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   STATEMENT OF THE PROBLEM

   OBJECTIVES

   HYPOTHESES

   RESEARCH METHODOLOGY

   RESULTS & DISCUSSION

   FINDINGS

   RECOMMENDATIONS/SUGGESTIONS

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PROPOSED FRAMEWORK FOR IMPROVING THE PAYMENT SYSTEM IN GHANA USING MOBILE MONEY

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ABSTRACT

In recent times, the National Communication Authority's (NCAs) figures suggest that there has been tremendous increase in the number of people who use mobile phones in Ghana. Majority of these subscribers basically use their phones for making calls, sending text messages and surfing through the internet. With the increase in the number of mobile users, the number of unbanked still remains significantly high. This problem led to the introduction of Mobile Banking by some of the Mobile Network Operators (MNO). The aim was to reduce the number of unbanked, reduce the amount of time wasted in the bank during transactions, and to make it easier for relatives to remit to their families back at home. However, there is no framework to guide interoperability, no legal framework to protect both customers and MNOs who provide these services, and a low level of interest is shown by subscribers. This paper therefore seeks to propose a framework that will improve interoperability, protect customers and service providers, improve general subscriber interest, and help bring more services onboard the Mobile Banking market.

KEYWORDS

Automated Teller Machine (ATM), Mobile Network Operator (MNO), Subscriber Identification Module (SIM), Short Message Service (SMS).

INTRODUCTION

Statistics from the NCA suggest that as at December 2011, over 21 million Ghanaians out of a total population of 24 million (Google, 2012) people, were using mobile phones (NCA, 2012). Out of this population, only 2.2 million people (Ghana Government, 2012) had bank accounts. An estimated 80% of the population is unbanked (PWC, 2012). The introduction of Mobile Money into the Ghanaian economy by mid-2009 (MTN, 2012) was seen as a means of increasing cashless transactions since the banking system in Ghana has numerous challenges (Ghanaweb, 2012) that serve as disincentives for the unbanked.

Mobile Money is a technology that allows users of mobile phones to transact business using their mobile phones as a tool (Ayo, Ukpere, Oni, Omote and Akinsiku, 2012).These transactions can be in the form of Person-to-Person transfer of money, transactions between a person and the bank, purchasing of goods and services using the phone among others.

Successes chalked by M-PESA (Sultana, 2011) in Kenya, has led to a change in how other Developing countries perceive Mobile Commerce. Currently, services onboard the Mobile Money market in Ghana include Person-to-Person transfer of money, Person to Bank transactions and Bank to Person transactions. Mobile Commerce is still in the early stages of development in Ghana, as a result there is no central database to keep track of all Mobile transactions, and the predominant means for transacting Mobile Commerce is via Short Message Services (SMS) even though the Mobile Network Operators offer other services such as Enhanced Data for GSM Evolution (EDGE), Multimedia Message Services (MMS) and Wireless Application Protocol (WAP). Most notable among Mobile commerce in Ghana is Mobile Banking. Banks such as Zenith, Ghana Commercial Bank, Ecobank, GTBank, Intercontinental Bank, among others offer Mobile banking in one way or the other. The potential that Mobile Money in the form of Person to Person transactions offers is currently not fully exploited.

Challenges facing the Mobile Money market in Ghana include lack of full interoperability between the major players in the industry. Customers with a Mobile bank account in Bank A cannot transact business with Bank B and subscribers with MNO A cannot also transact business with users of MNO B (except for some few Banks and MNOs). Patronage of these services even among the over 80% mobile phone subscribers is also very low. In addition, Ghana does not have a robust regulatory framework that will define the relationship between the financial, telecom and the private sectors (Ghana Government, 2012).

This paper therefore, seeks to develop a framework that will contribute to solving the legal and interoperability issues in order to improve subscriber patronage of Mobile commerce in Ghana. As a consequence, the country's payment system which includes salaries, savings and loans, taxes, utility bills, purchase of goods and services, etc. can be brought on board for ease and convenience of the customer. This will be made possible through a simple and available Information Technology (IT) facility such as SMS.

REVIEW OF LITERATURE AND RELATED WORK

BACKGROUND

According to the Bank of Ghana (BoG, 2012), payment system is the entire matrix of institutional infrastructure arrangements and processes in a country for initiating and transferring monetary claims in the form of commercial and central bank liabilities. The concept of Virtual money (Adaliwei, 2011) has made it possible to transact business with electronic cards such as Credit cards, Debit cards, ATM cards, Smart cards, etc. They are collectively referred to as virtual accounts or digital wallets. Mobile money falls under virtual money, and has proved to be economically successful in developing countries such as Kenya (Sultana, 2011).

Mobile Payment Systems (MPS) enable transactions to be effected (initiated, activated or confirmed) using a mobile device or more commonly, the mobile phone. Other devices capable of effecting mobile payments include Personal Digital Assistants (PDAs), Smartphones (combination of PDA and mobile phone technologies), Laptops, and Point of Sale devices. Mobile Payment Systems (MPS) have gained prominence in the major global economies as a result of the search for ease and convenience in business transactions.

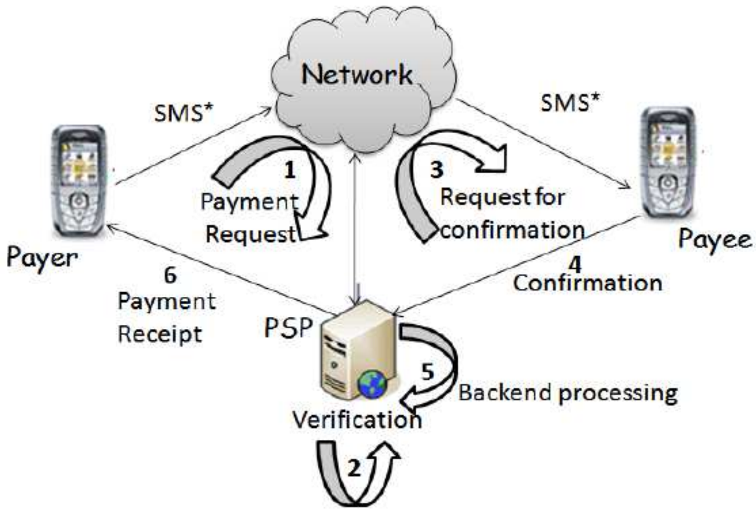
TYPES OF MOBILE PAYMENT SYSTEMS

i. Account-based payment systems: This mainly involves having an account with the Payment Service Provider (PSP) as a result of subscribing to the payment system. Examples include; Mobile phone based payment systems, Smart card payment systems and Credit-card payment systems.
ii. Point of Sale (POS) payment systems: This form of payment deals mainly with proximity payment systems where another automated device is needed to read customer account details in the process of transactions. They could either be Automated POS payments or Attended POS payments.
iii. Mobile wallets: In this system, the subscriber has a mobile wallet into which virtual money is stored. From this wallet all transactions are made.

MOBILE PAYMENT SOLUTIONS

These are classified according to the type of payment effected, and based on the technology adopted to implement the solution:
i. Bank Account based M-Payment: Banks have millions of customers and telecommunication operators also have several million customers. If they both collaborate to provide an m-payment solution, it is a win-win situation for both parties. In this model, the bank account is linked to the mobile phone number of the customer. When the customer makes an m-payment transaction with a merchant, the bank account of the customer is debited and the value is credited to the merchant account.
ii. Credit Card based M-Payment: In the credit card based m-payment model, the credit card number is linked to the mobile phone number of the customer. When the customer makes an m-payment transaction with a merchant, the credit card is charged and the value is credited to the merchant account. Credit card based solutions have the limitation that it is heavily dependent on the level of penetration of credit cards in the country.
iii. Telecommunication Company Billing of M-Payments: Customers may make payments to merchants using their mobile phones, these may subsequently be charged to the mobile phone bills of the customer. The customer then settles the bill with the telecommunication company. This may be further classified into prepaid airtime (debit) and postpaid subscription (credit).
The mobile technology landscape provides various possibilities for implementing m-payments. Essentially, a GSM mobile phone may send or receive information (mobile data service) through three possible channels –Short Message Service (SMS), Unstructured Supplementary Services Delivery (USSD) or Wireless Application Protocol/General Packet Radio Service (WAP/GPRS). The choice of the channel influences the way m-payment schemes are implemented. Secondly, an m-payment client application may reside on the phone or else it may reside in the subscriber identity module (SIM).
Mobile payment can be done in two modes or payment scenarios - Remote Payments and Proximity Payments (Near Field Communication Technology). In remote payment, the payer and the payee could be at remote locations, for example, a customer places an order from his home to a retail store. Proximity payment involves a transaction where both the payer and payee have to be within the same vicinity, for example, when a customer (payer) buys a cup of coffee from a vending machine (payee).
The Basic Architecture for Remote and Proximity M-Payment Systems (Agarwal, Khapra, Menezes and Uchat, 2011) are depicted in Figure 1 and Figure 2 respectively:

FIGURE 1: REMOTE M-PAYMENT SYSTEM



Source: Agarwal, Khapra, Menezes and Uchat, 2011

FIGURE 2: PROXIMITY M-PAYMENT SYSTEM

Source: Agarwal, Khapra, Menezes and Uchat, 2011

The main difference between the two systems is that, in the remote m-payments, the customer first sends the payment request to the PSP over a wireless network by using a remote wireless technology (Infrared, Bluetooth, RFID or NFC). The PSP then forwards this request to the payee. However, in proximity m-payments, the customer directly sends the payment request to the payee typically using a short-range wireless technology. The payee then forwards this payment request to the PSP over a wireless network.

RELATED WORK

Tobbin, and Kuwornu,(2011) proposed a mathematical model of consumer behavior towards the adoption of Mobile Money Transfer in Ghana. It established that, apart from Perceived Ease of Use and perceived usefulness, Perceived Trust, Trialability and Perceived Risk significantly affect Behavioural Intention towards the adoption and use of Mobile payment by subscribers. Bucyana and Tudor Sikanartey (2009) took a survey on the Mobile money revolution in Ghana. Most significant among their findings included the fact that Mobile Payment is an incentive for improved business transactions since it serves as a unique platform to bring convenience in business dealings. In a presentation organized by Enhancing Financial Innovation & Access (EFInA), Dela (2011), gave a talk on Branchless banking and mobile payments regulatory framework in Ghana. She emphasized that Mobile money services have the potential to accelerate remittances and payment services in Ghana, and that its innovative nature has the potential to reduce the number of unbanked people in the country. She reiterated the need for a legal framework to protect all parties involved in the Mobile payment system.

The above observations have motivated us to propose a framework which will serve as a guide to implement a nationwide Mobile Payment system with the following aims:

i. Encouraging cashless transactions and reducing the amount of money people carry with its attendant problems.
ii. Improve interoperability between existing operators and those that are yet to join.
iii. Protect both customers and service providers via a legal framework.

THE PAYMENT SYSTEM IN GHANA

The payment system in Ghana covers the following areas: Payment instruments used to initiate and direct transfer of funds, Network arrangements for transacting and clearing payment instruments, institutional players in the system, market conventions and regulations, and legal and regulatory framework (GhanaCedi, 2012). The Bank of Ghana (BoG), the commercial banks, and customers are the stakeholders in the Payment system. The Act that gives the BoG the legal backing to supervise the Payment system was passed in 2003 (Act 662), it is "for the establishment, operation and supervision of electronic and other payment, clearing and settlement systems; to provide for the rights and responsibilities of transacting and intermediating parties and for other related matters" (Hesse, 2010).

The Ghanaian economy is characterized by huge flow of physical cash. Almost every transaction carried out by the unbanked deals with physical cash. For instance, cocoa farmers in the Western Region of Ghana harvest their produce in December every year. On selling their produce to the clerks, 90% of them convey the money to their villages where there is no form of security. The incidence of crime and armed robbery increases during this period since unscrupulous people know that the cocoa farmer will always carry money on him when traveling. There have been occasions when banks in cocoa farming areas report shortage of money due to high demand. During such periods, farmers who need to transact monitory business have no option but to wait till the banks get cash. Aside farming, other areas of the informal sector such as private enterprises performs almost 80% of their transactions using physical cash, even though majority of them have bank accounts. They only deal with their banks when at the end of sales; they proceed to the bank to make a deposit or under circumstances when they need a loan.

The formal sector is made up of the majority of people who are banked in the country. This is so because salaries are paid through bank accounts. The major problem with this sector is that, it is cumbersome (Ghanaweb, 2012) to fulfill all the requirements for opening a new account at the bank. To most people, it does not make sense to queue at the bank to withdraw money that belongs to them; since as a matter of fact, there can be long intolerable queues in Ghanaian banks and ATMs. The high illiteracy rate in the country is a hindrance to reducing the number of the unbanked. The few who master courage to go for a bank account will have to get someone who can read and write before they can complete the complex bank forms.

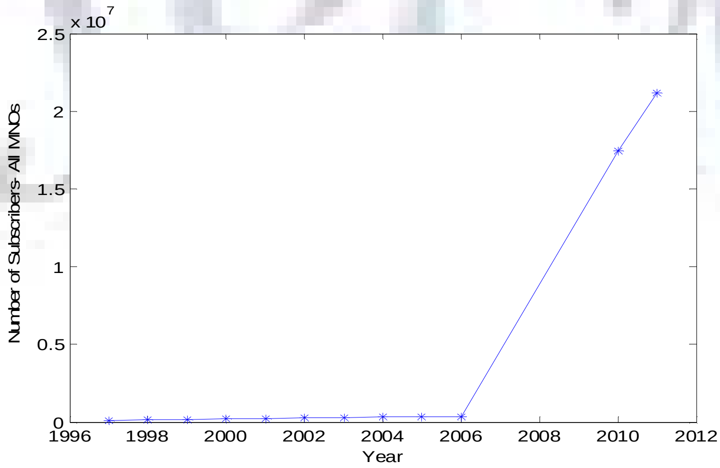
Even though different forms of electronic payments exist, for most of them, one must have a bank account (e.g. ATM), before one can use them. Most prominent among these electronic payments is e-Zwitch (Hesse, 2010). In an attempt to develop a cashless economy, the BoG through Ghana Interbank Payment & Settlement Systems Limited (GhIPSS) introduced electronic clearing and payment system designed to established a common platform to link the payment systems of all banking and financial institutions in Ghana. The system uses biometric identification, and is also the only requirement for registration of new users. Users do not need to be account holders of a bank before they register for e-Zwitch. It can be used to carry out all forms of transactions including payment of utility bills, etc.

Other forms of money transfer such as the Post Office system, Bus system, etc. exist; where the payer sends the money to the payee via the Post Office or a bus respectively. On remittances, the major player in the Ghanaian market is Western Union, even though one cannot send money outside Ghana through the same medium. Other services for receiving remittances from abroad are also in existence, the only requirement is that, the payee must produce a valid Identification Card and also be able to reproduce a secret code originating from the payer. Due to these and many more, the Payment system in the country is dominated by cash transactions instead of virtual money and digital wallets.

THE MOBILE PAYMENT SYSTEM IN GHANA

Currently, Ghana has 27 commercial banks (PWC, 2012) over 125 Rural banks (ARB, 2012) Credit Unions and Savings and Loans Companies. Most of these banks have gone into agreement with MNOs to operate Mobile Payment services. Ghana's MNO market is highly competitive since figures from NCA suggest that the number of subscribers seems to grow exponentially each year (refer to Figure 3). Presently, there are five MNOs with the sixth one fully registered as an MNO but yet to start commercial operations.

FIGURE 3: MOBILE SUBSCRIBER GROWTH IN GHANA



Source: NCA, 2012

The following are the most prominent Mobile Payments services that the collaboration between some of the banks and MNOs has generated:

i. MTN Money: MTN launched Mobile Money in July 2009 in partnership with 9 banks. Subscribers can use the service without the need to open or have a bank account (MTN, 2012). The system enables users to issue the following transactions:

- *Mobile banking*: Balance enquiries from bank accounts of subscriber's in partner banks.
- *Purchasing/recharging* mobile airtime.
- *Money transfer* between customers, merchants and from merchant to customer or vice versa.
- *Payment of utility bills* e.g. Digital Satellite Television (DStv) bills, electricity bills, water bills etc.
- *Mi-Life or M-Insurance* is a mobile insurance policy in which subscribers can initiate claims, queries and make premium payments using their mobile phones. Premium payments are deducted from the m-wallet monthly and customers are notified via SMS after which their insurance cover is renewed (Tellez, 2011). As at October 2009, MTN Money had over 20,000 customers with 1,200 (Leishman, 2009) authorised Merchants across the country.

ii. Airtel Money: Initially introduced by Zain-Africa as Zap, the service was one of the most promising in African mobile money. After Bharti Airtel took over from Zain, Zap became Airtel money and has still gained preference by mobile phone users and subscribers. Airtel money is Airtel‟s mobile money/mobile banking system. Airtel Ghana closed 2010 with nearly 2,000,000 subscribers (NCA, 2012), placing 5th in the ranking of MNOs according to subscriber base. Airtel money currently records more than 11 official merchants and has registered sales outlets with a good fraction of them offering the payment service to subscribers. Airtel is also linked up with a number of banks and financial institutions including Databank Brokerage Limited, Ecobank, Stanchart and UBA for effective transaction and mobile banking for subscribers. Airtel money can be used to perform the following transactions:

- Loading subscribers‟ Airtel mobile airtime and data bundles.
- Inland money transfer among users, merchants and non-subscribers.
- General merchandise and purchases.
- Payment of utility bills and other charges where the system is accepted.
- SMS banking as aided by partner banks and financial institutions.

iii. TxtnPay: Introduced by Afric Xpress, a New York based company operating in Africa for the first time starting with Ghana. Txtnpay commenced operations in 2009 as a mobile phone-based secure payment system that enables users to send money to anyone with the mobile phone, pay bills, buy prepaid airtime, and check their bank balance and purchase goods and services. The txtnpay wallet is funded by buying electronic cash at any approved agency or making transfer from one's bank account (TxtnPay, 2012). The service is universal on all MNOs for user convenience and subscriber portability. As at February 2010 (Owusu, 2010) Afric Xpress had processed over 500,000 transactions under the txtnpay service through purchases and payments, money transfer within and outside Ghana, and Mobile banking. Txtnpay is currently partnered with a number of banks, internet cafes and other outlets. The service has over 400 (Owusu, 2010) agents on its nationwide network.

iv. Tigo Cash: Tigo cash is a Mobile Payment system introduced by Millicom Gh. Ltd., operators of the Tigo network. It was launched in November 2010 to complement the efforts of other MNOs and PSPs geared towards raising a cashless Ghanaian market and mobile wallet services for the unbanked. Tigo has partnership with banks such as ADB, UBA, Fidelity and Ecobank to enable subscribers benefit from its mobile banking services.

CONTRIBUTION OF THIS PAPER

Ghana has the potential to utilise the power of Information and Communication Technology in the form of mobile phones to enhance the saving culture of her citizens. Majority of Ghanaians use mobile phones as depicted in Figure 3, however, few of these phone users have bank accounts. There are frantic efforts by MNOs to use Mobile money to improve the culture of saving in the citizenry. These efforts are impeded by the lack of comprehensive framework that will help boost the interest of subscribers, define the role of MNOs in the financial sector, protect both customers and MNOs, and improve the entire payment system in the country.

This paper therefore, proposes a framework that will utilise SMS to enable customers take advantage of the benefits of using Mobile money. This will reduce the long queues that are found at the banks and ATMs, increase the number of subscribers using mobile money due to its simplicity (only SMS) and interoperability, and through a proposed legal framework, make both MNOs, banks and customers safe to transact business using mobile money. This framework takes into account lots of services that can be brought into the Mobile money market which will ultimately improve the entire payment system in the country.

STATEMENT OF THE PROBLEM

The unbanked in Ghana are more than those with bank accounts. Even with the few people that have bank accounts, it is common to see a lot of people queue at the banks and ATMs just to withdraw cash. This is so because the payment system is dominated by transactions that use physical cash. Fortunately, majority of the people use mobile phones making it ideal to use Mobile commerce in place of cash transactions. However, problems of interoperability, lack of rigorous legal framework, and low levels of interest shown by subscribers (partly due to complexity and cost of transacting business with existing Mobile money services) are hindering the progress of this quest.

OBJECTIVES OF THIS PAPER

The main objective of this paper is to improve the payment system currently existing in Ghana through the use of Mobile Money. This can be achieved if the following are fulfilled:

- Increasing cashless transactions that takes place in the country.
- Proposing both operational and legal frameworks for mobile money which will eventually result in:
  - A boost in customer interest in mobile money due to its simplicity and interoperability as compared to current ones.
  - A clear definition of the roles MNOs are supposed to play in the payment system of the country.

THE PROPOSED FRAMEWORK

This framework seeks to eliminate the long and stressful queues at the banks and ATMs in the country and also provide a simple, cheap and secure way of sending money better than existing transfers.

SMS paths are not shown in Figure 4. Only transactional paths are shown labeled. The parties involved in this framework include:

- Bank of Ghana (BoG); supervises the payment system of the country.
- All MNOs in Ghana
- All Financial institutions including Rural Banks and Credit Unions.
- Agents representing MNOs in locations that are accessible to customers.
- Senders (e.g. customers, employers, etc.).
- Recipients (e.g. supermarkets, schools, revenue authorities, insurance companies, etc.)

The instruments involved include:

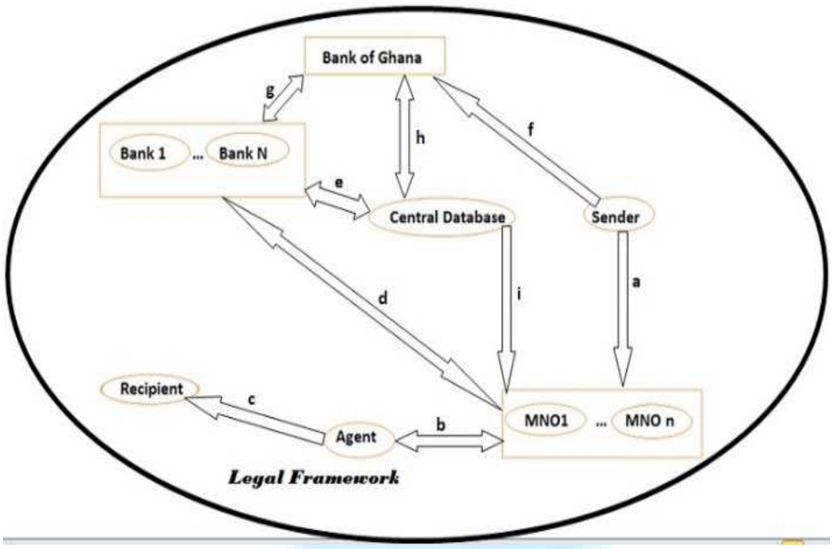
- Mobile phones
- Registered SIM card
- National ID card

The procedure involved in transferring money is divided into three categories (refer to Figure 4.):

1. Person-to-Person transfer via MNO accounts:

a) The sender must have an account with the MNO with sufficient fund for the transfer. Sender sends SMS to the MNO providing their national ID number, the receiver's phone number and how much they want to transfer,. The receiver must not necessarily be a subscriber to the MNO on which the transfer is taking place. The MNO sends SMS to the receiver to contact the nearest agent.
b) The agent sends SMS containing his identification, the ID of the receiver, phone number of the receiver, and the amount to be withdrawn to the MNO. The MNO debits the sender's account of the amount to be withdrawn, and credits the agent's account with it.
c) The MNO sends SMS to the sender, receiver, and agent indicating that the transfer has been completed. The agent then gives the money to the receiver.
d) The MNO sends the details of the transaction (via a secure connection) to its account holding bank. Only successful transactions are sent.

FIGURE 4: ARCHITECTURE OF THE PROPOSED FRAMEWORK



e) The bank commits the record of the transaction into a central database that is accessible to all MNOs, Banks, and the Bank of Ghana which serves as the supervisory body.

2. Person-to-Person transfer through the bank:

a) The sender must have an account with the bank with sufficient funds for the transfer. Sender sends SMS to the MNO indicating how much they want to transfer, their national ID number, their bank account number and the receiver's phone number. The receiver must not necessarily be a subscriber to the MNO or have an account with the bank.
d) The MNO verifies with the bank either the sender has sufficient funds in his/her account. If so, the MNO authorizes the bank to debit the sender's account of the said amount and credit the account of the MNO with it. The MNO sends SMS to the receiver to contact the nearest agent.
b) The agent sends SMS containing his identification, the ID and phone number of the receiver, and the amount to be withdrawn to the MNO. The account of the agent with the MNO is credited with the amount transferred. SMS is sent to sender, agent, and receiver to indicate the success of the transaction.
c) The agent pays the receiver.
d) Steps d) and e) for procedure 1) are repeated for successful transactions.

3. Remittance:

f) The sender sends the money to the transferring company with the receiver's phone number and national ID card number. All remittances to Ghana must be acknowledged by the Bank of Ghana.
g) BoG notifies the bank that is into partnership with the transferring company of the transfer.
d) The bank notifies the MNO to which the receiver is a subscriber of the transfer, and subsequently transfers the amount to the account of the MNO. The MNO sends SMS to the receiver to contact the nearest agent.
b) The agent sends SMS containing his identification, the ID and phone number of the receiver, and the amount to be withdrawn to the MNO. The account of the agent with the MNO is credited with the amount transferred. SMS is sent to sender, agent, and receiver to indicate the success of the transaction.
c) The agent pays the receiver.
d) Steps d) and e) for procedure 1) are repeated for successful transactions.

A mobile money subscriber of a given MNO by our framework can also deposit money to their accounts with the MNO or the bank. As stated earlier, this will reduce the long queues at the ATMs and the banking halls in the country. To deposit money into one's MNO account:

i. The account owner must be a subscriber to the MNO.
ii. The customer goes to see an agent. S/he gives their national ID number, phone number, and the amount they want to deposit to the agent.
iii. The agent sends this information to the MNO and request for an equivalent amount of e-money to be transferred to the customer's account.
iv. The agent collects the customer's money.
v. The account of the agent is debited with the amount of e-money credited to the customer's account.
vi. An SMS is sent to both the agent and the customer to signify a successful transaction.
vii. Steps d) and e) for procedure 1) are carried out if the transaction is successful.

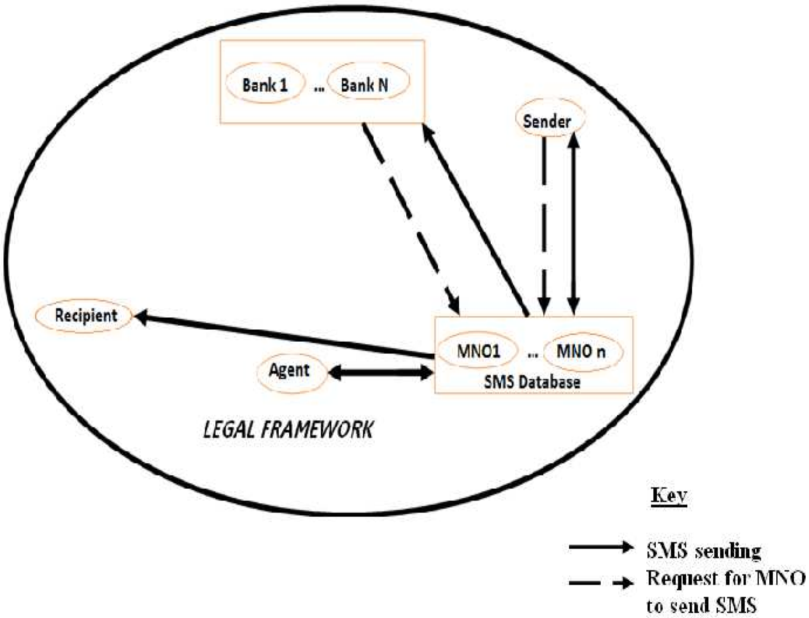
To deposit money to one's bank account:

i. The customer must be an account holder in the bank.
ii. The customer goes to see an agent. S/he gives their national ID, phone number, bank account number, and the amount to the agent.
iii. The agent sends this information to the MNO and request for an equivalent amount of money to be transferred to the customer's bank account.
iv. The MNO checks the authenticity of the account with the account holding bank. If it exists, the amount is credited to the account of the customer, and debited from the account of the MNO. At the level of the MNO, the agent's account is debited and credited to the MNO.
v. The agent collects the customer's money and steps d) and e) for procedure 1) carried out.

All the above processes must take place in a well-structured, all inclusive legal framework.

The flow of messages (SMS) is depicted in Figure 5. We use SMS as the base case, since every mobile phone in Ghana has the SMS facility. Other forms of message sending such as MMS, Emails, etc. can be substituted for SMS if the customer's mobile phone supports that feature and also if they are willing to use that feature of their phone for transaction. The MNO will simply take the format for the first request from the customer for subsequent transactions until the customer request for a change in the mode of interaction. It must be made clear that the use of a Mobile money application on either the subscriber's phone or SIM is also supported in this framework. In that case, Fig. 5 depicts the flow of communication, and not just SMS.

FIGURE 5: MESSAGE (SMS) PATHS FOR THE FRAMEWORK



The sender sends SMS to his MNO indicating the amount they want to transfer and to whom. SMS is sent to the receiver to contact the nearest agent. The agent identifies himself to the MNO by means of SMS. After the transaction is completed, SMSs are sent to all parties involved to indicate successful transactions. If a customer wants to pay their electricity bill using funds in their bank account, they must use the SMS services of the MNO to which they subscribe to (dotted lines) as a carrier, to send the request to the bank. The bank performs the operation and uses the MNO as a carrier to send notification via SMS to all parties that the transaction has been completed successfully.

All these must occur in a well-structured legal framework.

LEGAL FRAMEWORK

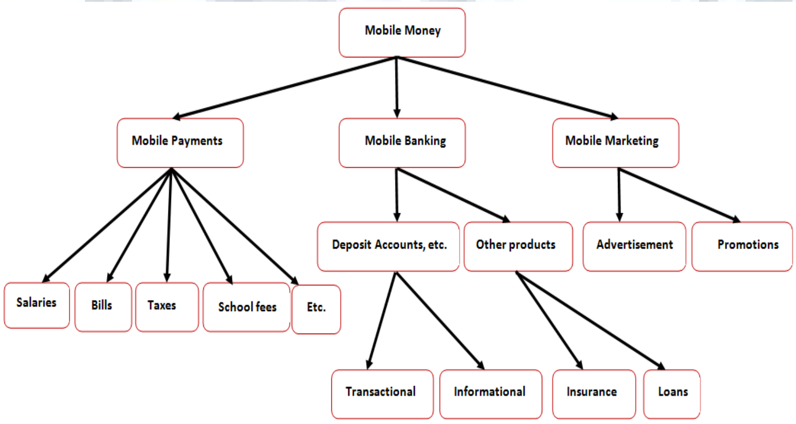
Ghana has well-defined regulations that govern the payment system, with BoG serving as the supervisory body and enforcer of these regulations. However, the country lacks a regulatory framework that will promote the inclusion of the unbanked, define the relationship between the banks, and MNOs (Ghana Government, 2012) and also, define the role of MNOs in the payment system of the country. Stringent regulations must be passed to protect both service providers and customers. We propose the following regulations:

1. Anti-Money Laundering, Combating the financing of terrorism and Drug trafficking: The amount of money that can be transferred or saved per day, per month, and per year for each customer must be clearly specified. Proper foreign exchange controls must impose limits on the amount of money a customer can transfer or receive. This will avoid people using the service as a channel to transfer huge sums of monies for other purposes. Proper Know Your Customer (KYC) procedures must be enforced to reduce these types of crimes.
2. Regulations to define the role of MNOs in Ghana's payment system and the relationship between all Mobile Money service providers: This will enhance interoperability between the various service providers and enable them to know where their limits are.
3. Data privacy: Data privacy laws will protect customer information, and prevent MNOs and Banks from using it for purposes other than those that have been agreed to by the customer.
4. E-commerce regulations: These will protect the customer from losing their money through no fault of theirs. They must also protect service providers from unnecessary lawsuits that will have negative impact on their services. The necessary regulations must be enacted to prepare the grounds for smooth operation.
5. Tax regulations: The laws on tax can be made to give some percentage off for Service providers. This will enable service providers to reduce their charges to motivate the unbanked to join.
6. Regulations for healthy competition: Anti-competitive practices must be strongly discouraged to provide a level playing ground for all service providers.

EXPECTED OUTCOME

Figure 6 depicts what the Mobile money landscape will look like on implementing our framework.

FIGURE 6: EXPECTED MOBILE MONEY SERVICES TO BE COVERED



The customer should be able to pay their bills, taxes, purchase items, and pay their wards school fees just by sending an SMS. They should also be able to contract loans, check their account balance, deposit money and insure their property using the service. On the other hand, MNOs and cooperate society can also benefit by means of promotional sales and the advertisement of their products via the service. People may deposit their money with MNOs to help reduce the issue of theft and arm-robbery in our society since people will stop carrying large sums of monies while travelling. Cocoa farmers will have an alternate source of income when their banks run out of money during cocoa seasons as they may have opened an account with one or many MNOs.

CONCLUSION AND SCOPE FOR FURTHER WORK

In this paper, we proposed a framework for implementing Mobile Money system in Ghana that will introduce interoperability between MNOs, and reduce the number of the unbanked. The only instrument required by a customer to carry out transactions is a mobile phone that can send SMS. Since the majority of Ghanaians possesses mobile phones, our framework will help reduce the stress and long queues at the banks and ATMs. A legal framework has also been proposed to protect both the customer and Mobile Money service providers.

Our interest will now be geared towards developing a prototype of the Central Database that will make Mobile Money transaction information available to all banks and MNOs, to enhance interoperability. This is the area where we want to concentrate our future research efforts.

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