

أعوذ بالله من الشيطان الرجيم

((الَّذِينَ يَأْكُلُونَ الرِّبَا لَا يَقُومُونَ إِلَّا كَمَا يَقُومُ الَّذِي يَتَخَبَّطُهُ الشَّيْطَانُ مِنَ الْمَسِّ ذَلِكَ بِأَنَّهُمْ قَالُوا إِنَّمَا الْبَيْعُ مِثْلُ الرِّبَا وَأَحَلَّ اللَّهُ الْبَيْعَ وَحَرَّمَ الرِّبَا فَمَنْ جَاءَهُ مَوْعِظَةٌ مِنْ رَبِّهِ فَانْتَهَى فَلَهُ مَا سَلَفَ وَأَمْرُهُ إِلَى اللَّهِ وَمَنْ عَادَ فَأُولَئِكَ أَصْحَابُ النَّارِ هُمْ فِيهَا خَالِدُونَ * يَمْحَقُ اللَّهُ الرِّبَا وَيُرِي الصَّدَقَاتِ وَاللَّهُ لَا يُحِبُّ كُلَّ كَفَّارٍ أَثِيمٍ *
إِنَّ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ وَأَقَامُوا الصَّلَاةَ وَآتَوُا الزَّكَاةَ لَهُمْ أَجْرُهُمْ عِنْدَ رَبِّهِمْ وَلَا خَوْفٌ عَلَيْهِمْ وَلَا هُمْ يَحْزَنُونَ * يَا أَيُّهَا الَّذِينَ آمَنُوا اتَّقُوا اللَّهَ وَذَرُوا مَا بَقِيَ مِنَ الرِّبَا إِن كُنْتُمْ مُؤْمِنِينَ * فَإِنْ لَمْ تَفْعَلُوا فَأْذَنُوا بِحَرْبٍ مِنَ اللَّهِ وَرَسُولِهِ وَإِنْ تُبْتُمْ فَلَكُمْ رُؤُوسُ أَمْوَالِكُمْ لَا تَظْلِمُونَ وَلَا تُظْلَمُونَ))

صدق الله العظيم

البقرة: 275 - 279

DEDICATION

This research is dedicated To the soul of my father from whom scholars learned knowledge and the one who taught us that science leads to the straight path, to my mother, my wife and to my beloved son Ahmed, to my brothers and sisters

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special thanks to Allah the Most Gracious for his special grace, love, steadfastness and strength throughout the study years, and the ability to carry out this thesis. Through His grace I have been able to come this far. I would like to express my gratitude to my research supervisor **Dr OSAMA AHMED** who worked tirelessly reading and giving comments and encouragements at every turn up to the completion of this work.

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ABSTRACT

No doubt that the spread of mobile phones has helped to provide a number of high-value services and modern technologies cover all aspects of life and financial transactions, certainly the most common of which is the e-commerce, e-banking and payment services via mobile phone. The study investigated the possibility of the application of M-PESA system in Sudan in terms of technological development, legal and regulatory framework for electronic payment compared to Kenya. The study relied on personal interviews and questionnaire as survey tool to collect data then analyzed by (SPSS) and the key result of the study is the intention and desire of interviewees in the introduction of M-PESA service in Sudan. This can be achieved, provided a number of factors are met, including a slew of organized legislation to electronic payment and infrastructure of communication companies and the reduction that have occurred in transaction fees and the existence of agents for service in rural areas and the stability of the network and its expansion then remains the provision of training provided to users on the service. Those are the most important factors that emphasize the importance the introduction of (M -Pesa) service in Sudan. This study contributes to the body of knowledge relating to the communications infrastructure and e-payment as well as legislation and regulation areas regarding electronic mobile. Through the growing desire and intention of interviewees to use M-PESA and provide useful information for regulators, financial institutions and providers of electronic payment service via mobile, to enable them to develop and implement appropriate service for users of M-PESA strategies, which meets their expectations, and can lead in turn to increase the desire to use the M-PESA service.

مستخلص

مما لا شك فيه ان إنتشار اجهزة الهواتف النقالة ساعد في تقديم عدد من الخدمات ذات القيمة العالية وبتقنية حديثة تتضمن كافة المعاملات الحياتية والمالية وبالتاكيد كان الاكثر شيوعا منها هي خدمات التجارة الالكترونية و الخدمات المصرفية و الدفع عبر الهاتف المحمول وقد تقصت هذه الدراسة إمكانية تطبيق نظام M-PESA في السودان من حيث التطوير التكنولوجي والاطار القانوني والتنظيمي لعمليات الدفع الالكتروني مقارنة بكينيا واعتمدت الدراسة علي المقابلات الشخصية والاستبيان كأداة لجمع البيانات وتحليلها بواسطة (SPSS) وبينت نتائج الدراسة رغبة المبحوثين في استحداث خدمة M-PESA في السودان. يتحقق ذلك لتوفر عدة عوامل منها صدور مجموعة من التشريعات القانونية المنظمة للدفع الإلكتروني والبنية التحتية لشركات الاتصالات والتخفيضات التي تمت في رسوم المعاملات وتوفر وكلاء للخدمة في المناطق الريفية واستقرار الشبكة وتوسعها ويبقى تقديم التدريب للمستخدمين علي الخدمة وهذه من اهم العوامل التي تؤكد اهمية استحداث خدمة M-PESA في السودان . وتسهم هذه الدراسة في مجموع المعارف المتعلقة في مجالات البنية التحتية للاتصالات والدفع الإلكتروني عبر الهاتف المحمول والتشريعات المنظمة من خلال تنامي الرغبة و نية المستخدمين لاستخدام M-PESA وتوفر معلومات مفيدة للمنظمين، والمؤسسات المالية ومقدمي خدمة الدفع الإلكتروني عبر الموبايل، لتمكينها من وضع وتنفيذ استراتيجيات الخدمة المناسبة لمستخدمي M-PESA ، والتي تلي توقعاتهم، و يمكن أن يؤدي ذلك بدوره الى زيادة الرغبة في استخدام خدمة M-PESA .

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ABBREVIATIONS

BOP	-	Bottom of the Pyramid
CBOS	-	Central Bank of Sudan
GDP	-	Gross Domestic Product
DRC	-	Democratic Republic of Congo
FSD	-	Financial Sector Deepening
P2P	-	Person to Person
MMT	-	Mobile Money Transfer
M-PESA	-	Mobile Pesa
EBS	-	Electronic Banking Services
ICT	-	Information and Communication Technology
TAM	-	Technology Acceptance Model

This chapter of the research shows the background to the study, its significance, research aims and objectives, research questions, and also outlines of the research.

1.0 Background

The evolution of mobile devices and wireless technologies has brought about an exceptional effect in the world today, with the ability to communicate anywhere, at any place and at any time. Diniz et al. (2011), stated that mobile technology can be viewed as a payment channel and has developed the possibility for two significant issues to be addressed at the same time; firstly is the demand side, which creates an opportunity for financial inclusion amongst the unbanked population and secondly the supply side which creates opportunities for financial institutions so they can deliver a wide range of services at minimum, mostly to people living in remote areas (Diniz et al. , 2011; Aker and Mbiti, 2010).

In a study by Aker and Mbiti (2010), they discussed that the proliferation of mobile devices has also brought about the introduction of a number of value added services, new technologies involving mobile transactions, while creating important commerce opportunities ranging from mobile banking to mobile payments (m-payments), and this was also supported by Must and Ludewig (2010). However, the different payment solutions that can be administered through the use of a mobile device are promising alternatives for countries that are still cash driven, and they are referred to as mobile payment services. The Gartner group (2009) defined mobile payment services as, “paying for a product or service through the use of a mobile device and technology, including Near Field Communication (NFC), Short Messaging Services (SMS) and Wireless Application Protocol (WAP)”. Nevertheless, Dahlberg et al. (2008) argued that mobile payments have brought about an exceptional increase in service opportunities for individuals, businesses,

and a country's economy at large, especially in developing countries, which are currently implementing mobile payment services to aid financial inclusion.

By comparison, the penetration of retail banking systems in most African countries is very low. While no reliable figures for the proportion of people banked yet exist at continental level, national household surveys are providing more reliable information for certain countries. According to Finscope (2005), as unbanked people start to use mobile phones, they can become more bankable as basic banking service become accessible via mobiles.

In March 2007, Kenya's largest mobile network operator, Safaricom (part of the Vodafone Group) launched M-PESA , an innovative payment service for the unbanked. "Pesa" is the Swahili word for cash; the "M" is for mobile. Within the first month Safaricom had registered over 20,000 M-PESA customers, well ahead of the targeted business plan. This rapid take-up is a clear sign that M-PESA fills a gap in the market. The product concept is very simple: an M-PESA customer can use his or her mobile phone to move money quickly, securely, and across great distances, directly to another mobile phone user. The customer does not need to have a bank account, but registers with Safaricom for an M-PESA account. Customers turn cash into e-money at Safaricom dealers, and then follow simple instructions on their phones to make payments through their M-PESA accounts; the system provides money transfers as banks do in the developed world. The account is very secure, PIN-protected, and supported with a 24/7 service provided by Safaricom and Vodafone Group.

This research aims at investigating mobile money in Sudan with insights from Kenya M-PESA , and a customer's perception to use mobile money service in Sudan. It would be based solely on the significance of mobile money. However, mobile money has become a focus for most researchers today as it has been used in assisting a number of individuals in rural areas, who have little or no access to traditional financial services. It has also generated high level financial inclusion for countries who have adopted it, such as Kenya. Since low-level financial inclusion is an impediment to the economic development of some countries, the need to develop or adopt mobile money has increased not necessarily for profit, but for financial inclusion (IFC, 2011). Jun and Cai (2001) argued that, a focus on understanding the needs of consumers, has become imperative in a competitive market place, and this has brought about the need for most companies to move from just being product-centric to customer-centric, i.e. focusing more on what the consumers expect from a particular product/service to what is being offered (product). Rao (2011) also added that “customers in Africa are in need of a strong e-commerce solution which provides safety measures, ease of access, acceptance, capacity and a global reach”.

Based on the above discussion, this research work seeks to gain insight into mobile money services, while assessing the factors that influence customers' intention to use M-PESA in Sudan.

1.1 Research problem

Since its inception in 2007, M-PESA has rapidly developed to become one of the most dynamic innovations for delivery of financial services using modern Information and Communications Technology (ICT).The innovation won the best mobile money service award at a GSMA global mobile awards gala dinner in Barcelona – Spain in February 2009. This innovation makes Kenya a world leader in the use of mobile phones to transfer money. To appreciate its rapid growth in

popularity, it is important to note that the number of people registered in Kenya using the M-PESA service regularly has grown rapidly. The pioneer money transfer service in Kenya Sokotele did not achieve much, Zap initiated by Zain after M-PESA though cheaper and “much more than a money transfer service” is struggling to penetrate the market. Unpublished studies done on “The adoption and usage of M-PESA ”, by Olga Morawczynski, focused on the rapid adoption of the innovation, looking at the innovation per-se and not the diffusion of information on the innovation. The researcher is of the view that Zap and M-PESA are similar technological inventions what is different is the adoption pattern.

It is in the appreciation of the unique adoption of the money transfer service M-PESA that this study sought to find out what communication strategy, techniques and tools Safaricom used and continues to use in order to persuade new customers to adopt and sustain those already using the service in Sudan. The study also sought to establish specific social, technological, environmental, law and economic needs driving the rapid adoption.

1.2 Research Aims and Objectives

The aim of this research is to identify and analyze the factors that influence a consumers’ intention, to use M-PESA in Sudan. The research objectives are as follows;

1. To investigate mobile payments in Sudan with insights from Kenya and M-PESA , including problems affecting its growth in Sudan.
2. Identify the factors that influence customers’ intention to use mobile money in Sudan.

3. To conduct a survey that explores users' perceptions regarding mobile money service in Sudan.
4. To carry out an evaluation of a mobile payment service, with prospective users.
5. To evaluate the results from the survey and draw conclusions.

The result of these objectives will facilitate in the investigation of the factors' that influences a customer's intention to use M-PESA .

1.3 Research Questions

The following research questions will be considered to guide the researcher during the process of data collection.

1. To what extent M-PESA service can be used in Sudan?
 - a. Which of the factors is most significant and can influence a customers' intention to use mobile money?
 - b. What are the factors that influence customer's intention to use M-PESA as mobile money in Sudan?
 - c. Has perceived usefulness and perceived ease of use, influenced customers' intention to use mobile money in Sudan?
2. Is there a tendency for telecommunications companies and banks to offer the M-PESA service in Sudan?
3. Is Sudanese legislation sufficient to establish a legal framework that allows providing the M-PESA service in Sudan?

1.4 Research Methodology

The study adopted a descriptive survey design. The population of interest comprised the key outlets who can offer M-PESA services in Sudan. Nine outlets were selected through sampling and the respondents

(customers) 45 interviewees were interviewed at the outlets as they transact their daily businesses. At least five customers were randomly picked from each outlet; using simple random sampling was used to select the respondents to avoid personal influence in the selection of the individuals to be interviewed. A semi- structured questionnaire was used to collect data.

Data was analyzed using descriptive statistics .The quantitative data was analyzed using Statistical Package for Social Sciences (SPSS) and the analyzed presented in frequency distribution tables to measure dimensions with the highest concentration, bar charts and explanation presented in prose. Mean scores and standard deviations to determine attributes with the greatest impact. The data was summarized and organized by using tables, and bar graphs for the information to be effective and in a meaningful way.

1.5 Significance of the Study

The significance depicts the necessity of this research, which focuses on evaluating the essential factors which influence customers' intention to use mobile money services in Sudan. It puts into considerations, the issues such as perceived ease of use, perceived risk, perceived usefulness, trust, security, confidence, reliability etc. Subsequently, the outcomes and findings would provide the researcher an insight about mobile money through the form of methodology employed. This research will investigate and reveal areas of concern relating to mobile money in Sudan and also factors that influences consumers' intention to use, by using a relevant theoretical framework, which will aid the service providers in investing suitable time, effort, and money in the improvement and provision of services.

However, the motivation for investigating mobile money in Sudan is because, research has shown that mobile payment has experienced growth globally, while aiding in financial inclusion and since this is a fairly new service in Sudan it therefore makes it attractive to use Sudan as a case study.

The introduction of Information Communication Technology (ICT) and the M-PESA method of payment through the use of a mobile device in Kenya, has helped changed a lot of business practices, aided financial inclusion and also economic growth (Mbogo, 2010). Kenya is also known to have the most successful mobile payment system, which makes Kenya a vital focus for this research, hence Kenya experience is used as a benchmark for comparison in this study.

1.6 Research Outline

This research is divided into Five Chapters. The first Chapter is the 'Introduction' which identifies an overview of the research statement, the problem under investigation and also research aims and objectives. Chapter Two provides a review of literature of existing ideas, researches already done in the field of mobile commerce and mobile payments relevant to the study and investigates mobile money in Sudan with insights from Kenya M-PESA . It also introduces different theories and the technology acceptance model used in the study.

Chapter Three presents the 'Research Model', that is, the chosen theoretical model and the hypothesis that has been formulated for this research. And describes the methodology used in research and also explains the data and data collection methods. The Fourth Chapter presents the findings and analysis of the survey data. The Fifth Chapter draws conclusions, recommendations, limitations and directions for future studies.

2.0 Introduction

This chapter reviews existing literatures relating to mobile payments, with reference to E-commerce and M-commerce and investigates mobile money in Sudan with insights from Kenya M-PESA . It also presents the theoretical background for the study and was created with the literature review relating to technology acceptance theories.

The banking industry has affirmed the major obstacles in the implementation of consumer associated electronic commerce to be information privacy and security. Therefore, it would discuss some characteristics of mobile transactions, the technologies used in securing mobile transactions, including enabling technologies.

2.1 Mobile Payments

Mobile payment has experienced rapid growth in recent years, due to the increased convergence rate between mobile telecommunications and the payment industries at large. According to Juniper research (2008), m-payments experienced an increased growth rate from \$10million in 2005 to \$115million in 2010, due to a rise in a range of different mobile payment schemes and consumer demand. Moreso, recent innovations in technologies and increase in the use of electronic pathway to carry out business transactions, has brought about changes to electronic means of payments, from cash-based payments. This is seen in the extensive use of credit and debit cards for business transactions (Begonhaet *al.*, 2002; Coursaris and Hassanein, 2002; Ondrus and Pigneur, 2006).

Likewise, the use of a mobile phone is being integrated into our everyday lives, and can be said to be one of the most thriving consumer products that was ever made (Mahatanankoonet *al.* 2005). Its functions have also been improved to not just making calls, but also for other

purposes such as carrying out transactions, tracking device, music player, etc. Mallat (2007, p.2) defined M-payments as,

“the use of a mobile device e.g., mobile phone or PDA (personal digital assistant) to conduct a payment transaction in which money or funds are transferred from a payer to a receiver via an intermediary or straight without an intermediary”.

However, payment in this instance according to Carr (2007), normally involves a direct or indirect exchange of monetary values in return for goods and services between two parties. Mallat (2007) posits that m-payments would enable viable and suitable mobile commerce transactions, to be carried out remotely via SMS, WAP billing, etc. Moreso, Ondrus *et al.* (2006) argued that payment transactions are being conducted using mobile handheld devices and this has resulted in increased speed of transactions and convenience to both businesses and consumers. Therefore, in order to avoid mixing up mobile payments and mobile banking, Mallat (2007) proposed that mobile banking is made up of banks, whose main aim are to provide banking services to their customers through the use of banking infrastructures by employing the use of a mobile device, while m-payments are payments carried out through the use of a mobile device and also categorized by competing banks, competing mobile network operators, customers (both the banked and unbanked) and mobile money retailers (merchants). Participants that exist within the value chain are able to benefit from the wide-scale operation and adoption of mobile payments, and they include the fiscal sector, mobile network operators, merchants, technology providers and end users as shown in the figure below.

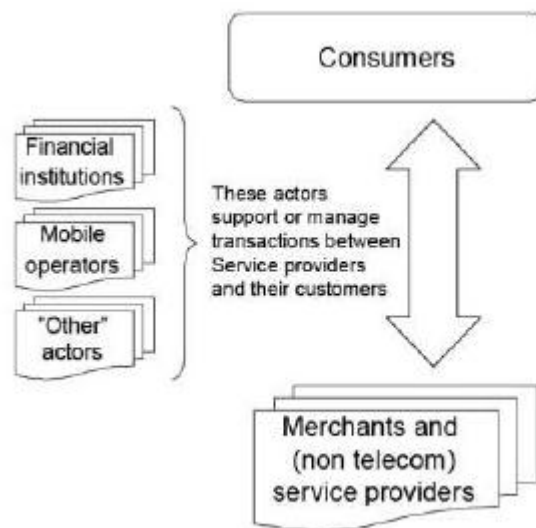


Figure 2.1: Mobile payment service value chain (Source: Smith et al., 2010)

According to Innopay (2010), m-payments for financial institutions would be a prospective scheme for safeguarding the current account, available loan products and preventing further provocation from customers. Similarly, for the mobile network operators, mobile payments serve as an attractive scheme that can be used to incur a return on the financing generated in communications, within the previous two decades, as a result of additional expense, associated returns and the rise in air time and data use (Smith *et al.*, 2010).

Consequently for merchants, Dahlberg *et al.* (2008) added that, the Point of Sale (POS) mobile payment permits the provision of quicker output at the checkout and the capacity to relay messages in real time to the consumer. In addition, remote mobile payments are attractive schemes for merchants, as they are another form of channel that can be used, if it can be used to achieve a large scale impact than existing channels. However, from the end-users point of view, the mobile phone has realized ‘permanent share of pocket’ i.e. it is the object which is likely to be always be with the consumer just like the keys and wallet, (Innopay, 2010), which makes consumers satisfied with the mobile device performing one or more function at a given time. In addition, they allow for divergence into different aspects of the end user’s wants.

Therefore, the benefits and prospects provided by m-payment seem clear for all parties involved. Furthermore, Kadhiwal and Zulfiquar (2007), discussed types of M-payment as; Account based payment systems (which include the mobile phone based payment systems, smart card payments systems, and credit card payment systems), POS (Point of Sale) payments systems (consists of automated POS payments and attended POS payments) and Mobile wallets and is described in the table below;

Table 2.1: Mobile Payment Classification

Mobile Payment Scheme	Description	Example Provider(s)
Payment to mobile phone bill	Run by operators & aimed at low value payments for mainly digital content	Most Operators, Zong
Premium Rate SMS (PRSMS)	To pay for digital content & for interactive TV.	Content Providers such as Jamster & TV companies
Mobile web & WAP billing	Browser user interface with WAP/mobile web billing via credit card.	UK's PayForIt, Rakuten, Digby, Intuit
SMS/Java/SIM toolkit	SMS/Java/SIM toolkit based application using a pre-registered account and/or mobile wallet. Includes text-based transactions at the physical storefront or vending machine.	PayPal Mobile, LUUP, MobiVending, Telecom Italia Mobile
Person2Person (P2P)	SMS based transfer of funds between two mobile phones to redeem for cash or goods; can be also provided by mobile wallet or account based	Obopay, Globe Telecom and M-PESA
Smartphone App	Credit or debit card payment for downloadable apps & in-app billing	Apple iTunes, ngpay
Contactless	"Wave & Pay" scheme where phones are waved in front of reader, e.g. NFC or FeliCa	NTT DoCoMo, MasterCard PayPass, Maxis and Visa
In Store	Mobile wallet	Mocapay, Mozido

(Source: Juniper Research)

However, when discussing m-payments, the services offered could be confused to mean another, due to lack of clarity on the independent variables in the system. The figure below describes the main entities involved in a mobile transaction from a user's perspective.

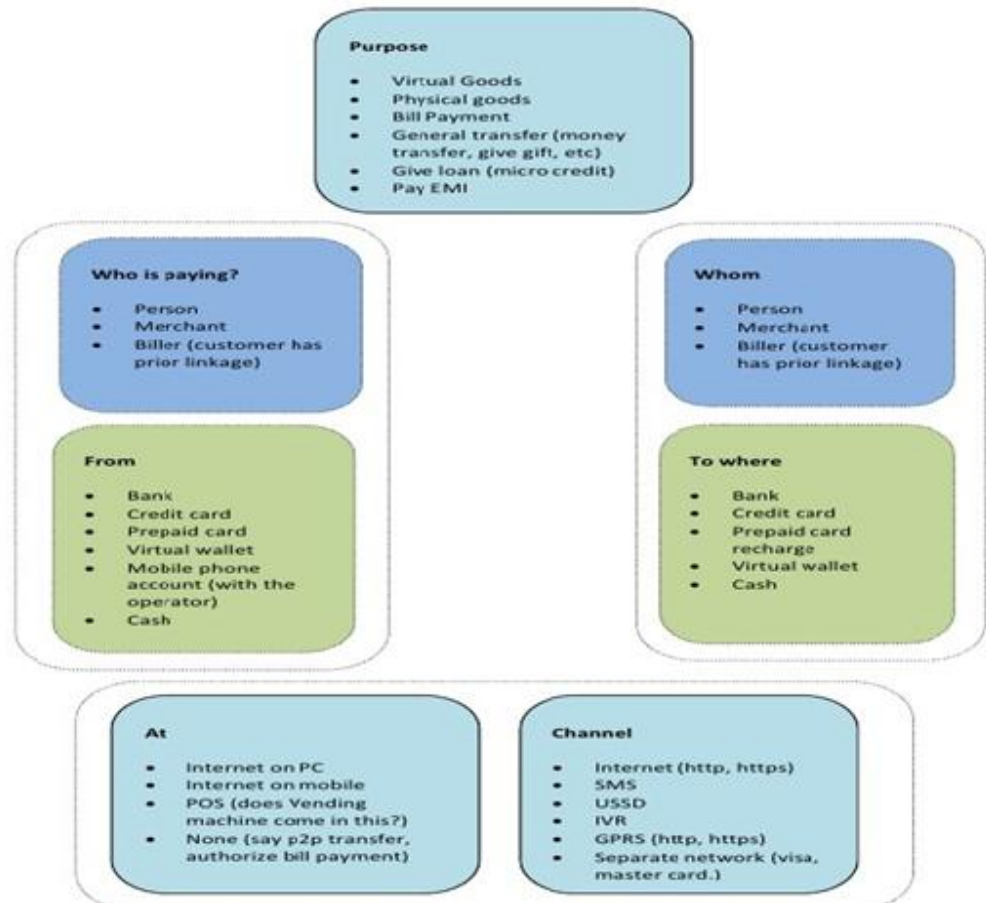


Figure 2.2: Entities involved in mobile transactions (Source: Noribo technologies).

Nevertheless, Au and Kauffman (2008) added that since e-commerce organizations tend to accomplish reasonable benefit through the delivery of mobile payment services to the end users, the need to focus on issues which relate to the customer's intention to use mobile payment is imperative to the researcher, since it can be useful to financial institutions, payment service providers, in providing an understanding to the key factors that influences a customers' intention to use (Lim, 2007; Dahlberg, Mallat and Oorni, 2003). Similarly, studies have shown that consumers' zeal to use mobile payments in carrying out transactions has increased, with a prediction for mobile payments business to be \$55 billion as at 2008 (Dewan and Chen, 2005; Kreyer *et al.*, 2003; Lev-Ram, 2006). In another study Juniper Research (2008), stated that the value of payments carried out using a mobile phone for digital commodities (e.g. songs and games) and material commodities

(e.g. offerings and books), is estimated to go over \$300 billion by 2013. The penetration rate of m-payments changes significantly from country to country (Ainin *et al.*, 2005; Au and Kauffman, 2008; Humphrey *et al.*, 2006). A number of urbanized countries principally in Europe and around Asia e.g. South Korea and Japan, own developed mobile payment systems, in contrast to the United States of America that has a small acceptance and practice, due to a large non cash infrastructure (53% of their payments is card based and only 36% is paper based i.e. cash and check) (BIS, 2004; BIS, 2006; Jonker, 2003; Foster *et al.* 2009). A good instance of a thriving m-money service in a developed nation is the implementation of 'Octopus card' in Hong Kong, which is being used in communal transport systems, and has a market infiltration rate of 70% in a city of over 7 million people. Examples of payment schemes that has recorded huge growth are Moneta, ZOOP in South Korea and K-merce (Chau and Poon, 2003; Ondrus *et al.*, 2006).

Similarly, a number of emerging nations have also been notable for an enhanced infiltration of mobile payment systems, in particular the m-money service, an example is M-PESA in Kenya which still stands out as the most successful (Camner and Sjoblom, 2009; Hughes and Susie, 2007; Mas and Olga; 2009). In spite of the achievements in most emerged and emerging countries, Dahlberg *et al.* (2008) argued that m-money diffusion is at its minimum in various parts of the globe, with failed attempts recorded in others. Paybox and Simpay are examples of mobile payment services that have been stopped in some areas of Europe, due to very small customer acceptance rate and disparity that exist amongst the different providers (Mallat, 2007). Despite the fact that preceding research suggest a common interest among consumers in the use of mobile payment applications (Dewan and Chen, 2005; Kreyer *et al.*, 2003), the early acceptance rate of mobile payments has however been on the decline (BIS, 2004). This has brought about the need for a deeper understanding with regards to consumer's expectations in relation to payment systems, to guide future developers of mobile payments systems (Van Hove, 2001).

Furthermore, a number of studies have been carried out with reference to the enabling technologies needed for mobile payments systems (Vilmos and Karnouskos, 2003; Ramfoset *al.*, 2004). The main security of network services used for m-commerce, according to Kadhiwal and Zulfiqar (2007) are; Wireless Application Protocol (Including the WAP identity module for additional security), SMS (Short Messaging Service), USSD (Unstructured supplementary Service Data, Intelligent Networks (GSM, GPRS, 3G, LTE), smart cards and SIMs/USIM (Subscriber Identity Module/Universal Subscriber Identity Module) application toolkit. They are important in addressing factors such as secured validation on mobile devices, secured communication infrastructure for wireless payments, permits consumer and retailer authentication data that is confirmed together with payment transactions and virtual wallets contained on a mobile phone(Kadhiwal and Zulfiqar, 2007). McKitterick and Dowling, (2003) also argued that the average mobile phone can transmit data using voice, USSD, SMS and also inbuilt internet connection (GSM, GPRS, 3G,etc) and they can be used to implement mobile payment solutions.

However, for the purpose of this research, the SMS is of utmost importance. SMS is a form of data service offered by GSM networks and is limited to 160 characters in most m-commerce scenarios. The receiver and sender of SMS can be identified using its IMSI, which cannot be penetrated by an attacker and this makes SMS messages suitable for authentication (Kadhiwal and Zulfiqar, 2007). (Schiller, 2003 and Mitchell, 2004) further discussed that SMS data is sent out in the GSM signaling plane, to guarantee privacy of communication between recipients. Consequently, Au and Kauffman (2008) discussed that the use of SMS technology has altered the social communications between the young populace in various parts of the world and as well aided in the delivery of payment transactions by businesses e.g. PayPal mobile, Barclays Pingit, and M-PESA . Moreover, it is used by Mobile Network Operators (MNOs) to carry out m-money transactions in developing countries (Hughes and Lonie, 2007).

2.2 M-PESA

2.2.0 M-PESA Overview

M-PESA (M for mobile, *pesa* is Swahili for money) is a mobile-phone based money transfer and micro-financing service, launched in 2007 by Vodafone for Safaricom and Vodacom, the largest mobile network operators in Kenya and Tanzania. It has since expanded to Afghanistan, South Africa, India and in 2014 to Eastern Europe. M-PESA allows users with a national ID card or passport to deposit, withdraw, and transfer money easily with a mobile device

The service allows users to deposit money into an account stored on their cell phones, to send balances using PIN-secured SMS text messages to other users, including sellers of goods and services, and to redeem deposits for regular money. Users are charged a small fee for sending and withdrawing money using the service. M-PESA is a branchless banking service; M-PESA customers can deposit and withdraw money from a network of agents that includes airtime resellers and retail outlets acting as banking agents.

M-PESA has spread quickly, and by 2010 had become the most successful mobile phone based financial service in the developing world. By 2012, a stock of about 17 million M-PESA accounts had been registered in Kenya. The service has been lauded for giving millions of people access to the formal financial system and for reducing crime in an otherwise largely cash-based society.

2.2.1 M-PESA Structure

There are three basic transactions that customers conduct with M-PESA

- A customer may deposit money at an M-PESA outlet in return for e-float (called a "cashing" Transaction.) The customer is required to show a valid identification document, and his identity and the amount of the deposit are logged in a book kept at the outlet. Up on receipt of the money, the M-PESA agent enters the customer's telephone number and deposit information into his/her cell phone, and the customer waits at the outlet window until he/she receives a confirmation text message that e-float has been deposited. Unless the system is running slowly (which happens occasionally), the whole transaction takes about a minute or less.
- A customer may exchange e-float for cash at an M-PESA outlet (called a "cash out" transaction.) Again, the customer must show a valid identification document, and the transaction is logged. The customer tells the shop clerk how much cash he/she wants, then chooses "withdraw cash" on the M-PESA menu on his phone, enters the amount to be withdrawn (plus the relevant fee), and enters the agent number. The agent then receives a text indicating that the transaction is complete, and the agent then gives the appropriate amount of cash to the customer. This whole transaction takes about one minute.

- Finally, a user may transfer e-float from his/her phone to another phone. Our study refers to such a transfer as a “person-to-person transfer,” even though one or both of the parties may be an institution or firm. The user enters the phone number of the recipient and the amount to be transferred on his/her cell phone. The sender and recipient each receive a text message stating that money has been transferred. These three basic transactions can be combined in a number of ways. For example, a user may deposit cash and send the full amount deposited to another user, who can then withdraw the full amount transferred. We refer to this use as “deposit-transfer-withdraw.” Alternatively, a user who receives a transfer from one person may transfer the e-float to some other user instead of withdrawing cash. E-float could circulate in this manner indefinitely, like conventional cash. A third usage possibility is where a user deposits cash and then later withdraws it him/herself without having transferred it. Anecdotally, it is said that people do this for safety when they are traveling (Vaughan, 2007; Morawczynski, 2009).

The usage patterns described above can be mixed in varying ways. For example, a user may receive a transfer and withdraw some of the value while transferring some of the remaining amount elsewhere and leaving some e-float in his account for future transactions. Of particular interest to us is a pattern in which a user might receive a transfer and not withdraw it right away for several reasons: to economize on transaction fees, to economize on the effort of going to an M-PESA outlet, or to benefit from the safety of storing value on a phone rather than in cash.

M-PESA is safer than cash because a PIN is required to perform any transaction. If a phone is stolen or lost, the M-PESA funds are safe unless the PIN has been compromised. If the PIN is compromised and funds are transferred to another account, the legitimate account holder can recover his/her funds if they have not been withdrawn by the fraudulent recipient by initiating a transfer reversal through the customer service department.

One of our goals is to better understand such patterns of use. One question in particular is how much of the use of M-PESA is of the deposit-transfer-withdraw type. To the extent that it is used just this way, M-PESA is primarily a simple money transfer service (which is hardly to say that it isn't economically important). By contrast, other uses of M-PESA suggest other functions. To the extent that e-money circulates among several users between an initial cash-in transaction and a final cash-out transaction, it can be seen as an evolving alternative to currency. Similarly, to the extent that people hold e-float balances on their phones for significant periods of time, M-PESA can be seen as having aspects of banking (as will be seen below, one can even view it as paying interest.)¹All M-PESA e-float is backed 100% by deposits held at three commercial banks in Kenya. Interest earned on these deposits is donated to a charity, which allows Safaricom to avoid being regulated as a bank. An extensive description of the arrangements between Safaricom and the network of agents who service M-PESA users can be found in Eijkman, Kendall, and Mas (2010) and Suri and Jack (2011

2.2.2 M-PESA Advantages

1- GOOD SERVICE OF M-PESA'S

MONEY-TRANSFER SERVICE: Strong branding and simple messaging for an easy-to-use service

M-PESA has benefited directly from closely binding its product brand to Safaricom's strong corporate brand. Many M-PESA retail agents are required to display corporate branding, including painting the entire store "Safaricom green," which makes it much easier for customers to locate the service. Agents are asked to become exclusive to Safaricom (not selling any products of other mobile operators), which gives the mobile operator greater control over the services provided. This is not required of airtime resellers who do not become M-PESA agents. In Kenya, sending and receiving money with a mobile phone is not an intuitive idea for many people. It is important, therefore, that communications around how the service works and how it benefits users be simple and clear. From its inception, MPESA has been presented to the public as offering a simple service—"send money home." This basic remittance product has become the must-have "killer" application that continues to drive service take-up. M-PESA's marketing campaigns have worked well; most Kenyans queried know that M-PESA can be used for money transfers. The simplicity of the message around the usefulness of the service has been matched by the simplicity of its usability. The M-PESA user interface is driven by an application that runs from the user's mobile phone. This has several advantages. The service can be launched right from the phone's menu, hence it is easy for users to find. The menu loads quickly because it resides on the phone and does not need to be downloaded from the network each time it is

called. The menu prompts the user to provide all the necessary information, one piece at a time, based on the type of transaction requested. Once all the information is gathered, it is sent for processing through the air interface in a single text message. This reduces messaging

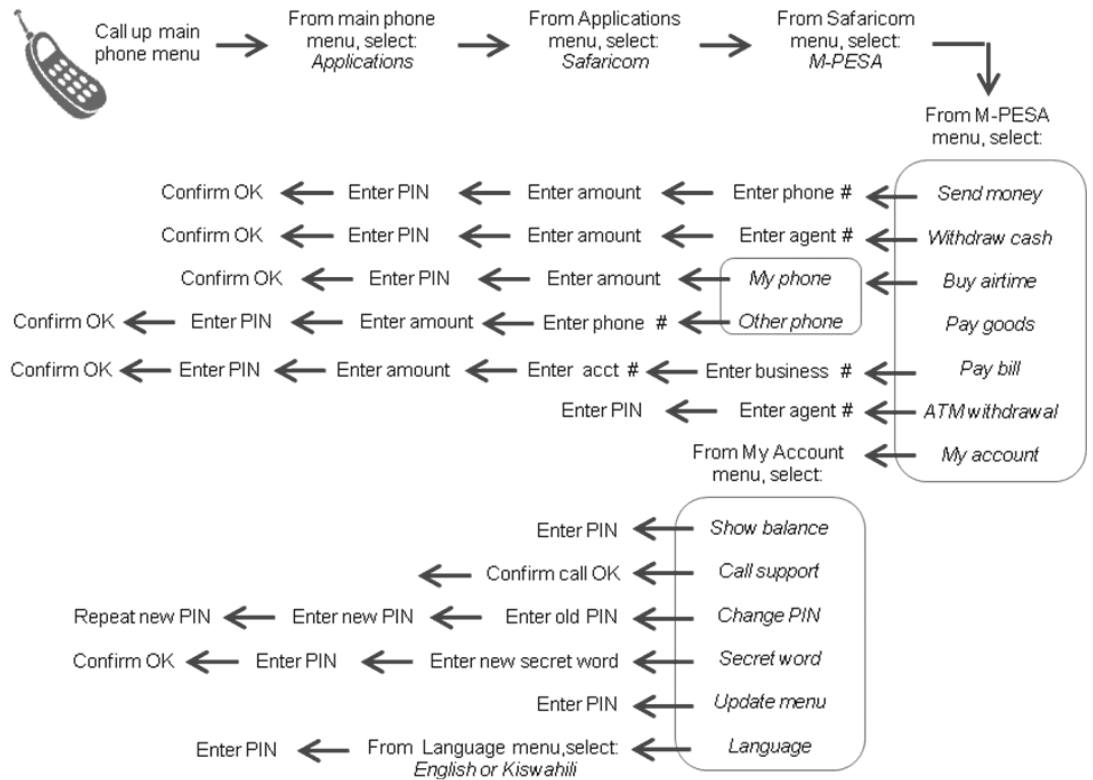


Figure 2. M-PESA Phone Menu Structure Used to Initiate Customer Transactions.

costs, as well as the risk of the transaction request being interrupted half-way through. A final advantage is that the application can use the security keys in the user's SIM card to encrypt messages end-to-end. This begins from the user's handset structure of the M-PESA user menu.

2. Customer registration: Easy and quick for customers, rewarding for agents

Safaricom designed a quick and simple process for customer registration, which can be done at any retail agent location. Customers pay nothing to register and the agent does most of the work during the process. First, the agent provides a paper registration form, where the customer enters their name, identity number (from Kenyan National ID, Passport, Military ID, Diplomatic ID or Alien ID), date of birth, occupation, and Safaricom phone number. The agent then checks the ID and inputs the customer's information from the registration form into their phone. If the customer's SIM card is an old one that is not preloaded with the M-PESA application, the agent replaces it; the customer's phone number is not changed even if the SIM card is. Both the customer and agent then receive an SMS confirming the transaction. The SMS gives customers a four-digit start key, which they use to activate their account. After the start key is entered, customers input their secret PIN and ID number, which completes the registration process. In addition to leading customers through this process, retail agents provide customers with information on the various ways to use the application, as well as transaction costs. Such agent support early in the process is particularly important in rural areas, where a significant percentage of the potential user base is illiterate or unfamiliar with the functioning of their mobile phone. Agents are given incentives to register customers. Safaricom initially offered an up-front fee of KSh 80 (around USD 1.30 at the time the service was launched) per customer registered. This helped enroll the cash-in/cash-out agents as selling

agents by giving them the possibility of a substantial early cash flow. It further allowed agents to become actively involved in the expansion of the customer base, which broke the “chicken-and-egg” problem: stores were interested in acting as agents because of the rapidly growing customer base, and customers simultaneously began to sign up with M-PESA because the service was made both visible and accessible by the retail agents.

The up-front commissions, however, were not without their problems. Some of the agents spent more time registering customers than they did providing MPESA services, and some did not properly complete the registration process. This put a burden on other agents, who had to fix the problem. To avoid this, Safaricom changed the commission structure in two ways: it deferred half the registration commission to be paid only after the customer made the first deposit, and it limited agents to register customers only within a certain radius of their store.

3. Simple and transparent retail pricing

M-PESA pricing is made transparent and predictable for users. All customer fees

Are subtracted from the customer’s M-PESA account, and agents cannot charge any direct fees. Thus, agents collect their commissions from Safaricom (through their master agents) rather than from customers. This reduces the potential for agent abuses. Customer fees are uniform nationwide, and they are prominently posted in all agent locations. There is, however, one situation that could lead to pricing confusion for customers. It is cheaper to send money to a registered user

than a non-registered one, but the system does not tell the sender whether the user is registered when the transaction is made. Hence, the cost of the transaction can be higher than expected if the sender wrongly believed the recipient is a registered customer. M-PESA chose to specify its fees in fixed currency terms (in KSh) rather than as a percentage of the transaction. This makes it easier for customers to be aware of the cost of transactions and helps them think of the fee in terms of the transaction's absolute value (e.g., sending money to grandmother). It also helps them compare the transaction cost against alternative and usually costlier money-transfer arrangements (e.g., the matatu fare plus travel time). Withdrawal charges are "banded" (i.e., larger transactions incur a larger cost) so as not to discourage smaller transactions. It is also noteworthy that M-PESA has maintained the same pricing for transactions in its first two years, despite the significant inflation experienced during the period. This has helped establish customer familiarity with the service.

However, Safaricom has changed the pricing for two customer requests that do not involve a transaction: balance inquiries (because the initial low price generated an overly burdensome volume of requests) and PIN changes (because customers were far more likely to remember their PIN if the fee to change it was higher). The volume of both types of requests was brought down substantially after these price changes.

As noted earlier, the SMS confirmation of a transaction contains the available balance, which also helps cut down on the number of balance inquiries.

4. Free deposits, no minimum balance

While the minimum deposit amount is KSh 100 (USD 1.25), there is no minimum

Balance requirement. Customers can deposit money for free, so there is no immediate barrier to taking up the service. M-PESA charges customers only for “doing something” with their money, such as making a transfer, withdrawal, or prepaid airtime purchase. But agents are rewarded for taking deposits in order to prevent them from both accepting withdrawal business and locating in communities with net cash-out requirements. In effect, Safaricom “advances” fees to agents at the time of customer deposits. For instance, on smaller transactions, the customer pays a KSh 25 (USD 0.30) fee to Safaricom on cash out, but Safaricom “splits” this between an agent commission of KSh 10 payable at the time of deposit and an agent commission of KSh 15 payable at the time of withdrawal. Accepting free deposits does raise the risk that customers may circumvent the P2P transfer charge by depositing money straight into the recipient’s account. In order to protect its P2P revenue stream, Safaricom needs to ensure that its agents are checking their customers’ IDs so that customers deposit money strictly into their own accounts.

5. Ability to send money to non-customers

M-PESA customers can send money to non-registered mobile phone users on any Phone network. Non-registered recipients get a code via SMS, which they can convert into cash by presenting it at any M-PESA retail agent. This capability enabled early adopters to use the system even when there were few other customers on M-PESA . It also

created an incentive for customers sending money to convince recipients to register for the service. The cost of sending money to non-M-PESA customers is designed to maximize customer growth. As shown in Figure 4, customers pay a higher (roughly triple) P2P charge when sending money to a non-customer than to a customer. On the other hand, non-customers can cash out the amount received for free, whereas registered customers pay a cash-out fee of at least KSh 25 (USD 0.30). So why Ignacio Mas and Olga Morawczynski Designing Mobile Money Services “penalize” the customer rather than the non-customer? Safaricom understood that the sender had power over the recipient, so it chose to put pressure on the sender to require the recipient to register with M-PESA . Furthermore, the non-customer got a great “first experience “with M-PESA when he received money for free, which Safaricom hoped would convince them to register for M-PESA . Safaricom’s plan to stimulate growth via the pricing structure worked well, as many rural cash recipients reported that their urban relatives, the senders, persuaded them to sign up with M-PESA .

6. Enabling ATM withdrawals

A year after its launch, M-PESA partnered with Pesa Point, one of the largest ATM service providers in Kenya. The Pesa Point network includes over 110 ATMs scattered all over the country, giving them a presence in all eight provinces. This partnership has given Pesa Point anew role—as an M-PESA agent. Customers can retrieve money from any of the Pesa Point ATMs by selecting “TM withdrawal” from their-PESA menu. After making this selection, customers receive a one-time ATM authorization code, which they use to make the withdrawal. No

bank card is needed for this transaction. The link with the extensive Pesa Point ATM network has given customers numerous benefits. First, money is more accessible, at least in urban areas. Customers can make withdrawals at any time of the day or night, which is not the case with M-PESA agents, who usually terminate operations before sunset because of security risks. Second, these ATMs also help to alleviate liquidity constraints. Because of cash float constraints, agents cannot always meet requests for withdrawals, especially large withdrawals. Furthermore, the agent commission structure discourages agents from handling large transactions. As a result, customers are forced to spread out their transactions over a few days, taking money out “in bits” rather than withdrawing lump sum, adding both cost and inconvenience. It also undermines customer trust in M-PESA as a mechanism for high-balance, long-term saving. Using ATMs to give customers a sort of liquidity mechanism of last resort bolsters the credibility of the M-PESA system.

2.3 Mobile Money in Sudan

2.3.0 Demography of Sudan

Sudan is located in the north eastern part of Africa bordering Egypt and Libya to the north, Chad, and Central African Republic to west, South Sudan to the South, Ethiopia and Eritrea to the east. Since independence from the UK in 1956 Sudan was embroiled in two prolonged civil wars during most of the remainder of the 20th century. The first civil war ended in 1972 but broke out again in 1983. Peace talks gained momentum in 2002-04 with the signing of several accords. The final North/South Comprehensive Peace Agreement (CPA), signed

in January 2005, granted the southern part autonomy for six years followed by a referendum on independence for Southern Sudan. The referendum was held in January 2011 and indicated overwhelming support for independence. Sudan exports crude oil which has helped grow the economy especially on the back of increases in oil production, high oil prices, and significant inflows of foreign direct investment until the second half of 2008. While the oil sector continues to drive growth, services and utilities play an increasingly important role in the economy with agriculture production remaining important as it employs 80% of the work force and contributes a third of GDP.

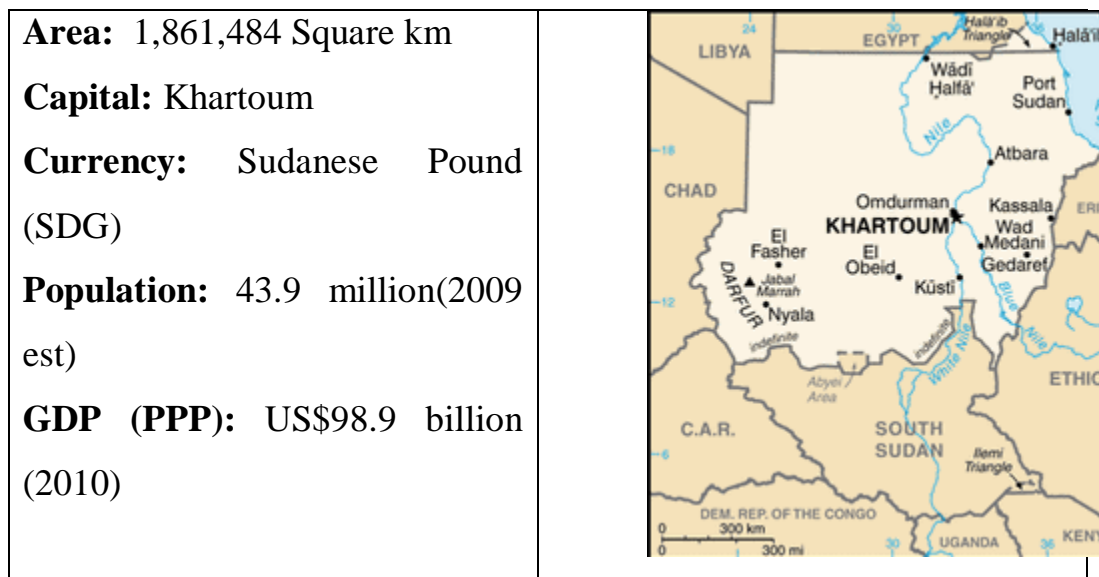


Figure 2.3: Sudan demography (source: ...)

2.3.1 ICT Sector Overview: ICT Sector Policy / Regulation

The Ministry of Information and Communication is the overall responsible for the ICT sector and is supported by among others the National Telecom Corporation (NTC) as the regulator, the Public Post and Telegram Corporation, and the Sudanese Radio and Television Corporation among others. The National Telecom Corporation was

established in 2001 in order to replace the national telecom council. A telecom Act was issued in 2001 with the purpose of improving the telecom sector.

2.3.2 Legal and Regulatory Framework

In 1998, The Central Bank of Sudan (CBOS) announced The Comprehensive Banking Policy, and it was launched in 1999. The major aim was to promote the banking sector to adapt to the contemporary international economic developments namely, the wide-range adoption of the economic liberalization policies, the enforcement of the stipulations of the Basle Committee accord and the trend of economic globalization. To effectively achieve the goals of that policy, detailed annual implementation programs were drawn in the areas of banking-services automation; BT, liquidity management, banking system development, foreign exchange market, and Islamization of the banking system (Tingari and Abdelrahman, 2010, Central Bank of Sudan, 2001). In the year 1998, CBOS assigned a committee to study the automation of banking operations, and it recommended the foundation of the following: electronic links of all branches of banks to their headquarters, and of ATMs and the national switch, electronic clearing system, electronic link of CBOS to all the working banks in Sudan, finally an electronic connection to the World Interchange Financial Transfer (SWIFT) (Ammar, 2005). To adopt e-banking services in Sudan, the company “Electronic Banking Services” was established.

The sector legislation in Sudan, provides The Electronic Transactions Act, 2007

for the establishment to Be it hereby passed, by the National Assembly, and signed, by the President of the Republic, in accordance with the provisions of the Interim National Constitution of the Republic of the Sudan. The relevant chapters read as follows:

Chapter V

Electronic Instruments Negotiable electronic instrument an electronic instrument shall be negotiable, where conditions of the negotiable instrument apply to it, in accordance with the Central Bank of Sudan Act.

Cogency of the electronic satisfaction

1. Electronic satisfaction, by any of the following means of electronic payment, shall have cogency against all.
2. Means of electronic payment shall be :
 1. electronic cheque;
 2. electronic payment card;
 3. Any other means of payment to be approved by orders of the Central Bank of Sudan.

Obligations of financial institutions

Every financial institution, which practices electronic transmission of money, in accordance with the provisions of this Act, shall abide by all the laws, relating to banking business, and such procedure and safeguards issued by the Central Bank of Sudan.

Electronic Banking Services Company

In July 1999 Electronic Banking Services Co. Ltd (EBS) was established and registered by CBOS as a multi-venture private company. It is a specialist company dedicated towards the introduction of modern BT and solutions to replace traditional methods being used by banks and financial institutions in the Sudan. The company started its operations in May 2000 with the number of objectives (EBS, (2013) :

- a) Electronically connecting banks in Sudan.
- b) Provision of electronic payment services in and out of Sudan.
- c) Provision of services and technical consulting to banks in their related field of work. Undertaking ground breaking and innovative projects requiring great efforts and major investments to improve banking operations.
- d) Adoption of standard specifications in software development allowing banks to Collaborate and cooperate through an electronic network.
- e) Provision of electronic financial services that require the collaboration of banks in their delivery.

2.3.3 Overview of the Financial Sector

The financial system in Sudan (with the exclusion of Southern Sudan) follows Islamic principles. The Central Bank of Sudan (CBOS) is responsible for supervising the whole financial system, determining and enforcing policy rules such as minimum profit levels, deposit reserves, ceilings for volume of credit and activities to which credit is provided. CBOS manages the clearing house of Sudanese banks.

CBOS oversees an institutionally diversified financial sector comprising 38 licensed banks, most of which are registered as commercial. Five additional banks are registered as „specialized“ including three important microfinance providers (MFPs): The Agricultural Bank of Sudan (ABS); the Savings and Social Development Bank (SSDB) and the Family Bank in Khartoum state.

In spite of the steady development of banks' branch networks (over 600 in 2009), banking penetration remains quite low, bearing in

mind that most banking institutions are concentrated in larger cities and particularly in and around Khartoum. Access to bank credit remains limited, with only 15% of Sudanese companies having loans from formal financial institutions, according to a recent World Bank study. The ratio of Non-Performing Loans stood at 20.5% at the end of 2009, half of it concentrated in the state-owned Omdurman National Bank.

Table 2.2: growth of Financial Sector

	2005	2006	2007	2008	2009
Nb banks	29	30	32	35	38
Branches & Offices	565	566	578	610	628
Incl : branches	517	522	532	564	585
Number ATMs	25	115	265	395	507
Number of Exchange Bureaus	15	18	18	22	20

Source: Report 2010 CBOS

In addition, the financial sector includes at least 12 financial services companies; a leasing company; a government bond institution issuing sukuk and other Islamic financial papers; the Khartoum Stock Exchange listing around 40 companies; some 20 foreign exchange companies (the central bank supplies foreign exchange to bureaus and commercial banks to meet private demand); 15 insurance companies; and 4 national funds, including the Pensioners Fund, the National Social Insurance Fund, the Industrial Finance Fund and the Bank Deposit Security Fund.

Table 2.3: the Bank Deposit Security Fund.

In Billion USD	2005	2006	2007	2008	2009	Jun 2010
Total bank assets	6.6	11.5	12.8	14.0	16.4	17.2
Total deposits	4.2	6.1	7.0	7.7	9.5	10.5
Total bank advances	2.9	5.3	6.3	6.9	8.1	8.4

Source: Report 2010 CBOS

Of the total lending, murabaha contracts had dropped to 47% in 2008, down from 58% the year before. The profit margin charged on commercial murabaha contracts varied from 8-18% in 2008 against the recommended 10%, which in 2010 has been reduced to a recommended 9%

2.3.4 M-banking in Sudan

M-banking in Sudan was firstly adopted in 2009 (Assalam Bank, 2013, Faisal Islamic Bank, 2013). M-banking services could be categorized to informational m-banking services and interactive m-banking services:

- a) Informational M-banking Services: These are inquiry services and information provided as short message (SMS) via mobile phones.

They include:

- Exchange Rate
- Balance Inquiry
- Check Status Inquiry
- Short Statement

b) Interactive M-banking Services: These are services designed to meet needs of bank customers. They include:

- E-payments
- Money transfer
- Account management

2.3.5 Challenges of M-banking in Sudan

The following statements highlight some challenges facing the adoption of m-banking in Sudan as observed and practiced by the researchers and their communities (Abdelrahman, 2013). Implementing m-banking requires a regulatory framework which presently does not exist in Sudan.

a) Lack of full co-operation between the concerned parties; literally the banking sector and telecommunication sector in Sudan. Banks in Sudan do not care much to the benefits and advantages of m-banking and mobile payment services to Sudanese community as a whole.

b) Security issues are not insured nor guaranteed to the dealing parts and customers.

2.3.6 M-Payment services in Sudan

I. Gorooshi: is a Mobile Payment Service enables client to buy and pay for all the purchased goods and services via mobile phones in sales points, authorized agents and banks all over Sudan. Mobile Payment Service reduces the need to carry cash and the risks associated with that.

Gorooshi sub services:

1. Subscription for Sudani customers

2. Registering the client basic information
3. Getting the virtual account.
4. Cash in: The customer is enabled to deposit cash in his virtual account through Faisal Islamic Bank branches, sales points and authorized agents.
5. Cash out: The customer can withdraw cash from his virtual account through banks, sales points and authorized agents
6. Money transfer: The client is enabled to transfer cash from his account to the accounts of other subscribed and non-subscribed clients.
7. Top –up mobile phone credit: The Mobile Payment Service enables the customer to top-up his Sudan mobile phone credit.
8. Sudani postpaid payment: The Mobile Payment Service enables the customer to pay his postpaid mobile phone bill.
9. Utility and services payments: Purchase electricity and water from the virtual account. The current available service is purchasing electricity, Paying Government fees at the Ministry of Interior, customs Authority and education facilities. The service will be soon available in micro-finance.(sudani website)

II. HASSA

Bank of Khartoum and Zain brings the Mobile Money service in Sudan called “HASSA” that will really revolutionize the way you handle your daily financial needs. Whether its depositing cash, making withdrawals, money transfer, bill payments, mobile air time purchase

etc. all of these can be done by either visiting any of the Hassa shops or using your own Hassa Mobile Account.

Any person with a valid Zain mobile phone connection can register for this service (zian website)

III. Mobile Cash

Nile bank and MTN brings the Mobile Money service in Sudan called “Mobile cash” that will really revolutionize the way you handle your daily financial needs. Whether it’s depositing cash, making withdrawals, money transfer, bill payments, mobile air time purchase etc.

Any person with a valid MTN mobile phone connection can register for this service(MTN website)

2.4 The Important of M-PESA in Sudan

Increased expansion of m-money businesses in developing countries like Kenya, has established indication of the necessity to employ same approach, in order to offer low financial cost services in Sudan, particularly to the unbanked population. According to IFC (2011), majority of the population in Sudan lack access to basic financial. Studies shows that only 25% of the Sudanese populace have an account or access fiscal services, since it is a cash-driven society, and in addition most financial institutions are located in commercial centers and capital cities, which limits access to those in rural areas.

Hence, the introduction of mobile money (m-money), where Vanguard (2012) stated that mobile money is a person-to-person (P2P) form of payment that is performed through a mobile phone for the

purpose of conducting financial transactions. BOS (2013) added that it is a strategy, intended to achieve financial inclusion for the unbanked population. It is the newest electronic banking innovation, and a revolution changing the lives of millions across the globe (EBS 2013). It is also expected to benefit many sectors of the Sudanese economy which would aid in financial inclusion and also economic growth. P2P payments are forms of money transfers from one person to another (e.g. between relatives), through the use of a mobile wallet.

Nevertheless, Sudan is a highly fragmented economy with no national retail network, with a challenging mobile money market, due to the distrust of both the mobile and financial sectors among the populace. However, the m-money service in Sudan has an 'open scheme', whereby the sending of funds between the sender and the recipient is likely to be a flawless one. This is as a result of the regulatory framework implemented by EBS, where the lead role in providing the service is given to the financial institutions

Governor of the Central Bank of Sudan (CBS), said the system was introduced to reduce the unbanked population put at over 18million, aid the cashless economy program and bring abundant benefits to stakeholders.

2.4.0 Sudan Mobile Money Stakeholders

The stakeholders in Sudan responsible for m-money services include customers/end users, MNOs, financial institutions or banks and the government. All the listed stakeholders above possess different interest regarding the service, some which poses as a conflict amongst them. Consumers involved with m-payment services are worried about security, convenience and reliability, where EBS (2013) stated that the number of consumers of a particular service determines how successful the service is. However, to fulfill the needs of consumers, payment systems ought to be fast, reliable, secured and convenient. For the service providers, they utilize the infrastructures of the Scheme

Operators to provide services to the end users and the participants involved in this aspect include the Telecommunication Companies and Independent Service Providers (CBOS, 2012). EBS (2013) posit that the functions of the mobile network operators include setting up a mobile payment service platform, provision of a secure communication channel, and generating a range of services that meets the demand of consumers. They further discussed that it represents a vital part of the organizations chain, and a very significant gap among financial institutions, consumers and service providers (EBS, 2012).

Nevertheless, with regards to the financial services structure, CBOS (2011) stated that Sudan currently has twenty (20) banks with a total of 1,124 branches. However, with the number of branches available, the financial institutions are still not adequate enough to serve the country's population which is estimated at 32.407074 million (World Bank, 2012). Moreso, a major issue that is being faced is the general distrust consumers have towards financial institutions, as a result of their preceding records. Where IFC (2010, p.1) stated that,

“...The financial sector is still on the road to recovery, from the disintegration of a number of banks in 2009...furthermore, communications infrastructures between banks (including ATM) are perceived to be unreliable”.

Therefore, the introduction of m-money in Sudan will present a positive substitute for the implementation of money transfer services and aims at contending with the ‘bank distrust’ problem, in view of the fact that the present regulatory framework in Sudan permits the banks to instigate m-money evolvement. However, the current regulatory framework according to CBS (2012) requires the financial Institutions to be responsible for the provision of all financial services, for the operation of the service and also ensure verification, approval and guaranteed creditability and integrity of the partner organization.

2.4.1 Technical and ICT Environment: Geographical Context and Basic physical infrastructure

Transport and Travel time: Sudan is the biggest country in Africa, but its transport network is sparse – with an existing road infrastructure having been deteriorated, particularly in war-affected areas.

The situation is improving quite rapidly: at the end of 2009, four main road construction contracts were under implementation by the Highway Authority, and construction on about 1,000 kilometers of roads was either under way or being planned.¹¹ However, the lack of road and transportation infrastructure in rural areas is one adverse factor hindering the expansion of Mobile payment (and perhaps most importantly business opportunities for M-PESA, the main target clientele of Mobile Payment).

Large distances compounded by lack of transportation infrastructure imply significant travel time and costs for both customers and bank agents. Major challenges for financial outreach in rural areas, as it impacts transaction costs significantly.

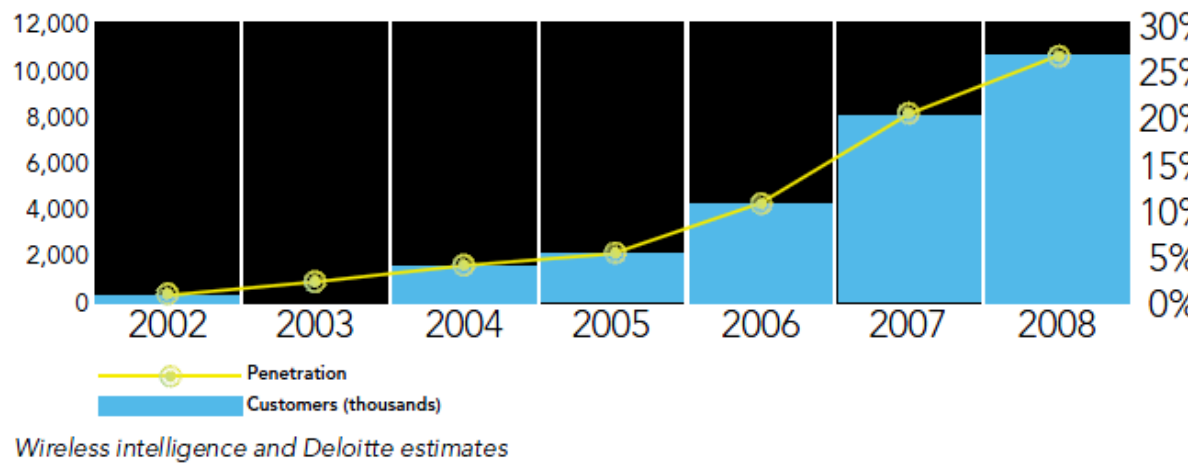
The Consultancy couldn't find studies with information pertaining to time travels and costs incurred by Mobile payment customers in rural areas. Targeted surveys in the Pilot areas of a pro-poor branchless banking initiative will have to be conducted, as comparing transaction costs with and without the availability of a mobile financial solution will have to be taking into account in the pricing of mobile services.

Telecommunication Market

(1) Sudan is benefitting from a good telecommunication infrastructure and the penetration rate of mobile is growing very fast.

Sudan's telecommunications infrastructure includes 11,000 km long optic fiber national backbone. It is complemented by a digital microwave network and a domestic satellite system. Telecommunications services are available in roughly 80% of the country, covering all major urban and rural settlements.

The penetration rate of mobile phone increased very significantly in the past years, as illustrated by the following figure (extracted from Zain/Ericsson Economic impact of telecommunications in Sudan, June 2009)



The penetration rate end of 2009 exceeded 42% or 15 million customers up from 28% in 2008 (10 millions).

(2) There are three main MNOs operating in Sudan: Zain, Sudani and MTN.

All of them are using GSM based networks (Sudani dropped its 2G network based on CDMA technology). Their respective mobile market share is presented below

Table 2.3: Telecommunication market

	Number	%
MTN	4 042 000	23%
NoW	25 000	0,1%
Zain	8 785 000	51%
Sudani (Sudatel)	4 380 000	25%
Gemtel	51 500	0%
Total	17 283 500	100%

Source : ICT Report 2012

Zain

In February 2006, Zain acquired Mobitel, the mobile spin-off of the incumbent fixed line operator Sudatel. All African subsidiaries of Kuwait-based Zain have been acquired by Indian based Bharti Airtel, except the Sudanese subsidiary.

According to Zain Sudan:

- Zain market share in October 2010 is around 60% (10 million customers).
- Zain is offering a national coverage of 80%.
- Its Internet coverage is also 80%, using 3G and EDGE technologies.
- Zain is offering bulk SMS services, distributed through its corporate sales department and 3rd party content providers. Its USSD gateway is not used by 3rd party value added services. Providers.

MTN

MTN Sudan was launched in 2005 (Bashair Telecom, acquired at 85% in May 2006 by the South African operator MTN). Its market share was estimated at 24% (June 2010). Technologies used are GSM 900 and 3G 2100.

Sudani

Sudani is the mobile subsidiary of Sudatel Group (STG) of Companies in Sudan (Sudatel, the fixed incumbent, re-entered the mobile market with Sudani after having sold its Mobitel mobile services to Zain in 2006). The Sudanese government has a 26% shareholding in Sudani. Its market share is estimated to be 25%. Sudani is the first telecommunication company in Sudan to deploy 3.75G.

Canar (not an MNO)

Canar is a subsidiary of Etisalat. It has no mobile license yet but has applied for such a license. Currently the core business of Canar is the corporate market, offering fixed wireless & wired integrated solutions. Both Zain and MTN rely on Canar for network backhaul, national and international connectivity and internet bandwidth. Canar expects to cover all major cities and all states of Sudan by the end of 2011, using its access fibre network and newest NGN (all-IP) and WLL (Wireless loop) technologies.

Canar would certainly be one of the key potential ITC suppliers of any mobile financial solutions in Sudan (especially for internet leased lines).

Telecommunications within Sudan are regulated by the National Telecommunication Council (NTC).

The National Telecommunication Council was restructured as the National Telecommunication Corporation (NTC) under the Telecommunications Act of 2001. The regulator established a universal service fund (USF) in 2004, financed by the government and licensees to oversee the provision of telecoms services. In 2008 the NTC introduced universal access fees payable by telecoms operators consisting of 2% of gross revenues plus SDP2 per customer on an annual basis. The government also increased VAT in the telecoms sector from 5% to 20%.

2.4.2 IT Services Providers

The most important IT service provider for the Sudanese financial market is Electronic Banking Services (EBS), a company created by CBOS.

EBS is a private company owned by CBOS (49%), Sudatel (30%) and other stakeholders (source: www.ebs-sd.com)¹⁶. It started its operations in 2000 and is dedicated towards introducing of banking technologies and solutions, and most importantly payment systems. EBS is in charge of the four major systems hosted at or delegated by CBOS: the National switch (for ATM transactions and for all EPOS transactions), Electronic Link system, the Core banking system of CBOS, and the Electronic Reports system for CBOS and commercial banks. EBS employs approximately 120 people.

FBS (Financial & Banking Systems Co. Ltd) is an IT company providing various services and solutions for the Sudanese banking industry.

FBS is owned by EBS (30%) and 10 Sudanese banks (70%). FBS has developed:

A core banking system (Penta Bank) which has been implemented in 12 Sudanese banks. “E-Bank”, a web-based e-banking application.¹⁶ The English version of this site seems obsolete, with some references to project to be implemented in 2005

A mobile application, but if this solution has not been implemented yet (up to our knowledge):

- FBS Top Up to make payments such as bill payments and transactions including money transfers, banking enquiries, (balances, detailed and mini statements) as well as the ability to both fund and withdraw funds from the [bank] account.
- FBS e Wallet “a complete 'standalone' banking solution with a fully functional and secure account which the customer can use to make convenient and secure payments, amongst other things, from their mobile phone” (source: FBS website.)
- A new Micro-Finance system just recently developed and not yet implemented in a financial institution.

FBS is also providing specific hardware equipments (money counters, automats...).

(3) Other companies may play a very significant role in the ITC market for financial solutions, especially for mobile financial solutions.

Among the software companies based in Sudan with experiences in the financial sector, the Consultancy has identified:

- Vision Valley: this company has been established in Dubai, in 2003, and in Sudan since 2004. Services provided are: IT strategy plans, design and implementation of wireless networks, system selection, configuration, installation, and verification (Open ERP

for instance), value added services (e-commerce) and in particular m BMW, a MFS platform.

- MATS (www.matscards.com)
- SMS Messaging platform (MATS and ZAIN signed an agreement certifying MATS to be the authorized ZAIN bulk SMS reseller).
- MATS are implementing the Electronic Fund Transfer project for CBOS and the commercial banks: installation of terminals (EPOS), development of EPOS, communication with the National Switch at CBOS (through Zain GPRS network).
- MATS Company has developed an application (M2E™) to manage services geared towards prepaid process like utilities (electricity, water, DSL...).
- In particular, MATS is implementing a national electronic/mobile voucher project for the Sudanese Company for Electricity Distribution. It also offers customizable applications to petrol station companies using POS terminal and magnetic stripe or smart cards.
- Automated Fingerprint Identification System (AFIS), for NSDPR project in East Sudan.
- Kiosk applications (for Payment of commodities, utilities or services).
- Hashab ITT (www.hashab.com)
- Mobile technology services, networking, software development (e-commerce, e-banking solutions...consulting for banks and MNOs).

2.4.3 Critical challenges facing mobile money in Sudan with insights from Kenya

A major challenge affecting mobile money in Sudan is the regulatory framework, where CBS (2012) posits that ‘it was developed to conform to international best practice and standards’. It also specifies the necessary functionalities expected of any mobile payment service in Sudan. The regulatory framework in Sudan applies to all activities of the participants involved in the provision of mobile payment services which include; service providers, infrastructure providers, solution providers, scheme operators and consumers (EBS, 2012). In contrast to Kenya, the regulatory framework between both countries can be described as two extremes fields, Where Nyaoma (2010), posits that Kenya has an open and controlled regulatory environment, while Sudan has a restricted regulatory environment. In Kenya, Safaricom launched M-PESA m-money service with no pre-existing regulation guiding its operation and executives from Safaricom who helped manage the development stated that,

“M-PESA is a form of E-money service which is new to Kenya, due to this fact; there are no clear regulations in place. Nevertheless, it was impressive how quickly the regulators’ questions progressed....But we had our homework done and eventually the regulator confirmed that it had no objection to the service launching. Ten days after receiving this letter, we launched” (Hughes and Susie, 2007, p.80).

In view of this, it can be seen that the set of laws for m-money in Kenya originated from the commencement of M-PESA . However, the regulations in Sudan unlimited the MNOs solely as a communication path through which m-money services can be routed (IFC, 2011). CBS (2009) stated in its guidelines, that Telecommunications Company shall “provide the network infrastructures for the use of m-money scheme” and also “make available its network scheme without discriminatory practice”. Mas (2012) also argued that, the policies pertaining to the security and reliability of m-money about whom should “issue accounts, conditions of service, data security and privacy standards, supervisory

treatment, consumer protections”, is kept within the domain of the banking regulator. Besides, authorities also need to address the various parts of mobile communication services, which the MNOs have restricted access to and are necessary for providing mobile financial services. An example is the SIM card; it contains pre-loaded security keys used to execute end-to-end data encryption from the mobile phone to the transaction approval server.

Furthermore, regulations guiding m-money in Sudan proposed three specific models to the m-money service, and according to CBN (2011), they include “a bank-focused model where the financial institutions are the lead initiators of the service, a bank-led model strictly driven by banks and supported by its technology partners, and the non-bank led model driven by corporate organizations, but with a level of bank control”. The role of the MNO’s is basically the provision of the telecommunications network to drive the service. According to IFC (2011) report, CBN’s choice to limit the role of the MNOs and is due to.

“...It’s desire to restrain particular companies from monopolizing the m-money sector, as was the case with Safaricom in Kenya. Also, with a series of upheavals in the financial services sectors, the CBN is concerned MNO’s will merge airtime with cash, and not provide the security to deposit holders that they would find in a regulated banking environment (IFC, 2011, p.19)”.

This framework proposed by CBS shows quite a few inferences for m-money implementation in Sudan, and relates to firstly, the support of the EBS. This puts the EBS role for m-money at its least and with this IFC (2011, p.1) stated that,

“...Allied with their experience, operating agent networks and their success at targeting the base of the pyramid, there is little incentive for MNOs to act only as a communications channel. As a result, all MNOs in Sudan have expressed little interest in acting as a communication channel, and are holding out for a change in regulations.”

Secondly, the existing system operators in Sudan do not have the extensive agent networks accessible to EBS. Where (2011) stated that,

“...Rock-solid schemes need to be put in place towards building a robust and successful agent network across the country by the operators. M-PESA in Kenya was successful due to its robust agent network and there are currently over 22,000 M-PESA agents and over 90 per cent of the agent networks are owned by Safaricom”.

In addition, the extra cost of SMS fees is another issue for consumers, if the MNO's were to operate as a communication channel, their usual charges for the SMS becomes applicable, which is in contrast to Safaricom in Kenya where M-PESA operates on an existing framework. In developing a service to consumers, which is centered on providing financial inclusion to the economy, “will consumers pay the extra price in addition to the normal applicable transaction fees?” (Okoegwale, 2011). The above question is a major concern in Sudan. Notwithstanding the disparity that exists in the regulatory frameworks, both countries also share a number of similar regulatory requirements, like the limitation on cash transaction limit, e-money account opening requirements also referred to as Know Your Customer (KYC) to curb money laundering, transaction security and integrity, etc. (Mas and Radcliffe, 2010). However, the elimination of the MNOs from active involvement should be looked into by the regulators, if the rapid development of m-money is expected, as their involvement in retail payments has been proven to present competitive challenges which the banking industry (Mas, 2012). He further discussed the concerns that, the MNOs may “transfer market power from their main market, to the up-and-coming retail mobile money market, in a way that banks might be shut out of mobile money” (Mas, 2012).

The table below describes the current regulatory framework by CBN (2012), which consists of three major models which include the bank-focused (where the financial institutions are lead initiators), bank-

led (where the financial institutions and consortiums are the lead initiators) and the non bank-led (where the corporate organization is the lead initiator).

Table 2.5: Regulatory Framework Models and Service

Bank-Focused (Banks Only)	Bank-Led (Consortium)	Non-Bank-Led
Participants		
Initiating Bank	Initiating Bank/s	Corporate Organisation
ICT Partner/s	Partner Organisations	Partner/s
	Scheme Operator/s	
	MNOs	
	Independent Operator/s	
Mobile Payment Scenarios		
Bank Account-Based	Card Account-Based	System-Based (SVA)
Services		
Provide all m-Payment services	Provide all financial services	Provide and manage technology
Facilitate International Remittances	Provide and manage technology	Provide Agent Network
	Provide Agent Network	Facilitate International Remittances
	Facilitate International Remittances	

(Source: Moerane, 2012).

Therefore, review of literatures (e.g. eTranzact/IFC/MTN, 2011, IFC, 2010), further stated that the regulatory framework can be described as a key factor, impeding the growth of Mobile Money in Sudan.

2.5 Mobile Money in Kenya

2.5.0 Demography of Kenya

The Republic of Kenya is situated on the upraised part of the eastern portion of the African continent astride the equatorial Latitude. It has an area of about 580,367 square km and is located between Somalia to the east, Ethiopia to the north, South Sudan to the north-west Uganda to the west, Tanzania to the south and Indian Ocean to the south-east.

Kenya's population currently stands at about 40 million with a growth rate of about 2.5 percent per annum.

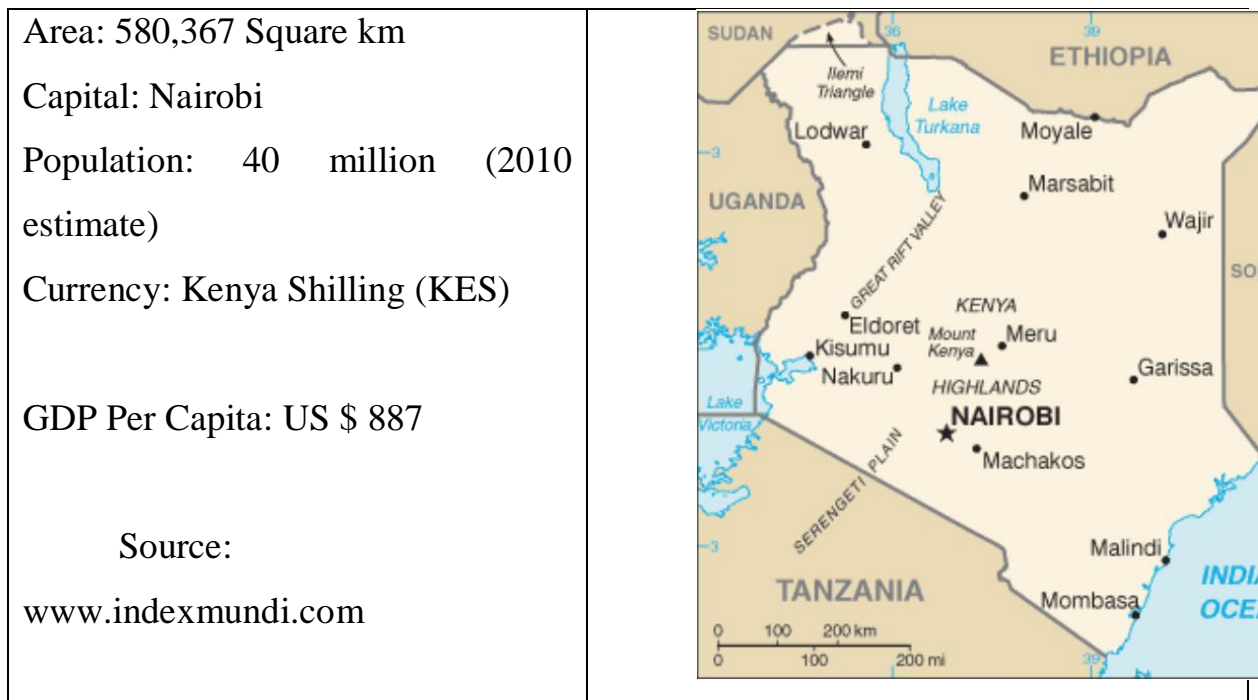


Figure 2.3 demography of Kenya source by

2.5.1 Regulatory Framework for ICT

The Communications Commission of Kenya is the regulatory authority for the ICT sector in Kenya and was established in 1999 by what is now referred to as the Kenya Information and Communications Act Cap 411 following some amendments in 2009. The Kenya Communications Regulations 2001 were reviewed in 2009/2010 to bring them up to date with technological developments and changes in the policy and law. The new Kenya Information and Communications Regulations, 2010 cover the following areas: Electronic Transactions, Universal Access and Service, Consumer Protection, Dispute Resolution, Radio Communications and Frequency Spectrum Management, Licensing and Quality of Service, Postal and Courier

Services, Fair Competition and Equality of Treatment, Broadcasting, Compliance Monitoring, Inspection and Enforcement, Type Approval, Tariff, Interconnection and Provision of Fixed Links, Access and Numbering

ICT Growth & Status

The telecommunications industry continues to post considerable growth spearheaded mainly by the mobile telephony segment which saw subscriber growth register a 15.9 percent increase in 2010. According to recently release statistics by the sector regulator Communications Commission of Kenya (CCK), there were an estimated 12.538 million internet users in the country as at 30th June 2011 up from 7.832 million the previous year.

The mobile subscriptions stood at 25.2 million subscribers in 2010 up from 20.1 million recorded the previous year, representing a growth of 25.6 per cent. Mobile penetration consequently increased from 51.2 percent in June 2010 to 63.6 percent as at 30th June 2011.

Following the regulators intervention in lowering mobile termination rates, the operators reduced both on-net and off-net tariffs in a bid to attract and retain customers on their respective networks.

2.5.2 The Regulatory Framework for Banking in Kenya

Given the critical role of banks for a modern market economy, the opacity of banks' balance sheets, the dispersion of banks' creditors – typically many small depositors – and the maturity transformation banks

perform converting short-term deposits into medium- to long-term assets there are limitations to market discipline and additional sources of fragility, compared to non-financial corporations. Banking has therefore historically been one of the most regulated sectors, with regulation ranging from licensing requirements to on-going supervision to a bank-specific failure regime and deposit insurance.

In Kenya, the Central Bank (CBK) is responsible for regulation and supervision of banks. Over the past decades, there have been numerous revisions to the Banking Act, Central Bank of Kenya Act and prudential guidelines aimed at strengthening CBK's supervisory role. The Banking Act has been reviewed over time to give more legal powers to the regulatory authority and to broaden the responsibilities and coverage of institutions. The first comprehensive review was made in 1985 following the rapid growth of NBFIs that was mainly attributed to weaknesses in the regulatory framework. In addition, there was a change in the licensing procedures for banks that introduced a clearer mandate for the Central Bank in the licensing process.

In 1995, further amendments of the Banking Act were made aimed at further strengthening supervision of the banking industry. Prudential guidelines were revised to encourage self-regulation and covered codes of conduct for directors, chief executives and other employees; duties and responsibilities of directors, chief executives and management; duties and responsibilities of external auditors; and the definition of bad and doubtful advances and loans.

In 1998 the Central Bank enhanced capital requirements to avoid a repeat of the banking crises experienced in the mid-1980s and early 1990s. To this end, the gearing ratio was raised to 7.5% from 5%. In

2000, the Central Bank adopted the Basel I standards on capital adequacy. This led to the introduction of additional capital adequacy ratios of 8% and 12 % for core capital and total capital to risk weighted assets respectively. These reforms were in tandem with the then prevailing global trends that required financial institutions to maintain capital commensurate with the credit risk inherent in their business.

In response to gaps identified in the 2003 joint IMF/ World Bank Financial Sector Assessment Program (FSAP), a series of legal and regulatory reforms have been undertaken. These have included significant changes to the Banking Act (Cap 488) and to prudential guidelines to strengthen arrangements in relation to bank licensing, corporate governance, capital adequacy, risk classification of assets and overall risk management.

Deposit insurance is often seen as an integral part of a financial safety net, in spite of significant risks that both case studies and cross-country comparisons have shown (see Demirguc-Kunt and Kane, 2002, for an overview). While the initial purpose is to protect small savings and prevent bank runs, deposit insurance also reduces market discipline even further, as depositors have fewer incentives to properly monitor and discipline banks. This results in additional pressure on supervisors, which in countries with a weak regulatory and supervisory framework can result in deposit insurance leading to more rather than less fragility (Demirguc-Kunt and Detragiache, 2002). Across countries with deposit insurance, structure, funding and mandates vary a lot. While some countries have pure pay-box deposit insurance funds, such as in Brazil and Uganda, other schemes have wide-ranging supervisory powers, such as in Canada or the U.S. Deposit insurers might be more likely to

carefully monitor banks and intervene rapidly into failing banks as they have to carry the costs in terms of higher pay-out to indemnified depositors. Cross-country comparisons show indeed that banks in countries where the deposit insurer has the responsibility of intervening failed banks and the power to revoke membership in the deposit insurance scheme are more stable and less likely to become insolvent (Beck and Laeven, 2008).

Following the banking crisis of 1985/86, Kenya established a Deposit Protection Fund Board (DPFB) with a wide mandate. Specifically, the DPFB's main tasks are to manage the deposit insurance fund and carry out the liquidation of insolvent institutions once they have been closed by CBK (by repaying protected deposits and dividends, carrying out debt recovery, and winding up the institutions under liquidation). DFPB offers protection to small depositors up to Kshs 100,000 (USD 1,250) against loss of their savings in case of a bank failure. Institutionally, DFPB is part of CBK and relies on staff from CBK, but also on information from CBK's supervisory department. It does not have any role in the supervisory process. While having a broad mandate, DFPB's responsibilities are thus not completely aligned with its incentive to minimize insurance fund losses.

In order to improve the role of the DPFB in enhancing depositor confidence, initiatives are underway to enact a new and separate Kenya Deposit Insurance Corporation Act that will give the Fund autonomy in its operations. Among other additional roles, the draft Act provides the DFPB with powers to request the Central Bank to carry out an inspection of a member institution and, where deemed necessary, to conduct the examination itself

2.5.3 The Regulatory Environment for M-Transactions in Kenya

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. But the country still lacked a clear framework for electronic transactions, which it needed to participate effectively in the new internet economy. It needed an appropriate and comprehensive information bill to address the specific details of electronic transactions including the critical laws for this sector. Though Kenya's government did publish the Electronic Transactions Bill of 2007 to address electronic commerce issues such as recognition of electronic transactions and electronic signatures, it has not enacted the Kenya Information and Communications Bill of 2007.⁷ Many interested parties—including mobile operators, merchants, banks, entrepreneurs and consumers—want to see the accurate and inclusive ICT enacted soon, to enhance trust in electronic transactions and more specifically, mobile transactions.

This issue arises constantly in discussions of M-transactions. Banks have often complained that M-PESA has been allowed to operate without much regulation, while banks are heavily monitored. Currently,

M-PESA abides by the minimal regulatory requirements set by the Central Bank of Kenya (CBK). On several occasions, the management of Safaricom has clearly indicated that it is ready to operate under any regulatory framework the government will implement. These innovations and levels of growth were not envisioned five years ago, and with so much attention, we do not know what is awaiting us in the next few years. I expect many players will get involved and develop several applications to extend payment and money transfer services to consumers. Different players from different sectors are likely to engage in more collaboration and create networks we never imagined. The ecosystem will enable different players to co-exist, creating unimagined possibilities. Amidst all these developments, what is the regulator doing—and going to do in the future? Excessive early regulation tends to choke innovation, and CBK has demonstrated that it can hold back on pressure, to allow M-PESA to grow.

Currently M-PESA is not as tightly regulated as banks, because, according to the banking act, Safaricom is not operating as a bank. As long as the money is in transit and is not used for anything else, the operator is not qualified to be a bank. This is not the case in many other countries like South Africa, where accepting deposits from the public easily qualifies an operator to be viewed as a bank. Regulation that limits innovation normally takes the form of tough rules, high fees and huge taxes on the new services that make the service costly to set up and expensive to run. For sustainability reasons, service providers transfer the costs to the consumers, which then inhibit adoption and diffusion. These regulations inhibit other potential entrants. This was the case with mobile telephony in Kenya and many other countries before the market

was liberalized. Regulation certainly is medicine, but it can be poison to an otherwise healthy technology.

However, delaying regulation tends to cause genuine anxiety when innovations grow into complex systems and become too complicated to regulate. Several service providers have proposed partnerships with Safaricom to extend M-PESA services. Some partnerships have already launched; as mentioned earlier, users can withdraw cash from Pesa Point ATMs. Investors in the Old Mutual fund can top up their monthly contributions to their unit trust investments using M-PESA .²² Other proposals are waiting in the wings. Gradually the network is growing more complex and boundaries are less clear—so supervision and monitoring will become more complex.

Banks in particular have expressed concern as to why M-PESA has been left to operate in some kind of regulatory vacuum. Their unease arises because many MPESA subscribers actually use their M-PESA accounts as checking accounts, and thus a great deal of money has shifted from physical bank accounts to the M-PESA

Tonny Omwansa

2.5.4 Trends in Kenya's Mobile Telecommunication Sector

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 2008) to regulate the communications sector.

4 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 have operated as a duopoly with Safaricom and Celtel taking the lead since 2000. The original intention of the KCA—to liberalize telecommunications in Kenya—has largely been met. Growth was tremendous:

From 17,000 mobile subscribers in 1999 to 11.3 million by December 2007.⁵ 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 1 shows how the number of both mobile phone and land line users has grown in Kenya over five years.

2.6 Mobile transaction

According to Shi (2004), mobile transaction can be defined as a, “...type of transaction submitted from a client (mobile or fixed) to server (mobile or fixed)”.

However, customers need to be guaranteed of the security and privacy of m-commerce infrastructure, so as to ensure continued use of the services being offered. Nambiar *et al.* (2004) stated that a mobile transaction should have the subsequent characteristics, which includes authentication, confidentiality, non-repudiation and integrity. Shi (2004) posits that authentication is a process of verifying the identities of individuals concerned in the payment transaction, to ensure they are genuine. There are two forms of authentication which include; Entity authentication (which entails confirming the identity of the

communicating individuals) and Data authentication, which relates to the source of the data received (Mitchell, 2004). Merz (2001) suggests that confidentiality is imperative in the characteristics of payment transactions, as it ensures that transactions cannot be accessed by unauthorized persons and this also guarantees that just the correspondent and beneficiary can access the data (content).

In addition, Mitchell (2004) also added that non-repudiation has to do with the service offered to the correspondent of the data, in order to ensure that the parties involved in the process do not proclaim they did not participate (Mitchell, 2004). Shi (2004) further added that integrity is ensuring that the data involved is in its original form, i.e. has not been altered in any way, and it also refers to the ability of the receiver to perceive if the data has been altered in any form. The figure below describes the different phases of mobile transactions, where the transaction process starts from the consumer, through the content provider who sends the purchase request to the service provider e.g. bank or Credit Card Company and they in turn bill, the customer for the transaction made.

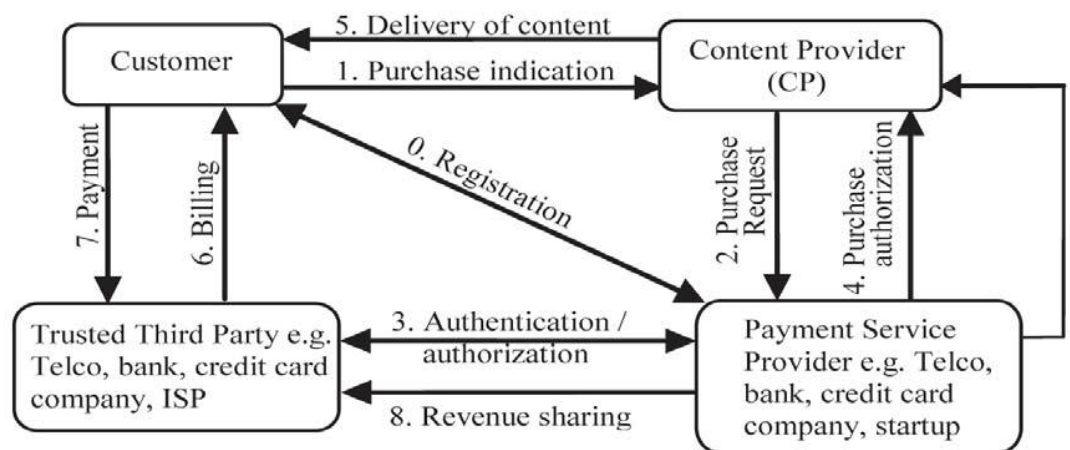


Figure 2.4: Phases of mobile payment transactions (Kadhiwal and Zulfiqar, 2007).

2.7 Technologies for securing mobile transactions

The mobile security technologies used for a wireless link between consumers and access networks are; Public Key Infrastructure (PKI), Subscriber Identity Module/Universal Subscriber Identity Module Application Toolkit (SIM/USIM), Wireless Application Protocol (WAP), and Near Field Communications Technology (NFC).

According to Nambiar *et al.* (2004), PKI is.

“a system of digital certificates, certification authorities and other registration authorities that provides solutions to enable a secure mobile commerce”.

Similarly, Raina and Harsh (2002) argued that PKI can be described as the only technology that provides authentication, confidentiality, data integrity and non-repudiation, and is characterized into firstly the Public Key Cryptography. The Public Key Infrastructure is based on an open key cryptography and uses two key types; a secret and a public key, which is centered on using asymmetric pair of keys. Mitchell (2004) suggests that the private key technique is noted on the fact that the correspondent and the intended beneficiary share a secret/private key, before they communicate with each other. The public key on the other hand can be revealed openly, and each user has one or more pair of keys. PKI augments security and is used by parties who are known to each other (Raina and Harsh, 2002). Secondly is Digital Signatures, which is referred to as electronic signatures. It is genuine, cannot be forged or reused and is non-reputable. Enciphering a document which is subject to signing with the secret key creates digital signature that can be verified by deciphering the enciphered document, with the public key (Lim and Siau, 2003). Thirdly is the Secret Key Technique, in this case the correspondent and beneficiary allocate a secret key before sending data across to each other (Raina and Harsh, 2002). The shared secret key is used to perform various cryptographic operations, for example, encryption and decryption of data, which is based on the use of symmetric techniques (Mitchell, 2004). The secret key technique is still being used for verification, since they are computationally fast in contrast to the public key technique. In addition, Mitchell (2004) discussed that, communications systems in recent

times, provide access to services, based on the type of subscription the consumer has with the service provider. A few security protocols employ the use of PKI, which are used in the provision of end to end security by applications in a mobile environment. An example is the Wireless Application Protocol (WAP), used to describe terms for access to internet data and services, with the use of wireless devices (Lim and Siau, 2003).

Subsequently, according to Knospe and Schwiderski-Grosche (2004), the SIM/USIM application toolkit permits mobile network operators to create applications which reside in the SIM/USIM. The applications can be used to transmit and interpret SMS strings. Security mechanisms that is found to be associated with SIM toolkit are “authentication, message integrity and message confidentiality, proof of execution with receipt and indication of the security mechanisms used” (Knospe and Schwiderski-Grosche, 2004).

Furthermore, NFC transactions are carried out with a wave from an NFC enabled device over a short distance of less than five centimeters, and its application has made life easier and more convenient for users (Mantoro et al.,n.d.). It is a short range RFID communication technologies, centred on 13.56MHz radio frequency, standardized in ISO 18092 and offers two way interaction (‘read and write’) with simplicity in user authentication (Giesecke and Devrient, 2011). NFC is based on secure chip modules used to authenticate the user to the service provider.

2.1 Related works

This section gives a brief overview of on theories used by the researcher to describe Mobile Money Transfer services. These theories are relevant to this study because they describe various means through which Mobile Money Transfer services can be provided.

- **Application of new technology in service theory**

This theory explains so far how the technology has contributed to improve mobile money transfer services. The theory has a number of advantages to society as it explain in details how so far this new technology has improved the service delivery as banking business has increased.((Hock Bee, 1999). The theory explain in details it availability and expansion to rural areas where other technology were not available hence effect a number of advantages through effecting transactions and payments systems. The banking industry technology has got positive competition which has resulted to positive impact on mobile money transfer services (Morawczynski and Pickens (2009).

Chapman and Holtham (2004) in the theory on application of new technology in service delivery have helped many organizations to improve services. In this theory they argued that application of new technologies creates potential for improvement in delivery of services as it is in recent developments in mobile phone technologies which has resulted in a rise in volume of banking business performed through the mobile phone such as mobile money transfers (Hock Bee, 1999). Vodacom M-PESA as the positive effect towards new technology as the theory suggest it has brought a number of positive impacts as to make easy transactions on matters which were not easy (FinAccess (2009). This theory has its weakness as it does not explain how so far it brought changes to areas where are unbanked (BOT report on Balancing Act Africa, issue 541 February 2011). The technology theory has been new to society such that it reveals no positive effect as it is new to society. Technological developments have brought many changes to society as transactions have been possible at every stage with no any limit. (BOT report on Balancing Act Africa, issue 541 February 2011). This is another weakness resulted by technological theory as it tries to excel mobile money transfer services with no boarder of control hence reveal shortfalls to users of this services.

- **Adoption of Mobile Money Transfer services theory**

Since 2005, Mobile Money Transfer services have been used in a number of ways in developing countries. It is the theory which explains the adoption of money transfer services and its effect to developing countries. A study conducted by Porteous (2006) on the adoption of Mobile Money Transfer services in Africa found out that Mobile Money Transfer s in Africa are in the following forms; transmitting airtime, paying bills and transferring money. The forms which has been explains in this theory base much on the activities being conducted by the society such as paying bills, as it is for water bills, electricity (LUKU), DSTV, Star times etc. There are also a few m-money systems in developing countries that allow international money transfers. In this theory it is much explaining its impact to developing countries for transacting e money while the matter of mobile money transfer services is wider than it has been stated in this theory. The positive effect of this theory is it explaining the actual situation being performed on adoption to mobile money transfer services as it explaining it effect in developing countries. Although this adoption theory has positive effect there are other negative effect whereby it does not explain how so far it has benefited the society and its impact to development of the society at large particularly in developing country and focusing on the society living in rural areas (FinMark Trust 2008).

- **Mobile Money Transfer services theory**

This is the theory which explains mobile money transfer services as the means of transferring money to different beneficiaries through money transactions as being provided either by banks or mobile phone companies. It is the system which is provided through the use of telecommunication systems.

The study by Porteous (2006) which involved a survey of mobile phone users in Kenya and South Africa, also found that some forms of Mobile Money Transfer services are offered entirely by banks while others are offered entirely by mobile phone companies and others are offered in partnership between banks and mobile phone companies. Most Mobile Money Transfer systems users to store value in an account accessible by the handset, convert cash in and out of the stored value account, and transfer value between users.

Majority of Mobile Money Transfer subsystems in Africa involve the use of a “pseudo account” by purchasing “electronic money” (e-money) from an agent, usually a third party or someone who works for the mobile phone operator or bank. The user can then send e-money to another recipient with a phone, who then withdraws the e-money from their local transfer agent. Fees are generally charged for each transaction (Porteous, 2006).

The most popular Mobile Money Transfer system in Africa is M-PESA (“M” for Mobile, “Pesa” for “Money” in Swahili). Although M-PESA has been touted as “banking the unbanked”, on average, M-PESA users are wealthier, better educated, urban and “already banked”. The theory has proved to have some weakness which fails to reward the society on direct benefit provided by transfer and security of their transactions. (Morawczynski and Pickens 2009). It is recommended that the system is accessible hence it reach to all areas which are not reachable by other banks.

- **M-PESA: case study of the critical early Adopter’s role in the rapid adoption of mobile money banking in Kenya**

This study reviews key factors that led to the phenomenal growth of mobile money banking services in Kenya using M-PESA, “mobile cash money”, the leading mobile money service provider as a case study. The study considers the outstanding challenges experienced by users, possible solutions and future trends. These aspects are covered through a critical review of existing literature, secondary data and a survey

targeting mobile phone users living in the major urban centers, considered to be the early adopters of new technologies in Kenya.

Several lessons learnt from the mobile money rollout in this Kenyan experience are identified for future researchers and practitioners.

- **Mobile banking: The impact of M-PESA in Kenya**

This paper examines how M-PESA is used as well as its economic impacts. Analyzing data from two waves of individual data on financial access in Kenya, They find that increased use of M-PESA lowers the propensity of people to use informal savings mechanisms such as ROSCAS, but raises the probability of their being banked. Using aggregate data, they calculate the velocity of M-PESA at between 11.0 and 14.6 person-to-person transfers per month. In addition, they find that M-PESA causes decreases in the prices of competing money transfer services such as Western Union. While they find little evidence that people use their M-PESA accounts as a place to store wealth, our results suggest that M-PESA improves individual outcomes by promoting banking and increasing transfers.

- **Penetration of Mobile Money Transfer services theory**

Penetration theory is that theory which states how so far the mobile money transfer services has captured the market. A study conducted by Fin Mark Trust (2006) on the penetration of banking services in East Africa found out that less than 30 percent of East Africans have formal bank accounts.

M-PESA money transfer system, launched in March 2007, has become popular with the unbanked population. A Fin Access (2009) survey found out M-PESA has grown to over 8.5 million customers (November, 2009), served by over 12,000 agents throughout Kenya. M-PESA services have expanded to include bill payments, group salary

payments and school fee payments. The study also found that over KSh20 billion has been transferred through the system since it was launched. This theory has contributed much easing money transaction on payments of various transactions. Though the theory did not show the impact on using mobile money transfer services for payment, in order to control and secure of the user (Vaughan, 2007). It is recommended that this theory has to be used for estimating the effect of mobile money payment theory as the factor to be taken into consideration as its effect is a one way for control purposes.

- **Mobile Money Transfer services and keeping balance theory**

The study by Morawczynski and Pickens (2009) also found out that M-PESA users often keep a balance on their M-PESA accounts, thereby using the system as a rudimentary bank account. M-PESA users also send smaller but more frequent remittances, suggesting that the use of M-PESA system might someday allow informal insurance networks to function more efficiently and effectively.

The rapid uptake of M-PESA and similar m-money services is not surprising when one considers the level of financial development in Kenya and in sub-Saharan Africa. Less than 30 percent of the population in East and Southern African has a formal bank account, ranging from 9 percent in Tanzania to 63 percent in South Africa. These findings are according to a study conducted by FinMark Trust (2008).

In 2006, Kenya had only 450 bank branches and 600 automatic teller machines, or less than two bank branches per 100,000 people (Vaughan, 2007). Kenyans primarily sent money by one of three mechanisms: via Western Union or post office, via intermediaries (such as bus drivers), or via friends or relatives. Wire transfers via Western Union are secure but expensive and not always available in remote rural areas.

- **Usage and impact of Mobile Money Transfer services theory**

Usage theory explains the impacts resulted by mobile money transfer services (Vodacom M-PESA) the impacts to individuals through personal savings and timing amount of transfers.

Jack and Suri (2009) suggest that that the inconspicuous nature of M-PESA transfers could allow individuals to increase their personal savings, because friends and relatives would be less likely to know about the timing or amount of transfers. Wilson, Harper and Griffith (2010) find that members of informal savings groups in Nairobi are using M-PESA to deposit individual savings into their group account.

A variety of qualitative studies provide some insights into the characteristics, patterns and potential impacts of Mobile Money Transfer usage. For example, a study by Morawczynski and Pickens (2009) on usage and impact of mobile financial services in Kenya found out that users often keep a balance on their M-PESA accounts, thereby using the system as a rudimentary bank account. This theory is much used for financial transactions and keeping of funds and their usage. The theory fails to reveal the impact to users as it does not recognize its impacts to society hence further study has to be applied.

- **Sending procedure of Mobile Money Transfer services theory**

This is the procedure used on transferring process as being explained in the theory.

The study by Morawczynski and Pickens (2009) found out that M-PESA users send smaller but more frequent remittances, suggesting that the system might allow informal insurance networks to function more effectively. The inconspicuous nature of M-PESA transfers allows individuals to increase their personal savings, because friends and relatives would be less likely to know about the timing or amount of transfers.

A variety of qualitative studies provide some insights into the characteristics, patterns and potential impacts of M-PESA usage. For example, Morawczynski and Pickens (2009) find that M-PESA users in Kenya use it to send money instead of using transport services or friends and relatives because it is more accessible and affordable, although it carries a high risk of theft. This theory also has a number of weaknesses which welcome other research to be conducted for the purpose of enriching the findings. The recommendations base on improving transferring methods hence to satisfy customers.

2.8.1 Research gap

Based on the above reviewed of empirical literature review, it is evident that extensive research has been done which are related to the research topic in developed and neighboring countries such as Kenya. In the development field, there is great interest in the use of mobile phones to increase citizens' access to efficient and affordable financial services a practice commonly referred to as mobile money.

Chapman and Holtham (2004) in the theory on application of new technology in service delivery have helped many organizations to improve services. In this theory they argued that application of new technologies creates potential for improvement in delivery of services as it is in recent developments in mobile phone technologies which has resulted in a rise in volume of banking business performed through the mobile phone such as mobile money transfers (Hock Bee, 1999).The research did not explain how far it has positive impact to customer/ users of mobile money transfer services.

A study conducted by Porteous (2006) on the adoption of Mobile Money Transfer services in Africa found out that Mobile Money Transfer in Africa are in the following forms; transmitting airtime, paying bills and transferring money. It did not explain anything about its impact to customer hence it is the research gap. Thus, it is the objective

of this research study to fill that literature gap and contribute in new knowledge.

2.9 Summary of the Literature Review Chapter

In view of the present state of studies regarding m-payment, this research therefore aims to ascertain the factors that influence a customer's intention to use mobile money in Sudan. This chapter evaluates mobile payment and mobile payments in the Sudan with insights from Kenya. It also includes the challenges currently facing mobile money in Sudan. It describes mobile transactions and some of the technologies used to secure mobile transaction, and also presents a background to the theoretical framework. The next chapter presents the proposed model that would be used in this research.

This section presents the proposed theoretical framework for this research. The research aims to identify the factors, that affect a customer's intention to use mobile money in Sudan and it employs the use of M-PESA .

3.0 Proposed Research Theoretical Framework

The aim of this section is to provide an appropriate framework suitable for investigating a customer's intention to use mobile money service in Sudan. There are different types of theories and models which have been proposed to analyse the acceptance of new technologies, and also assess customers' expectation when employing the use of new technology as discussed in Chapter two. However, for the purpose of this research the technology acceptance model (TAM) would be used. Legris *et al.* (2003) detected varied results with respect to the constructs in TAM, and posits that they resulted from factors that were not present and left out in experimental settings. Thus, it is essential to take account of other variables that relates to mobile payment, which can be integrated into TAM.

However, review of literatures regarding factors that affect mobile technology acceptance, is likely to benefit from prior research in related fields of study. Lee *et al.* (2001) employed TAM in their e-Commerce Adoption Model (e-CAM), it was also extended by Gefen *et al.* (2003). The IADIS International Conference, 2004, Compass Acceptance Model (CAM), by Amberg *et al.* (2003) also adapted TAM to mobile services. TAM was applied in a study of mobile portals by Serenko and Bontis (2004), Pedersen (2003) also adapted the Theory of Planned Behavior (TPB) alongside TAM to explain the implementation of mobile parking. In addition, Kim *et al.* (2010) in comparing people who had used mobile payment services carried out a study based on TAM and IDT. In each of the studies listed above, additional constructs were proposed with TAM to suit the context of the study for that given field, but the initial constructs, perceived ease of use and perceived usefulness were not queried (Mallat, 2007).

Research has shown that mobile payment systems is information technology, and a method whereby customers can make payments so therefore security/privacy can be used as a construct(Mallat, 2007). On the other hand trust and convenience are characteristics of m-payments; therefore it was found necessary to include them in the proposed model. These constructs can be seen in the model proposed shown in the figure below. The next sub-sections details the theoretical framework and the hypotheses proposed for the model.

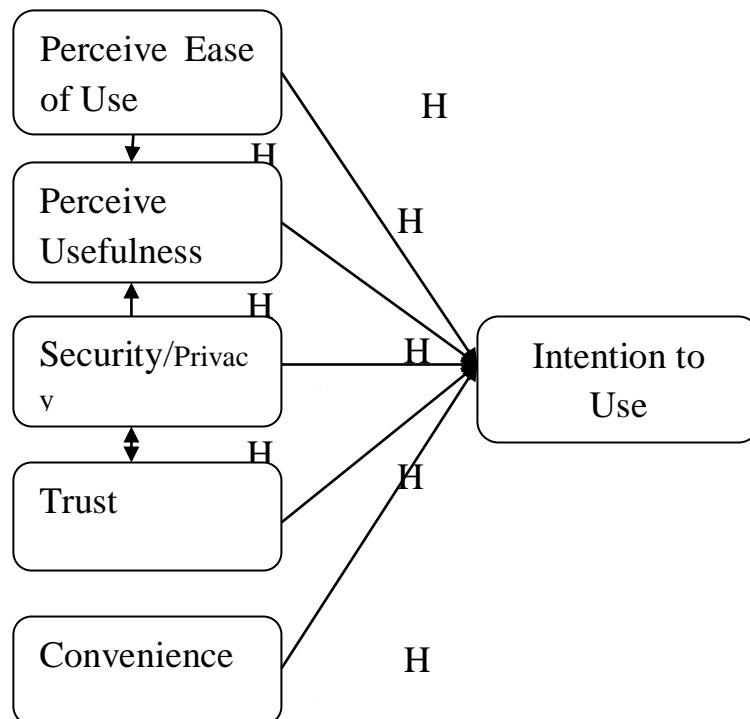


Figure 3.1: Proposed Research Model Using TAM. source (Davis, 1989)

3.1 Technology Acceptance Model and Mobile Payment

Mobile payment procedures in principle is information technology, therefore customer's intention to use mobile payment services can be assessed using the TAM (Davis, 1989) which makes TAM appropriate for this research. A number of empirical analysis conducted shows TAM to be a strong model used to measure the

acceptance rate of a new technology in a broad range of information technologies.

3.1.0 Perceived Ease of Use and Perceived Usefulness (PEOU & PU).

Davis (1989) stated that, Perceived Usefulness (PU) can be described as “the measure by which a person believes that using a particular system would enhance his or her job performance”, while Perceived Ease of Use (PEOU) is defined as, “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p.320). Davis *et al.* (1989) further stated that PU and PEOU can influence one’s attitude towards using a particular system, which also influences the intention to use the system and in turn decides actual system usage. Several studies have also stated the necessity of perceived usefulness and perceived ease of use for mobile payment acceptance (Dahlberg *et al.*, 2003; Dahlberg *et al.*, 2002; Pousttchi, 2003), and the fundamental reason is that IT users react rationally when they decide to use IT. In addition Jeyaraj *et al.* (2006), in reviewing technology adoption studies, discovered that among 29 studies carried out from 1992-2003, perceived usefulness is seen to be significant in 26 of the studies. In addition, perceived usefulness is a general construct, functional in previous mobile commerce and mobile payment literatures. Wei *et al.* (2009) in their study of mobile commerce in Malaysia found perceived usefulness to be positively associated with consumer’s intention to use mobile commerce in Malaysia.

Nevertheless, like PU, PEOU was adapted from TAM, even though consumers consider the system useful, they could still think it is difficult to use (Davis, 1989). In addition, apart from perceived usefulness, perceived ease of use can likewise be said to be a key significant factor in the acceptance of a number of information technologies, e.g. the intranet (Chang, 2004), electronic banking (Wang *et al.*, 2003) and wireless internet (Shih and Fang, 2004). Similarly, Amin (2007) in his study established the significance of perceived ease

of use as a decisive factor, which influences a consumer's intention to use mobile credit card transactions. However, despite of the fact that a number of studies have found perceived ease of use a significant factor, some others do not, for example Pikkarainen *et al.* (2004) and Wei *et al.* (2009) established that perceived ease of use does not have a significant effect on consumers' intention to use.

The perceived ease of use and usefulness of a mobile payment procedure therefore has an effect on its usage, and Davis (1989) opines that perceived ease of use of a system has a direct influence on perceived usefulness which was reflected in the proposed model. Hence, the following hypotheses were proposed;

H1: Customer's perceived ease of use will positively influence their intention to use mobile money

H2: Customer's perceived usefulness will positively influence their intention to use mobile money

H3: Customer's perceived ease of use will positively affect perceived usefulness of mobile money.

3.1.1 Security/Privacy

A number of arguments exist in literature, with regards to safety measures employed in electronic payment systems (Ketterer and Stroborn 2002; Strube 2002; Zieschang 2002). Zeithaml *et al.* (2000), defined security as the extent by which a consumer is assured a particular system is secured, free of threats and personal information is protected. With respect to the definitions above, security and privacy issues in mobile commerce is important and should be taken into consideration by developers of m-commerce applications (Miyazaki and Fernandez, 2001; Earp and Anton, 2004). This is due to the fact that consumers are aware of these issues, and can therefore directly or indirectly affect their intention to use the service (Malhotra *et al.*, 2004; Brown and Muchira, 2004; Sah and Han, 2003). Kreyer *et al.* (2002) and

Merz (2002) argued that security can be classified into objective and subjective security. Where objective security is,

“a concrete technical characteristic, given when a certain technological solution responds to all of the five security objectives which include; confidentiality, integrity, authentication, non-repudiation and authorization” (Merz, 2002; Shon and Swatman, 1998).

While subjective security as described according to Merz (2002), “is the extent to which a person believes that using a particular mobile payment procedure would be secured”. However, Egger and Abrazhevich (2001) posit that an average consumer cannot assess the objective security of a particular mobile payment procedure; therefore an important feature of mobile money acceptance is security. In addition, ambiguity and confidentiality are also forms of security important to consumers, and relates to the policies guiding consumer’s personal information (Jayawardhena and Foley, 1998; Shon and Swatman, 1998; Mallat, 2007).

Nevertheless, perceived security and trust in the vendors is imperative in a mobile environment (Siau *et al.*, 2004; Mallat, 2007), therefore the security techniques used in mobile payment transactions is a primary concern for consumers (Nam *et al.*, 2005). Security of payment transactions in this instance includes no delays, no incompleteness of transactions and no disclosure of private information (Nam *et al.* 2005). Dahlberg *et al.* (2003) further identified the security risks associated with mobile payments, and stated that they negatively affect a consumer’s attitude towards mobile payment. This justifies the fact that security is an important factor that can influence intention to use mobile money and is reflected in the model. Hence, the following hypotheses were proposed;

H4: Security/Privacy will influence a customer’s intention to use mobile money.

H5: Security/Privacy will influence the perceived usefulness of mobile money.

3.1.2 Trust

Trust is imperative, when assessing factors that affect a consumer's behavior, and also ascertains the accomplishment of a given technological implementation like e-commerce (Chen and Barnes, 2007; Yang *et al.*, 2009). Jones (2002) therefore defined trust as,

“the assurance of a person to predict the actions of a third party, may rely upon those actions, and that those actions will follow a predictable pattern in the future, especially under risky circumstances and when no explicit guaranty is provided”.

However, in this research, trust is described by the extent in which an individual is certain that the using mobile money service is secured and has no privacy threats. Prior research has shown that, trust is a key determinant for the growth of e-commerce and m-commerce applications (Dahlberg *et al.*, 2003; Grandison and Sloman, 2000; Hertzum *et al.*, 2002; Papadopoulos *et al.*, 2001). Gefen *et al.* (2003) further argued that, trust is an important determinant, as it affects a consumer's action towards a particular service or organization and can be defined as “a conviction concerning the features of the organization to be trusted”. The characteristics are an organizations reliability, generosity and proficiency and they encompass the organizations credibility, as perceived by the customer (Mayer, 1995).

For the purpose of this research, trust will be used to represent a customer's belief in financial institutions (banks), mobile network operators and retailers, since their perception of them can influence their intention to use mobile money. With the above the hypothesis proposed is;

H6: Trust will have an influence on a customer's intention to use mobile money.

Nevertheless, security and trust can be used as two separate theoretical constructs but they however influence each other (Hampton-

Sosa and Koufaris, 2005). If mobile network operators and financial institutions offer encryption procedures, so as to restrict unauthorized use, consumers may then see the service as secured, which in turn increases their trust. Therefore it can be stated that, a customer is prone to using a payment system that is secured and is offered by a trustworthy provider. Hence the hypothesis proposed is;

H7: there exist a positive correlation between security and trust.

3.1.3 Convenience

Convenience is one of the features of mobile payment, therefore can be used in extending TAM. Convenience in this context can be defined as “when a given system is developed with the objective to make life simpler for individuals” (Obe and balogu, 2007). Convenience as a research construct, has been used mainly in literatures relating to consumer behavior (e.g. Berry *et al.*, 2002; Jih, 2007; Ng-Kruelle *et al.*, 2002), and recognized as a very important factor necessary for the achievement of m-commerce applications (Xu and Gutierrez, 2006). In addition, Clarke (2001) posits that convenience is “associated with fundamentals generating time and place for consumers”. Berry *et al.* (2002) also argued that, time and effort is a good way to determine whether a product or service is convenient. In other words, it can be said that an end user will probably use a payment system that is convenient. Hence the proposed hypothesis is;

H8: Convenience will have a positive effect on a customer’s intention to use mobile money.

Nevertheless, eight hypotheses have been developed based on theories and related studies from literature review, in order to assess the factors which can influence a customer’s intention to use m-money in Sudan and can be used in answering the research objectives. However, based on the hypotheses, the proposed theoretical model was developed as seen in figure 3.1, which shows the relationship between the constructs used and the customer’s intent to use m-money.

This research measures the direct effect of all of the five factors, explained through five constructs on intention to use. Chen (2008) and (Venkatesh, *et al.*, 2003) however, argued that the attitude dimension

was difficult to assess and was therefore taken off their proposed research models. Therefore this model excludes the attitude construct and provides the research, an excellent starting point for assessing the effect of the five constructs directly on the intention to use mobile money in Sudan. The intention to use was measured using three items as shown in Appendix V.

3.2 Data collection methods

During the study, both primary and secondary data collection methods were applied. There are two main types of data collection methods that were used to collect data during the study namely; primary and secondary data collection methods. Primary data collection methods included; observation, questionnaires and interviews. Secondary data collection method that was used to collect data was documentation method.

Questionnaires were used because they enable the researcher to get detailed information on the subject matter. Also, interviews were used because they allow the researcher to have face-to-face discussions with respondents. This method were required and indirect oral examination under which the interviewer has to cross examine persons who has knowledge about the problem or the matter under review and the information obtained to be recorded for the case of the problem under review structured interview were used.(Kothari C.R 2006).The research involved structured questionnaire where the questions were closed with questions of in dichotomous or multiple choice and were presented with exactly the same wording and in the same order to all respondents reply to the same set of questions.(Kothari C.R 2006). Another method that was used to collect data was documentation. Documentation method were used because it helped the researcher simplify the researcher's task by providing information recorded in form of numbers and percentages and presented by using tables, charts and graphs.

3.2.0 Questionnaires

Saunders *et al.* (2009) opined that questionnaires are important when trying to achieve the answers to group of questions, and Kumar (1999) in another study, defined questionnaire as,

“a list of questions with which a respondent is expected to read, give an interpretation to what is expected and then select the option that best suits the question”.

The questionnaire survey offers a range of benefits, e.g. the respondents can choose a set of responses, which are easier to analyze and compare (Patton, 1990). In this research, web based questionnaires which has been commonly adopted by educational researchers (e.g. Couper, 2002; cited in Al-Subaihi, 2008) would be used to determine factors that influence customer’s intention to use m-money services in Nigeria. The web distributed questionnaire is a form of data collection, whereby the questions are distributed in forms of emails to the respondents and they can click on the attached link in order to participate in the survey.

As discussed by Jespersen (2005), the issue of validity of information used in a research is alleviated through the use of web surveys. Therefore, Qualtrics will be used to distribute the questionnaires need for this research, since it provides the services that self-administered questionnaires cannot proffer (Dillman 2000; cited in Meckelet *al.*, 2005). Using Qualtrics requires a monthly minimal fee, which allows for questionnaires to be sent through emails to respondents. This technique of collecting data is quick and saves the researcher time. However, it has some shortcomings, which includes lack of access to computers and the internet, and respondents may hurriedly fill out responses for the questionnaire, thus invalidating the results acquired. The questionnaire would be designed with reference to the model (TAM) adopted for the study. The questions will address the factors that would be used for evaluating mobile money services against customer’s expectations (security/privacy, convenience, trust, etc.), and measure the difference of opinion between expectations and perceptions

of m-money customers, which is useful to determine their satisfaction level and is dependent on customer's intention to use the service. The questions were adapted from a number of sources including Ventakesh *et al.* (2003), and were modified to fit the Sudan context. The questionnaire comprises three sections, and respondents were required to tick an option that best fits their perception. The first section examines the demographic characteristics of the respondents, such as gender, age, occupation and educational level. The second section aims to enquire about customer's usage of m-money and what they currently use the service for, while the third section addressed questions relating to the TAM constructs. The 'five-point Likert scale' will be adopted ranging from "1= *strongly disagree*, 2= *disagree*, 3= *neither agree nor disagree*, 4=*agree*, 5= *strongly agree*". The Likert scale can be used in "measuring attitudes, which has to do with the respondents signifying their degree of agreement or disagreement with a statement" (Pickard, 2007).

3.2.1 Observation

During the process of interviewing the respondents, the researcher got time to observe the realities presented by the respondents. This were made possible because the respondents were interviewed at a time their transacting M-PESA service.

3.2.2 Interviews

This method was employed especially for the illiterate who could not write and read well as to those were hurry and very busy. This was used to probe and get the required information. The interviewees were made to give the information freely and objectives for the study were fulfilled.

3.3 Data analysis and presentation

After data were collected, the analysis was done so as to get the full interpretation and content of the data by the use of descriptive and

explanatory techniques. Explanations were given to give the full understanding of the data, since the researcher was exploring an existing situation i.e **Customer intention towards mobile money transfer services M-PESA**. The analysis was supported by Microsoft Excel which is a computer application package. Output of the data analysis was presented in tables.

3.4 Chapter summary

This chapter describes the proposed model used in the research. Factors such as perceived ease of use, perceived usefulness, security/privacy, trust and convenience have been discussed with eight hypotheses proposed to aid in answering the research questions and data collection method applied. It also highlighted much on the study area of interest with the reasons that led to the choice of the areas. The explanation of the instruments used to collect data during the research has also been given so as to put the reader in the picture of how data were collected.

This chapter presents the collected data. The findings from the survey will be presented in this chapter and used for the analysis. As mentioned above in the methodological chapter, 45 questionnaires were distributed to m-money users in Sudan and a total of 45 were filled and returned. Represents 100% of the data distributed and is analyzed below. This section discusses data analysis and respondents under the context which the research was done on Customer satisfaction towards mobile money transfer services M-PESA. The same questionnaire was administered three municipalities in the City of Khartoum. The findings of the study are presented according to the specific research questions in the form of tables. Data analysis was done using frequencies and percentages.

The researcher in this section addresses a descriptive method and the procedures that followed in executing this study, this includes a description for the study population and its sample, and the method that prepared the tools that were used, and the procedures which were taken to verify its validity, and the method that followed its execution and statistical processing which lead to the analysis of the data and extraction of the results, also the section includes a specification and a description for the study method.

4.0 Research Population

The target population of the study comprises the total entities to which the researcher distributed the questionnaire to address the issues relevant to the statement of the problem. The population consists of all those interested in e-payment. The sample of the study was selected randomly method to population. In purpose of this research 45 copies of a questionnaire handed out to the targeted population, (100%) of the targeted group responded and returned the questionnaire filled with the

information required. To infer as much accurate results as possible the researcher insured of a diverse study sample which included:

1. Types of gender (male, female).
2. Individuals of different age groups.
3. Individuals from different social strata.
4. Individuals from different educational levels.
5. Individuals from various ranks of civil service.

1. General Information: This section presents data on the general information on the respondents such as gender, employment status and level of education and age.

2. Gender of Respondents: Data fostering the gender of respondents is presented in

table 4. 1. Table: Gender of Respondents

Gender	Frequency	Percentage (%)
Male	39	%86.7
Female	6	%13.3
Total	45	%100.0

Source: prepared by the researcher, the field study, 2014

Frequency distribution to members of the study according to the type:

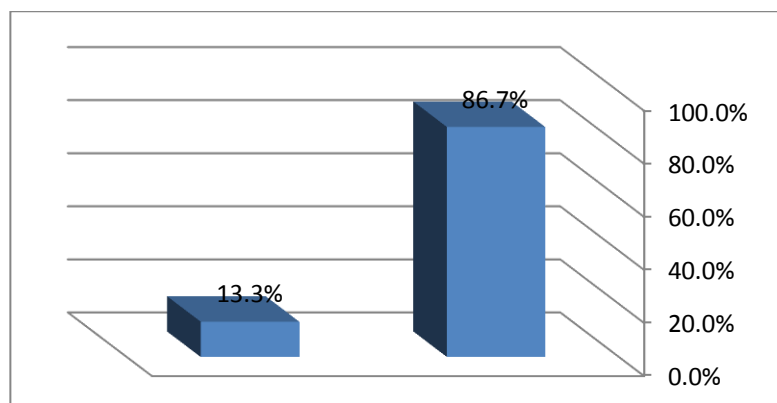


Figure 4.1 Source: prepared by the researcher, from the field study, Excel program (2014)

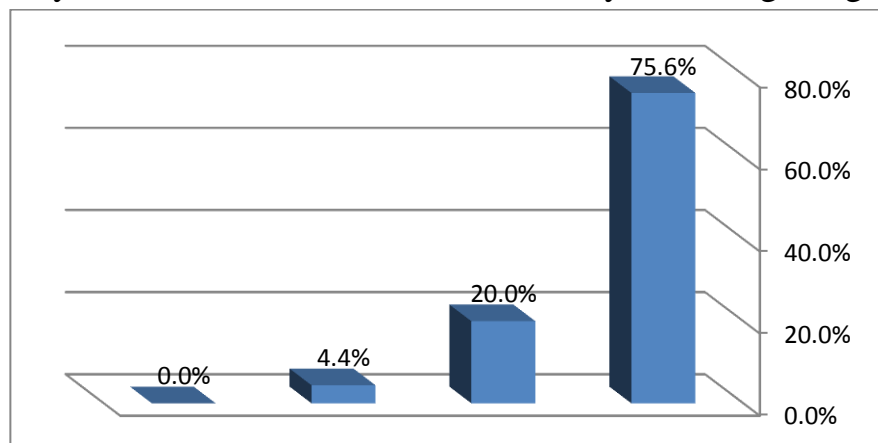
As illustrated in Table1 and Figure (4.1) it is plain that the majority of the research sample were male members numbered (39 individuals) comprising a percentage of (86.7%) of the sample, while the number of females was (6) members and make up a percentage of (13.3%) of the sample. It shows that the largest groups of respondents were males. This implies that males are much involved on mobile money transfer services than females.

3. Age Patterns of the Respondents: Data of the respondents’ age patterns presented below in

Table 4.2: Age of Respondents

age	Frequency	Percentage (%)
Less than 30 years	34	%75.6
Between 31 and 40 years	9	20.0%
Between 41 and 50 years	2	4.4%
Above 50 years	0	0.0%
Total	45	%100

Source: prepared by the researcher, the field study, 2014 - (Table 2)
Frequency distribution to members of the study according to age:



Source: prepared by the researcher, from the field study, Excel program (2014) – (Figure 4. 2)

As seen in Table2 and Figure (4.2) that the majority of the sample individuals in the age group (less than 30 years) are (34) members and

make up a percentage of (75.6%) of the sample, followed by those in the age group (31-40 years) are (9) members and make up a percentage of (20%) of the sample, while the total number of people in the age group (41-50 years) are two members and make up a percentage of (4.4%) of the sample.

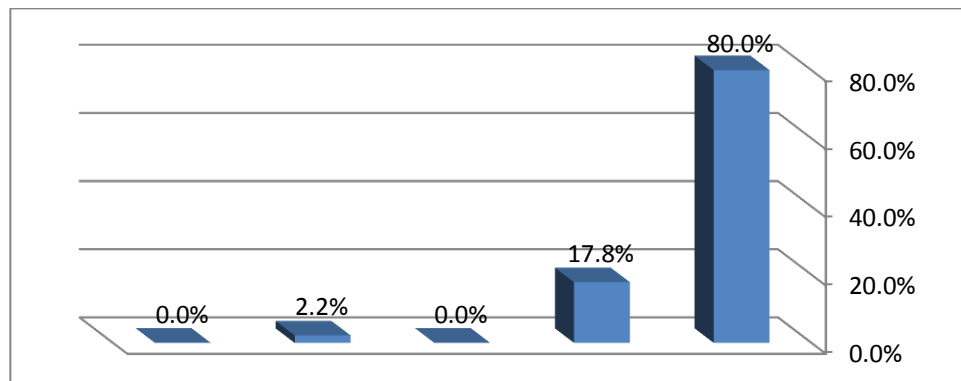
4. Marital status: The table shows distribution of the study sample according to marital status.

Table 4.3: Marital status of Respondents

Marital status	Frequency	Percentage (%)
Single	36	80.0%
Married	8	17.8%
Divorced	1	2.2%
Widower	0	0.0%
Total	45	%100

Source: prepared by the researcher, the field study, 2014

Frequency distribution to members of the study according to the marital status:



Source: prepared by the researcher, from the field study, Excel program (2014) – (Figure 4.3)

As seen in Table3 and Figure (3) that the majority of members of the study, marital status is (single), are (36) members and make up a percentage of (80%), followed by those whose marital status is (married)

are (8) members and make up a percentage of (17.8%), while the total number of who social status is (Divorced) is one individual representing a percentage of (2.2%).

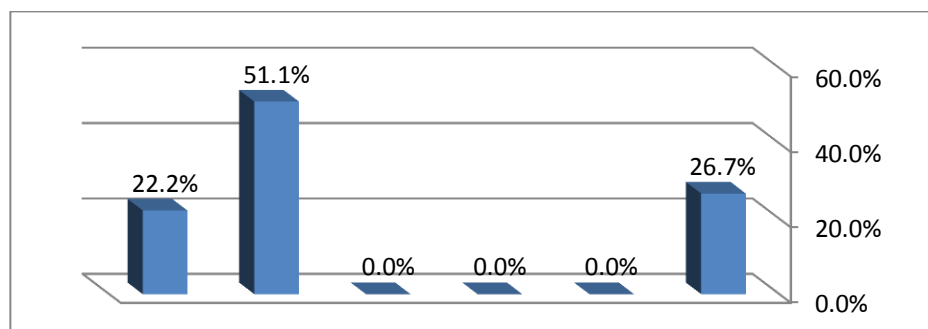
5. Education Level: distribution to members of the study according to the level of education.

Table 4.4: respondents' educational level

Educational level	Frequency	Percentage (%)
None	0	0.0%
Primary	0	0.0%
Ordinary Secondary	0	0.0%
Advanced Secondary	12	26.7%
Degree	23	51.1%
Postgraduate	10	22.2%
Total	45	%100.0

Source: prepared by the researcher, the field study, 2014

Frequency distribution to members of the study sample according to educational level



Source: prepared by the researcher, from the field study, Excel program 2014 (Figure 4.4)

As seen in Table(4) and Figure (4) that the majority of members of the study whose educational level is (Degree) were (23) members and make up (51.1%), followed by those whose level of education is (Advanced Secondary) were (12) members and by (26.7%), while the total number of (Post Graduate) level of education are (10) individuals and by (22.2%).

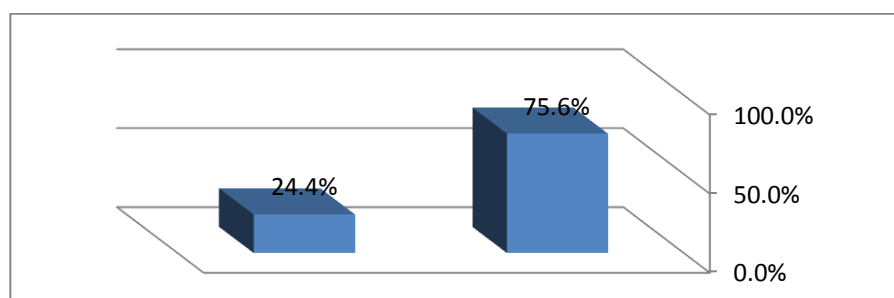
6. Employment Status: Table shows (5) and (Figure5) frequency distribution to members of the study according to the Employment status.

Table 4.5: Employment status of Respondent

Employment status	Frequency	Percentage (%)
Employed	34	75.6%
Not employed	11	24.4%
Total	45	%100.0

Source: prepared by the researcher, the field of study, 2014

Frequency distribution to members of the study sample according to the Employment Status



Source: prepared by the researcher, from the field study, Excel program 2014 (Figure 5)

As seen from the table (5) and (Figure5) that the majority of members of the study whose functional statuses employee where numbered (34) individual representing (75.6%), while the total number

of those functional status as not an employee are (11) members and by (24.4%).

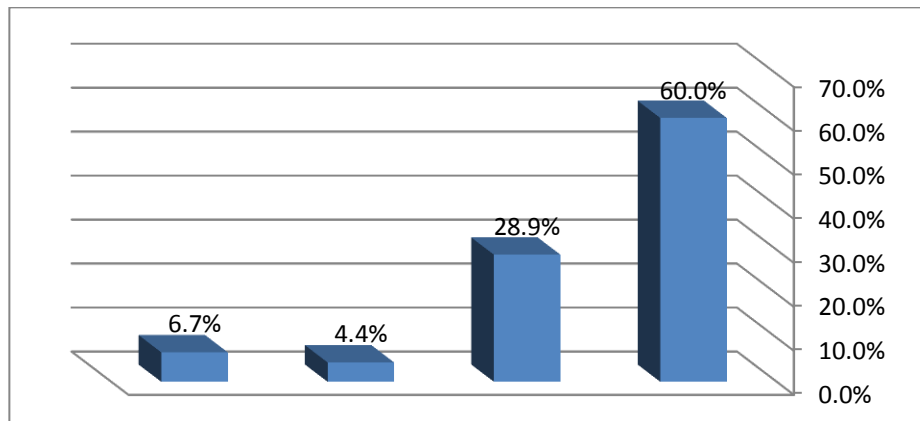
4.1 The Validity Test of M-Payment in Sudan:

1. How would you rate the quality of e-money services in Sudan?

Table 4.6: quality of e-money services in Sudan

Answer	Frequency	Percentage (%)
Poor	27	60.0%
Average	13	28.9%
Very good	2	4.4%
Excellent	3	6.7%
Total	45	%100.0

Source: prepared by the researcher, the field study, 2014



Source: prepared by the researcher, from the field study, Excel program2014 (Figure 4.6)

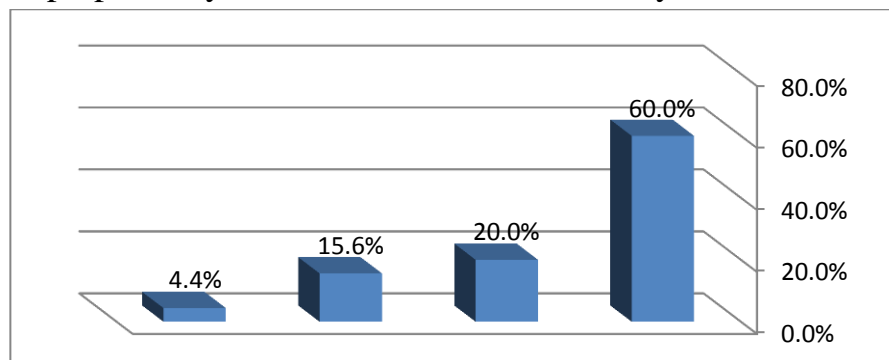
As seen from the table (6) and (Figure6) that the answer of the majority of members of the study is a poor where numbered (27) members and by (60%), followed by those who answered (average) are (13) members and by (28.9%), followed by those who answered (Excellent) are (3) members and by (6.7%), while the total number of those who answered (very good) are two and by (4.4%).

2. How do you rate the efficiency of platform of e-money service in Sudan?

Table 4.7: platform of e-money services in Sudan

Answer	Frequency	Percentage (%)
Poor	27	60.0%
Average	9	20.0%
Very good	7	15.6%
Excellent	2	4.4%
Total	45	%100.0

Source: prepared by the researcher, the field study, 2014



Source: prepared by the researcher, from the field study, Excel program2014 (Figure 4.7)

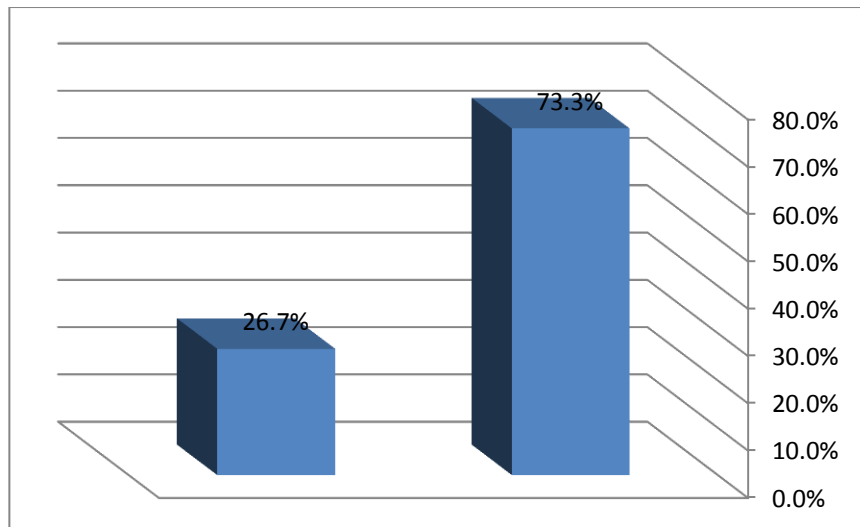
As seen from the table (4.7) and (Figure4.7) that the answer to the majority of members of the study is a poor where numbered (27) members and by (60%), followed by those who answered (average) are (9) individuals and (20%), followed by those who answered (very good) are (7) individuals and by (15.6%), while the total number of those who answered (Excellent) are two and by(4.4%).

3. Do you use e-money services to pay?

Table 4.8: Respondent used e-money

Answer	Frequency	Percentage (%)
Yes	33	73.3%
No	12	26.7%
Total	45	%100.0

Source: prepared by the researcher, the field study, 2014



Source: prepared by the researcher, from the field study, Excel program2014 (Figure 4.8)

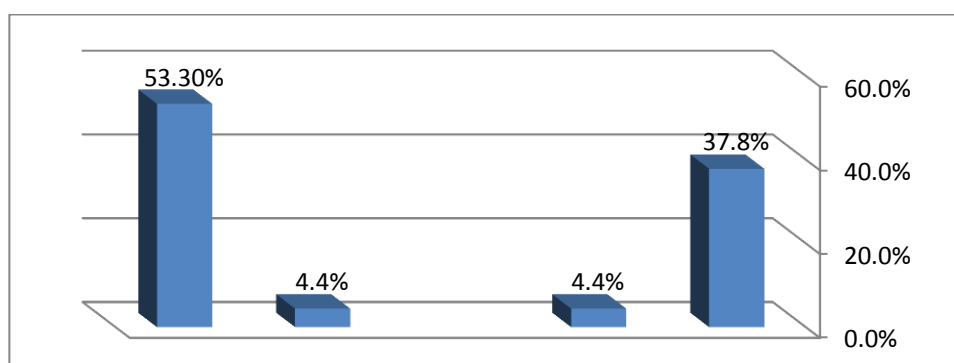
As seen from the table (4.8) and (Figure4.8) that the answer to the majority of members of the study is Yes where numbered (33) individuals and by (73.3%), while the number of who answered No is (12) and by individuals (26.7%).

4. The use of mobile money transfer services has been resulted due to the following?

Table 4.9: M-money resulted

Answer	Frequency	Percentage (%)
Poor banking services in rural areas	17	37.8%
Increase of mobile phone services in rural areas	2	4.4%
Change of technological aspect hence increase of money transfer services	2	4.4%
All of the above is applicable	24	%53.4
Total	45	%100.0

Source: prepared by the researcher, the field study, 2014



Source: prepared by the researcher, from the field study, Excel program 2014 (Figure 4.9)

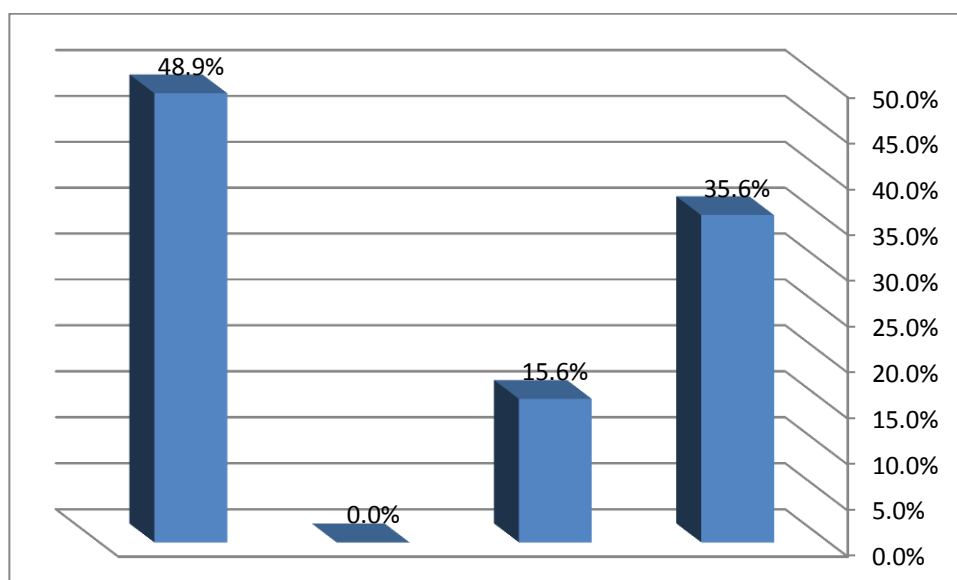
As seen from the table (4.9) and (Figure4.9) that the answer of the majority of members of the study is that all of the above applies to the number (24) members and by (53.3%), followed by respondents as the weakness of banking services in rural areas are (17) members and by (37.8 %), while the total number of who answered that the spread of mobile phone services in Sudan, especially in rural areas, as well as to get benefit from the technological aspect in the development of the transfer of funds is two and by (4.4%) for each.

5. In your view what do you think is necessary to be improved for the use of mobile e-money?

Table 4.10: improved for the use mobile e-money

Answer	Frequency	Percentage (%)
Life	16	35.6%
Economic	7	15.6%
Profit	0	0.0%
All of them	22	48.9%
	45	%100.0

Source: prepared by the researcher, the field of study, 2014



Source: prepared by the researcher, from the field study, Excel program 2014 (Figure 4.10)

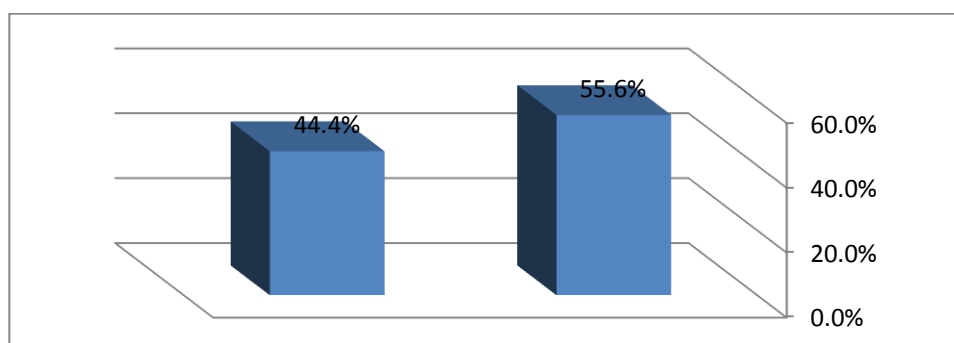
As seen from the table (4.10) and Figure (4.10) that the answer of the majority of members of the study is all of what mentioned above, where numbered (27) members and by (60%), followed by those who answered that in our public life is the number (16) members and by (35.6%) with the number of respondents that in the development of the economy is(7)individuals and by(15.6%).

6. Is mobile e-money services well known to the society?

Table 4.11: e-money services well known

Answer	Frequency	Percentage (%)
Yes	25	%55.6
No	20	%44.4
Total	45	%100.0

Source: prepared by the researcher, the field study, 2014



Source: prepared by the researcher, from the field study, Excel program 2014 (Figure 4.11)

As seen from the table (4.11) and Figure (4.11) that the answer of the majority of members of the studies yes, where numbered (25) individuals and by (55.6%), while the number of who answered No is (20) individuals and by (44.4%).

4.2 Reliability, Stability & Hypotheses Validity Test:

This section contains (26) phrases, the study sample members were asked to determine their response on what each phrase describe according to the Likert scale of the five-tiered, which consists of five levels (strongly agree, agree, neutral, disagree, strongly disagree). These phrases have been distributed to the three hypotheses of the study are as follows:

- The first hypothesis: Included (15) statement.
- The second hypothesis: Included (7) statement.

➤ The third hypothesis: Included (4) statement.

▪ **reliability and validity study tool:**

To make sure of virtual stability and honesty and to make sure of the virtual honesty of question of the questionnaire in terms of wording and clarity, the researcher presented the questionnaire to a number of arbitrators, academics and professionals who specialized in the same of the current study. Having regained the questionnaires from the arbitrators, some amendments were proposed by (Dr. Yahia Mustafa Alsiddiq Dean of Sudan Academy for Aviation Science and Technology (SUDAFAST), Dr. Mohamed Alamin Issa Lecturer in the Department of Statistics Sudan University).

▪ **Stability and statistical honesty**

The test stabilities intended to give the same results if used more than once under similar circumstances. As stabilities also known as the extent of accuracy and consistency of measurements that are obtained from what is measured by the test.

The truth is the measure used to determine the degree of sincerity of the respondents through their answers on a particular measure, it is calculated in many ways and the easiest way is that it represents the square root of the coefficient of reliability. And range in value of honesty and consistency is between zero and one right.
Honesty= $\sqrt{\text{Stability}}$

The researcher calculates the scale of the stability used in the questionnaire by Cronbach's alpha-factor equation.

- **The results were as in the following table:**

Stability and honesty statistical sample of individuals to the questionnaire

HYPOTHESES	Self-honesty scales	Stability scales
The questioner	<i>0.95</i>	<i>0.91</i>

Table 4.12: Stability and honesty statistical sample Source: prepared by the researcher, the field study, 2014

As seen from table (12) the honesty and stability scales to the answers of the sample members for all questionnaires statements were more than (50%) and it is near to one which shows the questionnaire study characterized by stability and honesty what achieve the study objectives and makes the statistical analysis well accepted.

- **The statistical methods used:**

To achieve the objectives of the study and to be sure of its hypotheses, the following statistical methods are used:

- Graphic format
- Frequency distribution of answers
- Percentages
- Equation for calculating reliability coefficient (Cronbach' Alpha)
- Mediator
- Chi-square test for significance difference between the answers

To obtain accurate results, SPSS (Statistical Package for Social Sciences) is used.

▪ **study hypotheses validity test:**

To answer the study question and to verify hypotheses, the mediator of each statement of the questionnaire would be calculated and what shows the study sample opinions where the degree (5) is given for (strongly agree) answer, degree (4) for (agree), the degree (3) for (neutral), the degree (2) for (disagree) and (1) for (strongly disagree). To know the direction of the response, the mediator is calculated. What was mentioned above and according to the statistical analysis is to convert the nominal variables to the amount of variables, then, Chi-square test will be used to know the differences in the answers to the study sample on every hypotheses statement

1. Present and discuss the results of the first hypotheses: Says:(to what extend M-PESA service can be used in Sudan) the following table shows frequency distribution of the answers to the study sample on the first hypotheses statement

Table 4.13: results of the first hypotheses

	STATEMENT	SA	A	N	D	SD
		1	2	3	4	5
1	Mobile money services have improved my performance in my daily activities.	23 %51.1	10 %22.2	9 %20	2 %4.4	1 %2.2
2	I intend to use mobile money services whenever available	28 %62.2	13 %28.9	3 %6.7	1 %2.2	0 %0.0
3	Mobile money would be easy for me to use	28 %62.2	13 %28.9	3 %6.7	1 %2.2	0 %0.0
4	Using mobile money enhances my effectiveness and efficiency in my life	27 %60	12 %26.7	5 %11.1	1 %2.2	0 %0.0
5	Using mobile money services extremely easy	27 %60	12 %26.7	5 %11.1	1 %2.2	0 %0.0
6	mobile money a useful way of making payment	31 %68.9	11 %24.4	3 %6.7	0 %0.0	0 %0.0

7	Mobile money helps save time	38 %84.4	7 %15.6	0 %0.0	0 %0.0	0 %0.0
8	I expect mobile money service to continue even in the future	28 %62.2	13 %28.9	4 %8.9	0 %0.0	0 %0.0
9	I enjoy making purchases with my mobile phone	26 %57.8	8 %17.8	9 %20	2 %4.4	0 %0.0
10	I believe it is a good idea to use mobile money for making payments	31 %68.9	12 %26.7	2 %4.4	0 %0.0	0 %0.0
11	I intend to use mobile money more frequently for payments	30 %66.7	11 %24.4	1 %2.2	3 %6.7	0 %0.0
12	Mobile money is convenient because my phone is always with me	30 %66.7	13 %28.9	0 %0.0	1 %2.2	1 %2.2
13	Mobile money is convenient because I can use it anywhere and at anytime	29 %64.4	13 %28.9	2 %4.4	1 %2.2	0 %0.0
14	Mobile money meets my transaction needs	25 %55.6	8 %17.8	9 %20.5	2 %4.4	1 %2.2

Source: prepared by the researcher, the field study, 2014

To test the presence of significant statistical differences between the numbers of the respondents, Chi-square test was used to know the differences between the answers on each statement of the first hypotheses statements, table (14) summarizes the test results to the next statements: (SA: Strongly agree)

Table 4.14: Chi-square test of the first hypotheses

	STATEMENT	Chi-square value	The potential value (sig)	Median value	Explanation in direction respondents
1	Mobile money services have improved my performance in my daily activities.	34.444	0.000	5	SA
2	I intend to use mobile money services whenever available	40.600	0.000	5	SA
3	Mobile money would be easy for me to use	40.600	0.000	5	SA
4	Using mobile money enhances my effectiveness and efficiency in my life	34.911	0.000	5	SA
5	Using mobile money services extremely easy	34.911	0.000	5	SA
6	mobile money a useful way of making payment	27.733	0.000	5	SA
7	Mobile money helps save time	21.356	0.000	5	SA

8	I expect mobile money service to continue even in the future	45.733	0.000	5	SA
9	I enjoy making purchases with my mobile phone	28.333	0.000	5	SA
10	I believe it is a good idea to use mobile money for making payments	28.933	0.000	5	SA
11	I intend to use mobile money more frequently for payments	46.644	0.000	5	SA
12	Mobile money is convenient because my phone is always with me	50.200	0.000	5	SA
13	Mobile money is convenient because I can use it anywhere and at anytime	45.222	0.000	5	SA
14	Mobile money meets my transaction needs	41.111	0.000	5	SA
	All statements	862.216	0.000	5	SA

Source: prepared by the researcher, the field of study, 2014

From the above table:

- The value of the calculated Chi-square to know the differences between the number of the study members based on the first statement is (34.444) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the Mobile money services have improved my performance in my daily activities.
- The value of the calculated Chi-square to know the differences between the number of the study members based on the second statement is (40.600) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly

agree that the I intend to use mobile money services whenever available.

- The value of the calculated Chi-square to know the differences between the number of the study members based on the Third statement is (40.600) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the Mobile money would be easy for me to use

 - The value of the calculated Chi-square to know the differences between the number of the study members based on the Fourth statement is (34.911) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the Using mobile money enhances my effectiveness and efficiency in my life

 - The value of the calculated Chi-square to know the differences between the number of the study members based on the fifth statement is (34.911) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between
- 98

the answers of the study members and in favor of the strongly agree that the Using mobile money services extremely easy

- The value of the calculated Chi-square to know the differences between the number of the study members based on the sixth statement is (27.733) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the mobile money a useful way of making payment
 - The value of the calculated Chi-square to know the differences between the number of the study members based on the seventh statement is (21.356) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the Mobile money helps save time
 - The value of the calculated Chi-square to know the differences between the number of the study members based on the Eighth statement is (19.600) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between
- 99

the answers of the study members and in favor of the strongly agree that the I expect mobile money service to continue even in the future

- The value of the calculated Chi-square to know the differences between the number of the study members based on the Ninth statement is (28.333) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the I enjoy making purchases with my mobile phone
 - The value of the calculated Chi-square to know the differences between the number of the study members based on the tenth statement is (28.933) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the I believe it is a good idea to use mobile money for making payments
 - The value of the calculated Chi-square to know the differences between the number of the study members based on the Eleventh statement is (46.644) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and
- 100

based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the I intend to use mobile money more frequently for payments

- The value of the calculated Chi-square to know the differences between the number of the study members based on the Twelfth statement is (50.200) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the Mobile money is convenient because my phone is always with me

- The value of the calculated Chi-square to know the differences between the number of the study members based on the thirteenth statement is (45.222) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the Mobile money is convenient because I can use it anywhere and at anytime

- The value of the calculated Chi-square to know the differences between the number of the study members based on the fourteen statement is (*41.111*) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree that the Mobile money meets my transaction needs

- The value of the calculated Chi-square to know the differences between the number of the study members based on the all statement is (*862.216*) and its probability value is (0.000) and this probability value is less than the level of the moral value (5%) and based on what was in table (4.13) it shows the presence of differences with statistical significant in the level (5%) between the answers of the study members and in favor of the strongly agree

For all and above we conclude that the first study hypothesis: **(to what extend M-PESA service can be used in Sudan)** has achieved for the benefit of approvers strongly

2. Present and discuss the results of the second hypotheses: Says: (“Is there a tendency for telecommunications companies and banks to offer the M-PESA service in Sudan.”) The following table shows frequency distribution of the answers to the study sample on the second hypotheses statement

Table 4.15: results of the second hypotheses

STATEMENT		SA	A	N	D	SD
		1	2	3	4	5
1	Sending SMS is easy	37 %82.2	8 %17.8	0 %0.0	0 %0.0	0 %0.0
2	The registration procedures is easy for me	29 %64.4	13 %28.9	2 %4.4	1 %2.2	0 %0.0
3	Using mobile money makes it easier to conduct transactions	36 %80	8 %17.8	1 %2.2	0 %0.0	0 %0.0
4	I can completely trust financial institutions	25 %55.6	9 %20	9 %20	2 %4.4	0 %0.0
5	mobile network operators and retailers can be trusted	24 %53.3	11 %24.4	7 15.6 %	2 %4.4	1 %2.2
6	Communication networks provide the best service in the Sudan and it is confident that it will be a leader in the provision of the M-PESA in Sudan	37 %82.2	8 %17.8	0 %0.0	0 %0.0	0 %0.0
7	Sudanese bank sophisticated in the use of information technology and a pioneer in the M-PESA in Sudan	31 %68.9	10 %22.2	4 %8.9	0 %0.0	0 %0.0

Source: prepared by the researcher, the field of study, 2014

To test the presence of significant statistical differences between the numbers of respondents, Chi-square test was used to know the differences between the answers on each statement of the second hypotheses statements, table (15) summarizes the test results to the next statements: (SA: Strongly agree)

Table 4.16:Chi-square test of the second hypotheses

	STATEMENT	Chi-square value	The potential value (sig)	Median value	Explanation in direction respondent
1	Sending SMS is easy	18.689	0.000	5	SA
2	The registration procedures is easy for me	45.222	0.000	5	SA
3	Using mobile money makes it easier to conduct transactions	45.733	0.000	5	SA
4	I can completely trust financial institutions	25.311	0.000	5	SA
5	mobile network operators and retailers can be trusted	38.444	0.000	5	SA
6	Communication networks provide the best service in the Sudan and it is confident that it will be a leader in the provision of the M-PESA in Sudan	18.689	0.000	5	SA
7	Sudanese bank sophisticated in the use of information technology and a pioneer in the M-PESA in Sudan	26.800	0.000	5	SA
	All statements	526.349	0.000	5	SA

Source: prepared by the researcher, the field of study,2014(Table 16)

From the above table:

- The value of the calculated Chi-square to know the differences between the number of the study members based on the first statement is(18.689) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.15) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the Sending SMS is easy.
- The value of the calculated Chi-square to know the differences between the number of the study members based on the second

statement is(45.222) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.15) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that The registration procedures is easy for me.

- The value of the calculated Chi-square to know the differences between the number of the study members based on the Third statement is(45.733) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.15) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the Using mobile money makes it easier to conduct transactions
- The value of the calculated Chi-square to know the differences between the number of the study members based on the Fourth statement is(25.311) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.15) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the I can completely trust financial institutions
- The value of the calculated Chi-square to know the differences between the number of the study members based on the fifth

statement is(38.444) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.15) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the mobile network operators and retailers can be trusted

- The value of the calculated Chi-square to know the differences between the number of the study members based on the sixth statement is(18.689) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.15) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the Communication networks provide the best service in the Sudan and it is confident that it will be a leader in the provision of the M-PESA in Sudan
- The value of the calculated Chi-square to know the differences between the number of the study members based on the sixth statement is(26.800) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.15) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the Sudanese bank sophisticated in the use of information technology and a pioneer in the M-PESA in Sudan

- The value of the calculated Chi-square to know the differences between the number of the study members based on the all statement is(526.349) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.15) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree

For all above we conclude that the second study hypothesis: (**“Is there a tendency for telecommunications companies and banks to offer the M-PESA service in Sudan.”**) has achieved for the benefit of approvers strongly

3. Present and discuss the results of the third hypotheses: Says: (“is Sudanese legislation sufficient to establish a legal framework that allows provision of the M-PESA service in Sudan”) The following table shows frequency distribution of the answers to the study sample on the second hypotheses statement

Table 4.17: results of the third hypotheses

	STATEMENT	SA	A	N	D	SD
		1	2	3	5	2
					%11.1	%4.4
1	There is no security threat with mobile money	24 %53.3	6 %13.3	8 %17.8	7 %15.6	1 %2.2
2	I have assurance of no vague transactions	24 %53.3	7 %15.6	6 %13.3	4 8.95	2 %4.4
3	I am confident that my personal data is secured	26 %57.8	7 %15.6	6 %13.3	1 %2.2	0 %0.0
4	I think that your -commerce and electronic crimes Sudanese law sufficient to allow the M-PESA services in Sudan	37 %82.2	5 %11.1	2 %4.4	5 %11.1	2 %4.4

Source: prepared by the researcher, the field of study, 2014

To test the presence of significant statistical differences between the number of the respondents, Chi-square test was used to know the differences between the answers on each statement of the second hypotheses statements, table (4.17) summarizes the test results to the next statements: (SA: Strongly agree)

Table 4.18: Chi-square test of the third hypotheses

	STATEMENT	Chi-square value	The potential value (sig)	Median value	Explanation in direction respondent
1	There is no security threat with mobile money	33.3333	0.000	5	SA
2	I have assurance of no vague transactions	34.600	0.000	5	SA
3	I am confident that my personal data is secured	41.778	0.000	5	SA
4	I think that your-commerce and electronic crimes Sudanese law sufficient to allow the M-PESA services in Sudan	79.356	0.000	5	SA
	All statements	201.778	0.000	5	SA

Source: prepared by the researcher, the field of study, 2014

From the above table:

- The value of the calculated Chi-square to know the differences between the number of the study members based on the first statement is(33.3333) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.17) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the There is no security threat with mobile money.

- The value of the calculated Chi-square to know the differences between the number of the study members based on the second statement is(34.600) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.17) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that I have assurance of no vague transactions.

- The value of the calculated Chi-square to know the differences between the number of the study members based on the Third statement is(41.778) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.17) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the I am confident that my personal data is secured

- The value of the calculated Chi-square to know the differences between the number of the study members based on the Fourth statement is(79.356) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.17) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree that the I think that your-commerce and electronic crimes Sudanese law sufficient to allow the M-PESA services in Sudan

- The value of the calculated Chi-square to know the differences between the number of the study members based on the all statement is(201.778) and its probability value is (0.000) and this probability value is less than the level of the moral value(5%) and based on what was in table (4.17) it shows the presence of differences with statistical significant in the level(5%) between the answers of the study members and in favor of the strongly agree

For all above we conclude that the third study hypothesis: (“**Do Sudanese legislation is sufficient to establish a legal framework that allows providing the M-PESA service in Sudan**”) has achieved for the benefit of approvers strongly

4.3 Comparison between Sudan and Kenya

The quality of services (QoS) in support of the most important means for the development of electronic payment via the mobile phone sector and give clear indications For the evolution of networks to the specifications required to provide the service. In this research study was based on evidence and accurate information provided by the Sudan NTC according to its annual report, which held accurate and correct information from the companies on the reality and quality of services were been invoked in assessing the possibility of providing the (M-PESA) service in Sudan.

Sudan

Sudan now makes up the northern part of a country which in 2011 was separated to form the new state of South Sudan. Three quarters of the former population live in the north, where mobile market penetration

is far higher. The country has a relatively well-equipped telecommunications infrastructure by regional standards, including a national fiber optic backbone and international fiber connections. The chronically poor performing economy has hindered the ability of operators to improve revenue from services and sufficiently invest in infrastructure upgrades, while social unrest in South Sudan continues to impose practical difficulties for telecom operators.

The national Telco, Sudatel was privatized more than a decade ago, with major shares and management control now held by Etisalat of the UAE and by Qatar Telecom. It is also listed on several regional stock exchanges. The company presided over the world's fastest growing fixed-line market until it started substituting traditional copper lines with CDMA2000 fixed-wireless access in 2005.

Competition in the fixed-line market comes from Canartel, which is also majority-owned by Etisalat. The operator also opted for CDMA2000 technology to cost effectively roll out fixed services and, like Sudatel, offers wireless broadband services through this network, having upgraded to the EV-DO standard. The company is lobbying for a license to offer mobile services as well but is meeting resistance from the other operators.

The market for mobile internet services is flourishing, and traffic for services such as SMS more than tripled in the year to June 2013.

Estimated market penetration rates in Sudan's telecoms sector – end 2014

Market Penetration rate

Mobile 71%

Fixed 1%

Internet 26%

(Source: BuddeComm based on various sources)

Key developments:

- MTN launches HSPA+ services;
- RedCloud, Zain provide platform for Hassa-branded mobile financial service;

- Higher telecom taxes impact on sector growth; telecom networks separated between North and South Sudan;
- Intensified mobile broadband competition;
- Wide variation of broadband pricing and mobile ARPU;
- Rapid growth in SMS traffic;
- Canar Telecom sees a continuing decline in its fixed-line market share;
- Regulator concludes its SIM registration project;
- Upgrade to EASSy cable enabling 10Tb/s.

Companies mentioned in this report:

- Zain
- MTN
- Sudatel
- Sudani
- Canar Telecom (Canartel)
- SudaNet
- ZinaNet
- Thuraya

Kenya

Kenya's mobile market has continued to show strong growth in the number of mobile subscribers. This has translated into sustained revenue growth for operators as they develop mobile data services on the back of heavy investments in technologies and infrastructure upgrades. Some market consolidation has occurred following the acquisition by Airtel and Safaricom of Essar Telecom's yuMobile business. Competition has nevertheless presented challenges to the profitability of network operators, encouraging them to streamline operations and develop revenue streams from services such as mobile data, m-commerce and m-banking. In mid-2014 the regulator compelled Safaricom to open up its popular M-Pesa platform to rival networks. To develop fourth generation (LTE) technology, the government has

pursued an open-access approach, though Safaricom pulled out of the proposed consortium which would operate the network. A number of MVNO licenses awarded since 2014 have added to the competitive mix.

Market Penetration rate

Mobile 77%

Fixed 1%

Internet 30%

(Source: BuddeComm based on various sources)

Key developments:

- Finserve launches services as an MVNO, reports 400,000 subscribers by end-2014;
- Safaricom contracts Nokia Networks to develop LTE-A network, shares capacity on its LTE infrastructure;
- Orange Kenya closes CDMA network;
- Safaricom and Bharti Airtel acquire Essar Telecom's assets and subscribers;
- Dubai Bank Kenya partners with Rapid Communications to develop the M-SASA mobile banking platform;
- Safaricom begins to deploy LTE networks in key cities, signs deal with MoneyGram to enable international remittances into M-Pesa accounts;
- Viettel withdraws bid to acquire Telecom Kenya from Orange group;
- One Network Area initiative expands to include mobile data and mobile money services;
- Safaricom's M-Pesa network to migrate to a locally hosted infrastructure during 2015;
- Handset device market showing stronger growth for 3G and LTE-enabled devices than 2G;
- New MVNO licenses awarded;

- Government's open-access approach to licensing LTE network revised;
- Report update includes the regulator's market data to December 2014, telcos' operating and financial data to Q4 2014, recent market developments.

Companies:

- Safaricom (Vodafone);
- Bharti Airtel (formerly Zain,
- Celtel); Essar Telecom Kenya (Yu, formerly Econet);
- Telkom Kenya (Orange, France Telecom);
- Huawei Technologies;
- ZTE;
- Alcatel-Lucent;
- Nokia Networks

Legal and Regulatory

Sudan

The sector legislation in Sudan, The Telecommunication Act 2001, provides for the establishment of the NRA with the mandate to approve the methods and costing of telecommunication services. It also provides for a framework for regulatory auditing and also for the issuance of By-Laws including those related to tariff regulation.

The relevant chapters read as follows:

Chapter II: The Corporation Establishment, Headquarters and Supervision of the Corporation

- (1) There shall be established a public corporation to be known as "The National Telecommunication Corporation" and shall have corporate personality, and the right to litigate in its own name.

8. The Corporation shall have the following functions and powers namely to:

(b) Approve the methods and cost of telecommunication services and regulate the tariffs of the services in coordination with entities providing such services and supervise them thereafter.

Chapter VI: Public Telecommunication Services Submission of Reports

31. The Licensee of a Public Telecommunication Service shall submit an annual report to the Director General showing therein the technical, administrative and financial matters that guarantee the provision of services in the required standard and shall provide the Director General with any other information and data relating to the services in a periodic or exceptional manner at the time specified by the Director General.

Chapter VIII–Power to Issue By-laws and Orders

46. (1) The Board with the approval of the competent Minister shall issue the necessary By-laws and orders for the enforcement of the provisions of this Act Notwithstanding the generality of the foregoing, such by-laws and orders may include:

- License applications,
- Licensing conditions,
- Obligations of the licensee,
- Regulation of the use of frequencies and their allocation,
- Procedures of inspection and submission of reports,
- Forms of licenses,
- Fees in return of services rendered in accordance with provisions of this Act,
- Penalties to be imposed for the contravention of the provisions of this Act or its ensuing by-laws.

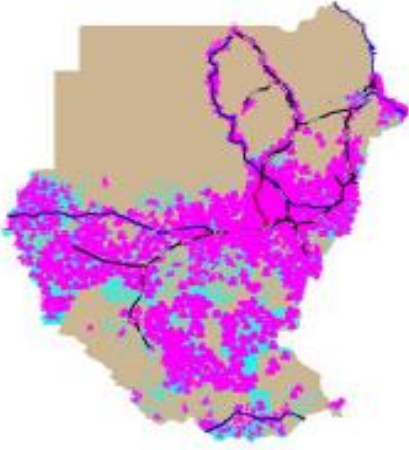
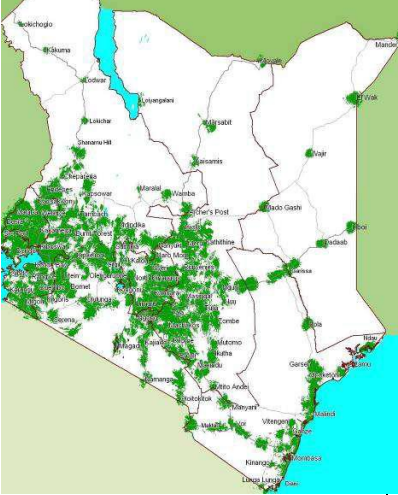
Kenya

The sector legislation in Kenya, the Kenya Information and Communications Act Cap 411A, provides the Legal framework for regulating tariffs based on efficiency and economy. The specific legal provisions are contained under Section 23 of the said legislation. Under this section it is the duty of the regulator to protect the interest of users with respect to prices charged, promote competition in order to ensure efficient and economic provisioning of ICT services. In essence this legal provision broadly provides for the undertaking of all manner of activities relating to price control and economic efficiency which is presumed to also include cost modeling as well as regulatory auditing. Further the supplementary legislation, the Kenya Information and Communications (Tariff Regulations) 2010, provides at Section 90 through 91, for the differentiation between regulated and unregulated services based on the level of competition prevailing in relation to a particular service. It further clarifies that the regulatory framework for tariff is based on price cap for the regulated service (i.e. those not subject to competition). Section 92 of the said supplementary legislation also provides for a framework for Regulatory Auditing. The Kenya Information and Communications (Interconnection and Provision of Fixed Links, Access and Facilities) Regulations 2010, provides among others for: mandatory interconnection (Section 4), Interconnection that promotes efficient systems and service, a framework for issuance of technical & costing guidelines, regulatory auditing of interconnection agreements (Sections 5 & 6), application of interconnection charges that are objective, independently verifiable, fair, based on the principle of causality, non-subsidy, below retail rates, and structured according to various cost streams e.g. fixed, variable, periodic, one off, etc. and a framework for issuance of guidelines on interconnection charging methodology (Section 12). These Regulations also provide for a framework for the application of a reference interconnection, access, and collocation offers for dominant operators (Sections 18, 19 & 20). In addition all issued licenses have a requirement that a service provider

must at least one month prior to offering a service or adjusting tariffs file the same for approval by the regulator. It also requires the licensee to publish the charges, terms and conditions of offering licensed services 30 days in advance. This in essence provides for a framework for detailed regulatory auditing as well as public disclosure of not only charges but also other terms and conditions for a particular service. In summary therefore the legal and regulatory framework in Kenya is such that wholesale tariffs are required to be cost oriented and that such tariffs are meant to guide operators in negotiating interconnection agreements. It is however recognized that there is a positive correlation between wholesale prices and retail prices which are largely unregulated unless in the event of an operator having a SMP and/or abusing its dominant market power. This situation is premised on the belief that competitive markets are the only proven methods for maintaining efficiency in the face of blistering technological change.

		Sudan	Kenya
General		Population 30 Million Over 45% are under the age of 14 79% of the population is rural 27% adults have a formal Bank Account Literacy at 70 % 85% have access to a mobile phone	Population 44 Million Over 42% are under the age of 14 78% of the population is rural 22.6 % adults have a formal Bank Account Literacy at 85 % 80% have access to a mobile phone

LEGAL & Regulatory FRAMEWORK	Regulatory Environment	The Electronic Transactions Act was approved 2007	Conducive – The Central Bank of Kenya is actively involved in the regulation of mobile money services in Kenya. They have taken an open approach to allowing telecom operators to offer mobile money services Without the requirement for bank partnership.
	Central Bank Law	X	X
	Banking Law	X	
	Payment Systems Law	X	
	Central Bank Regulations having the power of law	X	
	Other	X	X
Technology	Mobile Phone Penetration	Mobile penetration in Sudan was 79% or over 20 million subscribers. Estimated market penetration rates in Sudan’s telecoms sector – end 2013	Medium – by the end of 2008, mobile penetration in Kenya was 39% or over 15 million subscribers. The subscriber base is expected to rise to 29.28 million, or 66.7 percent penetration, by year-end 2013.
	Literacy Levels	The literacy rate is 70.2% of total population, male: 79.6%, female: 60.8%	High – literacy levels in Kenya are over 90% for males and over 80% for females ³
	Technology Adoption	Many Sudanese were familiar with the basic operations of a mobile such as texting and making voice calls.	Prepared – prior to the launch of M-PESA many Kenyans were familiar with the basic operations of a mobile such as texting and making voice calls. In Kenya, 83% of the population 15 years and older have access to mobile phone technology.

	Mobile technology	3. 75 G – 4 G	3 G
	Network converge		
Finance sector		Low In Sudan 68% of people didn't use any form of financial service; formal, semi formal or informal	Access to Finance Medium – In Kenya 38% of people didn't use any form of financial service; formal, semi formal or informal prior to the launch of M-PESA while only 19% of the population had access to formal financial services. ⁴ The country has approximately 4 or 5 million bank accounts for a population of 31 million.
	Banks	37	79
	ATM	1590	2569
	Demand for mobile payment Services	New application for mobile money in Sudan 1- Hassa 2- Growshi 3- Mobile cash	M-PESA High – due to lack of other competitive money transfer services and the need to reduce dependency on cash for security reasons. Also, national money transfer is a common practice in Kenya especially amongst urban migrant workers wishing to send money back to their families in the villages. Prior to M-PESA many

			people would have to resort to sending money with someone (possibly a stranger) who was travelling to their village.
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4.3 Chapter summary

This chapter analyses the data from the questionnaires and also the constructs used in the model. The results of the various test used to test the constructs are also analyzed in this chapter. From the regression test it can be seen that convenience has the strongest unique distribution for explaining customers' intention to use mobile money (M-PESA) in Sudan.

5.0 Result

Results from the research have shown that perceived usefulness, perceived ease of use, security/privacy, trust and convenience have an influence on customers' intention to use M-PESA , as they were found to be significant. Convenience was found to be the most important influencing factor, while Perceived Ease of Use was the least influencing factor in determining customers' intention to use. On the other hand, security/privacy of payment details and trust of MNOs and financial institutions are positively correlated. Where Pallant (2007) posits that a positive correlation indicates that as one variable increases, the other increases as well, and this indicates that increased security in mobile transactions, would increase customers trust in financial institutions, mobile network operators and retailers. In addition, there was a significant positive effect of perceived ease of use on the perceived usefulness of mobile money, also the which implies that those who consider mobile money (M-PESA) convenient and easy to use also perceive it to be useful. Also we conclude that all the study hypothesis: “to what extend M-PESA service can be used in Sudan”, “Is there a tendency for telecommunications companies and banks to offer the M-PESA service in Sudan” and “is Sudanese legislation sufficient to establish a legal framework that allows provision of the M-PESA service in Sudan” has achieved for the benefit of approvers strongly

5.1 Recommendations

The results of this research have brought about a guide to a number of strategies, which can be employed for the different parties of interest for mobile money in Sudan, so as to increase its use and encourage its general acceptance. This is due to the fact that the success and growth of the service lies in the hands of the consumers. In terms of security/privacy, it is imperative for financial institutions to have a comprehensive security scheme, so as to allow for secured transactions and safety of personal sensitive information. In addition, making customers aware of the importance of security and privacy of mobile money services is vital to protect their personal information and money, because as shown in the results from the study security/privacy was one of the key factors that influence customers' intention to use M-PESA. The use of mobile money transfer services in Sudan is the new technology which has taken part in economic development through generation of employment.

1. The government needs to prepare a clear money transfer laws to clarify the responsibility of service provider in order strengthen consumer protection in Sudan as well as establishing appropriate safety net procedures which immediately provide remedies if consumer involved into controversial deal.
2. The government through use of M-PESA services will benefit through its people to sell their products and have direct access with money transaction effect over the country hence increase revenue through tariff charged as the results of tax payable through interest charged to these mobile phone companies.
3. The government has increased its national income through indirect use of M-PESA services as it is the only easiest method of money transfer method being adopted by large population and has largest growing network model of money transfer known.

4. Observably population categories with lower levels of education happen to be the larger user category that is intended to use M-PESA services. The government has to institute positive effort so as to make this group participatory on economic development at large.
5. The government also has to use its agencies to link with this opportunity of its people using M-PESA services by availing implementation of renewable energy in rural energy so as to support charging of these phones to make the service operational with no limitation of power.
6. Banking services is still limited to some areas with the country where by people involve long time to travel for such service. The use of mobile money transfer services M-PESA will bridge this gap that is why it has resulted to high turn up and in rural areas where there is limitation of banks the only adopted banking service is for M-PESA. If all commercial banks will be established in rural areas their contribution factor will be established as needed for M-PESA. Mobile phone banking as being used for money transfer and information sharing this system frees up consumer from traditional banking system, as now through mobile phone banking the account holder can access certain information through his/her mobile phone. This service will enable the service to be easy for money transfer hence to faster the service. It is through this situation banks has to establish new approach which will enable to reach their services more and more in rural areas where mobile money transfer services already being in place.
7. Mobile phone companies are those which have the task to improve more and more on this mobile phone transfer services (Zain-PESA, MTN-PESA, Sudani etc). The coverage of their service has to reach all areas which are uncovered. Mobile phone companies has to establish new market strategy for market penetration in order to win the market share efficiently as to date the service being

provided still base in district level whereby still those living in the rural area although they have strong signal the problem is when it come the matter to receive cash as the result of, money transfer they have to travel in order to receive service. It is expected that money has to be obtained at the point where the customer live and not need to travel for service. Marketers and promoters of m-money services may be underutilizing word of mouth, SMS –text messaging and other information channels beyond mass media that has the potential to reach many more potential users.

8. Campaigning for these channels with mass media campaigns can enhance the effectiveness of raising awareness and use of m-money services. In rural areas there is a challenge on management of float (cash) in light of prospected demand as operators have tended to focus mainly on the densely populated economic zones, more so increase in local and international money transfers services with maximum consumer protection, against risks of fraud, loss of privacy and even loss of service is extremely critical for growth of M-PESA. This is another area where mobile companies have to work on it so as to reduce if not to eliminate it.
9. Skills for customers who will use mobile money transfers service will be the matter of fact for failure to capture the skills of manipulating the considerably sophisticated mobile phone menu items. This will be the limiting factor as it will result that most of the customer fail to register their mobile phones as they might not even follow the procedure required. Though not seriously impaired the capacity of wider population of Sudan users is fairly curtailed by not being fully conversant with all that they can accomplish through the mobile. Deliberate interventions should be undertaken to successfully ensure that the targeted persons/customers particularly the rural residents and

females are empowered not only with technology but also with skills and finance as well.

5.2 Suggestion for Future Studies

1. this research is determined from the perspective of M-PESA users in Sudan, while the idea of conducting a study in Sudan will provide insights into customers' expectations, future study can apply the model used in this study to other developing countries as well. In addition, there might be dissimilar attitudes with consumers, if the same study is carried out in a different context.
2. The factors assessed in this research may not cover all the reasons that can influence a consumer's intention to use M-PESA in Sudan. Therefore further studies can look into factors such as cultural issues, which might also influence intention to use.
3. Further study also can discuss the effect of mobile money transfer service on economic growth. As this technology is still new to developing countries a study can be conducted to assess the impact of mobile money transfer services on technological change and penetration of technology to users in rural areas.
4. The study also can asses challenging resulted on the use of mobile money transfer services on control for money laundering. Another study can be effect of power problem how has been hindering the broad growth of mobile money transfer services in Sudan.

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APPENDICES

APPENDIX I:

Dear respondent

My name is **ABDULRHMAN MOHAMMED A. MOH.** I am conducting a research in the possibility to customizing & apply M-PESA in Sudan as mobile money services in SUDAN the research is for partial fulfillment for awards of Masters of computer science (Software Engineering) from the Sudan University of Science and Technology (Sudan). The questionnaire takes less than 10 minutes to answer. Kindly respond to the following questions to the best of your knowledge. If you have any questions concerning this research, do not hesitate to call the researcher at +249912814923 or write me an email at:*shingeeti@hotmail.com*

General information

1.1 Age:	<input type="checkbox"/> Less than 30yrs <input type="checkbox"/> Between 31-40 yrs <input type="checkbox"/> Between 41-50 yrs <input type="checkbox"/> More than 50yrs	1.2 Gender:	<input type="checkbox"/> Male <input type="checkbox"/> Female
1.3 Education level:	<input type="checkbox"/> None <input type="checkbox"/> Primary <input type="checkbox"/> Ordinary Secondary <input type="checkbox"/> Advanced Secondary <input type="checkbox"/> Diploma <input type="checkbox"/> Degree	1.4 Marital status:	<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Separate <input type="checkbox"/> Divorced <input type="checkbox"/> Widowed
1.5 Employment status:	<input type="checkbox"/> Employed <input type="checkbox"/> Not employed		

Section one: fill in blanks and yes/no questions Please rate the following factors on a scale of 1-4 1=Excellent 2=Very good 3=Average 4=Poor

1. (a) How would you rate the quality of e-money services in Sudan?

1	2	3	4
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3. How do you rate the efficiency of platform of e-money service in Sudan?

1	2	3	4
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4. Do you use e-money services to pay? i) Yes ii) NO

5. If YES mention other services which you pay by using of e-money Services

Mobile airtime top-up () pay for goods and service () transfer money to friends and family () others ()

6. The use of mobile money transfer services has been resulted due to the following

- i) Poor banking services in rural areas
- ii) Increase of mobile phone services in rural areas.
- iii) Change of technological aspect hence increase of money transfer services
- iv) All of the above is applicable

7. In your view what do you think is necessary to be improved for the use of mobile e-money Services? Life () Economic () Profit () All of them ()

8. Is mobile e-money services known well to society? i) Yes ii) No

Section two: Rank the following statements

The following tables have statements about mobile money services. Rate your agreement with each of the statements by using the scale provided in the table. If you do not have an opinion about the statement, or if you think that the statement is not very well formulated, leave the line blank.

1= (SA) Strongly Agree, 2= (A) Agree, 3= (N) Neutral, 4= (D) Disagree, 5= (SD) Strongly Disagree

	STATEMENT	SA	A	N	D	SD
		1	2	3	4	5
9	Mobile money services have improved my performance in my daily activities.					
10	I intend to use mobile money services whenever available					
11	Mobile money would be easy for me to use					
12	Using mobile money enhances my effectiveness and efficiency in my life					
13	Using mobile money services extremely easy					
14	Sending SMS is easy					
15	The registration procedures is easy for me					
16	mobile money a useful way of making payment					
17	Mobile money helps save time					
18	Using mobile money makes it easier to conduct transactions					
19	I can completely trust financial institutions					
20	mobile network operators and retailers can be trusted					
21	I expect mobile money service to continue even in the future					
22	There is no security threat with mobile money					
23	I have assurance of no vague transactions					
24	I am confident that my personal data is secured					
25	I enjoy making purchases with my mobile phone					
26	I believe it is a good idea to use mobile money for making payments					
27	I intend to use mobile money more frequently for payments					
28	Mobile money is convenient because my phone is always with me					
29	Mobile money is convenient because I can use it anywhere and at anytime					
30	Mobile money meets my transaction needs					
31	Communication networks provide the best service in the Sudan and it is confident that it will be a leader in the provision of the M-PESA in Sudan					
32	Sudanese bank sophisticated in the use of information technology and a pioneer in the M-PESA in Sudan					
33	I think that your -commerce and electronic crimes Sudanese law sufficient to allow the M-PESA services in Sudan					

Thanks' for your time!