to conduct online purchases, while lack of it prevents online shopping (Hoffman, et al., 1999).

The providers as well as the technology for mobile money should be trusted by users to enhance adoption and uptake. Lack of consumer perceived Trust in such systems is one of the main barriers to mobile commerce transactions in a mobile environment (Siau, et al., 2004). Uncertainty about security raises concerns about the safety of money. While studying internet banking in Mauritius, researchers found that perceived trust was an important influencing adoption among users. The sampled respondents had bank accounts as well (Padachi, et al., 2008).

The assurance that the money deposited, money sent or money saved would not be lost and will be accessible at the point of need is certainly important to any kind of user, irrespective of the level of prosperity. For a poor user, trust might just be certaintly even more important. The study findings seem to suggest that the trust in the product does influence behavioural intention. This trust did not focus on the provider of the product or the person

interacting with the customer, though all these aspects may be related in one way or another.

Transaction Cost

H6 stating that TC has an influence on AU was supported in this study. This was the second additional construct to the original UTAUT model besides Perceived Trust.

Transaction Cost needed to be interpreted in opposite direction. The data was coded in reverse order in order to make sense and therefore would be interpreted in reverse (See questionnaire in Appendix 1 where a score of 5 in the likert scale would mean positive correlation with Behavioural Intention). This is to say that Transaction Cost has a negative correlation on actual usage of mobile money.

Transaction cost for mobile money users comes in the form of withdrawal fee or cost of transfering funds. Unlike Facilitating Conditions, Transaction Cost is bound to have a negative correlation with actual usage of mobile money. From the comparative analysis of the Transaction Cost between the main mobile money services in Table 1-1 it is clear that the transaction fees charged by the various products does not differ substantially. But compared to financial institutions mobile money services are considered cheaper. The study did not focus on making a comparison between various mobile money services, but rather focused on establishing if Transaction Costs influences actual usage, an aspect that produced positive outcome.

In a study to understand the consumer adoption of internet banking in Australia, the researchers established that consumers cited cost as an inhibiting factor in their use of internet banking (Lichtenstein & Williamson, 2006). The costs that consumers consider when switching between various types of service offerings have been investigated. One way to classify these costs is procedural, financial and relational costs (Burnham, et al., 2003). Procedural costs revolve around set-up and learning requirements, transactional costs include fees paid for the services rendered while relational costs include the loss of relationships established in the previous services that a customer was using.

A number of researchers investigating mobile money related areas established the effect of transaction cost on behavioural intention or actual adoption. In a qualitative study to

explore consumer adoption of mobile payments, Mallat (2010) found that transaction cost was a barrier to consumers signing up for electronic payments and more particularly mobile payments. The study was based on focus group discussions and did not necessarily focus on the poor people (Mallat, 2010).

In their study on the effect of transaction cost on behavioural intention among youthful mobile phone users in South Africa, the researchers found that transaction cost had a negative effect on the intention to download ring tones and other forms of mobile phone content among the youth (Gilham & Belle, n.d.). While studying internet banking in Mauritius, researchers found that transaction cost was influencing adoption among users. The sampled respondents had bank accounts as well (Padachi, et al., 2008).

Facilitating Conditions

H7 stating that FC has a positive influence on AU was confirmed. The original UTAUT model confirmed the existence of this relationship (Venkatesh, et al., 2003). Other resaerchers explored an aspect of technical support as a moderating variable and confirmed its influence (Chung & Kwon, 2009). They concluded that with a higher level of technical support, it is particularly true that customers will use a technology. In a study on the impact of mobile payments on the success and growth of micro-businesses, the researcher established perceived support from mobile money providers influences intention to use (Mbogo, 2010). Another study explored convenience as one of the factors that contribute to usage of mobile payments and confirmed the influence (Pousttchi, 2003). In their quest to understand what drives adoption of internet banking in Australia, researchers found that accessibility, self-efficacy, knowledge and support influenced internet banking adoption (Lichtenstein & Williamson, 2006). In their study on the adoption drivers of internet banking in India, researchers found that perceived usefulness had a positive influence on the behavioural intention to adopt the services. The clients interviewed were already banked and were considering an alternative channel (Safeena, et al., 2011).

This factors are lumped together in the UTAUT model in form of facilitating conditions (Venkatesh, et al., 2003).

The researcher investigated the impact on actual usage as per the original UTAUT framework. Knowledge, access to help from the mobile money provider and access to agents

were used to evaluate Facilitating Conditions. The fact that users have the assurance that they can get help once they have began using mobile money is apparently very vital for poor users to actualy use the product. The BoP users are likely to be even more sensitive about their money. The assurance that they can access information, get help or easily reach agents to facilitate their transaction drives up actual usage.

Behavioral Intention

H8 stated that BI has a positive influence on AU. This hypothesis was supported, consistent with a number of studies. The original UTAUT model confirmed the existence of this relationship (Venkatesh, et al., 2003). Other studies, particularly using TAM, TRA and TPB also found usage behaviour to be a direct determinant of behavioural intention (Davis, 1989); (Davis, et al., 1989); (Ajzen, 1991); (Ajzen & Fishbein, 1980); (Fishbein & Ajzen, 1975).

The fact that the hypothesis was supported, implies that the original model can be partly applied in non-western contexts yet remain relevant. The inclusion of BI as a mediator between exogenous constructs and AU is believed to increase the predictive power of the model (Taylor & Todd, 1995).

4.7 Discussion on the constructs that were dropped

Trialability

It was hypothesised that if users have an opportunity to experiment with a mobile money service prior to committing to its usage, chances are that their intention to adopt would be increased. A number of studies exploring information systems adoption found that trialaibility influences behavioural intention to adopt (Moore & Benbasat, 1991); (Karahanna, et al., 1999); (Tan & Teo, 2000) and (Plouffe, et al., 2001). There are hardly any publications that focus on mobile money in particular. The closest the researcher found was the exploration of trialability as a determinant of internet banking behavioral intention to adopt (Khalil & Pearson, 2007). In the case of internet banking and possibly internet commerce, consumers already have options of obtaining the same services. Internet banking is considered an additive service. Considering these users were already banking and had reliable alternatives, they were willing to test drive an additional channel to establish if this channel would offer a better service.

e cases, researchers have found an effect of trialability on behavioural intention. In udy on downloading ring tones and other forms of mobile phone content among the the researchers found trialability having a positive influence on behavioural intention ı & Belle, n.d.). This study was done in South Africa among youthful users.

case of mobile money users at the 'base of the pyramid', the lack of a reliable tive coupled by the confidence already developed in using mobile phone services, the o test drive did not seem to matter much. The researcher felt that the level of ication of this kind of users did not give room for a need for substantial testing of the ts before adoption.

ition, it is important to note that the dropping of trialability did not mean that all ners did not care about test driving the products; rather the contribution of trialability ıt substantial enough to warrant inclusion in the final model.

er argument that could possibly be considered is whether trialability is indeed part of model, such that the construct would be dropped after all. The researcher did not basis for extending this argument and therefore the aspect is not investigated in this This provides an opportunity for further research.

Expectancy

Expectancy (Venkatesh, et al., 2003) also referred to as perceived ease of use in other ls (TAM and TAM2) or ease of use (IDT) (Thompson, et al., 1991); (Plouffe, et al., 2001) ned as the degree to which a person believes that using a particular system would be f effort (Davis, 1989).

case of mobile money, aspects like registration procedure; ease of use of the payment dure, minimal steps required to make a payment and appropriate screen size would mine ease of use.

es around mobile money have focused on internet or internet banking and electronic ng. A study focusing on SME adoption of e-banking services in developing countries TAM as the basis, but did not include perceived ease of use (Riyadh, et al., 2009). The nent for exclusion was that the study focused on the institutions and not the iduals.

In another study on the adoption of internet banking in Hong Kong, the researchers found that Perceived Ease of Use had only an indirect effect on Behavioural Intention (Edwin, et al., 2006). In their study on the adoption drivers of internet banking in India, researchers found that perceived ease of use had a positive influence on the behavioural intention to adopt the services. The clients interviewed were already banked and were considering an alternative channel (Safeena, et al., 2011). While studying internet banking in Mauritius, researchers found that perceived ease of use was the most important influencing adoption among users. The sampled respondents had bank accounts as well (Padachi, et al., 2008).

While investigating the factors influencing adoption of mobile financial services with a focus on India, researchers found that Perceived Ease of Use influenced the intention to use. The respondents interviewed had used alternative means like ATMs and were concerned about the level of complexity of mobile financial services (Das & Pal, 2011).

Another study exploring Chinese mobile banking adoption found that Perceived ease of Use had no significant effect on user adoption of mobile banking (Deng, et al., n.d.). The researchers used TAM and argued that their sample had owned mobile phone more than one year and therefore were familiar with mobile phone use as well as the many services in the phone. As a result they perceived the mobile banking service is easy to use. This construct did not have much impact on attitude toward mobile banking. This argument could substantially fit the respondents in this mobile money study. The users were already very familiar with the use of their phones, use of airtime, access agents and related aspects. This meant that there was very little motivation about the ease of use as a determinant of behavioural intention.

Just like in trialability, it is important to note that the dropping of this construct did not mean that all consumers did not care about the ease of use; rather the contribution of the construct was not substantial enough to warrant inclusion in the final model.

4.8 Moderator Effect (Multiple Group Analysis)

Besides establishing and testing an extended model, the researcher was interested in exploring the differences evoked between various segments of the respondents. Of interest were demographic characteristics age, gender, education level and experience. In addition, risk was investigated as a moderator to PT and BI.

To investigate the impact of moderators on the influence of predictors toward dependent variables, multiple-group analysis in AMOS should be used (Arbuckle, 2005). The AMOS user guide suggests the purpose, advantages and how to interpret the analysis results in respect of performing a single analysis of several groups - simultaneous multiple-group analysis (Arbuckle, 2005).

The main purpose of a multiple-group analysis is to compare different groups to establish the effect of the moderator on the paths between constructs. By creating two different groups (or multiple groups), being sure that the differentiating factor is actually the moderating variables and studying the differences between the generated path diagrams, one is able to tell the effect of the moderator variable on the entire model or on specific paths. The first step is to establish if the groups have the same path diagram. If that is the case, the next step is to test if there are any differences among groups (Hair, et al., 2010).

In the case of the model in this research, the moderating variables are gender, age, education level, risk and experience. Though the study started off with the conceptual framework shown in Figure 4-1, the testing of the moderator variables was based on the final measurement model shown in Figure 4-9 and the structural model in Figure 4-10.

Not very many studies have been done focusing on mobile money related areas that have utilized UTAUT. In most cases, researchers have used TAM (Riyadh, et al., 2009); (Das & Pal, 2011); (Deng, et al., n.d.).

4.8.1 Age

The question is whether age affects the intention of a poor person to adopt mobile money. To address this issue, the age was divided into a number of groupings. Age had been captured as 'year of birth' from which the age was computed. Researchers who have investigated age as a moderating factor have grouped age brackets in different ways.

In their study on wireless mobile adoption in China, (Lu, et al., 2010) grouped the variable only into two. In some cases, researchers have grouped the data into three such as (Baron & Kenny, 1986) while in other cases, four blocks (Ellis & Allaire, 1999). In earlier studies, (Morris & Venkatesh, 2000) grouped the data into four and recommended that researchers do so. However, it is important to realize that the aim of this grouping is to establish what

the effect of age has on the various relationships already confirmed. Grouping of age could be done at lower granularity so as to un-earth more details if the researcher so wishes (Morris & Venkatesh, 2000). For purposes of analysis, the researcher coded the age variable into four groups: Below 30, 31-40, 41-50 and over 50 years. The distribution was as shown in Table 4-20.

Table 4-20: Age brackets

Age Bracket	Number of respondents
0-30	63
31-40	32
41-50	19
Over 50	7

Table 4-21 shows the results of running the model separately to establish fitness for each group resulted in fit statistics.

Table 4-21: Age moderator fit indices

Age Bracket	Chi-Square	CMIN	Df	CMIN/df	RMSEA	PCLOSE	CFI	TLI
Below 30	248.3	248.3337	124	2.0027	0.0914	0.0001	0.9206	0.9020
30-40	230.5	230.5011	124	1.8589	0.1667	0.0000	0.7274	0.6637
40-50	427.0	426.9675	124	3.4433	0.3684	0.4070	0.5470	0.4410
Over 50	248.3	248.3337	124	2.0027	0.0748	0.0001	0.9206	0.9020

For age below 30 and above 50, there was good fit. The age 30 to 40 had reasonable fit, while age 40-50 had poor fit. The reasonable fit and poor fit were not to cause too much alarm given the small dataset. The fit indices are sensitive to sample size among other factors. Overall, the fit indices were within acceptable ranges. To study the moderating effects, the poor fit was ignored (Hair, et al., 2010).

Table 4-22: Summarized comparison of age brackets

			Below 30		31-40		Over 50		z-index
			Estimate	P	Estimate	P	Estimate	p	
BI	<---	SI	.1666	0.209	.2192	0.273	.1716	0.2832	1.255**
BI	<---	PE	.1826	0.274	.1756	0.011	.2285	0.090	0.354
BI	<---	PT	.2489	0.263	.2341	0.000	.3590	0.273	0.517
AU	<---	TC	.1092	0.000	.2817	0.000	.4142	0.011	-0.279
AU	<---	FC	.1600	0.002	.1155	0.273	.2170	0.273	1.6573***
AU	<---	BI	.3103	0.000	.1444	0.000	.4849	0.000	0.090

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

In general it was observed that age did have a moderating effect on behavioural intention to adopt mobile money among the poor.

For specifics, the researcher went further and drilled down to demonstrate that this moderating effect is specific to certain paths.

The paths with a significant z-score indicated that they were statistically significant; hence manifesting that age did moderate that relationship.Table 4-22 summarizes the comparison between the three groups. Only two paths were statistically significant for the three groups, SI-BI and FC-AU, indicating that age did moderate those relationships. The other paths were not significant in the three groups.

Age had effect on SI-BI and FC-AU. In the case of Social Influence, the analysis indicates that younger and older respondents react differently to social influences about adopting mobile money. More specifically, younger users were less likely to be influenced by their significant others than their older counterparts. This is consistent with previous research on IS adoption (Cook and Wall 1980); (Venkatesh, et al., 2003). This outcome made both theoretical and practical sense. Younger users tend to form stronger opinions about technology or tools they use. Given how dynamic technology is, the younger are likely to get more excited, learn fast and form strong views about the choices they make. The older are more flexible in taking the views of others.

In a similar manner, older and younger respondents are affected by Facilitating Conditions differently thus resulting in a moderating effect on the relationship between Facilitating Conditions and Actual Usage. Older users were more likely to be influenced by changes in FCs. For example, access to technical or customer support, access to agents, having sufficient knowledge were more beneficial to the older respondents than younger ones. For example, older respondents were more concerned about how close agents were than the younger respondents. This was most likely so because the older respondents were more concerned about how far they had to walk, something that younger respondents were less concerned about.

This made theoretical and practical sense. Older respondents were more likely to need support than younger ones. Given that older respondents were less likely to be influenced by their significant others, chances that they would get relevant information from these individuals is lower for the older than for the younger. In addition, younger respondents tend to be more technologically savvy than older ones, making it easier for them to access necessary information much faster without help.

Similar findings about the moderating effect of age in influencing technology adoption were established by other researchers (Venkatesh, et al., 2003) (Das & Pal, 2011) (Davis, et al., 1989).

Age has received very little attention in the technology acceptance research literature. Researchers who have used UTAUT to investigated the impact of age indicate that it moderates all of the key relationships in the model (Venkatesh, et al., 2003); (Levy, 1988). In this study, only two paths were moderated. Particularly, its only PE - BI that is in original UTAUT that was not moderated. This could be most likely due to the nature of the respondents sampled. At the same time, it is possible that the context of the development of UTAUT influences its outcome on this factor. The orignial UTAUT was developed and tested in organizational settings, where information systems are complex and have impact on the productivity of individuals, while the less sophisticated mobile money services are occasionaly used for very simple functions.

There are several other researchers who have investigated the influence of age on technology adoption. For example, when examining computer interest among older adults,

researchers found that age was negatively associated with computer knowledge and computer interest and positively associated with computer anxiety (Ellis & Allaire, 1999). While investigating technology adoption in developing countries, with specific emphasis on use of technology for microbial contamination, (Cabral, et al., 2009) found that age moderated SI – BI relationship as well as FC – AU relationship. This was consistent with the findings in this study. While investigating mobile learning in developing countries, (Iqbal & Qureshi, 2012), used UTAUT as the conceptual framework and established that age moderates the SI – BI relationship. This was consistent to (Morris & Venkatesh, 2000), a study that focused on the impact of age in technology adoption.

4.2 Education level

Education levels were re-coded primary school, high school and tertiary as shown in Table 4-23.

Table 4-23: Education level distribution

Education Level	Number of respondents
Primary	116
High School	131
Tertiary	36

Running the model separately to establish fitness for each group resulted in fit statistics shown in Table 4-24.

Table 4-24: Education moderator fit indices

Education	Chi-SQ	CMIN	Df	CMIN/df	RMSEA	PCLOSE	CFI	TLI
Primary	291.6	291.6271	124	2.3518	0.1084	0.0000	0.8983	0.8745
High	246.7	246.6873	124	1.9894	0.0720	0.0002	0.9351	0.9199
Tertiary	175.3	175.3402	124	1.4140	0.1088	0.0135	0.9108	0.8899

All the three categories had good fit. Next was an exploration of the moderating effect.

Table 4-25: Summarized comparisons between school levels

			Primary		High		Tertiary		z-index
			Estimate	P	Estimate	P	Estimate	P	
BI	<---	SI	.1666	0.273	.2192	0.090	.1716	0.109	0.0441
BI	<---	PE	.1826	0.001	.1756	0.101	.2285	0.114	3.2889**
BI	<---	PT	.2489	0.000	.2341	0.002	.3590	0.163	0.9108
AU	<---	TC	.1092	0.010	.2817	0.090	.4142	0.000	0.8745
AU	<---	FC	.1600	0.273	.1155	0.273	.2170	0.001	3.3342***

In general it was observed that education did have a moderating effect on behavioural intention to adopt mobile money among the poor.

The researcher went further to investigate which paths demonstrated the moderating effect. The paths with a significant z-score indicated that they were statistically significant; hence manifesting that education did moderate that relationship. The results are summarized in Table 4-25 showing that the effects on the relationships between PE – BI and FC – AU were statistically significant.

The education moderator variable only had bearing on PE – BI and FC – AU. In the case of Performance Expectancy, it implies that the more educated a person at BoP is, their perception of the value of mobile money changes, resulting in a moderating effect on the relationship between Performance Expectancy and Behavioural Intention. More specifically, the more educated respondents had a higher chance of adopting than less educated ones. The more educated probably felt that mobile money would have a greater benefit to them. More educated individuals were more likely to have bank accounts and found greater convenience in mobile money than in traditional banking. The more educated individuals were more likely living a more sophisticated financial life and would appreciate mobile money as a more useful channel.

In the case of Facilitating Conditions, the appreciation of the impact or value of these conditions seems to vary as a user gets more educated, thus moderating the relationship between Facilitating Conditions and Actual Usage. The more educated a user was, the less they were concerned about facilitating conditions. Those with lower literacy levels valued facilitating conditions more. This made sense in that low literacy suggested a higher need for support and training in order to adopt the technology. The more literate users found their way around the technology more easily without much help.

Studies have supported the argument that less educated people demonstrate insufficient knowledge, greater anxiety and less sophisticated cognitive structures to learn new things. As a result they have an inherent barrier to adopt technology (Igbaria, 1993); (Igbaria, et al., 1989).

Outside the sphere of mobile technologies, researchers have found the effect of education level on technology adoption. While investigating the effect of education on medical technology adoption, (Lleras-Muney & Lichtenberg, n.d.) found that education moderates a number of relationships, but the variable only seemed to matter for individuals who repeatedly purchased drugs for a given condition, suggesting that the more educated were better able to learn from experience.

4.8.3 Duration of usage/experience

Mobile money usage in Kenya was less than five years at the time of data collection. The duration of usage was asked in terms of years (or months) and re-coded into months as shown in Table 4-26.

Table 4-26: Duration of use distribution

Duration of usage in months	Number of respondents
< 6	6
6 to 12	30
12 to 24	78
25 to 36	63
37 to 48	106

Running the model separately to establish fitness for each group resulted in fit statistics shown in Table 4-27.

Table 4-27: Summarized comparisons between duration of usage (experience)

Duration	Chi-SQ	CMIN	Df	CMIN/df	RMSEA	PCLOSE	CFI	TLI
<6	246.3	230.5011	124	1.8589	0.5684	0.2667	0.0000	0.5264
6 to 12	291.6	248.3337	124	2.0027	0.1084	0.1667	0.0000	0.6274
12 to 24	145.6	248.3337	124	2.0027	0.1084	0.0000	0.8983	0.8745
25 to 36	175.3	426.9675	124	3.4433	0.1088	0.0135	0.9108	0.8899
37 to 48	210.5	175.3402	124	1.4140	0.0720	0.0002	0.9351	0.9199

The duration below six months did not have a good fit, the same for the group six to twelve months. This was not much of a surprise given the number of respondents in the categories. The other duration options had a good fit. Table 4-28 then summarizes the comparison between the groups.

Table 4-28: Summarized comparisons between experience levels

			12 to 24		25 to 36		37 to 48		z-index
			Estimate	P	Estimate	P	Estimate	P	
BI	<---	SI	.2343	0.012	.1816	0.076	.1446	0.042	0.2046
BI	<---	PE	.5566	0.126	.0589	0.021	.2446	0.280	-0.1087
BI	<---	PT	.5645	0.011	.0149	0.001	.4239	0.003	0.5344
AU	<---	TC	.1112	0.001	.0031	0.021	.3442	0.002	-0.3401
AU	<---	FC	.3450	0.001	.7762	0.003	.2434	0.010	0.3458

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

The paths did not have significant z-score, implying they were not statistically significant; hence manifesting that duration of usage did not moderate the relationships. Considering the simplicity of the mobile money applications, it appears that the duration of usage did not have any significant bearing on the paths.

A number of researchers have supported this finding. For example while studying adoption of mobile technologies among Chinese consumers, researchers used multi -group analysis

in SEM and found that gender and education level were significant moderating factors while internet usage experience did not have any significant moderating effect (Park, et al., 2007).

Other researchers have presented the finding in a different way. In the context of technology for education, a number of researchers explored the impact of experience on the use of these technologies (Kotrlik & Redmann, 2009). In one study, researchers concluded that lack of teaching experience with technology resulted in teachers avoiding the use of technology (Mumtaz, 2000). In another study, researchers found that more experienced teachers were less likely to utilize technology than less experienced teachers (Smerdon, et al., 2000).

4.8.4 Gender

The gender variable is distributed into 162 male and 121 female. Table 4-29 summarizes the fit indices for gender as a moderating variable. Both the male and female had a good fit, though the male fit was a lot better.

Table 4-29: Gender moderator fit indices

Gender	Chi-Square	CMIN	Df	CMIN/df	RMSEA	PCLOSE	CFI	TLI
Male	267.5	277.1329	124	2.2349	0.0876	0.0000	0.9391	0.9249
Female	175.3	175.3402	124	1.4140	0. 0817	0.0076	0.8830	0.8676

After establishing the fitness, the next aspect was to establish the statistical significance in paths. Table 4-30 summarizes the comparison between the groups.

Table 4-30: Summarized comparison of male and female data

			Male		Female		
			Estimate	P	Estimate	P	z-score
BI	<---	SI	0.405	0.000	0.726	0.002	1.255***
BI	<---	PE	0.260	0.000	0.209	0.090	1.354**
BI	<---	PT	0.418	0.000	0.274	0.273	1.517***
AU	<---	TC	0.230	0.000	0.263	0.011	0.279
AU	<---	FC	0.287	0.000	0.308	0.000	0.207

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

it was observed that gender did have a moderating effect on behavioural intention to adopt mobile money among the poor.

More specifically, the paths with a significant z-score indicated that they were statistically significant; hence manifesting that gender did moderate that relationship. The results showed that the effects on the relationships between PE – BI, SI – BI and PT – BI were statistically significant. This was evidence that gender did moderate these relationships.

The analysis confirmed the effect of gender on PE - BI, SI – BI and PT-BI. In the case of Performance Expectancy, it implies that male and female participants view the value achieved from mobile money differently thus moderating the relationship between Performance Expectancy and Behavioural Intention. Female users found mobile money more useful than their male counterparts. Not all literature agrees with this finding but for mobile money among the poor, it was not surprising (Venkatesh, et al., 2003); (Das & Pal, 2011) (Venkatesh & Davies, 1996). The respondents were poor and chances that female users had challenges in accessing alternative convenient financial tools must have been very high. In addition, given the cultural orientation in many developing countries, where women have less control over family resources, it is very possible that these women found mobile money very empowering by giving them control over some resources.

In the case of Social Influence, it implies that male users are influenced by their significant other differently from female counterparts resulting in a moderating effect on the relationship between Social Influence and Behavioural Intention. More specifically, female respondents were more likely to be influenced by their significant others than their male counterparts.

This finding was supported by literature. One study that sought to establish the factors that can influence adoption of mobile banking among users of internet banking in Singapore confirmed that gender moderates social influence (Riquelme & Rios, 2010). This was consistent with research on mobile technology adoption in China (Park, et al., 2007).

A number of studies have established that women have a higher level of computer anxiety and are more techno-phobic than men. This makes them more reluctant to interact with technology (Igbaria & Chakrabarti, 1990) (Weil & Rosen, 1998). In addition, others studies

have established that women are more flexible towards compliance with other people's influence and orders which makes them accept behaviours if they are confirmed by a majority of people (Venkatesh & Davies, 2000); (Gefen & Straub, 2000). Venkatesh et al, (2000) demonstrated that women were more easily influenced to adopt new technologies than men.

In their study (Riquelme & Rios, 2010), exploring mobile banking adoption, researchers found that gender moderated some of the relatiohsips. Ease of use had a stronger influence on female respondents. At the same time relative advantage had a stronger effect on perception of usefulness on male respondents. Social norms influenced adoption more strongly among female respondents than male (Riquelme & Rios, 2010).

4.8.5 Risk

Risk was theorized to moderate the relationship between PT and BI. To analyse the effect of risk on trust, the respondents were divided into two, those who felt using mobile money was risky and those who did not. First, since there were three questions used to operationalize the Risk construct, a mean of the three questions rounded off to the whole number was determined, which generated a value between 1 and 5. To reduce the options and make the assessment meaningful, those who answered 'strongly agree' and 'agree' were grouped together as 'Risk Yes' while those who answered 'disagree' and 'strongly disagree' were grouped together as 'Risk No'.

'Risk Yes' were 31 while 'Risk No' were 184 both of which had a good fit as per Table 4-31. The rest were neutral about risk.

Table 4-31: Risk moderator fit indices

	Chi-Square	CMIN	Df	CMIN/df	RMSEA	PCLOSE	CFI	TLI
Risk Yes	167.5	175.1232	124	1.4123	0.0866	0.0021	0.9121	0.9249
Risk No	275.4	265.3102	124	2.1398	0. 0823	0.0077	0.9820	0.9676

In the context of information systems research and more particularly in e-commerce the two constructs, Trust and Risk, have been found to act independently on behaviour, or have a mediating relationship or have a moderating relationship (Gefen, et al., 2003). Other studies have attempted to explore Risk as a determinant of Trust, and vice versa - a mediating effect (Lee, et al., 2007); (Jarvenpaa, et al., 1998); (Sztompka, 1999); (Pavlou, 2001); (Olson & Olson, 2000). One particular study established that Trust and Risk can alternate in determining the intention to participate in an online transaction. In the study, the researchers established that for scenarios where Risk is low, Trust and not perceived Risk determines the intention and as the Risk increases, Trust takes a secondary role and the perceived Risk plays a greater role in determining intention (Gefen, 2002a).

Despite the varied views, the researcher had established a basis for investigating risk as a moderating variable of the relationship between trust and behavioral intention to adopt mobile money by the poor and confirmed this aspect. It however indicates that there is an opportunity to conduct further specific research on the relationship between these constructs.

Conclusion

This analysis chapter started off with a theorized model for mobile money adoption. After going through a rigorous analysis process, the outcome was a slightly different adoption model from the one theorized in chapter 4. Some of the paths were stronger than others, but the aim was to pick out the paths that were statistically significant. The hypotheses **H1, H3, H5, H6, H7** and **H8** were supported while **H2** and **H4** were not supported. Moderating variables had effects in some cases. H1a was partially supported whereby only gender and education moderated the relationship, implying that **H1a2** and **H1a3** were supported while H1a1 was not. **H3a** was partially supported. Age and gender were found to moderate the relationship; as such H3a1 and **H3a2** were supported while **H3a3** and **H3a4** were not. **H5a** was partially supported. Gender and Risk were found to moderate the relationship. **H5a2** and **H5a5** were supported while **H5a1, H5a3, H5a4** and **H5a5** were not. **H6a** was partially supported. Age and education were found to moderate the relationship. **H6a1 and H6a3** were supported while **H6a2** was not supported. **H7a** was not supported at all. None of the moderating variables were found to influence the relationship.

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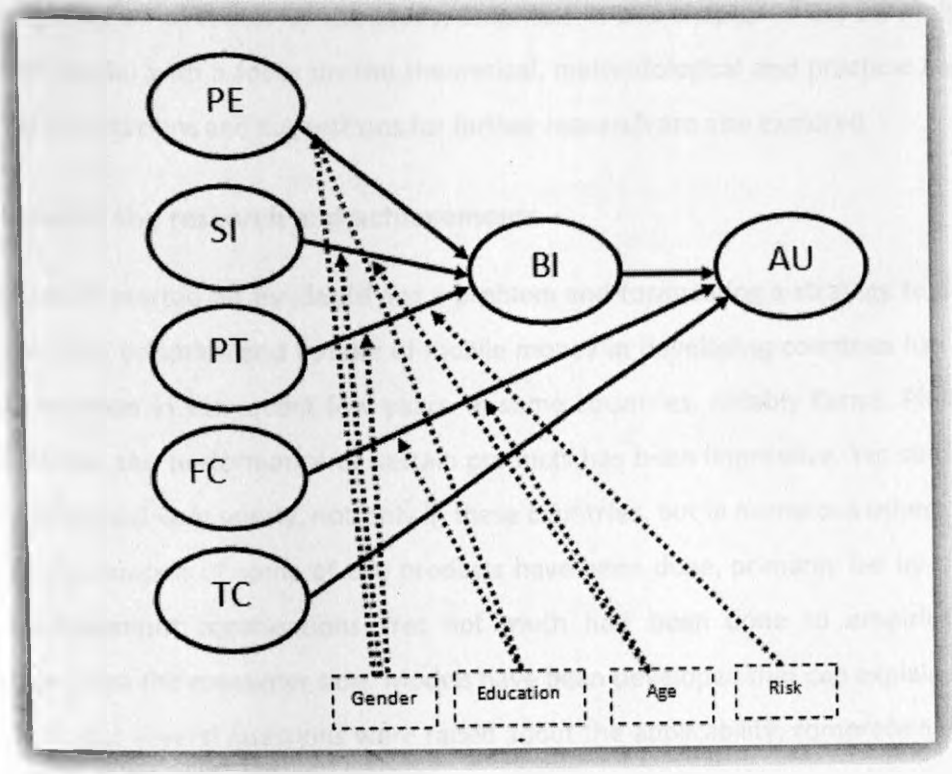
Based on the analysis, the revised mobile money adoption model is presented in Figure 4-11.

Figure 4-11: Revised mobile money adoption model



CHAPTER 5: ACHIEVEMENTS, CONTRIBUTIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Besides giving an overview of the study, emphasis in this chapter is laid on mobile money adoption model with a focus on the theoretical, methodological and practical implications. The study limitations and suggestions for further research are also explored.

5.2 Overview of the research and achievements

The research started off by identifying a problem and formulating a strategy to address the problem. The adoption and uptake of mobile money in developing countries has received a lot of attention in the recent few years. In some countries, notably Kenya, Phillipines and South Africa, the performance of certain products has been impressive. Yet some products have performed very poorly, not only in these countries, but in numerous others. Studies to explain the success of some of the products have been done, primarily led by the industry and development organisations. Yet not much had been done to empirically explain adoption from the consumer side. Models have been developed that can explain technology adoption. But several questions were raised about the applicability, comprehensiveness and relevance of these models to specific contexts and products.

The research set out to develop a model of technology adoption that will have the power to demonstrate adoption of the mobile money among the Kenyan BoP population. Prior to starting the study, the researcher developed a research question, which led to a set of three objectives namely a) Establish the relevant determining and moderating factors and use them to formulate a mobile money adoption model for Kenya's BoP, b) Validate the model using the data collected using Structural Equation Modelling (SEM) and c) Generate a research model that best describes Kenya's BoP mobile money usage behaviour intention and actual use.

The scope and significance were outlined, setting the foundation for the actual study. These aspects are recorded in chapter one of the thesis.

To develop the framework, the researcher rigorously reviewed literature on modelling, technology adoption, poverty in Kenya, constructs determining and moderating intention to

adopt and actually use mobile money. In addition, the researcher conducted preliminary exploratory studies to establish the drivers of adoption. This exploratory study, broadly translated into a book published under the title "Money, Real Quick: Kenya's Disruptive Mobile Money Innovation" (Omwansa & Sullivan, 2012). Upon understanding the models and constructs, the researcher developed a conceptual framework to guide this study. The framework was a modification and extension of the UTAUT - Unified Theory of Acceptance and Use of Technology model. The researcher provided substantial justification for starting off with UTAUT and for making the necessary extensions. After reviewing the UTAUT framework's moderators, it was deemed necessary to drop 'voluntariness' and add 'risk'. All the other moderators were retained. New constructs added were Trialability, Perceived Trust and Transaction Cost. All the constructs in the original UTAUT model were retained. From this framework, the researcher developed a set of hypotheses to guide the development of a research instrument. Details of these processes are discussed in chapter 2.

Chapter 3 elaborates the process of conducting the study, the research design, including the sampling process and the data collection instrument were presented. An instrument was developed, evaluated and tested through an iterative process. Over time, the instrument was improved and was scientifically evaluated for validity and reliability. Armed with a good instrument, the researcher designed a sample frame, determined a sample size and geographical location for collecting the data. With a set of research assistants, the researcher visited a set of locations within Nairobi, Kenya which are considered poor. The procedure for interviewing respondents was defined to ensure that it was as random as possible and the timing, convenient to users was pre-determined.

A minimum of 200 respondents was required and the researcher set out to collect responses form 300 people. The motivation for aiming for a larger number was to take care of unforeseen occurrences such as incorrect entries. At the end of the collection period, a total of 283 responses were obtained from users of three mobile money users, M-Pesa, Airtel Money and Orange Money. The researcher entered the data into SPSS, in preparation for analysis. Prior to the analysis, preliminary data management was done, cleaning and verifying the entries.

Using Structural Equation Modelling, a technique considered powerful in analysing multiple aspects at a time to enable one to answer interrelated questions in a single model, the

researcher began to test the validity of the model that was earlier conceptualized. The objective of this stage was to establish if the data that was collected was consistent with the model, a form of fitting. A two-step approach starting with the measurement model followed by the structural model was used to test the model fitness, verifying each step using conventional fit indices. The model was drawn in AMOS – Analysis for Moment Structures, a graphical tool designed for testing causal effects between constructs of models, while the data remained in SPSS. Linking the two applications, the researcher was able to analyse the model fitness, relevance of construct, power of relationships and causal effects.

The outcome of this analysis process was a model, which was a modification of UTAUT. The new model had five of the original six constructs retained (Performance Expectancy, Social Influence, Facilitating Conditions, Behavioural Intention and Actual Usage). Behavioural Intention remained a mediating construct to Actual Usage. In addition two constructs were confirmed valid (Perceived Trust and Transaction Costs). It was established that Effort Expectancy and Trialability did not influence Behavioural Intention. The moderators: age, gender, education and risk were found relevant and contributing to influencing specific paths of the model. Details of the data analysis process and discussions around the results are provided in chapter 4, which included an examination of the model in relation to the research findings.

With these findings, the researcher realized that there were several contributions and recommendations. The rest of the sections provide these details.

5.3 Revisiting the study objectives

The research aim was broken down into three objectives. The section that follows discusses each of the objectives and what was achieved.

Establish relevant determining factors and moderating factors and use them to formulate a framework of technology adoption for mobile money by those at the 'base of the pyramid' in Kenya

This objective was achieved in two ways. First through rigorous review of literature of adoption models. The models reviewed are in addition to these models. Studies conducted

on mobile banking, internet banking, e-commerce and related fields were used to establish which factors are considered relevant for mobile money adoption.

Secondly, the researcher conducted exploratory studies to obtain a set of variables that users considered important when determining what mobile money services to adopt. These variables were mapped to UTAUT to establish if they already exist. New variables were aggregated into constructs and used to extend the model, coming up with a framework that was later used to conduct this study. Besides the constructs, moderating variables were also modified.

Validate the model using primary data collected using Structural Equation Modelling (SEM)

Through a detailed methodology, guided by previous studies that have used SEM, the researcher meticulously translated the conceptual framework into a data collection instrument. The researcher obtained data from a well planned sample and then analysed it using SPSS and AMOS guided by the SEM steps.

Using SPSS as well as AMOS, the researcher validated the data. After a rigorous analysis process, including model modification, the data fit the model bringing the analysis process to a close, with a structural model (see Section 4.4 and Figure 4-10)

Generate a research model that best describes Kenya's 'base of the pyramid' mobile money usage behaviour and behaviour intention to adopt and use.

Out of the second objective above, a new framework with five exogenous variables (Performance Expectancy, Social Influence, Perceived Trust, Facilitating Conditions and Transaction Cost), two endogenous variables (Behavioural Intention and Actual Usage) and four moderating variables (Age, Gender, Education and Risk) was developed (See Figure 4-11).

5.4 Research contribution

This research makes a contribution to the body of knowledge from theoretical, methodological and practical or managerial points of view.

5.4.1 Theoretical contribution

From a theoretical point of view, the mobile money adoption model provides a basis for understanding relationships of the determinants and usage behaviour of mobile money. The relationship between these constructs and variables has a significant theoretical power. Through the review of literature and analysis, the research strengthens the appreciation of these constructs and moderators of not only influencing the adoption of technology, but more specifically of mobile money.

Synthesis of technology adoption literature

This study conducted a rigorous synthesis of literature ranging from adoption models, to poverty and then to mobile money. The nine most influential theoretical models relevant for technology adoption were reviewed. The models were reviewed with critical comparisons done to establish strengths and weaknesses of these models. Theoretically, the analysis of technology adoption model and in more detail the UTAUT demonstrated that direct mapping of such models does not work well when studying adoption of technology in developing markets and in particular mobile money.

The synthesis also included comparisons and evaluations of the various models. Strengths and weaknesses, gaps and developments were expounded. By relating, linking and critiquing, it was possible to make addition to the adoption model gaps that were identified.

The review of literature and methodology provided a broader understanding of the context of the study. The current technology adoption models were developed and tested in developed countries and in particular the USA (Venkatesh, et al., 2003). A few studies have been done exploring technology adoption in developing countries but none, as far as the researcher is aware, has focused on mobile money adoption in Kenya using an elaborately developed framework. Therefore, this study contributes to the body of knowledge on technology adoption by validating constructs and extending the well established UTAUT framework in the context of mobile money in a developing country.

Extension of literature to understand context

The review of literature was not conducted in a generic way. The context of a developing country, reflecting on the poor and mobile money innovation usage guided the review of the literature. In the process, details about poverty in Kenya, mobile technology growth in

Kenya, mobile money development in the country and the tran
and lives of people as a result of mobile money adoption was rev
review will form a foundation for further investigation in the area

Existing constructs were deeply investigated with the context of
develop the study framework and instrument, the research
articulate all the constructs in the right context. The research
understanding that new constructs of Perceived Trust and T
bearing on intention to adopt as well as actual use of mobile m
gender, education, experience and risk were generically d
contextualized. This value addition provides theoretical contrib
might find useful.

Prior to validating the model, the appreciation of all the constru
possible impact on behavioural intention and actual usage was

Generation of the new study framework for mobile money ad

In light of the unique setting, the study extended the UTA
Perceived Trust, Trialability and Transaction Cost as well as dr
variables and adding perceived risk. This review provided a
empirical studies in this area.

The extension of UTAUT to accommodate new constru
provided an additional contribution to the growing literatu
are additional relationships between constructs that need to
the case for developing countries where low cost technol
deployed rapidly.

This extended model is more comprehensive than the orig
opposite of the recommendation of parsimony well dis
models. However, researchers have argued that it is nec
order to facilitate understanding of concepts and relations
These additions add to the richness and depth of unders
seven exogenous variables and eight hypotheses.

single model. The two-step approach starting with the measurement model followed by the structural model is systematically presented to enable other researchers to adopt and apply in their studies.

There are various benefits of SEM (Byrne, 2001) over other multivariate techniques. For example, hypothesis testing is much easier, SEM provides explicit estimates of error variance parameters and that SEM analysis is able to combine both latent variables and observed variables

In addition, the study demonstrates use of multi-group analysis technique by AMOS to investigate the effect of moderating variables on the relationship between constructs.

The use of both SPSS and AMOS as tools for analysis should help researchers to understand about the options and capabilities of these tools.

5.4.3 Practical and managerial contribution

The results of this study have significant practical implications. Primarily, it demonstrates deploying mobile money services because there is perceived demand is not good enough. Given the large investment in developing and deploying mobile money services, a good understanding of the drivers of adoption is useful so as to make the organizations prioritize their resources appropriately.

The study helped to answer the question about what influences a user in adopting a mobile money service. Not only are the constructs now clear, their relative significance can be established.

It is important for management responsible for development and deploying mobile money services to think about the constructs and moderators established in this study. Organizations deploying mobile money services, and most certainly related technologies, must have the priorities right as regards these constructs and variables.

Performance expectancy is about value and usefulness of a mobile money service. A successful product like M-Pesa started off by filling a gap that already existed. Users conducted local remittances prior to the uptake of mobile money in Kenya, it is just that they used informal methods. By understanding this need, the management led the

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development of a simple, fast, reliable product to meet this need. Over time, the product evolved to meet more needs.

Facilitating is considered over loaded and can be analysed broadly in the context of mobile money. Users, particularly at the 'base of the pyramid', care a lot about supporting services around their money. They want to know about the processes and how to use the products. They want to be sure they can get help and technical support reliably. They want access to mobile network anytime, anywhere. They want to be sure they will access agent network for cash-in-cash-out services. These supporting services cannot be substituted by any other thing. This means management must prioritize the development of these services by allocating resources accordingly. Some practical recommendations include developing innovative consumer support solutions, train branch staff on handling technical customer issues, developing new knowledge management strategies, among others.

Social influence, sometimes called subjective norm or image, matters to the users of mobile money. Consumers at the 'base of the pyramid' depend a lot on what their significant others believe in. These people are not very literate or technologically savvy and they are sensitive due to the little money they have. They depend on the opinions of others. Unfortunately if those significant others have the wrong information, then they also become victims of wrong information. This means, the right information must reach these opinion leaders. When information is passed from one person to another, it evolves. The more accurate it is at the start of the chain, the better it is for the product. Management must then prioritize allocating resources in properly educating the market through advertising, marketing campaigns, promotions and similar initiatives.

Perceived Trust is a new construct investigated in this study. Mobile money providers must lay out strategies to make sure consumers, who are at the BoP develop trust in the product, and even more so in the provider. Trust can take time to build and can be lost within a very short time, therefore, systems to ensure trust is maintained are paramount. Lack of trust, privacy risks and perceived insufficient security can be addressed by taking specific steps like providing consumer reassurance and information; improving application security and privacy as well as assisting consumers in developing secure practices and risk management procedures. Trust can be lost very easily and should be treated as something fragile.

Some researchers view Transaction Cost as being a component of Facilitating Conditions. This research investigated them separately due to the nature of relationship with Actual Usage (being inversely related). Transaction Costs matter, more so to the poor and will determine adoption. These consumers are likely to sign up for mobile money and not other financial channels as banks. Pricing models for mobile money must always be comparatively determined.

Moderators also have practical implications. The way a mobile money service would be marketed to a young educated man would be different from that of an old un-educated woman. Gender, age, education level moderate some of the relationships. In addition risk moderates the relationship of trust. Management would need to be sensitive to these dynamics. For example since male users may perhaps be more persuaded by emphasizing the functionality, giving details of relative advantage of using specific mobile money services would increase their chances of adopting the product.

In a nutshell, as mobile money services are being rolled out all over the world, thinking about what determines adoption is vital. The research provides a basis for investigating what could make a new product work from a consumer point of view. In addition, for products that are already in the market and not necessarily doing well, the research informs what parameters to investigate further with the intention of strengthening the product and improving adoption.

5.5 Research conclusions

In this section, the researcher presents a summary of the key findings in form of conclusions from the work done and reported in this thesis.

UTAUT is a useful framework for studying technology adoption in western or non-western societies.

UTAUT was developed in an organizational setting in the USA. Most of the testing and application has been in similar setting. It may be tempting to consider that this model may not be applicable in a developing country or non-western context for that matter. From this study, it is possible conclude that in as much as the model needs adjustments to fit, it is applicable. Five constructs (Performance Expectancy, Social Influence, Facilitating Conditions, Behavioural Intention and Actual Usage) out of the original six constructs were

retained. Only one construct (Effort Expectancy) was dropped during the analysis. Only one moderator (voluntariness) was dropped during the formulation of the research conceptual framework. It is important to note that voluntariness can be retained in certain cases where users have a choice to use or not to use a specific technology. This is clear evidence that UTAUT model can be applied in diverse contexts.

Generic models cannot be applied directly without domesticating and contextualizing to areas of study

Venkatesh et al (2003) indicated that it is not possible to apply a model like UTAUT directly as it is to all context. Researchers must establish the uniqueness of their situations and find pragmatic ways of applying the models. In the context of Kenya, a developing country and in relations to the poor, there are new innovations constantly being developed and the societies are consistently evolving. Circumstances are not similar and will not remain similar as humanity continues to innovate solutions to problems. The researcher theoretically and empirically established clearly that UTAUT model needed to be modified in order to fit and address the unique aspects of the poor users of mobile money in Kenya.

Performance Expectancy, Social Influence, Perceived Trust play an important role in determining Behavioural Intention to use mobile money among the poor, and more so in developing countries.

Basing the conclusions on empirical analysis of primary data, backed by review of literature and evaluation of qualitative work, the researcher confirmed that the three exogenous constructs, Performance Expectancy, Social Influence and Perceived Trust do positively influence Behavioural Intention to adopt mobile money by the poor.

The users are sensitive to the actual value of mobile money. The products must be able to improve their lives in one way or another. They want the products to solve specific problems and these problems must be well understood by the providers. Low access to financial services or lack of formal options for that matter, do influence the adoption of mobile money.

Users are also influenced by other significant individuals. They make decisions to adopt and use mobile money depending on who else is using. Due to low literacy levels, the poor may not have solid technical knowhow to appreciate the features, capabilities or even the risks

associated with any technologies. Instead, they are likely to rely more on what their significant others may say. This is likely to be even stronger for the women than the men.

Perceived trust in a product or technology for that matter, possibly coupled by trust in the provider or the agent who is the interface to the provider influences Behavioural Intention. The trust would be a vote of confidence on the provider and the product. The study focused on the trust in the product as opposed to the provider.

Facilitating Conditions, Transaction Cost and Behavioural Intention determine actual usage of mobile money.

Mobile money users care about the technical support, customers support, access to agents and knowledge about mobile money. They want to feel empowered and able to access information about their transactions. Money is sensitive and it is even more likely to be for the poor. Information about transaction costs, transaction history and access to human agents should be as conveniently available as possible. The provision of instant messages indicating what transactions have been conducted with fine details about date, time, amount, recipient, sender and balance are all important forms of facilitating conditions.

Transaction Cost influences adoption of mobile money. It is an objective issue and people use it to make a decision as to whether they will use a technology or not. Unlike the original UTAUT, where the model was developed in a context where the organization purchased the software for the employees, mobile money kind of products cost the consumer every moment they use the service. From qualitative assessment, users indicated that the Transaction Cost might become a secondary factor depending on how significant other constructs like Performance Expectancy, Social Influence or Perceived Trust are.

Behavioural Intention is a mediating factor which increases the predictive power of the other exogenous constructs.

Age, gender, education and risk moderate the relationships between constructs that determine behavioural intention as well as actual usage.

Moderating variables affect the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable. Age, Gender,

Education and Risk were found to influence specific paths in the final model. Experience did not seem to influence any relationship.

Gender and education moderate the relationship between Performance Expectancy and Behavioural Intention. The relationship between Social Influence and Behavioural Intention is moderated by Gender and Age. Perceived Trust linking to Behavioural Intention is moderated by Gender and Risk. Education and Age moderate the relationship between Facilitating Condition and Actual Usage, while Transaction Cost's like with Actual Usage is not moderated by any variable.

Evaluating products and the market is critical before and during deployment of mobile money services.

As deployments are launched all over the world, it is absolutely important to develop the products bottom-up. This means that mobile money providers must first evaluate the needs, design relevant solutions, test them and evolve them to not only meet specific needs but also ensure that consumers are part and parcel of the development.

The evaluation of the market and product should be customized and sensitive to local specific circumstances. The framework used for this study had to be customized in order to be appropriate and relevant.

5.6 Assumptions and Limitations

5.6.1 Assumptions of the study

There were assumptions made, given some issues were somewhat of the control of the researcher.

Rationality

As Ajzen & Fishbein (1980) argue, the researcher made the assumptions that the individuals are rational and make systematic use of the information available to them to take action. Their choices to adopt mobile money products was rational. Individuals consider the implications of their actions before they decide to engage or not engage in a given behaviour (Ajzen & Fishbein, 1980).

Voluntary use

It was assumed that usage of mobile money was voluntary. In other studies, voluntariness is used as a moderating factor.

Satisfaction

It could not be ruled out if at some point in future the users would quit using specific mobile money products. It was assumed that users were happy and satisfied with the product they were using. Some responded indicating that they do not intend to continue using the specified product. These responses were factored when doing the analysis.

Supply side factors

There are many supply side factors that change rapidly particularly in the mobile technology industry. The researcher made the assumptions that the supply side and even environmental factors were similar for the respondents.

Honesty of responses

The researcher assumed that respondents were honest about their answers. Measures were put in place to guarantee unanimity and confidentiality. Respondents had a choice to withdraw from the study if they so wished. Respondents participated in free will and therefore it was assumed that they wouldn't lie when answering. The researcher was conscious that respondents could mislead about their age or level of education. The researcher framed the questions in a manner that it wouldn't be easy to mislead without having to think hard.

5.6.2 Limitations of the study

In as much the study produced meaningful results, it has some limitations.

Original model

The researcher argued that the context of African countries is different from western ones. However the basis of the conceptual framework was a western developed model. This may appear as a contradiction as researchers may wish to see a bottom up developed model factoring the local context issues. The limitation under which this research was done did not

allow for the model to be developed without riding on existing ones. This provides a huge opportunity for further research in the same area.

Internal Validity

Respondents did indicate that they used or intended to use the various mobile money services. There was no way of obtaining evidence about this. The only sure way is to conduct an analysis of the data held by the MNOs regarding the actual usage. This has a privacy and ethical implication. This leads to the conclusion that internal validity can be questioned because despite the level of vigour in designing the instrument and conducting the analysis the final outcome is a proxy measure of participants self perceptions (Campbell & Stanley, 1963).

Broad application of the findings

The study was conducted among poor people in the city of Nairobi in a specific technology domain of mobile money. The users in Nairobi, Kenya may have different characteristics from other regions and countries. It is therefore uncertain if the findings can be applied more broadly.

Use of multiple mobile money services

The possibility that some users were using multiple mobile money services exists. This leads to a possibility that some respondents answered questions about one product possibly while under some kind of influence from the use of the other product. For purposes of this study, for every respondent who was obtained in the context of a specific mobile money service, there was no discussion about whether or not they had signed up or were currently using another product.

Representativeness of the data

Due to logistical constraints, the data was only collected in poor areas in Nairobi. In as much as this gives an indication of poor people in Kenya, having all cultural groups accommodated, the sampling was not a national representation. It was also observed that the sampling was not designed to distribute respondents proportionately e.g. Enumeration Areas did not have same number of users and therefore could not have same number of respondents. In

addition, interviewing the first set of respondents who arrived at an agent shop did not accommodate for gender disparities in the subscriber base.

Regarding weighting, though the researcher interviewed respondents in the ratio of market share of the mobile money products, equal number of respondents were obtained from all sampled enumeration areas. This suggests that the number of agents and consumers is equal in all the areas, which is not the case. In this case the data was not obtained proportionately.

Qualification of poor

Data was collected from the poor areas. In as much as there was a qualifying question to establish the income levels, no further verifications were done. The researcher relied on what the respondents said about their income level. The nature of the study did not lay emphasis on the accuracy of the figures mentioned, rather depended more on the indicative nature of those figures.

Duration of mobile money existence

Mobile money has existed in Kenya for about five years. This is not a very long time compared to other technologies that have been investigated in other studies. In addition, the different providers launched their products at different times, creating a gap in terms of product development and value addition. The earliest, M-Pesa had significantly penetrated the market by the time the others were rolling out.

7 Recommendations for further study

Trust can be investigated more deeply. In the context of mobile money, trust can be manifested in multiple perspectives. The trust relationship can be linked to the product, the provider, the agent (face of the provider) among others. Culture does influence perceptions, not just for trust, but among other aspects, making it worth investigating further.

Considering the short duration of mobile money existence in Kenya and even more so in other developing markets, the opportunity to do rigorous study after the market has stabilized will be valuable. After five years since introduction, the uptake of mobile money in Kenya has been exponential. It is likely that as products get more and more integrated in

consumers' lives and financial literacy gets more and more advanced, the decisions by users could be influenced by other additional factors. In addition, the features offered by mobile money services are evolving. It is expected that in the near future, users will access micro-insurance, micro-savings, micro-lending and similar services. These in one way or another, may have an impact on the users' perceptions.

Much of the current technology adoption research uses Davis' TAM as opposed to UTAUT. Many researchers have extended TAM to study similar technologies. However, UTAUT provides a more robust framework for this kind of study. It is worth investigating the constructs in further detail because they are more comprehensive than previous models' constructs.

Some of the constructs in the model need to be investigated further with an intention of unpacking them further. Facilitating Conditions, for example, is potentially a very loaded construct. In the context of mobile money adoption, it would involve aspects like access to agent network, knowledge of how to operate mobile money services, access to customer support services and mobile network coverage, among others. This is relatively broad and may need to be unpacked and investigated further. Probably some of these components would matter less than others. During the qualitative fieldwork, respondents consistently indicated that access to agent network was very crucial. Apparently it seemed much more crucial than ability to get customer service from the mobile money provider.

Another construct that could be investigated further is the Social Influence. Researchers in literature have argued that the relationship between SI and BI becomes weaker as time passes and users become more experienced. Early adopters, who lack much information and are less familiar with the technology making them reliant on other people's opinions. At the same time, mobile money services are evolving and becoming more and more useful, making the user's value specific products more than others. As such the effect of SI on BI may be gradually influenced. Besides, the opportunity to investigate the relationships between constructs also exists. For example, SI and PE or obtain the effect of time and usage on other constructs and paths.

Cross product studies can also be conducted to un-earth the interrelationships between constructs. Transaction cost, for example, was found to influence actual usage. There is an

opportunity to investigate further and establish how this construct relates to other constructs. In particular, some mobile money services are more successful than others, yet they are not necessarily the cheapest. Performance expectancy as well may mislead and needs further investigation. Individual mobile money services offer more features than others. One would assume that these features should be valuable to users making them want to sign up for them. Yet this does not always happen.

Technology uptake, more so mobile phone based, in developing countries has mushroomed rapidly in the last few years. Most of this is driven by the rapid diffusion of mobile phones among the users. Mobile money is considered one of the most successful innovations in the developing market. There are several other innovations which have not taken much root, such as m-learning, m-health and m-agriculture. There is an opportunity to investigate the drivers of adoption for these other relevant initiatives more so in the developing countries.

5.8 Evaluation of the research study

This research work was evaluated based on the recommendations provided by Whetten (1989). In his paper titled "What Constitutes a Theoretical Contribution", Whetten presents the argument that a complete theory must contain four elements namely *what, how, why* and a combination of *who, where and when* (Whetten, 1989).

The first three aspects provide a description and an explanation. Below is a brief description of the *what, how and why* with a short mapping to this mobile money study.

'What' describes the constructs, variables or factors logically considered relevant in explaining the subject under study. To judge the extent to which the research has included the right factors, two dimensions are proposed: comprehensiveness (all relevant factors included) and parsimony (deleting factors that add little value). In this study, literature and qualitative studies were used to develop a conceptual framework that was comprehensive. Using all the constructs of UTAUT, the researcher was convinced that the starting point was solid enough. By adding new constructs, with clear justification, the researcher strengthened the comprehensiveness argument. Using rigorous analysis, a number of constructs, measurements and variables were justifiably deleted making the model parsimonious.

'How' expounds on the relationships between constructs. Using arrows and boxes the researcher was able to add order and causality. Though a researcher may not be able to test these causal effects, the relationships are not invalidated (Whetten, 1989). These arrows and boxes clearly indicate what the researcher is thinking and makes understanding by the reader much better. In the case of this mobile money study, the researcher presented a conceptual framework of nine constructs using boxes and multiple arrows between from the exogenous to endogenous constructs (see Figure 2-18). The arrows helped to show how the exogenous constructs were theorized to cause the endogenous variables.

'Why' provides the justification for the constructs and relationships. This is where the rational and assumptions about the various decisions are presented. The researcher presented these arguments while building the conceptual framework. Each construct included in the study framework was meticulously discussed, leading to an argument for inclusion. The relationships between constructs are as well backed by literature. Removal of constructs, measurements and variables from the study framework was also argued out and justified.

'Who', 'where' and 'when' provide the limitations of the proposition presented in the study. It is not possible to generalize findings when a study does not cover all scenarios. These three aspects provide the context, setting the boundaries of the generalizability. Whetten recommends that in as much as researchers would want to focus their studies to specific limitations, they should think about the effect of aspects like time. By testing the what, how and why in different settings, researchers are able to discover the limiting conditions. The researcher in this study elaborated that the target audience was the poor people living in Nairobi. Using a detailed sampling technique identified the 'who' and 'where' for the study. The timing is important; the respondents informing the study had used mobile money for at least four years and were located at a specific time of this study.

Beyond these aspects discussed above, Whetten expressed the need for researchers to understand the factors considered in judging conceptual papers. These are factors that reviewers consider. In particular the factors include clarity of expression, impact on research, timeliness and relevance. This proposal was translated to a set of seven questions which aimed at answering the broad question of what really constitutes a publishable theoretical research.

Below the researcher answers the seven questions as presented by (Whetten, 1989) as a way of evaluating the research. While some of the issues mentioned here have been presented under Section 5.4 on the contribution of this research, this section follows the structured and systematic way of evaluating contributions made.

1. **Does the study make significant value-added contribution to current thinking?**

   The model developed from this research is not totally new. The constructs in it are available in other research theses and papers. The outcome, which is a modified UTAUT does provide insight on domestication of models. The researcher makes effort to explain why constructs earlier thought to be critical, such as effort expectancy and trialability are dropped. In addition, new constructs (transaction cost and perceived trust) are convincingly introduced. In addition alterations were done to specific moderating variables. Though these modifications are not radical, they do provide substantial and significant value addition to current thinking about technologies for the 'base of the pyramid' and more particularly, on mobile money.

2. **Will the study change the practice of IS implementation in this area?**

   Information Systems practice, particularly mobile application at the 'base of the pyramid' will be influenced by the outcome of this study. Researchers, developers and implementers will find the details worth thinking about. The findings show what may not be or may be critical to consider. The researcher made effort to demonstrate that the outcome is not just a modified or tweaked model; it is actually aimed at altering research and implementation practice. Researchers should be more in tune with relevant constructs, developers should be more in touch with what the consumers actually expect while implementers should consistently monitor the consumers needs.

3. **Are the underlying logic and supporting evidence compelling?**

   Backing all arguments presented in the thesis with literature or rational justification, the researcher made effort to ensure that what is written is believable or reasonable. Assumptions were made in the introduction, literature review and methodology chapters, with specific arguments as to why. For example, addition of constructs to the original UTAUT framework was done after broad study and qualitative work which was presented precisely. The approach was used in all sections where choices were made.

The researcher also made effort to provide compelling evidence for whichever choices were made. This evidence was obtained from literature and qualitative work. In the analysis and discussion chapter, the researcher logically followed the steps provided for SEM analysis providing evidence from conclusions made at every level. This led to logical conclusions outlined in this last chapter.

4. **How well does the research convey completeness and thoroughness?**

The theoretical elements of *what, how, why* as well as *who, where and when* are all provided. This was done in order to guarantee completeness and thoughtfulness. To address completeness, the researcher dug deep into areas on and beyond mobile money demonstrating current understanding of the subject. In each chapter and section, not only did the researcher demonstrate familiarity with the latest development in that aspect, but also the fact that the thoughts were developed over a period of time with peer input.

5. **Is the thesis well written and does it flow logically?**

The study is reported in this thesis in a logical developmental manner. In five chapters, the researcher builds the arguments to a climax making it easy to follow the thought process. Key aspects of the study are easily identifiable from the table of contents as well as the topics and subtopics in the document. The introduction chapter sets the pace for the study providing the rationale, scope and expected work. The literature review chapter expounds on relevant work and builds into a conceptual framework for the study. The methodology chapter systematically elaborates on how the study was conducted. The findings and discussions chapter gives a view of what the researcher found, and for each finding discusses what it implies. Finally the last chapter (Achievements, Contributions, Conclusions and Recommendations) wraps everything up showing what was achieved and its implications. The researcher made effort to remain professionally consistent in the format as well as specifications.

6. **Why now? Is the topic of interest to researchers and practitioners in this area?**

This study is timely. The interest in aspects like addressing global poverty, encouraging savings, increasing efficiency, serving the 'base of the pyramid', developing innovative and relevant applications and similar aspects is very high in modern times. All these

aspects are relevant to mobile money. Researchers interested in linking the existing adoption models to developing country contexts will find the theoretical choices made in this study valuable. Practitioners from institutions such as financial sector regulators, communication sector regulators, financial institutions, telecommunication companies, non governmental institutions interested in development among others will all find this topic relevant.

The study is likely to stimulate further discussions as to what really matters when designing, deploying mobile money services and more generally low cost technologies for masses at the 'base of the pyramid'. Established arguments about technology adoption are likely to be revisited with contextualization in mind.

7. **Who else including academics reader is interested in this topic?**

This topic is of interest to a number of individuals and organisations. Policy makers in areas such as development, financial services, telecommunication, economic planning and poverty reduction will find it useful when shaping policies that influence how related interventions are likely to be adopted. Development minded organizations, telecommunication and financial sector regulators, financial institutions, telecommunication companies and independent providers of mobile money applications will find this topic relevant.

The researcher made effort in developing the arguments that the readership is not too specific, rather a broader audience will find value in this concepts.

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Appendix 1: Questionnaires

MM ADOPTION QUESTIONNAIRE

(Customized for the three MM products)

Filter Question

1a)	Which of these ranges best describes your household income per month in terms of salary or wages in KShs? • Less than 10,000 • Between 10,000 and 20,000 • Between 20,000 and 30,000 • Between 30,000 and 40,000 • Over 40,000	
1 b)	Which of these ranges best describes your household income per month in terms of self employment and property income or business or income from agricultural produce and farming in KShs? • Less than 10,000 • Between 10,000 and 20,000 • Between 20,000 and 30,000 • Between 30,000 and 40,000 • Over 40,000	
	TOTAL	

If total of 1 a) and 1 b) is less or equal to KShs. 23,671, then proceed with questionnaire, otherwise, terminate.

Gender: [__] Male [__] Female

Year of Birth

Highest class attended (level in school):

How long have you used M-PESA?

__] < 6 months

__] 6 months to ONE year

__] ONE year to TWO years

__] TWO years to THREE years

__] THREE years to FOUR years

ETERMINANTS

ERFORMANCE EXPECTANCY

M-PESA is very useful in managing my finances.

M-PESA inanisaidia kuhifadhi na kupanga fedha zangu)

__] Strongly disagree [Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

. I do not need to go to bank frequently because I use M-PESA

(Sihitaji kutembelea banki mara kwa mara kwa sababu niko na M-PESA)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

8. I save time by using M-PESA *(M-PESA hunisaidia kuokoa mda)*

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

EFFORT EXPECTANCY

9. M-PESA was easy to learn

(M-PESA ilikuwa rahisi kujifunza)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

10. M-PESA is easy to use

(M-PESA ni rahisi kutumia)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

11. The registration process for M-PESA was simple and easy

(Mpangilio wa kusajiliwa kwa M-PESA ulikuwa rahisi na wa kueleweka)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

SOCIAL INFLUENCE

12. My parents, siblings and friends think that I should use M-PESA.

(Wazazi, ndigu zangu and marafiki wanaona ni vyema nitumie M-PESA)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

13. My friends use M-PESA.

(Marafiki wangu hutumia M-PESA)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

4. Using M-PESA makes me feel better than those who do not use it.

(Nikitumia M-PESA najihisi vyema kuliko wasiotumia)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

FACILITATING CONDITIONS

5. I know how to use M-PESA very well *(Najua kutumia M-PESA vizuri sana)*

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

16. I get help from the Safaricom about M-PESA when I need it.

(Nikihitaji msaada kutoka Safaricom kuhusu M-PESA, ninasaidiwa)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

17. Agents are available for me to use M-PESA

(Agents wa M-PESA wako karibu)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

PERCEIVED TRUST

18. If I made a mistake or lost my phone, the M-PESA safeguards my money and information.

(Nikifanya makosa wakati ninatumia M-PESA, kila kitu kitahifadhiwa)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

19. My financial information is safe when I use M-PESA

(Hakuna mtu anaweza kuona habari ya fedha zangu ninapotumia M-PESA)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

20. People working and managing M-PESA can be trusted

(Watu wanaosimamia M-PESA wanaaminika)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

TRANSACTION COST

21. The transaction costs for M-PESA are too high *(Gharama ya kutumia M-PESA iko juu sana)*

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

22. Sometimes I do not send money because sending M-PESA is expensive.

(wakati mwingine situme pesa kwa sababu garama ya kutumia M-Pesa ni kubwa)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

23. M-PESA is cheaper than Western Union and Banks.

if never used these channels, compare it with travelling by matatu to take the money to recipient

(M-PESA ina gharama ya chini kuliko Western Union ama Benki)

[__] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

TRIAL-ABILITY

24. I encourage new users to try M-PESA with little money, before starting to use it.

(Ninawashauri watu wajaribu M-PESA na pesa kidodo, kabla waanze kuitumia kabisa)

[_] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

25. I tried out the M-PESA service I use before adopting it fully

(nilijaribu M-PESA nione iwapo inafanya kazi vizuri kabla sijaitumia)

[_] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

26. If I try other services like Orange Money or Airtel Money etc for free, I could end up using them.

(Nikijaribu Orange Money ama Airtel Money, bila malipo kwanza, huenda nikaanza kuzitumia)

[_] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

MODERATORS

PERCEIVED RISK

27. Transacting in M-PESA is risky, the information I send can be accessed by other people.

(Kuna hatari nikitumia M-PESA, ujumbe ninaotuma unaweza kujulikana)

[_] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

28. The cash I put in M-PESA could possibly get lost.

(Pesa nilizoweka kwa M-PESA zaweza kupotea)

[_] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

29. The M-PESA technology can fail, e.g. the network collapse

(Teknologia ya M-PESA inaweza kuharibiba wakati wowote)

[_] Strongly disagree (Nakataa kabisa)	[__] Disagree (Nakataa)	[__] Neutral (Sina Uamuzi)	[__] Agree (Nakubaliana)	[__] Strongly agree (Nakubaliana kabisa)

ENDOGENOUS VARIABLES

BEHAVIORAL INTENTION

30. I intend to continue using M-PESA in the future

nitaenelea kutumia M-PESA siku za usoni)

[__] Strongly disagree	[__] Disagree	[__] Neutral	[__] Agree	[__] Strongly agree
(Nakataa kabisa)	(Nakataa)	(Sina Uamuzi)	(Nakubaliana)	(Nakubaliana kabisa)

31. I recommend people to use M-PESA

ninawahimiza watu kutumia M-PESA)

[__] Strongly disagree	[__] Disagree	[__] Neutral	[__] Agree	[__] Strongly agree
(Nakataa kabisa)	(Nakataa)	(Sina Uamuzi)	(Nakubaliana)	(Nakubaliana kabisa)

ACTUAL USAGE

32. I use M-PESA to receive money *(ninatumia M-PESA kupokea pesa)*

[__] Strongly disagree	[__] Disagree	[__] Neutral	[__] Agree	[__] Strongly agree
(Nakataa kabisa)	(Nakataa)	(Sina Uamuzi)	(Nakubaliana)	(Nakubaliana kabisa)

33. I use M-PESA to send money *(ninatumia M-PESA kutuma pesa)*

[__] Strongly disagree	[__] Disagree	[__] Neutral	[__] Agree	[__] Strongly agree
(Nakataa kabisa)	(Nakataa)	(Sina Uamuzi)	(Nakubaliana)	(Nakubaliana kabisa)

34. I use M-PESA to save money *(ninatumia M-PESA kuweka hakiba ya pesa)*

[__] Strongly disagree	[__] Disagree	[__] Neutral	[__] Agree	[__] Strongly agree
(Nakataa kabisa)	(Nakataa)	(Sina Uamuzi)	(Nakubaliana)	(Nakubaliana kabisa)

Appendix 2: Chi-Square Statistics

Table of Chi-square statistics

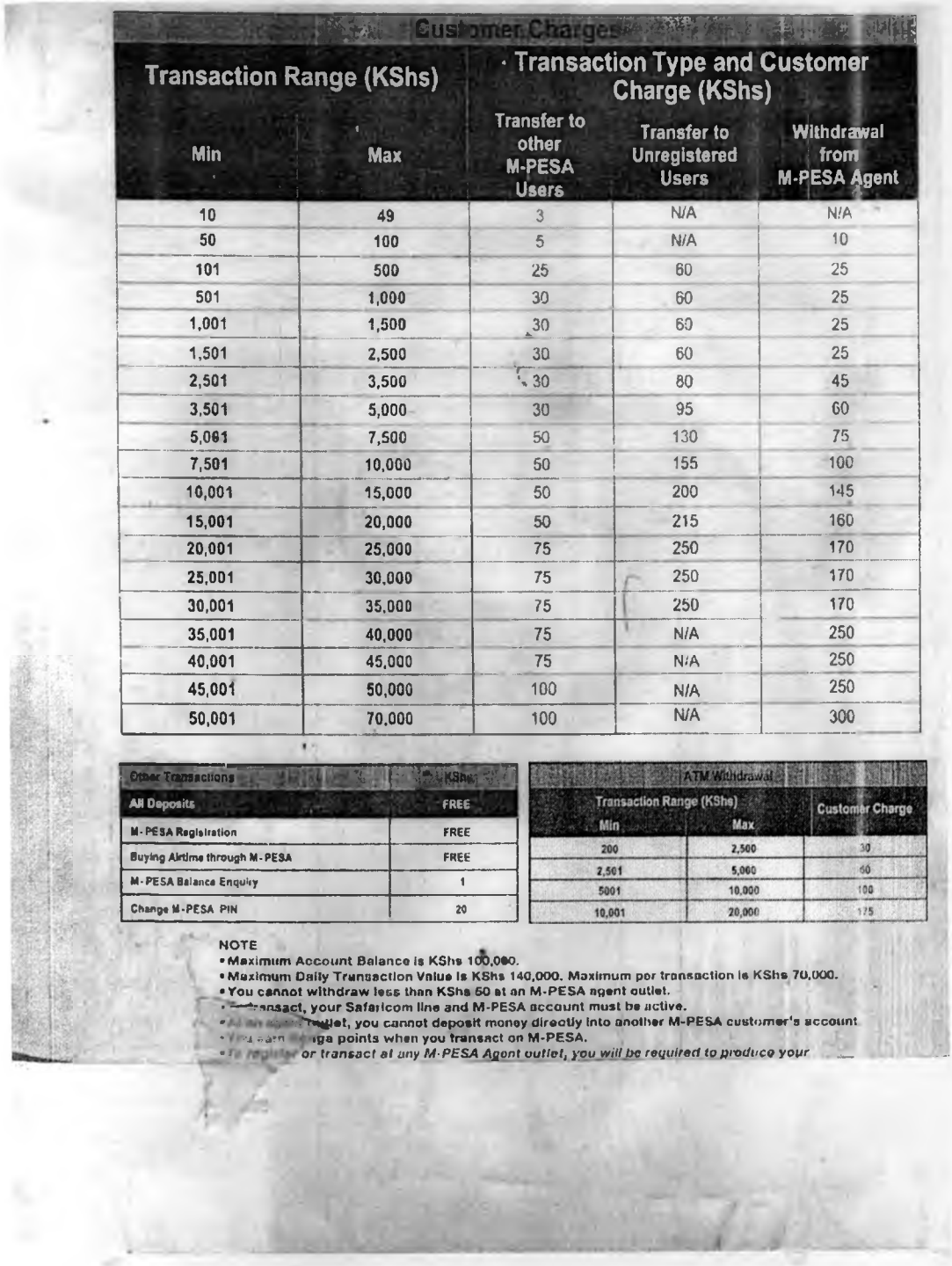
df	P = 0.05	P = 0.01	P = 0.001
1	3.84	6.64	10.83
2	5.99	9.21	13.82
3	7.82	11.35	16.27
4	9.49	13.28	18.47
5	11.07	15.09	20.52
6	12.59	16.81	22.46
7	14.07	18.48	24.32
8	15.51	20.09	26.13
9	16.92	21.67	27.88
10	18.31	23.21	29.59
11	19.68	24.73	31.26
12	21.03	26.22	32.91
13	22.36	27.69	34.53
14	23.69	29.14	36.12
15	25.00	30.58	37.70
16	26.30	32.00	39.25
17	27.59	33.41	40.79
18	28.87	34.81	42.31
19	30.14	36.19	43.82
20	31.41	37.57	45.32
21	32.67	38.93	46.80
22	33.92	40.29	48.27
23	35.17	41.64	49.73
24	36.42	42.98	51.18
25	37.65	44.31	52.62
26	38.89	45.64	54.05
27	40.11	46.96	55.48
28	41.34	48.28	56.89
29	42.56	49.59	58.30
30	43.77	50.89	59.70
31	44.99	52.19	61.10
32	46.19	53.49	62.49
33	47.40	54.78	63.87
34	48.60	56.06	65.25
35	49.80	57.34	66.62
36	51.00	58.62	67.99
37	52.19	59.89	69.35
38	53.38	61.16	70.71
39	54.57	62.43	72.06
40	55.76	63.69	73.41

41	56.94	64.95	74.75
42	58.12	66.21	76.09
43	59.30	67.46	77.42
44	60.48	68.71	78.75
45	61.66	69.96	80.08
46	62.83	71.20	81.40
47	64.00	72.44	82.72
48	65.17	73.68	84.03
49	66.34	74.92	85.35
50	67.51	76.15	86.66
51	68.67	77.39	87.97
52	69.83	78.62	89.27
53	70.99	79.84	90.57
54	72.15	81.07	91.88
55	73.31	82.29	93.17
56	74.47	83.52	94.47
57	75.62	84.73	95.75
58	76.78	85.95	97.03
59	77.93	87.17	98.34
60	79.08	88.38	99.62
61	80.23	89.59	100.88
62	81.38	90.80	102.15
63	82.53	92.01	103.46
64	83.68	93.22	104.72
65	84.82	94.42	105.97
66	85.97	95.63	107.26
67	87.11	96.83	108.54
68	88.25	98.03	109.79
69	89.39	99.23	111.06
70	90.53	100.42	112.31
71	91.67	101.62	113.56
72	92.81	102.82	114.84
73	93.95	104.01	116.08
74	95.08	105.20	117.35
75	96.22	106.39	118.60
76	97.35	107.58	119.85
77	98.49	108.77	121.11
78	99.62	109.96	122.36
79	100.75	111.15	123.60
80	101.88	112.33	124.84
81	103.01	113.51	126.09
82	104.14	114.70	127.33
83	105.27	115.88	128.57
84	106.40	117.06	129.80
85	107.52	118.24	131.04
86	108.65	119.41	132.28
87	109.77	120.59	133.51

88	110.90	121.77	134.74
89	112.02	122.94	135.96
90	113.15	124.12	137.19
91	114.27	125.29	138.45
92	115.39	126.46	139.66
93	116.51	127.63	140.90
94	117.63	128.80	142.12
95	118.75	129.97	143.32
96	119.87	131.14	144.55
97	120.99	132.31	145.78
98	122.11	133.47	146.99
99	123.23	134.64	148.21
100	124.34	135.81	149.48

Appendix 3: Transaction costs for the three mobile money services

Transaction Cost for M-Pesa[1]



Customer Charges

Transaction Range (KShs)		Transaction Type and Customer Charge (KShs)		
Min	Max	Transfer to other M-PESA Users	Transfer to Unregistered Users	Withdrawal from M-PESA Agent
10	49	3	N/A	N/A
50	100	5	N/A	10
101	500	25	60	25
501	1,000	30	60	25
1,001	1,500	30	60	25
1,501	2,500	30	60	25
2,501	3,500	30	80	45
3,501	5,000	30	95	60
5,001	7,500	50	130	75
7,501	10,000	50	155	100
10,001	15,000	50	200	145
15,001	20,000	50	215	160
20,001	25,000	75	250	170
25,001	30,000	75	250	170
30,001	35,000	75	250	170
35,001	40,000	75	N/A	250
40,001	45,000	75	N/A	250
45,001	50,000	100	N/A	250
50,001	70,000	100	N/A	300

Other Transactions	KShs
All Deposits	FREE
M-PESA Registration	FREE
Buying Airtime through M-PESA	FREE
M-PESA Balance Enquiry	1
Change M-PESA PIN	20

ATM Withdrawal		
Transaction Range (KShs)		Customer Charge
Min	Max	
200	2,500	30
2,501	5,000	60
5001	10,000	100
10,001	20,000	175

NOTE
- Maximum Account Balance is KShs 100,000.
- Maximum Daily Transaction Value is KShs 140,000. Maximum per transaction is KShs 70,000.
- You cannot withdraw less than KShs 50 at an M-PESA agent outlet.
- [illegible]transact, your Safaricom line and M-PESA account must be active.
- [illegible]tlet, you cannot deposit money directly into another M-PESA customer's account
- [illegible]ge points when you transact on M-PESA.
- *[illegible] or transact at any M-PESA Agent outlet, you will be required to produce your*

[1] http://www.safaricom.co.ke/personal/m-pesa/m-pesa-services-tariffs/tariffs

Transaction Cost for Airtel Money [2]

Transaction Type	Transaction Limits (Kshs.)		Customer Charge (Kshs.)
	Min	Max	
Deposit Money	50	70,000	FREE
Send Money to airtel Customer	50	100	5
	101	70,000	25
Send Money to Other Network Customer	101	35,000	25
Withdraw Money from airtel money Agent	50	100	15
	101	2,500	25
	2,501	5,000	45
	5,001	10,000	75
	10,001	20,000	145
	20,001	35,000	170
	35,001	50,000	250
	50,001	70,000	300
Withdraw Money from ATM*(Pesapoint)	200	2,500	40
	2,501	5,000	55
	5,001	10,000	80
	10,001	20,000	175

Transaction Type	Customer Charge (Kshs.)
airtel money Balance Check	1
Change of Nickname	20
Change of airtel money PIN	20
Buy Airtime	FREE
Transaction Reports	20

*Withdrawals for both on-net and off-net customers cost the same.

**Customers from other networks cannot withdraw more than Kshs.35,000 per transaction.

[illegible]

[2] http://www.africa.airtel.com/wps/wcm/connect/africaairtel/Kenya/AirtelMoney/get_airtel_money/tariff/

Transaction Cost for Orange Money (Part 2)[3]

Orange Money

Tariff

TRANSACTION TYPE	TRANSACTION RANGE		TRANSACTION FEES
	Min	Max	Ksh
Orange Money Registration	N/A	N/A	Free
Orange Money Debit Card Application	N/A	N/A	400
[redacted]			
Cash Deposit	100	100,000	Free
Buy airtime (For self or other)	10	10,000	Free
Send Money to a registered Orange Money user	100	35,000	30
	35,001	50,000	40
	50,001	100,000	50
Withdrawal by a registered Orange Money user	100	2,500	25
	2,501	5,000	45
	5,001	10,000	75
	10,001	20,000	145
	20,001	35,000	170
	35,001	50,000	195
	50,001	100,000	225
Send Money to a non-registered user	100	2,500	70
	2,501	5,000	90
	5,001	10,000	155
	10,001	20,000	305
	20,001	35,000	355
	35,001	50,000	390
	50,001	100,000	450
Withdrawal by a non-registered user	100	100,000	Free
ATM Withdrawal by a registered Orange Money user	100	2,500	40
	2,501	5,000	60
	5,001	10,000	100
	10,001	40,000	175
ATM Withdrawal using Orange Money Debit Card	0	40,000	40
Pay for goods and services using Orange Money Debit Card			Free
Pay B[redacted] Transactions	100	100,000	Varies. See note below
[redacted]			
Transfer to Equity Account	100	35,000	30
	35,001	50,000	40
	50,001	100,000	50
Transfer to Any Bank Account	100	35,000	400
	35,001	50,000	450
	50,001	100,000	500
Transfer from My Equity Account to Orange Money	100	35,000	30
	35,001	50,000	40
	50,001	100,000	50

[3] http://money.orange.co.ke/forms/Orange_Money_Tariff_Guide.pdf

Appendix 4: Detailed data table of enumeration areas in Nairobi

NUM	DIVISION	LOCATION	SUB_LOC	EANAME	STRATA
1	KASARANI	ROYSAMBU	ROYSAMBU	MARURUI 'A'	1
2	KASARANI	ROYSAMBU	ROYSAMBU	THOME I & EVANGEL HOUSE	1
3	KASARANI	ROYSAMBU	ROYSAMBU	THOME V	1
4	WESTLANDS	PARKLANDS	UPPER PARKLANDS	PARKLANDS	1
5	WESTLANDS	PARKLANDS	SPRING VALLEY	SPRING VALLEY	1
6	WESTLANDS	PARKLANDS	SPRING VALLEY	SPRING VALLEY	1
7	WESTLANDS	KITISURU	LORESHO	LORESHO SOUTH	1
8	WESTLANDS	KITISURU	KYUNA	KYUNA ESTATE	1
9	WESTLANDS	KITISURU	KITISURU	LOWER KABETE	1
10	WESTLANDS	HIGHRIDGE	MUTHAIGA	MUTHAIGA(UBALOZI)	1
11	WESTLANDS	HIGHRIDGE	MUTHAIGA	MUTHAIGA(GOLF CLUB)	1
12	WESTLANDS	HIGHRIDGE	KARURA	KARURA	1
13	WESTLANDS	HIGHRIDGE	KARURA	KARURA	1
14	WESTLANDS	KANGEMI	MOUNTAIN VIEW	MOUNTAIN VIEW	1
15	WESTLANDS	LAVINGTON	MUTHANGARI	MUTHANGARI	1
16	WESTLANDS	LAVINGTON	MUTHANGARI	MUTHANGARI	1
17	WESTLANDS	LAVINGTON	MUTHANGARI	RIVERSIDE PARK	1
18	WESTLANDS	LAVINGTON	MAZIWA	CHAMBI DRIVE 'A' & 'B'	1
19	WESTLANDS	LAVINGTON	MAZIWA	RUSINGA	1
20	WESTLANDS	LAVINGTON	MAZIWA	RIARA	1
21	KIBERA	LANGATA	LANGATA	RIVER BANK	1
22	KIBERA	LANGATA	HARDY	HARDY ESTATE	1
23	KIBERA	LANGATA	HARDY	HARDY ESTATE	1
24	KIBERA	LANGATA	HARDY	HARDY ESTATE	1
25	KIBERA	KAREN	KAREN	WINDYRIGE	1
26	KIBERA	KAREN	KAREN	COLLEGE	1
27	KIBERA	KAREN	LENANA	MIOTONI RIVER	1
28	KIBERA	KAREN	LENANA	NANDI	1
29	KASARANI	ROYSAMBU	GARDEN	GARDEN	2
30	WESTLANDS	KITISURU	KYUNA	KIBANGARE	2
31	WESTLANDS	HIGHRIDGE	HIGHRIDGE	HIGHRIDGE	2
32	WESTLANDS	HIGHRIDGE	HIGHRIDGE	HIGHRIDGE	2

33	WESTLANDS	HIGHRIDGE	HIGHRIDGE	HIGHRIDGE	2
34	WESTLANDS	HIGHRIDGE	HIGHRIDGE	HIGHRIDGE	2
35	WESTLANDS	KILIMANI	KILIMANI	KILIMANI	2
36	WESTLANDS	KILIMANI	KILIMANI	KILIMANI	2
37	WESTLANDS	KILIMANI	KILIMANI	KILIMANI	2
38	WESTLANDS	KILIMANI	KILIMANI	KILIMANI	2
39	WESTLANDS	KILIMANI	KILELESHWA	KILIMAMBOGO	2
40	WESTLANDS	KILIMANI	KILELESHWA	HAMISI	2
41	CENTRAL	KARIOKOR	ZIWANI/KARIOKOR	RACE COURSE	3
42	MAKADARA	MAKADARA	HAMZA	MARTIN LUTHER	3
43	MAKADARA	MUKURU NYAYO	HAZINA	HAZINA ESTATE	3
44	KASARANI	KAHAWA	KIWANJA	KENYATTA UNIVERSITY	3
45	KASARANI	GITHURAI	GITHURAI	ZIMMERMAN	3
46	KASARANI	KASARANI	MWIKI	KARURA	3
47	KASARANI	KASARANI	KASARANI	KASARANI	3
48	EMBAKASI	MUKURU KWA NJENA	MUKURU KWA NJENGA	MUKURU KWA NJENGA	3
49	EMBAKASI	UMOJA	UMOJA	UMOJA MARKET	3
50	EMBAKASI	KAYOLE	KOMAROCK	KOMAROCK	3
51	EMBAKASI	RUAI	RUAI	BONDENI	3
52	PUMWANI	BAHATI	UHURU	BURUBURU PHASE I	3
53	DAGORETTI	KENYATTA/GOLF C	KENYATTA	UPPER HILL	3
54	KIBERA	MUGUMOINI	MUGUMOINI	SOUTHLANDS	3
55	KIBERA	MUGUMOINI	MUGUMOINI	EA NAME?	3
56	KIBERA	NAIROBI WEST	SOUTH 'C'	SOUTH 'C'	3
57	*CENTRAL*	*KARIOKOR*	*PANGANI*	*CHAI ROAD*	*4*
58	*CENTRAL*	*MATHARE*	*MLANGO KUBWA*	*KAMWINGI*	*4*
59	*CENTRAL*	*HURUMA*	*HURUMA*	*HURUMA*	*4*
60	*CENTRAL*	*HURUMA*	*HURUMA*	*HURUMA*	*4*
61	*MAKADARA*	*MAKONGENI*	*MAKONGENI*	*MAKONGENI*	*4*
62	*MAKADARA*	*MAKADARA*	*HARAMBEE*	*JERICHO*	*4*
63	*MAKADARA*	*MARINGO*	*OFAFA MARINGO*	*OFAFA I*	*4*
64	*KASARANI*	*KARIOBANGI*	*KARIOBANGI NORTH*	*MARURA*	*4*
65	*KASARANI*	*KARIOBANGI*	*BABA DOGO*	*KASABUNI*	*4*
66	*KASARANI*	*KOROGOCHO*	*GITATHURU*	*NGUNYUMU VILLAGE*	*4*
67	*KASARANI*	*GITHURAI*	*GITHURAI*	*GITHURAI*	*4*
68	*KASARANI*	*RUARAKA*	*UTALII*	*UTALII*	*4*
69	*KASARANI*	*RUARAKA*	*MATHARE NORTH*	*MATHARE NORTH*	*4*

70	KASARANI	RUARAKA	MATHARE NORTH	MATHARE NORTH	4
71	EMBAKASI	MUKURU KWA NJEN	MUKURU KWA NJENGA	MUKURU KWA NJENGA	4
72	EMBAKASI	UMOJA	UMOJA	UMOJA II	4
73	EMBAKASI	UMOJA	SAVANNAH	MUTHAIGA	4
74	EMBAKASI	KAYOLE	KAYOLE	KAYOLE	4
75	EMBAKASI	KAYOLE	KAYOLE	KAYOLE	4
76	EMBAKASI	KAYOLE	KAYOLE	KAYOLE	4
77	EMBAKASI	DANDORA	DANDORA 'A'	DANDORA PHASE I	4
78	EMBAKASI	DANDORA	DANDORA 'A'	DANDORA PHASE II	4
79	EMBAKASI	DANDORA	DANDORA 'B'	PHASE III	4
80	EMBAKASI	DANDORA	DANDORA 'B'	PHASE IV	4
81	EMBAKASI	KARIOBANGI S.	KARIOBANGI SOUTH	JUA KALI	4
82	PUMWANI	EASTLEIGH NORTH	AIRBASE	SECTION II	4
83	PUMWANI	EASTLEIGH NORTH	EASTLEIGH NORTH	EASTLEIGH NORTH	4
84	PUMWANI	EASTLEIGH SOUTH	EASTLEIGH SOUTH	EASTLEIGH SOUTH	4
85	PUMWANI	BAHATI	UHURU	OUTER RING ESTATE	4
86	WESTLANDS	KANGEMI	GICHAGI	GICHAGI	4
87	WESTLANDS	KANGEMI	KANGEMI	MARENGA	4
88	WESTLANDS	KANGEMI	KANGEMI	WARUKU	4
89	DAGORETTI	MUTUINI	KIRIGU	SAIGONI 'A'	4
90	DAGORETTI	RIRUTA	RIRUTA	RIRUTA SATELITE	4
91	DAGORETTI	RIRUTA	NGANDO	DAGORETTI	4
92	KIBERA	LAINI SABA	NYAYO HIGHRISE	HIGHRISE	4
93	CENTRAL	MATHARE	MATHARE	VILLAGE 2	5
94	CENTRAL	HURUMA	KIA MAIKO	KIA MAIKO	5
95	MAKADARA	VIWANDANI	VIWANDANI	LUNGA LUNGA	5
96	KASARANI	KARIOBANGI	BABA DOGO	BABA DOGO I	5
97	KASARANI	KOROGOCHO	NYAYO	HIGH-RIDGE	5
98	EMBAKASI	MUKURU KWA NJEN	MUKURU KWA NJENGA	MUKURU KWA NJENGA	5
99	EMBAKASI	NJIRU	MAILI SABA	MAILI SABA	5
100	PUMWANI	PUMWANI	MAJENGO	MAJENGO	5
101	DAGORETTI	UTHIRU/RUTHMITU	UTHIRU	UTHIRU 87/MUTHWA }	5
102	DAGORETTI	KAWANGWARE	KAWANGWARE	CENTRE/CIUGUINI	5
103	DAGORETTI	KAWANGWARE	GATINA	KAMITHA	5
104	KIBERA	KIBERA	KIBERA	KAMBI MURU	5

105	KIBERA	KIBERA	SILANGA	SILANGA	5
106	KIBERA	MUGUMOINI	BOMAS	QUARRY VILL	5
107	KIBERA	LAINI SABA	NYAYO HIGHRISE	KIBERA	5
108	KIBERA	SERA NGOMBE	OLYMPIC	SOWETO	5

Appendix 5: Data analysis screen shorts

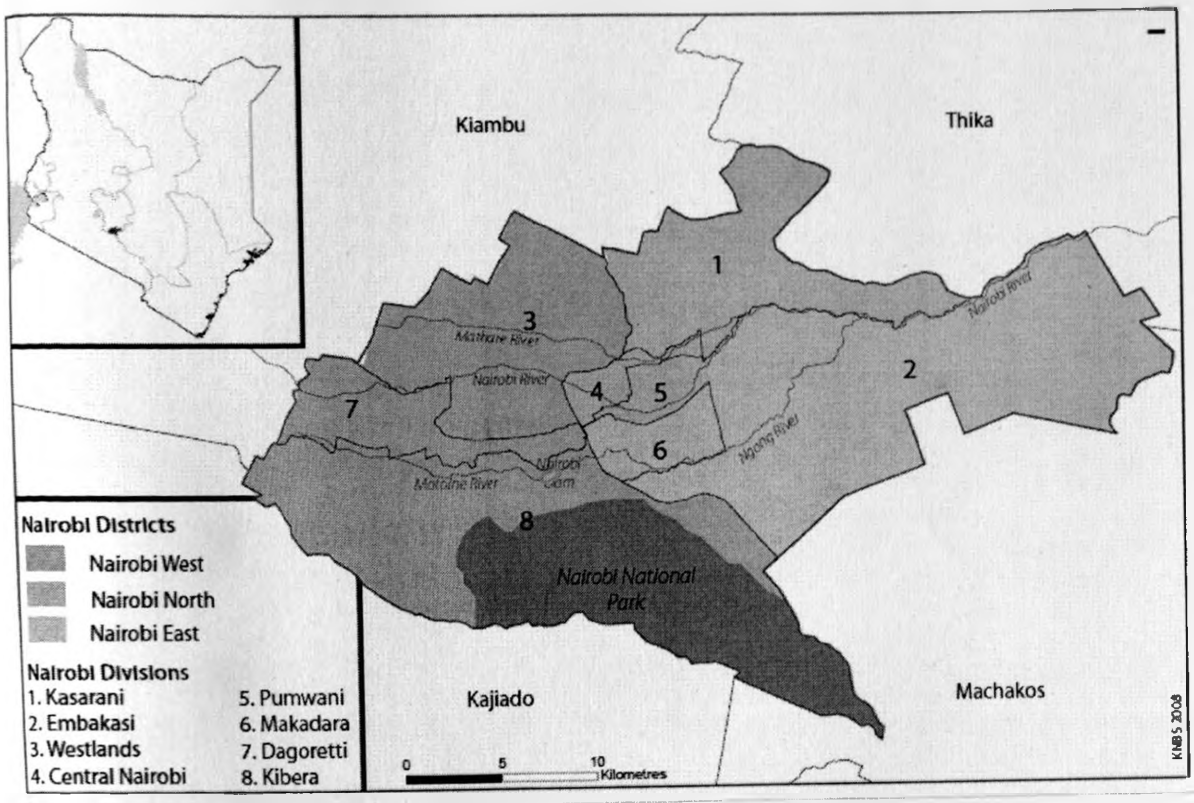
Partial screen of the variable view in SPSS

	Name	Type	Width	Decimals	Label	Values
4	Duration_U	Numeric	1	0	How long have you used M-PESA	{1, < 6 Months}...
5	Q6	Numeric	1	0	M-PESA is very useful in managing my finances	{1, Strongly Disagree}...
6	Q7	Numeric	1	0	I don't need to go to bank frequently because I use M-PESA	{1, Strongly Disagree}...
7	Q8	Numeric	1	0	I save time by using M-PESA	{1, Strongly Disagree}...
8	Q9	Numeric	1	0	M-PESA was easy to learn	{1, Strongly Disagree}...
9	Q10	Numeric	1	0	M-PESA is easy to use	{1, Strongly Disagree}...
10	Q11	Numeric	1	0	The registration process for M-PESA was simple and easy	{1, Strongly Disagree}...
11	Q12	Numeric	1	0	My parents, siblings and friends think that I should use M-PESA	{1, Strongly Disagree}...
12	Q13	Numeric	1	0	My friends use M-PESA	{1, Strongly Disagree}...
13	Q14	Numeric	1	0	Using M-PESA makes me feel better than those who do not use it	{1, Strongly Disagree}...
14	Q15	Numeric	1	0	I know how to use M-PESA very well	{1, Strongly Disagree}...
15	Q16	Numeric	1	0	I get help from the Safaricom about M-PESA when I need it	{1, Strongly Disagree}...
16	Q17	Numeric	1	0	A gents are available for me to use M-PESA	{1, Strongly Disagree}...
17	Q18	Numeric	1	0	If I made a mistake or lost my phone, the M-PESA safeguards my m	{1, Strongly Disagree}...
18	Q19	Numeric	1	0	My financial information is safe when I use M-PESA	{1, Strongly Disagree}...
19	Q20	Numeric	1	0	People working and managing M-PESA can be trusted	{1, Strongly Disagree}...
20	Q21	Numeric	1	0	The transaction costs for M-PESA are too high	{1, Strongly Disagree}...
21	Q22	Numeric	1	0	Sometimes I don't send money because sending M-PESA is expensi	{1, Strongly Disagree}...
22	Q23	Numeric	1	0	M-PESA is cheaper than Westrern Union and Banks	{1, Strongly Disagree}...
23	Q24	Numeric	1	0	I encourage new users to try M-PESA with little money, before startin	{1, Strongly Disagree}...
24	Q25	Numeric	1	0	I tried out the M-PESA service I use before adopting it fully	{1, Strongly Disagree}...
25	Q26	Numeric	1	0	If I try other servies like Orange Money or Airtel Money etc for free, I	{1, Strongly Disagree}...
26	Q27	Numeric	1	0	Transacting in M-PESA is risky, the information I send can be acces	{1, Strongly Disagree}...
27	Q28	Numeric	1	0	The cash I put in M-PESA could possibly get lost	{1, Strongly Disagree}...
28	Q29	Numeric	1	0	The M-PESA technology can fail	{1, Strongly Disagree}...

	Gender	Age	Education	Duration Usage	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
2	2	22	15	3	5	5	5	5	5	5	4	4	4	5	5	5	5
3	1	55	13	5	4	2	5	5	5	5	5	5	4	5	5	4	5
4	2	20	5	2	5	5	5	5	5	5	4	4	4	5	5	5	5
5	1	38	13	5	4	5	5	4	4	5	4	5	5	4	3	4	4
6	1	32	13	5	5	5	5	5	5	5	5	4	4	5	5	5	5
7	1	32	9	3	5	5	5	5	5	5	5	5	5	5	5	5	5
8	1	58	9	3	5	5	5	5	5	4	4	5	5	5	5	5	4
9	2	33	7	3	5	5	5	5	5	2	4	4	4	4	5	5	5
10	2	38	9	5	5	5	5	4	4	2	4	4	5	5	5	5	5
11	1	20	13	3	4	5	5	4	5	5	4	4	5	5	4	5	4
12	1	18	12	3	5	5	5	5	5	4	4	5	5	5	5	5	5
13	1	40	13	5	5	5	5	4	5	5	4	4	4	4	5	5	5
14	1	42	8	5	5	5	5	5	5	2	2	4	4	5	4	5	5
15	2	25	13	4	5	5	5	5	5	5	4	5	4	2	5	4	5
16	2	33	9	5	5	5	5	5	5	5	5	5	4	5	5	5	5
17	1	43	9	5	5	5	5	5	5	5	5	5	5	4	4	4	4
18	2	37	9	2	5	5	5	5	5	4	4	5	4	4	5	5	3
19	1	52	13	3	5	5	5	5	5	5	5	5	5	5	5	5	5
20	1	48	8	5	5	5	5	5	5	5	5	5	5	5	5	5	5
21	1	32	13	4	5	5	5	5	5	5	5	5	5	5	5	4	5
22	1	42	13	5	5	5	5	5	5	5	5	5	5	5	4	5	3
23	1	35	9	5	5	5	5	5	5	5	5	5	5	5	5	4	5

Appendix 6: Maps for the study

Map of the divisions of Nairobi[4]



[4] http://na.unep.net/atlas/kenya/downloads/chapters/Kenya_Screen_Chapter5-End.pdf