Addis Ababa University
School of Graduate Studies
Master's Thesis Proposal

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Title of Thesis: **Design of a Model for Mobile Money Interoperability: The Case of Mobile Money Service Providers Operating in Ethiopia**

December, 2017

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1. Introduction

Nowadays, mobile technology is being part of our day to day life and it is changing the way of doing business. People around the world use their mobile phone for a variety of purposes, including but not limited to calls, text messages, sending and receiving multimedia messages, and getting access to information via the Internet. In addition to these services, mobile technology can enable users to get financial services which promote financial inclusion, especially in developing countries.

In developing countries, expanding financial service outlets to reach people with no banking facility is highly affected by infrastructure expansion. Most people living in the developing countries are financially excluded as financial service outlets like branches, ATM and POS terminals etc are not well established. The reasons behind the exclusion of such a large number of people are related to barriers such as cost of infrastructure expansion in rural area, travel distances to financial service outlets and unable to meet strong documentation and know-your-customer (KYC) requirements for opening a bank account in developing countries [1,2].

However, since the reach of mobile telephony networks is much larger than that of the formal banking sector; mobile money certainly offers the prospect of a low-cost solution to create access to the financial sector [3]. Very recently, in developing countries, mobile technology is transforming lives by providing access to a range of financial services such as cash deposit, cash withdrawals, and transferring fund mostly used by people who do not have formal bank accounts. These services are accessible from an electronic account

linked to the SIM card in the mobile phone of the user not from her/his formal bank account. This electronic account is known as mobile wallet and it is protected by a personal identification number (PIN) verification. The money held in such account is referred to as mobile money [3].

Mobile money was initially made popular by Safaricom and Vodafone's M-Pesa ("M" for "mobile", "pesa" for "money" in Swahili) in Kenya, which started in 2007 and the application is installed on the SIM cards of customers and works on all handset brands, it is free to register and the user does not need to have a formal bank account to use the service[4].Mobile money ecosystem span a wide range of different stakeholders like regulators, mobile money operators, infrastructure providers, other service providers, consumers, utility companies, retailers, civil society organizations, donors and mobile money agents [6].

To start mobile money transaction, mobile phone users need to register for the service and deposit cash into their mobile wallet at the outlet of mobile money service agents. The agent will get the money from the user and transfer it to the user through her/his own mobile phone. If mobile phone users wish to withdraw cash from their mobile wallet, they also need to go to a mobile money agent or other outlets.

In the framework of mobile money services, the sender's and receivers mobile wallets are not linked to their individual bank accounts but to their SIM cards and balances of all their mobile wallets are maintained by the mobile network operator [4]. Mobile money services have spread rapidly in many developing countries

and the solution is best suited for them to bring large number of population to financial services as it doesn't require one to have a formal bank account since large population of developing countries don't have it. Considering the experience of mobile payments and market trends in many developing countries, currently, Ethiopian financial institutions and microfinance firms are also introducing mobile money services. However, the nature of mobile money services differs from country to country depending on the regulation of the governing regulatory organization (central bank) in specific country considering national interests, awareness, contexts and maturity in to account.

Unlike other countries in which mobile network operators are allowed to run the business on their own, in Ethiopia, mobile money services are being led by banks as per the directive of the National Bank of Ethiopia which follows bank lead mobile money model [7]. To obey the directive of the National Bank of Ethiopia, some banks have implemented their own mobile money platform while others have outsourced the service to mobile money service providers. Currently, there are a number of mobile money service providers operating in Ethiopia working with banks and micro finance institutions. The Netherlands-based BelCash which is offering a helloCash services, and an Ireland-based firm (MOSS ICT PLC) rolling out M-Birr service are some of the service providers [15]. Five microfinance institutions are running M-Birr service [14] while helloCash is in operation with three banks [15] and one microfinance institution and other banks are also implementing the services in-house on their own. These all mobile money services are being provided by a single mobile network operator, mobile infrastructure service provider-Ethiotelecom using USSD technology.

However, each mobile money service is being developed and deployed as a scheme in its own, with its own platform, its own operating rules and independent networks of retail agents and customers, operating independently; as a result, money transfers from one scheme of mobile money service cannot be made to another scheme. For example, if mobile money platforms are interconnected, a customer with an account with one mobile money service provider can send or receive money to or from the account of a customer with a different mobile money service provider and an agent of specific mobile money operator will serve customers of another mobile money operators and customers will access their account from any SIM on the same network. The mobile money users would get many benefits from interoperability of mobile money operators including but not limited to deepening the penetration of mobile money, lowering cost of transactions, broader customer choice, increased competition, cooperation and break down of dominant positions [2].

Interoperability allows mobile money operators to cooperate with each other and with banks, financial institutions regulators, and other partners, identify problems and implement solutions. It will allow more mobile financial services to be flexible and delivered to a broader range of people while maintaining high service quality.

2. Motivation

In this study the following points have motivated the researchers to work on this area.

- In Ethiopia, the provision of mobile service has begun in 1999 with a total of 36,000 subscribers in Addis Ababa and reached 48,000,000 covering 43.9 % of the population. Meanwhile, the

numbers of mobile subscribers are expected to reach 100% by the end 2020 [8]. Out of these mobile subscribers, large numbers of population are those who are living in the rural area where infrastructure is constraints, and they will be benefited from interoperable mobile money services as agents will not be exclusive to one scheme in the framework.

- A large number populations living in the rural area are bankable; they are using mobile telephones, but they are left excluded due to unavailability of infrastructure necessary for branch expansion to the rural area. We are motivated to enable those scattered bankable societies in rural area to exploit the use of mobile money services through agent level interoperability.
- National Bank of Ethiopia has prepared regulations governing mobile money services and banks are diversifying their service to include mobile money services. This will increase instances of mobile money operators as banks are in competition with one another by the diversity of the services they are providing.
- Some banks are implementing their own in-house mobile money solution and others are cooperating with mobile money service providers; which implies there will be a number of independent mobile money service providers in Ethiopia, each of which are deployed independently, have their own exclusive agents and customers, and serving their own customers. So, interoperability will allow more mobile financial services to be flexible and delivered to a broader range of people and reduce cost for operators by avoiding duplicate investments.
- There is a high demand from customer side as the agents located in a rural area are exclusive to a single mobile money operator, customers need to transfer fund from their own wallet to their families, relatives, and friends who are living far away from home

and using another scheme of mobile money. For example, students who are attending their higher education at universities are living far away from their family and they need financial support from their parents. But the mobile money scheme may be different. So, the interoperability framework will solve this kind of problems and motivated as to work on it.

3. Statement of Problem

The main significance of interoperability of mobile money operators is to increase financial inclusion of the poor and unbanked through the reach of mobile telephony networks which is much larger (and increasing) than that of the formal banking sector [3]. Interoperability supports financial inclusion as it reduces the duplication of services, facilitates organizational cooperation, contributes to market access and service reach, addresses some of the barriers the consumer may face, including high user fees and limited access and, makes service delivery more efficient and flexible [9].

However, all mobile money services operating in Ethiopia are developed and deployed as a scheme in its own, with its own platform, operating rules, independent networks of agents, with their own customers and independent operation; as a result, money transfer from one scheme cannot be made to another scheme. There is no mobile money interoperability model that enables customers of different mobile money service providers to transact with customers of other mobile money service providers. Under current scheme of mobile money services, there is no infrastructure and agent sharing; there are duplicate investments like agent recruitment in the same area by different competitors. There are numbers of retail of agents at

the same location serving as service outlets of their own scheme. Customers of one mobile money service need to know and go far to get an agent of her/his mobile money services to perform financial transactions even if agent of another scheme is accessible near by the customer. Mobile money agents are exclusive to specific mobile money service providers; they cannot serve customers outside of their scheme.

This situation will not encourage financial inclusion and hinder flexibility of the digital financial services which will not attract customers to use the service. Hence, without interoperability, originators and recipients of transfers need to visit multiple agents to make transactions with different networks and must cash out or cash in, each of which is subject to fees. If networks are interconnected, fees are expected to be lower and money can be kept in mobile wallets. Thus, transactions are cheaper and more other people can be reached, which will increase the volume of transactions [3].

4. Objectives

General Objective

The general objective of this work is to design interoperability model for mobile money services.

Specific Objectives

To realize the stated general objective, the following specific objectives will be performed;

- Review relevant articles and related research works done in mobile money and digital financial services,

- Study and analyze the business rule of mobile money operators,
- Learn detailed use case of mobile money services, and study how they can be used in the interoperability framework,
- Review experience of other countries, country specific regulatory issues in cooperating different mobile money operators to work together,
- Study regulatory framework for mobile money operations and propose enabling interoperability model that encourages digital financial inclusion,
- Identify stake holders of mobile money services and study their role in the mobile money ecosystem and their position in the proposed interoperability model,
- Develop necessary algorithms and identify appropriate tools and technologies that can be used in the implementation of the interoperability model and
- Evaluate performance and usability of the proposed interoperability framework through simulation.

5. Methods

5.1 Data Source

In this study, policy, procedure, operational manual of mobile money operators and guide lines of regulatory organ will be studied. To properly understand the challenges and the business rule of mobile money services, the way operators are doing their business will be observed and discussed with a focus group in operation at a real environment.

5.2 Literature Review

In this study, exhaustive literature review will be carried out to gain a general knowledge in the area of mobile money and digital financial services. The experience of other researchers that were conducted for other countries will be carefully studied.

5.3 Techniques and Tools

In this study, appropriate simulation tools will be used to show the interaction of stakeholders involved in the mobile money interoperability framework.

6. Related Work

Many international and national commitments have been made toward achieving interoperability and the implementation of these commitments has often varied due to various national interests, awareness and regulatory maturity and business models, interoperability should be responsive to the national and regional peculiarities, context and takes on many different shapes and is included in national frameworks in different ways [9,19].

According to [5], interoperability between mobile money providers is live in some countries like India, Indonesia, Madagascar, Mexico, Nigeria, Pakistan, Peru, Sri Lanka, Rwanda, Tanzania, and Thailand. We have tried to list some country specific experiences towards the introduction of interoperability between mobile money operators.

On May 15, 2013, Indonesia's three major mobile operators Telkomsel, Indosat and XL launched interoperability framework that enabled their mobile money customers to send and receive money across each other's networks and it was a milestone in the mobile money industry of the country for the first time, mobile money

platforms run by different mobile operators could talk to each other account to account, or "wallet-to-wallet" in real time. The level of interoperability is A2A and interoperability with bank is considered as out of scope of the study [10].

In Nigeria there are 23 licensed Mobile Money Operators. At the end of 2012, the central bank of Nigeria mandated that all mobile money operators had to interconnect to a national switch for the purpose of ensuring interoperability in the system; but this order was not put into practice [11]. The reason behind unsuccessful implementation is that some of the operators have restricted their platforms from interacting with the platforms of other providers. As a result, In 2016, a subcommittee mobile money operator group has studied the situation and recommended that the CBN may wish to more actively engage industry stakeholders, particularly mobile money operators, as direct participants in promoting interoperability in Nigeria [12].

In Ghana, interoperability has been mandated since 2008 but never took off. This imposition was repealed in 2015. The central bank announced in September 2016 that it initiated a project to implement an interoperable mobile money payment infrastructure and that it is in conversation with stakeholders about its implementation [11].
Starting from 2012, mobile money operators in Tanzania have achieved A2A interoperability. Currently, they have realized that they should continue to explore how improvements in the technological and financial infrastructure could make mobile money interoperability more efficient [13, 18].

According to [11, 16], e-money issuers in Peru have launched an open and interoperable e-money platform in February 2016. The

platform enables fully-interoperable digital financial services across mobile networks and financial service providers in the country. This multitenant, interoperable, financial industry-led scheme is described as the first of its kind, and is based on an initiative of the Association of Banks.

In 2014, bilateral agreements have been signed between mobile money operators in accordance with the wallet to wallet interoperable rules. All have implemented and launched wallet to wallet service from September 2014 to December 2014. The secret behind their success is industry collaboration with one another and the process led to the first step towards reaching a successful interoperability [17].

In 2014, operators in Pakistan interconnected their mobile money services. Six out of seven mobile money operators are connected to a national switch, which allows them to route payments to each other and to bank accounts [11, 18].

7. Scope and Limitation

Considering the available time, the scope of this study is limited to design of a framework that enables mobile money service providers cooperate so that customer will enjoy flexible digital financial services. The levels of interoperability to be considered for our study are listed as follows. These are;

- Platform level interoperability,

  This is when mobile money platforms are interconnected and a customer with an account with one service provider can send or receive money to or from the account of a customer with a different service provider.
- Agent level interoperability

This is when agents of a given service provider have the ability to serve customers of another service provider. The agent is not an exclusive to specific mobile money operator and can give cash-in/cash-out service for customers of other operators.

- Customer level interoperability
  In this case customers are allowed to access their account through any SIM on the same network.

Cross-border and inter-network interoperability are considered as out of scope of this study.

8. Application of Results

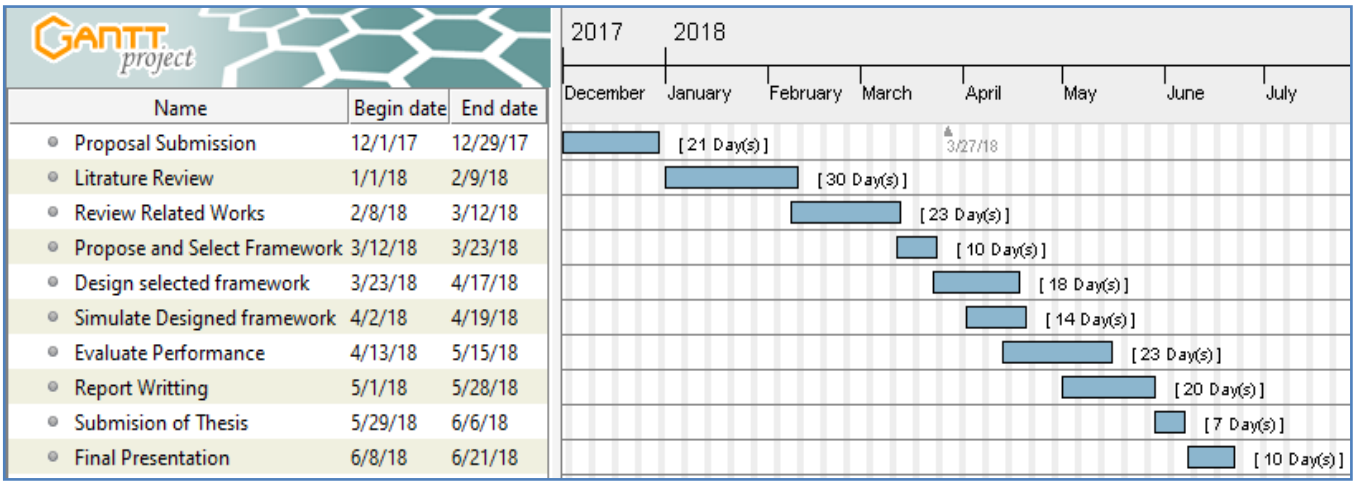
When successfully implemented, the proposed framework will be used by mobile money operators and other stakeholders for many use cases. Some of the use cases are listed as follows but not limited to:

- A customer of one mobile money service can transfer fund from her/his wallet to a customer of another mobile money service,
- A customer of one mobile money service can refill her/his mobile wallet by depositing cash to an agent of the other mobile money service.
- A customer of one mobile money service can withdraw cash from an agent of the other mobile money service.
- In case of utility bill payments, customer of one mobile money service can pay utility bill by transferring the amount to the biller wallet which resides in another mobile money service providers,
- Pay for goods and services,
- Pay school fees, Informal loan
- Receive salary, pension payments and
- Effect insurance payment

Annexes

Annex A: Time Table

Under normal condition, the study will be concluded within six months. The work breakdown structure of the study is as shown in the following timeline.



Name	Begin date	End date
Proposal Submission	12/1/17	12/29/17
Litrature Review	1/1/18	2/9/18
Review Related Works	2/8/18	3/12/18
Propose and Select Framework	3/12/18	3/23/18
Design selected framework	3/23/18	4/17/18
Simulate Designed framework	4/2/18	4/19/18
Evaluate Performance	4/13/18	5/15/18
Report Writting	5/1/18	5/28/18
Submision of Thesis	5/29/18	6/6/18
Final Presentation	6/8/18	6/21/18

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