

The Mobile Money Revolution

Part 2: Financial Inclusion Enabler

ITU-T Technology Watch Report
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Globally, more than 2.5 billion adults do not have a formal bank account, most of them in developing economies. Low levels of financial inclusion represent a barrier to socio-economic development in developing countries. Mobile money can be a game changer for the poor and an enabler for financial inclusion in developing countries. This second part of the report on mobile money considers innovations driving mobile money transfer applications in developing countries and how these are contributing towards achieving the goals of financial inclusion. This report also reviews the technical standards behind securing mobile money transfer services.



The rapid evolution of the telecommunication/information and communication technology (ICT) environment requires related technology foresight and immediate action in order to propose ITU-T standardization activities as early as possible.

ITU-T Technology Watch surveys the ICT landscape to capture new topics for standardization activities. Technology Watch Reports assess new technologies with regard to existing standards inside and outside ITU-T and their likely impact on future standardization.

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Please send your feedback and comments to tsbtechwatch@itu.int.

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1. Introduction

Mobile money has attracted more interest from the developing countries than from developed countries. Mobile money adoption is currently lower in more developed countries, where most people have bank accounts and the mobile phone is evolving as just another payment channel for existing financial products and services and for customers with bank accounts. In emerging economies, however, mobile money is being used strategically to enable people without bank accounts to carry out financial transactions.

According to the World Bank, financial inclusion, or broad access to financial services, is defined as an absence of price or non-price barriers in the use of financial services. In a developing country, the financial infrastructure is not well developed, with a limited number of payment instruments and a larger unbanked population, because access to financial services is very costly. This results in a large percentage of the population operating on a cash only basis and outside the formal banking system. In some parts of the developing world, unemployment benefits and health insurance are not available, so in difficult times, people rely on informal risk-sharing arrangements involving networks of friends and family. In some cases, informal methods are also used to transfer money, which presents several risks. Poorly developed transportation systems and expensive money-transfer services also help to make mobile money more appealing. In rural areas, people have to travel long distances from their homes to collect remittances; this represents a significant cost in addition to the already high transfer fees. Mobile money may be the only viable alternative to cash.

Part 2 of this report highlights the innovations in mobile money transfer and mobile banking in emerging economies, including the business model ecosystem and interoperability issues. Finally, the report reviews the technical standards behind securing mobile money transfer services and identifies potential areas for standardization activities.

2. Mobile money in emerging economies

Globally, more than 2.5 billion adults do not have a formal bank account, most of them in developing economies¹. Low levels of financial inclusion represent a barrier to socio economic development in developing countries. Only 41 per cent of adults in the developing countries have a formal bank account (for more information, see Figure 1(a)). In Africa, only 20 per cent of families have bank accounts². The most important reason for not having a bank account is the lack of money to use one. The other reasons are that bank accounts are too expensive, banks are too far away (especially in rural areas), documentation is lacking, and people do not trust banks. A growing number of people in remote areas are using new alternatives to traditional banking made possible by the rapid spread of mobile phones, as mobile penetration is expected to reach 100 per cent worldwide by 2015. In most cases, mobile money is a substitute both for paper-based banks and for sending cash by informal methods through a third party. It enables people who cannot get to a bank branch or ATM to use financial services.

The recent growth of mobile money has allowed millions of people who are otherwise excluded from the formal financial system to perform financial transactions relatively cheaply, securely, and reliably. Mobile money has achieved the broadest success in Sub-Saharan Africa, where 16 per cent of adults report having used a mobile phone in the past 12 months to pay bills or send or receive money (see Figure 1(b)). The share using mobile money is less than 5 per cent in all other regions. In Africa, the most visible case is Kenya, where active bank accounts increased in number from 2.5 million in 2007 to more than 15 million in 2011. Transactions through the mobile banking service M-PESA exceed USD 375 million each month and users save up to USD 3 on each transaction³. A report on M-PESA⁴ reveals that between 2007 and 2009 the percentage of M-PESA users who were unbanked doubled (from 25 to 50 per cent) and the number living in rural areas also increased (from 29 to 41 per cent). M-PESA users are not just using the service to send and receive money but also for savings.

According to the GSMA's annual report, *Mobile Money for the Unbanked 2012*, there were 140 live mobile money transfer systems in place in low- and middle-income countries targeting the unbanked in 2012⁵. Remittances and remote payments are the most common uses of mobile money in developing countries. For example, M-PESA, which markets its service as "Send money home", is used primarily for domestic remittances. In the Philippines, international remittances are more popular, with Smart Communications' Smart Padala enabling overseas workers to send money to their relatives. Consumers are using mobile money where there is a very clear, simple value proposition. Differences in the rate of adoption of mobile money services across markets are therefore dependent on what the user regards as being of value. For instance, in Bangladesh, people may spend three to four hours off work in travelling and queuing at banks to pay utility bills. In this case, mobile utility payments are quite popular. In Russia, on the other hand, this type of payment option for utilities is less popular as it usually takes around six to twelve months of non-payment before utility companies disconnect a customer's service.

¹ World Bank, Asli Demirguc-Kunt, L. Klapper: Measuring Financial Inclusion: the Global Findex Database. April 2012, <http://go.worldbank.org/J3T8AZ4KX0>

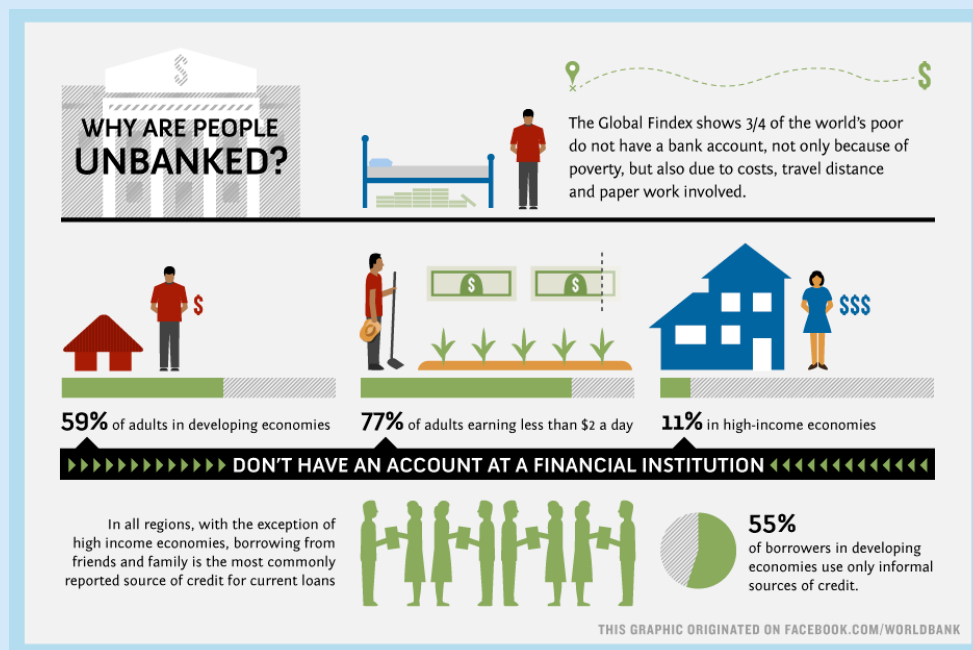
² Source: <http://mobilemarketingandtechnology.com/2011/03/07/mobile-banking-in-africa-an-overview/>

³ idem

⁴ J. W. Suri: *Economics of M-PESA*. 2010, http://www.mit.edu/~tavneet/M-PESA_Update.pdf

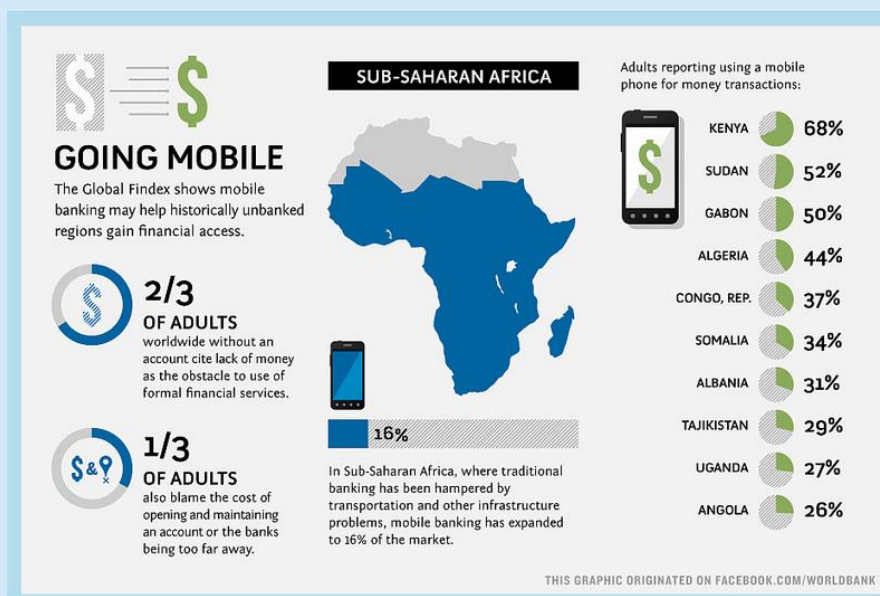
⁵ <http://www.mobileworldlive.com/mobile-money-tracker>

Figure 1(a): Why are people unbanked?



Source: World Bank: Global Findex 2012, <http://www.flickr.com/photos/worldbank/6948286384/>, CC BY-NC-ND 2.0.

Figure 1(b): Mobile Money in sub-Saharan Africa



Source: World Bank: Global Findex 2012, <http://www.flickr.com/photos/worldbank/7094355307/>, CC BY-NC-ND 2.0.

Mobile money in emerging countries is more than just technology. A well-developed agent network is essential in order to achieve scale. In addition to providing vital cash-in and cash-out services, agents are important for building trust for first-time users of formal financial services. The agents receive a commission for the work they do, i.e converting cash into e-money and vice versa. In addition, since the mobile money services involve both telecommunications and financial services sectors, there is a wide range of stakeholders in both these areas. Moreover, the whole sector requires government regulation to establish a

level playing field for operators in both the financial services and the telecommunications sectors and to protect consumers.

In developing countries, the monetary value of most of the financial transactions carried out using mobile payment services is small. The main services offered by mobile money service providers in emerging economies are:

- Money transfers (domestic and international);
- Payment of bills;
- Government to person payments (e.g. social security payments, salaries, pension etc.);
- Banking services; and
- Purchasing airtime.

However, in recent years mobile money services have been extended to offer financial services for formal financial products (savings, credit, insurance), informal service providers (moneylenders), personal networks (on-demand, scheduled payments, sending and receiving money), in-store merchant payments (goods and services), and remote B2C/C2B payments (salaries, pensions, loan disbursements, bill payments, online/e-commerce). Governments have also started using mobile money transfer services for making payments to citizens (e.g. salaries and pensions) and to collect revenues such as taxes. In Afghanistan policemen and other officials are paid their wages using a local version of M-PAISA. Tanzania accepts tax payments through mobile-money services. In other countries such as India, it is being used to deliver welfare or social aid payments. M-money has also facilitated emergency response. In Haiti, for example, following the 2010 earthquake, Voilà partnered with international aid agency Mercy Corps to provide virtual vouchers to victims through a cheap mobile phone loaded with an e-wallet from Indonesia's PT Telkomsel.

Some institutions such as the World Bank, GSMA and the Melinda and Bill Gates Foundation, have initiated and are funding mobile money programmes for the unbanked.

Table 1: Some examples of mobile money applications in emerging economies

M-money application	Countries implemented	Main Features	Technology
M-PESA	Kenya, Tanzania, South Africa and Afghanistan	<ul style="list-style-type: none"> • P2P transfers • Pay school fees • Pay electricity bills • Pay for goods and services 	STK ⁶ , USSD ⁷
Easypaisa	Pakistan	<ul style="list-style-type: none"> • Pay utility bills • Make P2P transfers • Increase air time credits • Save money • Pay for goods and services 	USSD and Internet
T-Cash	Haiti	<ul style="list-style-type: none"> • Receive salary • Make P2P transfers • Pay bills 	USSD
Globe GCash	Philippines	<ul style="list-style-type: none"> • Pay utility bills • Make P2P transfers 	SMS, STK

⁶ STK: SIM Toolkit

⁷ USSD: Unstructured Supplementary Service Data

M-money application	Countries implemented	Main Features	Technology
		<ul style="list-style-type: none"> • Use as a mobile wallet • Increase air time credits • Pay for goods and services 	
Airtel Money	India and 14 African countries including Uganda, Tanzania and Kenya	<ul style="list-style-type: none"> • Make P2P transfers • Pay for goods and services • Bill payments 	USSD
MTN Mobile Money	Africa, including Uganda, Ghana, Cameroon, Ivory Coast, Rwanda and Benin.	<ul style="list-style-type: none"> • P2P transfers • Buy air time • Check balances • Pay utility bills 	USSD and STK
EKO	India	<ul style="list-style-type: none"> • Make P2P transfers • Bill payments • Loan payments 	USSD
WIZZIT	South Africa	<ul style="list-style-type: none"> • P2P transfers • Buy air time • Check balances • View statements • Pay electricity 	USSD

3. Mobile money transfer

Mobile money transfer typically refers to services whereby customers can use their mobile devices to send and receive money or to transfer money electronically from one person to another using a mobile phone. This transfer can be either a domestic transfer or international remittance transaction. The key characteristic of mobile money transfer services is the fact that they relate to private transactions only (i.e. transactions involving transfers of money from one person to another). Mobile money transfer addresses person-to-person (P2P) money transfers and is a subset of mobile payments (See Part 1 of this report for a definition of mobile payments).

Mobile money transfers using mobile phones require senders to give the money to a remittance centre and pay a fee. The remittance centre then transfers the money electronically through the phone service provider to the recipient's phone. In the case of international remittances, the person receiving the money gets a text message advising of the transfer. The recipient can go to any licensed outlet, including a retail store or restaurant, to get the money. The recipient may have to pay a fee to collect the money. In the case of domestic remittances, the transfer is handled automatically on the mobile money platform.

The mobile remittance industry is burgeoning owing to the increased penetration of mobile phones in remote regions and the mushrooming of various remittance service providers, both national and international, for global money transfers. According to the Migration Development Brief⁸ of the World Bank, remittance flows to developing countries were estimated to have reached USD 372 billion in 2011, and are expected to reach USD 467 billion by 2014, and total worldwide remittance flows are expected to reach USD 615 billion by 2014. India and China rank highest as recipients of migrant remittances, to the tune of USD 64 billion and USD 62 billion respectively. Tajikistan and Lesotho receive remittances that are as high as 31 per cent and 29 per cent of GDP respectively. Various money transfers options (phone to phone, cash to

⁸ <http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1110315015165/MigrationandDevelopmentBrief18.pdf>

phone, phone to cash, mobile-wallets etc.) can be made conveniently using mobile devices through platforms and applications provided by various banking institutions and money transfer operators worldwide. Various money transfer operators provide services either through a network of agents or partnering with banking institutions depending on the regulations of the central bank and other financial bodies of various nations.

In addition to the mobile wallet discussed in Part 1 of this report, mobile phones can be used for making P2P payments. In this section, some successful implementations of mobile money transfer services, such as M-PESA, Easypaisa and GCASH, are discussed.

3.1 M-PESA

In 2007, Safaricom and Vodafone launched a mobile money transfer service called M-PESA. Five years later M-PESA provides services to 15 million Kenyans (more than a third of the country's population) and serves as a conduit for a fifth of the country's GDP. M-PESA⁹ now processes more transactions domestically within Kenya than Western Union does globally and provides mobile banking facilities to more than 70 per cent of the country's adult population. However, the service cannot function without the presence of the formal financial sector. Bank branches are a vital part of the cash management operation of an M-PESA agent (see Annex 1 for more information). Moreover, the early adopters of the service in Kenya were more likely to be banked than non-users. M-PESA has also been implemented in Tanzania, South Africa and Afghanistan. In Kenya it uses STK technology, whilst in Tanzania, USSD has been used. The M-PESA application has also served as a platform for innovations in other areas such as insurance, savings and banking in Kenya.

3.2 Easypaisa

In Pakistan, 89 per cent of the adult population does not have a bank account¹⁰. Easypaisa was established in 2009 in Pakistan through a partnership between Telenor Pakistan and Tameer Microfinance Bank. The regulation mandated a bank led model and hence the license for branchless banking rests with Tameer Microfinance Bank, while Telenor Pakistan also acquired 51 per cent ownership in Tameer for better governance of the new business. The partnership has developed a network of over 20 000 agents. The main differentiating factor in Easypaisa is that customers do not require a mobile phone or account with Telenor to pay their bills or to send/receive money. These transactions are done at any of the 20 000 Easypaisa shops around the country by the merchant on his mobile phone. In 2010, Easypaisa mobile accounts (m-wallets) were launched for Telenor SIM subscribers only. Mobile Account subscribers use their own phones for all transactions and only need to go to Easypaisa shops in Pakistan to deposit or withdraw cash from their Easypaisa mobile account. Services offered include bill payments, money transfers, airtime purchase, savings and insurance, retail purchase, corporate solutions, viewing account balances and recent transactions, managing PIN codes, and so on. In 2012, Easypaisa conducted on average over 5 million transactions every month.

3.3 GCASH

GCASH is a mobile money transfer service from Globe Telecom in the Philippines, which transforms a mobile phone into a virtual wallet for secure, fast, and convenient money transfers at the speed and cost of a text message. The recipient in the Philippines can easily receive a sender's remittance direct to his mobile phone. Globe Telecom issues an account which is the GCASH account in which the money is sent by the sender to be withdrawn by the recipient. The recipient is sent an SMS alert indicating the amount sent to his or her GCASH account.

⁹ <http://www.imf.org/external/pubs/ft/reo/2011/afr/eng/sreo1011.pdf>

¹⁰ See: <http://telenor.com/corporate-responsibility/initiatives-worldwide/easypaisa-banking-services-made-easy/>

3.4 Airtel Mobile Money

Airtel Mobile Money is a core offering of Airtel which offers more than money transfer services. By July 2012, Airtel Mobile Money had been launched in 14 countries where Airtel operates. This follows successful improvements to the previous product called Zap. Airtel Mobile Money enables customers to send money, pay bills, buy airtime, pay online and also receive batch payments. With over 11 million registered customers representing about 20 per cent of Airtel Customers, Airtel Money is intended to service the unbanked population.

Airtel Mobile Money is set up as a separate operation within the Airtel business. It uses an internally developed application which enables both STK and USSD access. It is aiming to introduce new relevant financial products, mainly savings and insurance.

4. Mobile banking

Mobile banking allows customers to use their mobile phones as another channel for their banking services, such as deposits, withdrawals, viewing of statements, account transfers, bill payments, and balance inquiries. Most mobile banking applications add a new delivery channel to existing bank customers. However, there are also new types of mobile banking application, such as M-PESA, which integrate unbanked populations into the formal financial sector. These applications are being driven by the widespread penetration of mobile handsets which in turn, are bringing banking facilities to the unbanked and providing micro-finance in the palm of the hand.

A mobile banking strategy for financial inclusion aims at providing complete banking facilities as well as financial services for the customers through their mobile devices. The key solutions of this strategy are:

- Mobile retail banking – This business strategy aims to bring the key retail banking services such as statements, balance enquiries, cheque deposits, money transfers, bill payments, direct debits, and so on, to the customers over mobile channels.
- Mobile cheque deposits – This business service allows customers to make cheque deposits remotely.
- Mobile peer to peer payments – Allows users to make money transfers or payments directly to one another using mobile channels, either using their mobile wallet accounts or with their bank accounts including card accounts.
- Mobile money transfers – Mobile-enabled local and cross-border money transfers can help many customers to make money transfers easily from their mobile devices, using their card/banks. Transfers involve inter-account transfers, transfers within the same bank and same country, transfers within the same bank across the globe, and transfers to other banks within the same country, the same region, or across the globe.

Various mobile core banking services are currently being offered in developing nations providing financial inclusion to the billions of unbanked worldwide. Some examples are considered below.

4.1 India : EKO and the inter-bank mobile payment system (IMPS)

EKO in India provides financial services to non-banking customers and connects the telecom infrastructure to the bank's core banking system. EKO was established in September 2007 and started operating in 2009. Delivering banking services through the mobile phone makes banking substantially cheaper and thus affordable for a broader population. It provides a platform for universal financial access and low-cost micro-transactions. EKO hopes to tap a huge potential market in India, where three quarters of the country's 1.25 billion people live on less than USD2 a day. The Reserve Bank of India recently removed restrictions on agent exclusivity, so customers can now transact at customer service points of one bank even if their accounts are held at another bank. Such interoperability should mean greater efficiency and lower costs across the system.

Out of the total of 4 million transactions, some 3.5 million, to a total value of USD350 million, have been for domestic remittance to 1.3 million State Bank India (SBI) accounts. EKO has served more than 1.5 million unique users including 250 000 No Frill Savings Account (NFSA) holders (zero-balance accounts). EKO provides a multi-modal (USSD, SMS, and IVR¹¹) approach to perform a transaction. The service works across all phones (i.e. lowest to most sophisticated handsets) and does not require a special SIM card or SMS application. EKO also uses a two-factor strong authentication to complete the transaction. Performing a transaction requires only numeric literacy for number dialing.

Electronic benefit transfers and remittances account for almost 4 per cent of GDP in India. In February 2012, the Government of India released a task force report¹² on a unified payments infrastructure linked to the biometric Aadhaar¹³ number that proposes electronic payments for government-to-people (G2P) payments as a means to cut costs for the government and bring added convenience to welfare recipients. About 180 million people have been enrolled in the scheme. The Government proposes a provision for a mobile and Aadhaar-linked account by banks. The IMPS is being established by NPCI (National Payment Corporation of India) to connect various approved non-bank entities on this platform and thus provide wider access. NPCI itself is promoted by ten leading banks in India. While these banks compete in the market, they also collaborate to achieve national objectives.

Some of the features of the IMPS are:

1. Instant, 24/7, 365 days/year operation — the first such remittance solution without the need for cards of any kind; money moves from account to account instantly, using mobile as the channel.
2. Works on all mobile phones.
3. Mobile Money Identifier (MMID):
 - a. a unique 7-digit number for each account;
 - b. enables customers to link same mobile to multiple accounts;
 - c. eliminates the possibility of erroneous transfer resulting from change of mobile numbers and typing errors.
4. Mobile number and MMID combination uniquely points to a bank account.
5. Works on the existing ATM messaging, switch and network, making it easier for banks to adopt this quickly.

Customers of banks will access funds in their accounts through banking channels already in place. In addition, banks will set up the Business Correspondent (BC) banking channel at the last mile. BC sub-agents will be equipped with microATMs that can conduct transactions on the basis of Aadhaar number and biometric authentication, as well as using other authentication methods that are already in use by banks. Just like ATMs, BCs will be able to serve customers of any bank connected to the bank that has appointed them, by routing transactions through the NPCI switch or any other organization's switch, where permitted under the Payment and Settlement Systems Act 2007.

4.2 M-KESHO

Equity Bank Kenya's M-KESHO is a collaborative effort between Safaricom's M-PESA and Equity Bank. Registered M-PESA users can sign up for an M-KESHO account which is an equity bank account linked directly to their M-PESA account. A major benefit of M-KESHO is that once registered, the user's M-PESA menu on the SIM application toolkit is updated with an M-KESHO section. M-KESHO offers Equity Bank customers several advantages over keeping money in an M-PESA account, including: account deposit

¹¹ IVR: interactive voice response

¹² See http://finmin.nic.in/reports/Report_Task_Force_Aadhaar_PaymentInfra.pdf

¹³ See http://www.uidai.gov.in/images/FrontPageUpdates/role_of_biometric_technology_in_aadhaar_jan21_2012.pdf

protection, microcredit, micro-insurance and personal accident cover, no limit to the amount that can be saved (M-PESA has a limit), and interest earned above a minimum threshold (customers can earn interest from as little as 1 Kenyan shilling). Money can be conveniently transferred between M-PESA and M-KESHO accounts to take advantage of these features.

4.3 Text-A-Payment

The *Text-A-Payment* service is a mobile phone banking service that uses SMS technology to allow micro borrowers to make microfinance loan payments, and deposits to or withdrawals from a bank account. Rural customers of banks such as Rural Bank of Cainta, Filipino Saver's bank, Card Bank, Green Bank of Caraga, or Phillipine Rural Banking Corporation, need only to enroll at their bank branch and register their mobile phones with Globe's GCASHservice¹⁴ and can then easily load their mobile wallet at any GCASH Cash-In centre or re-seller. After completing these steps, bank clients can conveniently and remotely send their loan payment to the bank without incurring the time and expense associated with travelling to a rural bank to make a loan payment. Borrowers can pay off loans without leaving their businesses.

4.4 bKash

bKash Limited (incorporated as a subsidiary of BRAC Bank) is a joint venture between BRAC Bank Limited, Bangladesh, and Money in Motion LLC, USA, and was launched in 2011 with Robi, a mobile operator. It has a special focus on serving the "base of the pyramid" with a view to broader financial inclusion by providing convenient, affordable and reliable services. Weak infrastructure and widespread poverty leave little incentive for banks to venture out of large cities and into rural areas.

bKash enables a customer to carry out financial transactions like sending and receiving money over long distances, making microloan payments and payments at partner merchant outlets through mobile phones. Corporate solutions for salary payments, loan disbursements and collection of fees and loan installments are also available. Using bKash eliminates short-term risks of carrying, transferring and storing cash.

Grameenphone joined the bKash network in January 2012, followed by Banglalink (Orascom) in August 2012. Partnering with these three mobile operators makes bKash accessible to more than 90 per cent of mobile owners in the country. Combining the ubiquitous presence of mobile phones with its own expanding nationwide network of over 20 000 agents allows bKash today to reach into the deepest rural areas. bKash uses Visa's Fundamo platform which works as effectively on sophisticated smartphones as on simple mobile phones.

5. Looking into the future: Bitcoin

The Bitcoin phenomenon is another technology that could revolutionise money transfer in the near future. Previously, e-mail let us send letters for free, anywhere in the world and then Skype lets us make phone and video calls for free, anywhere in the world. Now there's bitcoin, a digital virtual currency which uses cryptography to control its creation and transactions rather than financial institutions. Bitcoin lets you send money to anyone online, anywhere in the world at very low transaction fees. It's the first decentralized electronic currency not controlled by a single organization or government. Bitcoin, is a type of virtual currency composed of digital bits which was devised by Satoshi Nakamoto and became operational in 2009. It is based on sophisticated mathematical schemes for encryption and digital signatures to protect against counterfeiting. All over the world people are trading hundreds of thousands of dollars' worth of bitcoin every day with no middle man and no credit card companies. Bitcoins can be bought on Bitcoin Exchanges.

¹⁴ See: <http://mobilephonebanking.rbap.org/article/archive/15>

Bitcoin is the first digital currency that is completely distributed. Bitcoin currency is generated by computers (a process referred to as bitcoin mining) and secured exclusively by the community who runs Bitcoin software. The network is made up of users. No bank or payment processor is required between users and whoever they are trading with. This decentralization is the basis for Bitcoin's security and freedom. Bitcoin is open source software and is not controlled by any bank or government. Bitcoin has been regularly in the news in the first quarter of 2013, as the value of an individual Bitcoin, which was just \$20 at the beginning of February, hit record highs above \$250, before falling abruptly to below \$150 on April 11th (due to the bailout crisis in Cyprus seen by many analysts as one of the main causes for this)¹⁵. The enormous rise in value is also linked to what some economists say is the biggest problem with the currency: that the supply of bitcoins increases only slowly, at a rate that's coded into the system.

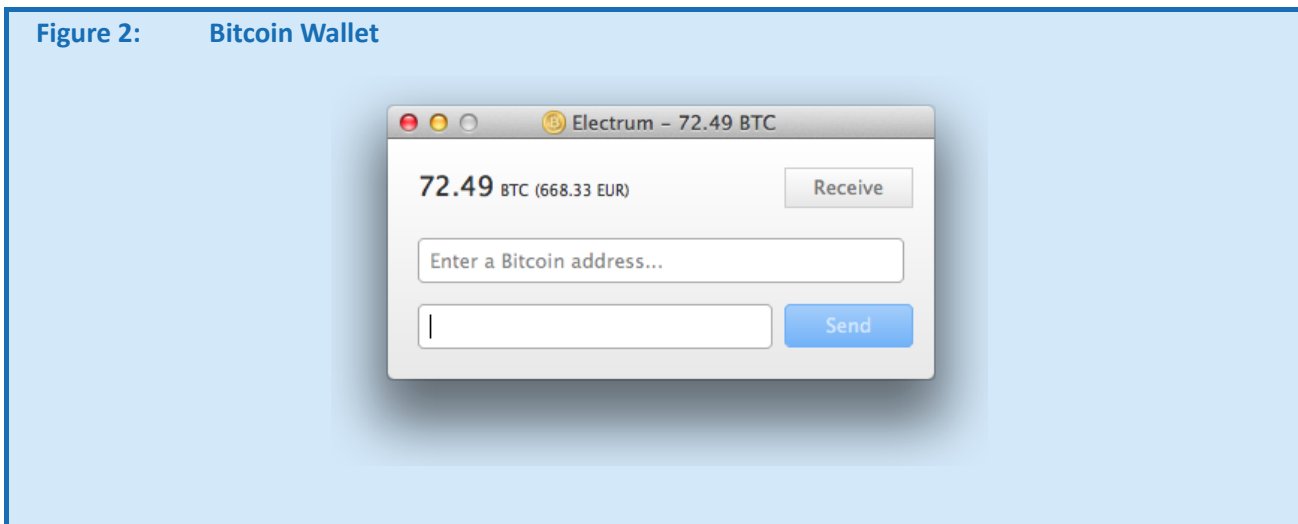
This is in contrast with regular paper currency like the dollar, whose supply is managed by a central bank like the Federal Reserve. The central bank controls the dollar supply to increase slightly faster than the growth of the economy, which means that the value of the dollar falls slightly every year, in the phenomenon known as inflation. In addition, Bitcoin is different from other payment systems. Because transactions are authenticated cryptographically and cannot be reversed, there's no need to restrict access to the network. There's no risk to accepting payments from complete strangers. That means people don't need anyone's permission or trust to go into business as a Bitcoin-based merchant or financial intermediary. Accepting Bitcoins also allows merchants to avoid much of the administrative overhead, like dealing with chargebacks that come with a conventional merchant account.

In order to receive bitcoins¹⁶, a user must also have a Bitcoin address, which is a randomly generated string of 27-34 letters and numbers and similar to a type of virtual mailbox. A Bitcoin address is a hash of the public key of an Elliptic Curve Digital Signature Algorithm (ECDSA) public/private key pair. Whenever a new user starts up the Bitcoin client, it generates a new Bitcoin address that is initially associated with zero Bitcoins. People can use the Bitcoin address to protect their anonymity when making a transaction since there is no registry of these addresses. These addresses are kept in Bitcoin wallets which operate like bank accounts. However, if the data is lost, the Bitcoins contained are gone too. The user's keys are stored locally in the wallet file.

¹⁵ The Economist: <http://www.economist.com/blogs/economist-explains/2013/04/economist-explains-how-does-bitcoin-work>

¹⁶ A bitcoin can be divided down to 8 decimal places. Therefore, 0.00000001 BTC (bitcoin) is the smallest amount that can be handled in a transaction. This is also referred to as the "satoshi."

Figure 2: Bitcoin Wallet



There were about 11 million bitcoins in circulation in April 2013¹⁷, and the maximum that can be generated is 21 million. Currently, 25 bitcoins are generated every 10 minutes. By 2032, 99 percent of those will have been created¹⁸ and by 2140 all bitcoins would have been generation. The supply of bitcoin is slow and is controlled by the system. Roughly every four years, the number of bitcoins to be generated is halved (for example, from 2009 to 2013 some 11 million bitcoins have been generated, over the next four years this will be halved and so on). The supply of bitcoin growth rate closely resembles the supply of gold over time. The first half of the supply was created in the first four years but the next half will be created over the next 127 years. Moving Bitcoins from one address to another is undertaken by creating a transaction to the network, showing both the source and destination address as well as the amount, signed by the source address's private key. The transaction is propagated to all of the active clients on the network.

Bitcoin on mobile phones will revolutionise payments. All that is needed to receive Bitcoin payments is to display the QR code in your Bitcoin wallet app and let a friend scan your mobile, or touch the two phones together (using NFC radio technology).

Security, fraud prevention and regulation are issues which are currently not very clear for Bitcoin and how these will influence on the perception of people in using a currency which is not backed by a government. Since it is early days still for Bitcoin, there is not much standardization work that has taken place. Areas where standardization could be considered in the future are the security of the bitcoin wallet and protocol, bitcoin transactions and mining of bitcoins.

6. Mobile money transfer ecosystems and models

A number of stakeholders are involved in the mobile money business. For mobile operators, m-money means increasing numbers of customers and higher average revenue per customer. Most of the offerings are thus based around increasing customer loyalty to increase revenue from telephone services. Table 2 shows the main expectations of stakeholders in the mobile money ecosystem in emerging economies. Figure 3 shows the win-win situations which mobile money brings to different stakeholders in the ecosystem.

¹⁷ Source: <http://blockexplorer.com/q/totalbc>

¹⁸ Source: <http://www.businessweek.com/ap/2013-04-10/bitcoin-economics-a-primer-on-a-volatile-currency>

Table 2: Expectations of stakeholders in mobile money transfer ecosystem

Stakeholder	Expectations
Consumer	<ul style="list-style-type: none"> • Reduced risk of carrying cash • Minimal learning curve • New service is available everywhere • Low or zero additional cost of usage • Security of transactions • Person-to-person transactions • Able to send and receive money (both domestic and international remittances)
Friends/family members	<ul style="list-style-type: none"> • Able to send and receive money (both domestic and international remittances) • Able to send/receive money in emergency situations
Employers	<ul style="list-style-type: none"> • Reduce time • Reduce cash risks
Mobile network operator (MNO)	<ul style="list-style-type: none"> • Potential to add value to existing services • Increase customer loyalty • New revenue channels • Increase average revenue per user • Reduce airtime distribution cost
Banks/microfinance institutions (MFI)	<ul style="list-style-type: none"> • Branding and customer loyalty • New customers • Ownership or co-ownership of the new payment application • Secure and trusted payment service • Anti-money laundering requirements • Integration/use of existing infrastructure and payment methods
Agents	<ul style="list-style-type: none"> • Earns commission on transactions • New revenue streams • Increase traffic and sales
Merchants	<ul style="list-style-type: none"> • Offer convenience to customers
Regulator	<ul style="list-style-type: none"> • Promote financial inclusion • Promote interoperability among payment services • Reduce risks of money laundering

Source: Adapted from S. Karnouskos, *Mobile payment: a journey through existing procedures and standardization activities, Communications Surveys & Tutorials, IEEE, vol.6, no.4, pp.44,66, Fourth Quarter 2004.* <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5342298>

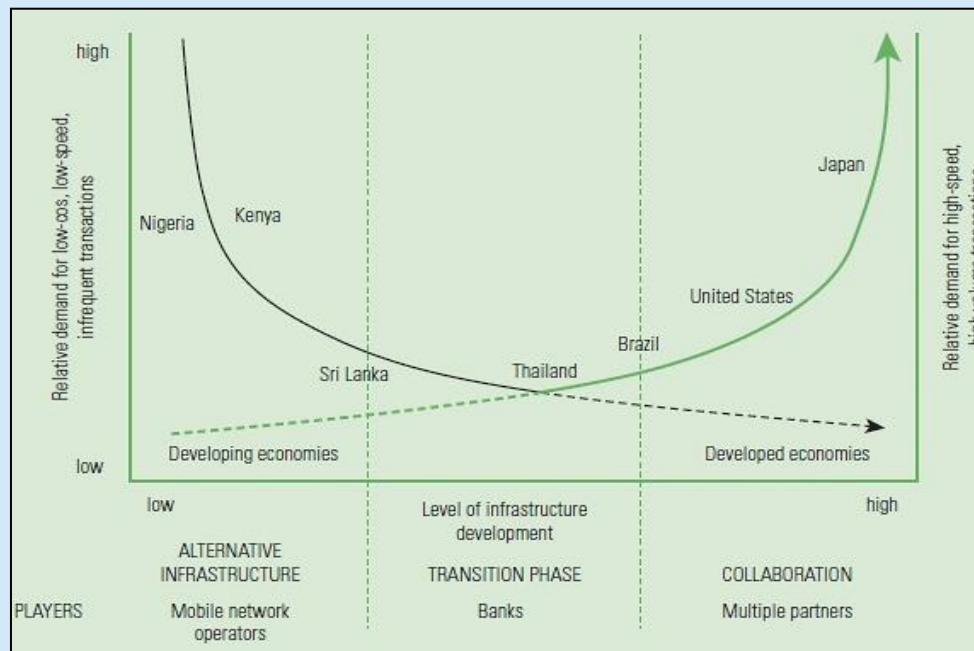
Different business models have emerged, depending on regulatory regime, culture, and population size:

1. Bank centric
2. Mobile operator-led (MNO-centric model) or non-bank-based
3. Partnership

The mobile money demand curve from the World Bank (Figure 3), shows where each model is more likely to occur. For instance, the black curve represents mobile money demand for developing countries. In the beginning, in developing countries, mobile money represents an alternative infrastructure for financial services, and as the infrastructure improves over time, a transition phase is reached as demand migrates from low speed, low cost to high speed, high volume and there is also more competition from banks and financial institutions.

MNO-centric models tend to be more prevalent in developing economies, where financial services infrastructure is not well developed. Bank-centric models are more likely to be prevalent in countries where there is a good level of infrastructure development and regulation for such transactions. In the collaboration phase, mobile money must integrate the financial infrastructure. The partnership business model is likely to be prevalent in such countries, which are mostly developed economies.

Figure 3: Mobile Money Demand Curve

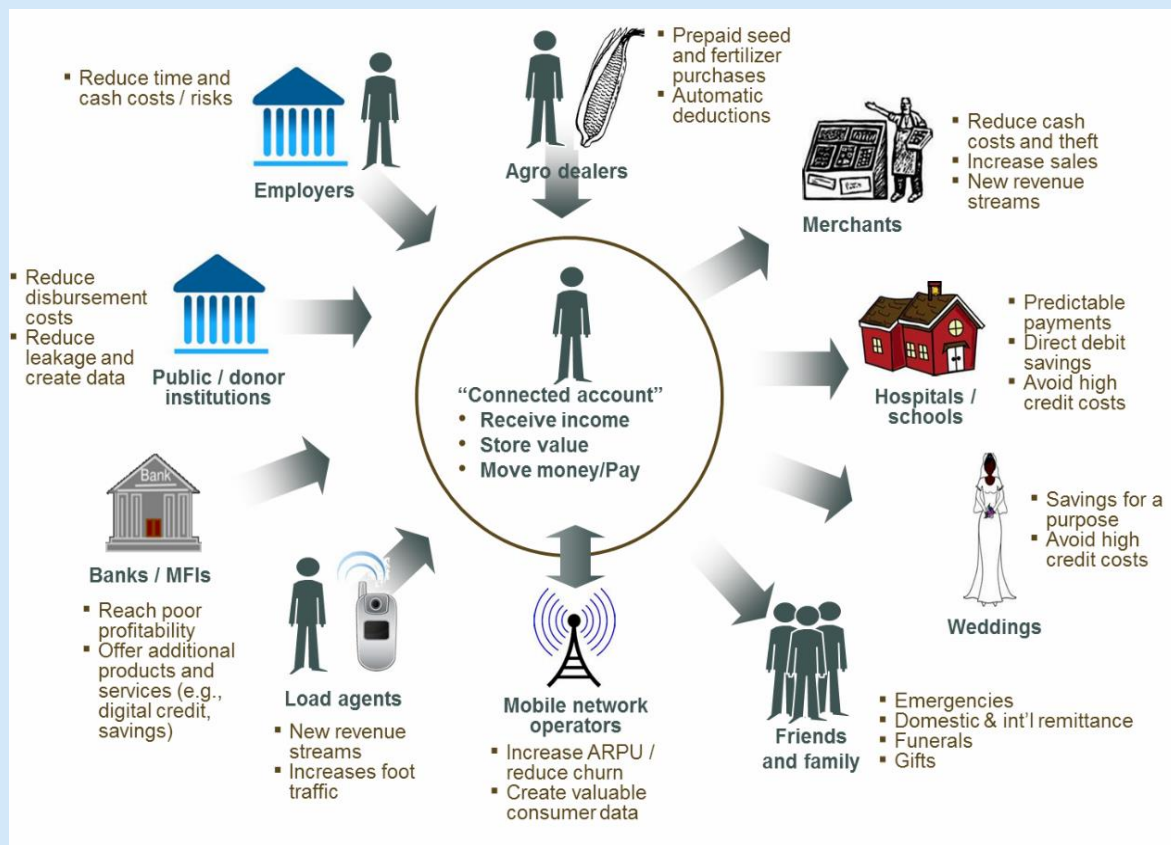


Source: World Bank: *Maximizing Mobile. Report on Information and Communications for 2012.*
<http://www.worldbank.org/ict/ic4d2012>.

In the MNO-centric model, the role of the bank/financial institution is limited in the payment delivery and settlement. In developing countries, MNOs dominate the mobile money transfer market and handle the customer relationship (e.g. M-PESA). MNOs provide an alternative infrastructure for financial services (see Figure 5). MNOs also provide a network of agents for payment and settlement functions. MNO-led models have been successful in developing countries because they have been able to reach large numbers of unbanked people in rural areas where there are no banking facilities. Furthermore, the geographic reach of this model can be extended through multilateral agreements with other telecommunications operators. The MNO-centric models in developing countries are implemented mainly on STK or USSD and handle low-value payments. In some of the payment schemes, the wireless carrier can also charge the payment made via SMS to the consumer's mobile phone bill.

In the bank-centric model, the bank/financial institution is responsible for the customer relationship and provides mobile services primarily as a new channel in addition to existing services. The mobile operator is responsible mainly for provision of the telecommunications facility for domestic and international transfers. This model has seen slow uptake because of low perceived value proposition vis-à-vis traditional payment services and its limited ability to reach the unbanked.

Figure 4: Win-win situations of mobile money for stakeholders



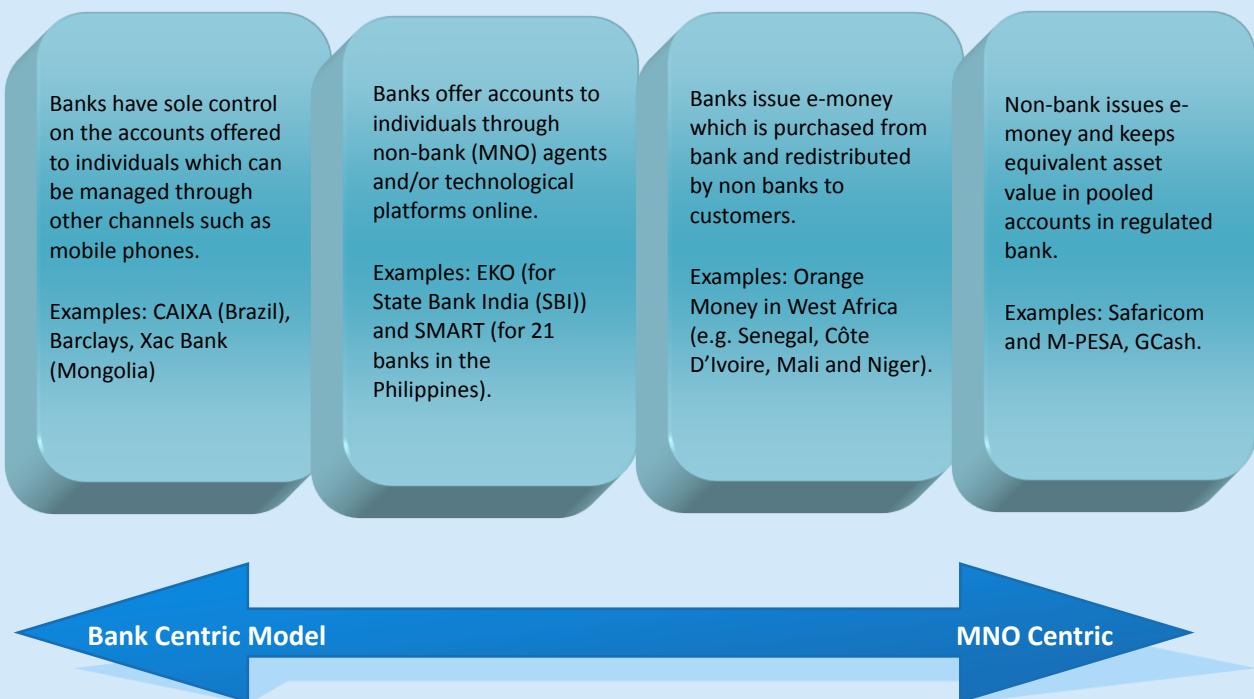
Source: Bill and Melinda Gates Foundation / Jake Kendall: MMU Data From Advanced Mobile Money Markets. (2012), Jake Kendall, <http://prezi.com/y9aktlkq2wi/mmu-data-from-advanced-mobile-money-markets/>

There are different variations as regards arrangements in the bank-centric model as the number of operators entering this field increases and new services are offered. There is no simple binary delineation between bank-centric and MNO-centric models as the level of bank involvement varies in the different models (see Figure 4). The various arrangements between banks and non-banks also vary in the bank-centric and MNO-centric models.

The following arrangements are common:¹⁹

- One to one: The bank has an exclusive arrangement with a mobile operator for offering its services.
- One to many: The bank provides mobile money services through multiple MNOs, or an MNO provides mobile money services through multiple operators.
- Many to many: Exclusivity is not allowed and banks and MNOs can provide mobile money services.

¹⁹ ITU: *Regulatory Landscape for Mobile Banking*. ITU GSR Discussion Paper, 2011, <http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR11/documents/04-M-Banking-E.pdf>

Figure 5: Level of banks' involvement in the different business models

Source: CGAP: *Nonbank E-Money Issuers: Regulatory Approaches to Protecting Customer Funds*. CGAP Focus note No. 63, July 2010, <http://www.cgap.org/sites/default/files/CGAP-Focus-Note-Nonbank-E-Money-Issuers-Regulatory-Approaches-to-Protecting-Customer-Funds-Jul-2010.pdf>

In the partnership model, the financial institutions, MNOs and third party service providers form the ecosystem and collaborate to provide payment services. In such an ecosystem, partners can capitalize on one another's strengths in terms of innovation, compliance with the regulatory regime and consumer experience. New solution providers using this type of model face lower barriers to market entry. Examples include PayPal and Obopay, which have launched P2P payment systems in the United States and in other countries in partnership with financial institutions. Other examples include Visa and Mastercard, which have announced similar services in partnership with Moneygram and Western Union. In the Philippines, Western Union has entered into agreements with Globe Telecom and Smart Communications for international remittances.

7. Interoperability

Interoperability protects the customer and could be a factor in driving customer acquisition and usage as well as promoting financial inclusion. However, the reality of the way in which interoperability works in detail can be quite complex. At the technical level, there are issues of how to handle payment clearing and settlement between the different operators. In a country with just a few mobile payment operators, it might be possible to do this bilaterally or multilaterally. However, as the number of operators increases, the relationships between them, and the costs of the solution, grow exponentially. In such a situation, the problem may be solved by a national payment switch and perhaps an interbank settlement service, which in some countries may not have the capability to add non-bank operators and mobile payments to their systems.

Governments have an important role in facilitating mobile money payments in order to promote financial inclusion. In emerging markets, interbank settlement systems, and often payment switches, are operated by a consortium of local banks which may not have the greatest incentive to see mobile payments take off.

According to the Consultative Group to Assist the Poor (CGAP), some of the most common issues related to interoperability in mobile money transfer are:

1. Platform interconnection – enables customers of one mobile money service to send and receive money from customers of another service.
2. Agent level interoperability – allows agents of one mobile money service to provide such services to customers of another service.
3. Customer level interoperability – refers to customers being able to access their account using any SIM card.

This report will focus mainly on platform interconnection interoperability issues. The other two are outside the scope of this report and will in any case be greatly facilitated once platform interconnection interoperability is achieved. Platform interconnection interoperability requires interconnection of mobile operators' payment services, which is not currently in place because it is perceived as a complex, and in all likelihood very costly, process. There are four possible options for platform interconnection according to the CGAP:

- Mobile money providers bilaterally connect their platforms.
- Multiple providers connect via a common platform or switch.
- Groups of providers interconnect their respective platforms /switches.
- Groups of providers interconnect their respective platforms/switches via another platform.

The incentive for operators to interconnect will be influenced by several factors such as the number of firms in the market, size of the existing and forecast user base, and the possibility of entering new markets after interconnection. Governments can also regulate for the provision of interoperability at an operator level (either SIM or handset), as has been the case in Ghana. Ghana has a very interesting focus on interoperability and interesting dynamics in the bank-MNO partnerships.

In 2008, Bank of Ghana developed guidelines for branchless banking which allow a bank-based model of branchless banking using non-bank retail agents. However, exclusive partnerships were prohibited, and a “many-to-many” model allowed. The objective of this regulation was to create a situation in which all banks and telecom operators would collaborate and allow transactions across their networks. As a result, each of the MNOs with branchless banking services has signed up at least three partner banks. There are six mobile money deployments in Ghana and three of them (Airtel Money, MTN Mobile Money and Tigo Cash) are run by MNOs in partnership with banks. MTN Mobile Money has the highest number of registered customers. Two of the remaining three (AfricXpress and eTranzact) are start-ups, whilst eZwich is run by the [Ghana Interbank Payment and Settlement System](#) (IPSS). It is to be noted that transactions between mobile money deployments are not yet routed through the Ghana IPSS.

Some countries allow interoperability without making it compulsory, an example being Pakistan's many-to-many model, whilst others make no provision for it at all. And without being obliged to do so, operators have little incentive to make their services interoperable. It may be the case that governments wishing to enable interoperability have to amend existing mobile payment regulations to ensure that it is provided, although such changes may not be politically feasible.

The GSMA's global Mobile Money for the Unbanked initiative also focuses on addressing interoperability issues for transfers at an international, multilateral “hub” level, rather than at the local level. The GSMA's approach aims to replace bilateral agreements between mobile network operators and other members of the mobile money ecosystem with a multilateral approach. These multilateral models would enable an operator to save on costs and resources, as each operator connected to a multilateral hub is then able to send a remittance to any mobile phone user in the world on any other participating network without any additional negotiation or agreement.

8. Security

Mobile money transfer applications use various communication channels which are not usually secure, including SMS, USSD and IP-based communications. As usage of these communications channels by payment applications increases, security flaws are becoming serious concerns for both service providers and customers.

Critical threats such as fraudulent transactions, request/response manipulations, weak encryption and insecure message communications can impact on mobile payment service providers. Fraudulent transactions, mobile application request/response tampering/dropping, sensitive information disclosure due to weak cryptographic implementation, improper account management, and modification of sensitive information, can also cause security breaches and loss of sensitive data in USSD-based mobile payment applications.

The main technologies currently employed for mobile money mobile money transfers are:

1. SMS
2. STK
3. USSD
4. Wireless Application Protocol (WAP)

These technologies have their own security issues. SMS is the most commonly used application in mobile money transfers in developing countries for low-value payments because it is simple to use and is compatible with a variety of phones including low-end devices. In addition, for developing countries in rural areas where the literacy rate may not be high, the application should be fairly simple, to enable people to understand how to use it.

The default data format for SMS messages is plaintext. The only encryption involved during transmission is the encryption between the base transceiver station and the mobile station. End-to-end encryption is currently not available. The encryption algorithm used is A5 which has proven to be vulnerable. SMS is not the ideal platform for making payments because of security issues, as messages travel and are stored on the mobile device in plain text without encryption.

STK is a standard from GSM which has been used since 1998 to secure mobile phone applications, especially for mobile banking and privacy. A passcode or PIN is needed to access the application, which is stored on the SIM card. The keys to encrypt the session between the mobile device and the wireless gateway of the MNO are also stored on the SIM card. The data transmitted between the device and the wireless gateway is encrypted by the keys on the mobile device. At the wireless gateway the data is decrypted and encrypted again using the keys at the wireless gateway for transmission to the financial services institution gateway. In this scenario, the information when transmitted over the air is encrypted. M-PESA makes use of the STK to secure the application. In 3G mobile devices, the USIM application toolkit is the equivalent of the STK and is used to secure the application.

USSD, unlike SMS, is session-oriented, which has the advantage that it will inform the user whether a message has reached the recipient or not. Moreover, no session information is stored on the mobile device. However, the message is still sent in plain text as in SMS. WIZZIT, in South Africa, uses USSD for its mobile money transfer service. USSD can also be used to transfer money to the user's balance on the SIM card and to deliver One Time Passwords or PIN codes.

WAP-based implementations, however, can provide better security, as data are encrypted between the customer and the merchant/bank. WAP implementations are more common with banks adding mobile as another channel for users to access their accounts.

Security of mobile money transfer will be an increasingly important issue as use increases in the developing world and new technologies such as smartphones also become more affordable. It would appear that as a consequence of the adoption of smartphones and increasing availability of mobile broadband in emerging economies, where it is increasingly being used for mobile money transfer transactions, the security architecture would soon converge to using a mobile application loaded on the phone, with the concept of the Secure Element for storing the application and payment information (as described in Part 1 of the Technology Watch Report on Mobile Money). The security of the mobile application will be increasingly important owing to the threat of mobile malware targeting smartphones. However, the mobile money transfer application should be kept as simple as possible for the end user. India is currently the only country in the developing world to go as far as providing biometric identification to all citizens for user authentication in order to facilitate G2P payments. This is likely to cost a lot of money but once in place it is a secure method for authenticating users during mobile money transfer transactions.

9. Standardization

The mobile money transfer ecosystem is challenging in terms of the diversity of available mobile devices, applications, communication channels, banks and service providers. A number of issues encountered by financial institutions and mobile network operators pose a potential threat to the security of financial transactions on mobile devices. Despite all reasonable precautions in the mobile banking scenario, banks may be exposed to an enhanced risk of liability to customers on account of breaches of secrecy, denial of service, or mobile malware associated with hacking and other technological failures.

Encryption in SMS and USSD communications is not necessarily end-to-end, creating vulnerabilities at various points where data can be intercepted, read and acted on by third parties. There are no common technology standards²⁰ for mobile money transfer and there are many different mobile phone devices, specific client-based and server-based technologies used; it is a major challenge for banks to offer mobile banking solutions on any type of device. Interoperability is a key issue and becomes tougher with more complex banking transactions and the proliferation of smartphone apps for mobile money. The end-user must be able to transfer money to anyone, regardless of the recipient's bank, and even if they are unbanked.

In addition, cloud computing is likely in the near future to offer a very efficient platform for handling mobile money transfer services in emerging economies. Banks could leverage the cloud to offer mobile banking services to existing clients, and could offer transaction management services integrated with the core banking system through mobile Internet to their clients. The cloud could also be leveraged as an interoperable platform to enable mobile payments. In this scenario, a large multinational bank or MNO in collaboration with a service provider could jointly offer mobile money services in a given region. In this case, multiple MNOs could also use the cloud to offer their mobile money services to clients in the region. Other players such as agents and retail outlets could also join the cloud as cash in/cash out agents. This model may be attractive for governments looking to create a national interoperable mobile payments ecosystem, and the operational costs for MNOs, banks and retailers would also be low as the central cloud infrastructure model would provide economies of scale.

ITU-T Study Group 17 is the lead study group on "telecommunication security" which includes developing and maintaining security outreach material, coordination of security-related work and identification of needs and assignment and prioritization of work to encourage timely development of telecommunication security recommendations. As such, it could investigate security architecture issues in mobile money transfer services and interoperability issues under a new Question on mobile money security architectures. Bitcoin security could also be investigated under ITU-T Study Group 17 in the future.

²⁰ http://www.swift.com/resources/documents/SWIFT_white_paper_Mobile_Payments.pdf.

10. Conclusion

As has been shown, the interest in mobile money is evident and standardization efforts are ongoing. In the developing world, mobile money has a strong potential to become an enabler for financial inclusion. The innovations in mobile money transfer are forcing regulators to re-evaluate their rules for financial service provision. Non-banks like MNOs could be strategically positioned to dramatically expand the reach and range of financial services for the poor and unbanked. The challenge is to develop policies and flexible regulations that mitigate the risks for the customer without hampering innovation in this field. E-money has traditionally been seen by regulators as a payment instrument rather than being also positioned as a means for savings (i.e. earning interest on deposits) for the poor. Passing on such interest would not only benefit customers but bring more money into the economy. The virtual currency Bitcoin is also an area which will become very interesting to watch in the near future.

With individuals in emerging markets still conducting over 90 per cent of all transactions in cash, mobile money is poised to become a multi-billion dollar industry in the near future. The ability of providers of mobile financial services to optimize the value chain through collaborative partnerships and effective use of technology will be a critical success factor. Players who aim to become global leaders in mobile money services cannot avoid entering emerging economies. They need to invest, however, if they want to enter the attractive markets for mobile money. Anticipating changes in regulations, establishing a sound agent network and responding to country-specific market and consumer characteristics, are all essential for success.

ITU, as a multi-stakeholder body with representation from the governments of 193 countries around the world, could also work towards developing a code of practice for regulators (especially in the developing world) with a view to creating a level playing field that will enable stakeholders to engage in mobile money services, thereby promoting financial inclusion. As a precursor to this, ITU could establish a Task Force on Mobile Money for Emerging Economies, with stakeholders such as GSMA, the World Bank, the Gates Foundation which could discuss issues related to standards, technology for mobile payments and regulation for mobile money with relevant stakeholders with the aim of elaborating a code of practice for governments in emerging countries and sustaining innovations in the field. ITU could also play an important role in facilitating the standardization of innovations in the area of m-money in emerging economies, possibly by setting up an ITU-T Focus Group on Mobile Money.

Annex 1: How M-PESA works

To access a mobile money service such as M-PESA, customers must first register at an authorized M-PESA retail outlet. They are then assigned an individual electronic money account that is linked to their phone number and accessible through a SIM card - resident application on the mobile phone. Customers can deposit and withdraw cash by exchanging cash for electronic value at a network of retail stores (often referred to as agents). Safaricom pays these stores a fee each time they exchange these two forms of liquidity on behalf of customers. Once customers have money in their accounts, they can use their phones to transfer funds to other M-PESA users and even to non-registered users, pay bills, and purchase mobile airtime credit. All transactions are authorized and recorded in real time using secure SMS.

Customer registration and deposits are free and do not involve guarantees or elaborate paperwork; this is the key advantage for the financial inclusion of the huge unbanked population. Customers then pay a flat fee for person-to-person (P2P) transfers and bill payments. Individual customer accounts are maintained in a server that is owned and managed by Vodafone, but Safaricom deposits the full value of its customers' balances on the system in pooled accounts in two regulated banks. Thus, Safaricom issues and manages the M-PESA accounts, but the value in the accounts is fully backed by highly liquid deposits at commercial banks. M-PESA is useful as a retail payment platform because it has extensive reach into large segments of the population. With the introduction of "Nunua Na M-PESA, Lipa Karo Na M-PESA" customers are able to buy goods from supermarkets and pay children's school fees using their M-PESA accounts. With an alliance between Safaricom and Western Union for international money transfers from 80 000 Western Union agents in 45 countries, funds can be transferred to an M-PESA mobile phone in Kenya from anywhere in the world.

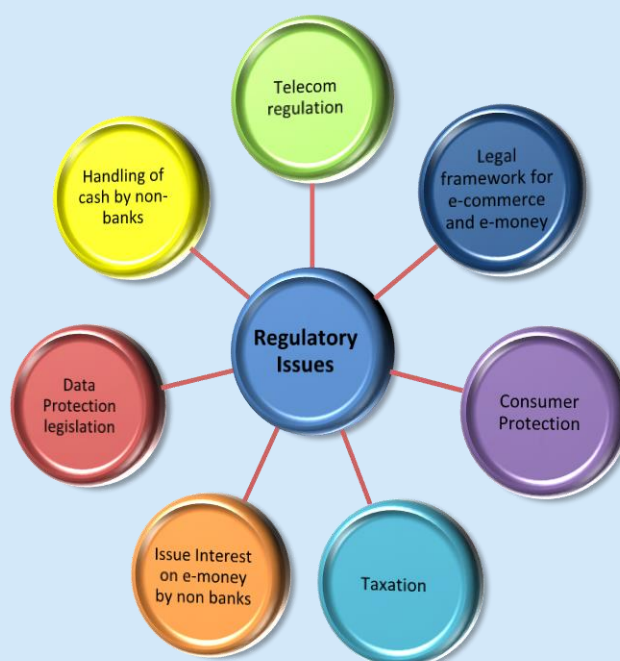
Annex 2: Regulatory issues

Mobile money encompasses the regulatory space of both telecommunications and banking and therefore require partnership and collaboration between both sectors in order to mitigate the risks for the consumer. The primary goal of regulation is to safeguard the interests of the consumer and enhance trust in the payment system to ensure that participants have effective means for identifying, measuring and managing business risk. A number of countries, such as Kenya and Cambodia, have not issued specific regulations but have nevertheless allowed MNO-centric models on an ad hoc basis through “no objection” letters, conditional approvals or other means.

The Philippines regulates telephone carriers that provide mobile phone services as money service businesses. The country requires mobile phone subscribers to register in person with the service providers with valid photographic identification. Subscribers need to do this if they want to put cash into their mobile accounts or withdraw cash. The Philippines also regulates how much money a mobile phone user can transfer at any one time, during a day or during the month.

The regulatory regime is likely to be different from country to country and this can be an obstacle for the service provider, depending on the business model that has been adopted. For example, if the country has regulation that stipulates that only banks are allowed to handle cash in the context of financial transactions, it will be difficult to outsource the cash handling function to agents. Another question is whether or not a company offering mobile money services should be regulated as a bank. This is the case in Pakistan but not in Kenya.

Figure 5: Regulatory issues



Some of the issues in the regulatory framework that need to be considered are:

- Telecommunication regulation not preventing telecom operators to enter in non-telecommunication activities.
- How to regulate dominant positions which may reinforce existing dominant positions in the sector. For instance, in Kenya, Safaricom's market share has actually increased over time because of the lock-in attributes of MPESA.
- Fraud prevention

Does the regulation allow for non-banks to operate cash handling functions?

- Payment and e-commerce legislation should cater for transactions undertaken using mobile devices and allow non-banks to issue e-money. This is definitely required in mobile operator-centric models whereby mobile operators start running services such as mobile wallets. Since this is a new trend, the regulation needs to be put in place in developing countries for such activities to take off.
- Should non-banking institutions be allowed to issue interest on e-money?
- Data protection legislation should not be too restrictive.
- Taxation.

In some countries, the telecommunication regulation regime could prevent mobile operators from entering into non-telecommunication activities and would thus prevent them from launching mobile money transfer activities. For example, in South Africa, a mobile operator has to partner with a bank in order to operate mobile money transfer services.

Fraud prevention is an important issue for regulators and policymakers. There are four possible types of fraud:²¹

1. Money laundering;
2. Agents taking advantage of consumers' lack of education in order to obtain their PINs and make transactions or change their fees;
3. Agents and consumers colluding together to defraud the system;
4. Customers target agents to defraud the system (e.g. by obtaining access to an agent's account and sending SMS messages to initiate cash-out transactions).

Programs that allow remittances to be sent via mobile phones raise anti-money laundering compliance issues for banks because these devices, particularly those using prepaid accounts, have few checks on the user's identity and money movements may be linked to funding for terrorism. In the case of money laundering, service providers and financial institutions should be requested to comply with anti-money laundering procedures already in place. There is usually a ceiling for mobile money transactions fixed by regulators. The MNO and service providers also have a responsibility to put in place measures to prevent fraud at their level as well. Usually, the regulations for fraud may encompass more than one regulatory body as the financial services and telecommunications regulators should work together in this process.

Some developing countries do not have legislation in place for e-commerce payments and this could be a barrier to entry for players in this type of activity. Mobile financial services may under certain conditions require storing of "money" in monetary value in a stored value account on a network, to be accessed via a mobile phone. Normally, payment regulation and e-commerce legislation should handle this. However, not all developing countries have clear regulatory frameworks for mobile financial services. In some countries, non-banking institutions are expressly forbidden to issue e-money. Furthermore, in some countries, regulators have not yet considered the treatment of prepaid airtime when it is used to make payments to providers other than the MNO which sold the airtime. E-Money and payment regulation becomes relevant

²¹ ITU: *Regulatory Landscape for Mobile Banking*. ITU GSR Discussion Paper, 2011, <http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR11/documents/04-M-Banking-E.pdf>

in the MNO centric business models, whereby MNOs start to take on some financial activities such as m-wallets and stored value accounts as non-banking institutions.

Non-banking companies are permitted to issue e-money in an increasing number of developed and developing nations, including the countries of the West African Union, Kenya, Rwanda, the Philippines, Malaysia, Indonesia, Fiji, and Cambodia²². The current rule of law in most countries allows only banks to pay interest on deposits. It could be argued on the other hand that non-banking companies (e.g. MNOs) are also handling deposits when operating mobile money activities and as such could be allowed to pay interest on e-money, or interest substitutes such as free mobile airtime, linked to a customer's account balance. It can also be argued that the fact of not providing interest poses no threat to the MNO business model, so why is there a need to pay interest at all? In developing countries many low-income individuals would find it difficult to meet the banks' minimum balance requirements for earning interest. E-money could provide them with this benefit in addition to payments, and also offer opportunities to save money and earn interest on their deposits. Thus, non-banking companies should be seen as complementing the services provided by banking institutions by extending saving instruments to the millions of low-income individuals who would otherwise not have access to such benefits.

Any data protection legislation that is in place should not be too restrictive as it might otherwise hamper the ability of financial services institutions and mobile operators to transfer, release or make use of client data other than for purposes agreed by the client. This could arise when both the financial institution and the mobile operator expand their initial scope of service provision when offering mobile payments and remittances.

Mobile operators can be at a disadvantage compared to banks when it comes to taxation of revenue and financial services. Different tax rates are applied for revenue and financial services; in the case of financial services, the tax amount could be significantly lower. In some countries, value-added tax (VAT) is not levied on financial services such as person-to-person transfers operated by mobile operators, whereas it can apply to telecommunication services. In some countries, a distinction is not yet made between financial transfers via mobile operators and airtime purchases. This can lead to the situation in which total mobile money remittances (as opposed to revenue from the mobile money remittance business) are taxed as revenue of the mobile operator.

²² World Economic Forum: Mobile Financial Services Development Report. 2011, http://www3.weforum.org/docs/WEF_MFSD_Report_2011.pdf

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