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An Aadhaar-based Mobile Money Framework for Financial Inclusion in India

by

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Definitions

i) BC - Business correspondent
ii) CSP – Customer service point
iii) CGAP – Consultative group to assist the poor
iv) DoT – Department of Telecommunications
v) FI - Financial Institutions
vi) GDP – Gross Domestic Product
vii) KYC – Know your customer
viii) KYR – Know your resident
ix) MVNO – Mobile Virtual Network Operator
x) MNO – Mobile Network Operator
xi) NTP – New Telecom Policy , 1999
xii) NPCI – National Payments Corporation of India
xiii) NREGA – National Rural Employment Guarantee Act.
xiv) RBI – Reserve Bank of India
xv) REMIT – Real time micro transactions
xvi) TRAI – Telecom Regulatory Authority of India
xvii) UID – Unique ID
xviii) UIDAI – Unique Identification Authority of India
xix) USOF – Universal Service Obligation Fund

1. Introduction

Financial Inclusion:

Today India's GDP is witnessing growth of the order of 7.8%[1] per year. This rapid growth and transformation has not only evoked a sense of optimism but also a sense of hysteria due to the widening disparities between the rich and the poor. Many developing nations are grappling with the problem[2] of non inclusive growth and hence the term "inclusive growth" has now become the new policy mantra for India. By the term inclusive growth, we essentially mean a phenomenon of sustained economic growth across broad sectors to reduce poverty effectively by way of creating productive economic opportunities for the poor and vulnerable sections of the society[3]. Access to low cost finance, especially by the rural and the unbanked is a prerequisite for productive employment, economic growth, poverty alleviation and social cohesion. Quoting financial Inclusion in the words of Dr. C.Rangarajan Committee[4], we have:

"Financial inclusion may be defined as the process of ensuring access to financial services and timely and adequate credit where needed by vulnerable groups such as weaker sections and low income groups at an affordable cost"

Government of India, along with RBI has taken up many initiatives aimed at financial inclusion such as Lead Bank Scheme, Self Help Groups, Business Correspondent Models, 'no-frill accounts' etc. Despite these initiatives, the impact on the ground seems to be limited and non uniform. Even with near total control over the banking sector for more than two decades, financial inclusion of the needy segments of population has not been possible[5].Basic financial services are still an unrealized dream for millions of people in India, even more so for people in rural and remote areas. As per National Sample survey data, 45.9 million farmer households in the country out of a total of 89.3 million households do not have access to credit, either from institutional or non-institutional sources. Only 27% of total farm households are indebted to formal sources (of which one-third also borrow from informal sources). In other words, 73% of farm households do not have access to formal credit sources. A quick look at data given in Table1 exemplifies a declining trend of rural bank branches as a percentage of total number of bank branches.

Table 1: Declining trend of rural bank branches[6]

Year	Rural	Semi-Urban	Urban	Metro	Total	Rural/Total (%)
2000	32734	14407	10052	8219	65412	50
2001	32562	14597	10293	8467	65919	49.4
2002	32380	14747	10477	8586	66190	48.9
2003	32303	14859	10693	8680	66535	48.6
2004	32121	15091	11000	8976	67188	47.8
2005	32082	15403	11500	9370	68355	46.9
2006	30579	15556	12032	11304	69471	44
2007	30551	16361	12970	11957	71839	42.5
2008	31002	17724	14397	13019	76142	40.7
2009	31646	18969	15439	13877	79931	39.6
2010	32494	20494	16761	14855	84604	38.4

Evidently, from the above data we can observe that the number of rural branches as a percentage of total branches has dropped from 50% in the year 2000 to 38.4% in 2010, even though there is a surge in the total number of bank branches from 65412 in the year 2000 to 84604 in 2010.

In November 2005, RBI gave directive to open no-frill accounts* and use of business correspondent's to reach unbanked citizens. The latest data from RBI website about BC/CSPs shows that increasing number of CSP's being opened in urban areas relative to rural places in the recent years. A growth rate of more than 700% in urban CSPs over the last financial year indicates the shift towards rapid increase in urban CSPs.

Table 2: Statistics of CSP's[7]

S. No:	Particulars	Mar-10	Mar-11	Growth %
1	Total number of CSP's	33042	58351	76.60
2	Total number of Rural CSP's	32619	54698	67.69
3	Total number of Urban CSP's	423	3653	**763.59**

Also the number of active no-frill accounts as reported by many banks ranges from 3% to 20%[8] out of a 74 million total number of no-frill accounts during the year 2011. Apparently, this reflects that the recent initiatives in the likes of no-frills accounts taken by RBI seem inadequate to meet the objective of financial inclusion. There are several reasons for the low financial inclusion, of which, the major issues listed below need further introspection for future course of action.

1. Number of active accounts continues to be small and banks find it difficult to operate large number of tiny accounts and micro transactions profitably[9]
2. Limited presence of banks in rural areas
3. High information barriers and low awareness in rural areas
4. Lack of clear identity-documentation for the poor, to establish their identities to the banks[10]
5. Even where the network presence is established a delivery mechanism in the form of staffing and processes employed for customer acquisition/servicing have not been of the desired quality

Financial inclusion requires broadening and deepening the reach of banking. A wider distribution of financial services would help the poor to build savings, make investments, and avail credit. Apart from the banks, players who have demonstrated their reach in rural areas in a cost effective manner like MNO's must be allowed to offer financial services. The problem of limited presence of banks in rural areas and operating large number of tiny accounts profitably can be addressed by bringing in MNO's into the ecosystem of financial inclusion. In our view there seems to be a huge opportunity to provide basic financial services to the unbanked citizens of the country by riding on mobile infrastructure.

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* No Frills Account: Normally Savings account requires people to maintain a minimum balance whereas no-fill account allows no or negligible balance without any other facilities to lower the cost for both the banks and the individuals

Mobile Revolution:

In recent years, the telecommunication sector in India has been witnessing highest growth rates in the world. This growth in the user subscriber base is particularly led by unprecedented growth in mobile telephony. The clear value proposition by the telecom operators coupled with low tariff rates, low cost of handset and intense industry competition has been the driver of mobile growth. Even though mobile technology was a late starter in rural areas, it has witnessed a rapid growth in recent times. TRAI's annual report for the year 2010 indicates that 32.67% of total wireless subscribers as of 2010 are in rural areas. Following bar chart in Figure 1 show the growth of wireless subscribers from 2007 to 2011 in rural India.

Figure 1: Rural wireless Subscriber base (in millions)[11]
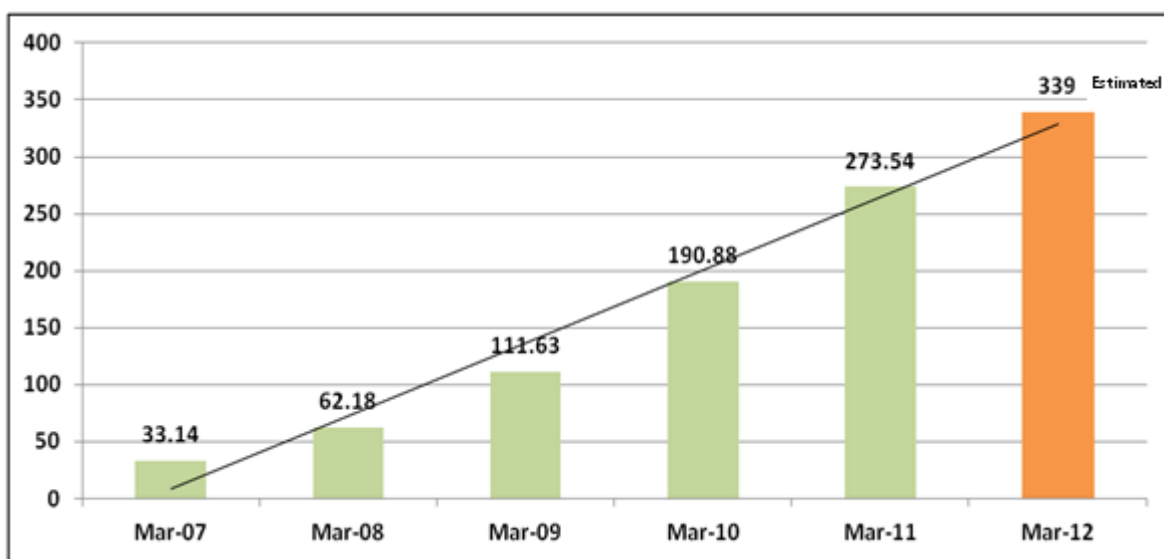
Mobile phones thus present an enormous opportunity in spreading financial services to the un-banked citizens of the country because of its unique feature of easy access and availability in remote places. With an MNO offering basic financial services, large number of tiny and micro transactions could be operated profitably as the mobile e-money (savings account accessed from mobile phone) accounts can be easily accessed cutting down the transaction costs involved in traditional banking firms. The role played by bank branches can be replaced by local kirana stores or the business correspondents of MNO as cash-in/cash-outlet centres. Thus, MNO would be able to offer basic financial services at a much lower operating costs when compared to banks by leveraging its existing wide spread network and infrastructure to offer mobile e-money accounts.

However, critical challenge to successfully implement this concept lies in identity verification or for completing the KYC (Know Your Customer) requirements of RBI, to open the mobile e-money accounts. The lack of clear identity documentation for the poor creates substantial difficulties in establishing their identities to the banks. This issue could be addressed with the recent government initiative of providing unique identity to all the citizens under the project Aadhaar (http://uidai.gov.in).

Project Aadhaar:

The Government of India started the ambitious program to provide a Unique Identification number, Aadhaar, to every resident of India and has constituted the Unique Identification Authority of India[12] (UIDAI) for this purpose in the year 2009. As of August 2011, 2.87 crore unique identification numbers have been issued across the country and the government has set a target to cover 60 crore citizens by 2014[13]. Aadhaar has been envisioned as a means for residents to easily and effectively establish their identity, to any agency, anywhere in the country, without having to repeatedly produce the identity documentation to agencies. The timing of this initiative coincidentally comes at a time when there is an increased focus of Government on inclusive growth.

For a MNO trying to emulate the role of a bank, Project Aadhar provides the recourse to its KYC requirement or the identity verification of the customer. Since RBI agreed UID number as a valid identity document for opening bank accounts, MNOs can leverage this as a valid source for user verification, unless otherwise stated by RBI. MNOs in coordination with UID project can facilitate the poor in making micro transactions, remotely and at a low cost while addressing the issue of identity verification. A UID-enabled mobile micropayments approach can bring about universal financial access for the poor — they would be able to access their accounts on the move, wherever they are, through any mobile phone.

Our Proposition:

"*Reach and affordability of mobile telephony in rural India can be leveraged to meet the basic financial requirements of poor and unbanked people. MNO's facilitating the micropayment transactions in coordination with Aadhaar project can emulate the role of traditional banking firms, fulfilling the objective of financial inclusion*"

Thus, our proposition entwines the efficiency of MNOs in reaching masses with foolproof identity verification capabilities of Project Aadhaar to achieve financial inclusion (Figure 2).

Figure 2: Project Aadhaar, MNO aiding in achieving the objective of financial inclusion
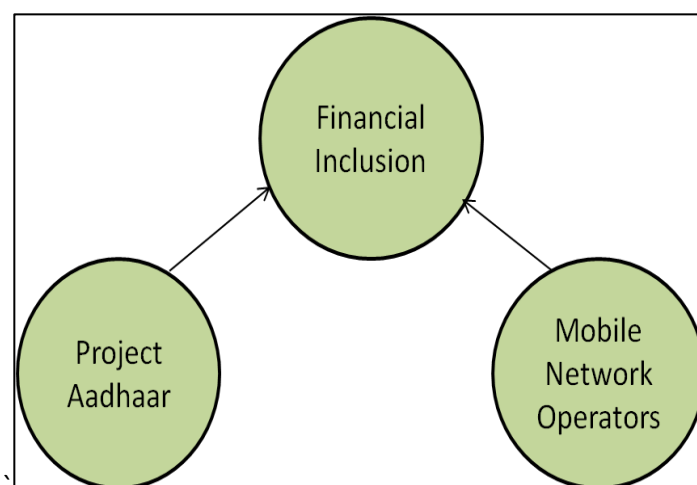
This paper suggests an Aadhaar-based framework to provide basic financial services using mobile phones. Section 3 details about the different stakeholders involved, Section 4 gives holistic view of different possible models that are worth introspecting before arriving at a final solution, Section 5 develops our proposed framework detailing the transaction mechanism, roles and responsibilities of players involved, integration with other systems, Infrastructure support set up, and Section 6 deals with potential applications that are possible based on the framework developed in Section 5. A detailed analysis of the framework is performed in Section 7, which includes risks involved, revenue sharing mechanism, regulatory issues and sources of financing the project. Finally, Section 8 presents a comparative analysis of the proposed framework with other models.

2. Stakeholders

The various stakeholders (Figure 3) who are expected to play an important role in the delivery of financial services through mobile payments framework in India are:

Regulator: Reserve Bank of India[14]
The Reserve Bank of India is the central bank of India that formulates, implements and monitors policies and acts as the regulator and supervisor of the financial system. RBI also manages foreign exchange, issues currency, acts as a Banker to the Government of India and other Banks in India and performs a wide range of promotional functions to support national objectives. RBI has been pursuing the goal of Financial Inclusion as a necessary condition for sustaining equitable growth and has introduced a number of measures such as "No frills" accounts, simplified KYC norms for "No Frills" accounts, 100% Financial Inclusion Drive, the Business Correspondent Model and so on. MNO's willing to offer financial services would require license from RBI to issue e-money. As of today only banks are allowed to issue e-money in India.

Regulator and Facilitator: Government
Government plays critical role in ensuring enough funding for pilot program of the project. Besides it has to take care that a strong framework of rules and regulations are laid out by RBI and other governing authorities to prevent any kind of fraud or illicit cases while dealing with the public money. Since government would definitely find this program useful for many of welfare programs where it can expedite the money deposits or withdrawals into accounts of villagers. This is because currently 80% of the money that is intended for the socio economic welfare programs is going into the hands of corrupt bureaucratic officials governing them.

Regulator: Telecom regulatory Authority of India
TRAI is a key stakeholder in providing necessary regulations for security and technical standards relating to the use of mobile communications for financial services. TRAI must look at preventing illegal issues and should lay the basic tariff structures within MNO players dealing with mobile e-money transfers, while promoting an effective competitive environment which can bring down the operational costs.

Back end: Unique Identification Authority of India[15]
UIDAI's Know your resident (KYR) and (KYC) would be sufficient as proof of identity for any individual. Banks in India are required to follow customer identification procedures while opening new accounts, to reduce the risk of fraud and money laundering. In a similar fashion when MNO's play the role of banks they would be required to follow customer identification

procedures. The strong authentication that the UIDAI will offer, combined with its KYR standards, can remove the need for such individual KYC by MNO's. A recent circular by RBI states that letters issued by UIDAI containing details like name, address, and Aadhaar number can be treated as 'officially valid documents' to open small accounts[±]. This could be extended to MNOs as well, when they play the role of banks offering micropayment transactions on mobile e-money accounts.

Gateway: National Payment Corporation of India

An umbrella institution for all the retail payment systems with its core objective to consolidate and integrate the multiple systems with varying service levels into nation-wide uniform and standard business process. NPCI proposes to build a 24x7 real time remittance processing system (IML[♣]) to give customer convenience for instant payments and online transfers[16].

Intermediary: Banks

A commercial bank brings the discipline and compliance aspects of storing and managing customers' funds. It helps in collecting the hard cash from the MNO's and securely manages depositing them offering interest on the amount.

Figure 3: Key stakeholders in delivering financial services

Front End: Mobile Network Operators

MNOs with their huge access and reach, forms key player helping individuals to open their mobile e-money accounts and do basic transactions like deposits, withdrawals and peer to peer transfers; With the already established retail network of MNO that operate currently to recharge the air talktime, the resources can be better utilized to make the micropayments possible even in remote areas where there is no access to any financial service provider or banks.

[±] Small accounts - Is same as no-frills accounts

[♣] IML- India Money line system which is going to replace in near future the NEFT system currently operated by RBI in batch mode. IML switch being built by NPCI can be leveraged for round the clock, real time processing of small value transactions through mobile phones.

MNOs offering e-money accounts should channel all their funds raised from public into potentially regulated banks.

End Customer: Individuals

They are mainly the common people who are the intended end users of this facility. 90% of the target group comprises of the people in remote areas who essentially lack access to bank accounts because of the reach and partly because of the prevailing illiteracy to deal with all the documentation stuff of opening accounts in the banks and making transactions.

Though this program targets the villagers, we perceive that in long run this might be a big success in urban penetration too replacing the extensive use of hard currency with e-money transfers.
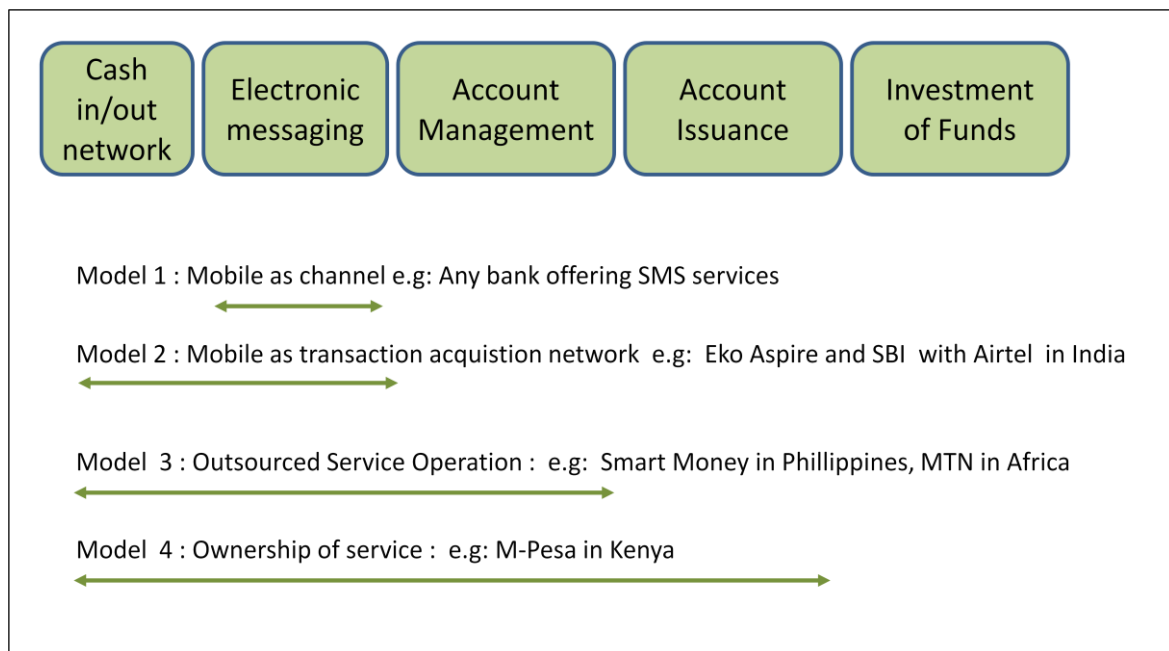
3. Models of Branchless Banking Services

Branchless banking services allow MNO's in coordination with banks to offer micropayment transactions on mobile phone like deposits, withdrawls and peer to peer transfers without the need of opening of bank branches. Branchless banking as defined by CGAP[17] is "*Delivery of financial services outside conventional bank branches using information and communications technologies and retail agents*". It has the potential to reduce radically the cost of delivery and increase convenience for the customers with a huge coverage to new and previously unbanked segments of the population.

A wide spectrum of branchless banking models has evolved which primarily differ on the entity (Market player) who establishes the relationship with end customer providing financial services like account opening, deposits, cash withdrawals, peer- peer transfers etc. Significant research was made by Mr. Eignacio Mas, senior advisor at Bill and Melinda Gates foundation, in his paper on 'Transforming access to finance in Developing countries through mobile phones'. Based on his models we tried to analyze them in Indian context that is characterized by large unbanked rural populace.

1. Bank focused model – Traditional retail banking model wherein, Banks offer Internet and ATM services to the existing customers. In this model the role of MNO is limited and acts as a channel to send SMS notifications whenever the customer makes any transaction through conventional means of banking

2. Branch less banking (Third party channel) model – A JV or an arrangement between a bank and third party which helps in expanding the banks outreach by having outlets for customer transactions. Transactions at retail stores may be performed using a card and POS infrastructure or by using the mobile phones of both the customer and the store. In this model, MNO acts as a transaction acquisition network facilitating the transactions using mobile as a medium

3. Branch less Banking (MNO's Channel) model – The retail bank, instead of building its own retail distribution, outsources the necessary infrastructure for MNO to manage the individual user accounts while the account issuance and fund management services are still retained with the bank.

4. MNO led branch less banking solution – In this model, MNO owns the entire value chain of banking service by obtaining an e-money license, signing up a network of cash-in/out retail stores, and maintaining a pooled account with a bank holding 100 percent of the value of e-money issued. MNO entity would require customer management systems, channel development, audit trails, reporting etc.

Figure 4: Role of MNO in enabling mobile banking services[18]:

In a traditional retail branchless banking, low-cost delivery channels are used to provide banking services to its existing customers. For instance, use of automatic teller machines (ATMs), internet banking or mobile phone banking to provide certain limited banking services to customers fall under this category.MNO role in this kind of model is limited to electronic messaging capability while providing services through interactive voice response (IVR), the mobile internet or Wireless Application Protocol (WAP), or simple text messaging (SMS or USSD)

Second model of branchless banking involves a joint venture or an agreement between a bank and third party where customer does the transactions at retail chain of stores instead of approaching the bank branches. Transactions at these stores may be facilitated on card and POS infrastructure or mobile phones as the medium of operation. Classic example of this kind of model is Eko Aspire Foundation[19] wherein, it is helping SBI to reach rural customers with its network of sub-agents. In this case, the primary activities of bank like the account opening, cash deposit, cash withdrawal, peer-peer transfer will be performed by the BCs of Eko Aspire while leveraging the network infrastructure and coverage of mobile operator Airtel. Eko Aspire thus acts only as a representative to SBI, while the core part of Account-management lies with bank itself. In similar lines, SBI recently has appointed SPANCO[20] as a business correspondent to open kiosk banking outlets to provide banking transactions of cash deposits, withdrawals, peer-peer transfers, loans etc to people in the villages of Maharashtra.

In the third model, the bank could outsource the operation of the banking platform, letting the mobile operator manage the accounts and authorize transactions directly. The accounts may be branded, marketed, and sold by the mobile operator replicating the case of Smart Money[21] in the Philippines, while they are legally issued by a bank under a normal banking license.

Finally the fourth model entails the mobile operator to be the legal account issuer, operating under some kind of e-money license. In the previous three models, the bank delegates certain functions to a mobile operator while this model allows mobile operator to delegate fund management to a bank while retaining the account management of customers. This requires MNO to obtain an e-money license from the regulator to issue e-money. M-Pesa[22] model of Kenya is a very good example for this model, where Safaricom accepts deposits of cash from customers with a Safaricom cell phone SIM card and who have registered as M-PESA users. Thus in exchange for cash deposits, Safaricom issues mobile e-money, measured in the same units as money under the user's account.

Table 3: Models of Branchless banking

Model	Bank focused model	Bank led with third party	Bank led with MNO	Non Bank led by MNO
Account	Bank	Bank	Bank	MNO
Cash in /out	Bank	Third party	MNO	MNO
Brand	Bank	Joint (Bank and Third party)	MNO	MNO
Role of MNO	Mobile as channel	Mobile as transaction acquisition network	MNOs being outsourced for banking services	Complete ownership of service
Cost / Revenue for MNO	Low cost/ Margins are also low	Low Cost/ High Revenue	High Cost/ High Revenue	High Cost/ High Revenue
Example	SBI's mobile banking service	Eko Aspire Foundation as BC to SBI, using communication network and prepaid channel of Airtel	Smart Money in the Philippines	M-PESA model of Kenya

After thorough introspection, the following reasons seem to make fourth model worth considering in Indian Context.

1. Bank led models like Co-operative Movement, Lead Bank Scheme, RRBs, Service Area Approach, Self Help Groups, no-frill accounts have not been able to achieve the objective of financial inclusion[23]. Inclusive growth should not suffer on the account of insistence on a particular model. Regulator must explore new models of offering banking services which provide an extensive reach and easy accessibility as that of the case with MNO based banking model.

2. The entrepreneurial and managerial talent amply demonstrated by industrial and business houses in Telecom like Airtel, Idea and Vodafone, could be also be leveraged in banking sector. MNO's can leverage their mobile network reach, customer base and infrastructure to offer financial services through mobile telephony.

3. An MNO led model with appropriate regulatory mechanism in place would not only be as safe as a bank-led model but also enable greater penetration into under banked and non-banked areas and thereby contribute to the financial inclusion process.

    a. The Unique Identity number which is being issued by UIDAI would help to a large extent in solving the problem of customer identification process. Also the UID-based micropayments offer stronger compliance with Anti money laundering laws, both to the MNO and the regulator.

    b. If appropriate regulations are laid by RBI, then it can be ensured that public money is as safe as the money deposited in bank. RBI should lay down appropriate regulatory mechanism to deal with the all the concerns in an MNO led banking model like,
        • MNO's should be prohibited from engaging in intermediation of funds or asset transformation.
        • MNO's should be required to transfer the risk arising out of investment of funds to fully prudential regulated banks through pooled account mechanism.
        • RBI must ensure that any liabilities issued by MNO, is fully covered by the pooled account mechanism.

4. Key aspects of accountability and ownership of the end-users would invariably be missing in the model where there are more than two players as in the case of model 1, model 2 and model 3. In MNO led branchless banking model (Model 4) this issue is resolved as the ownership completely lies with operator.

5. DoT is considering the option of providing an exit route for operators, who wish to surrender their 2G Spectrum[24] licenses and avail refund of money paid. If this happens then there would be further consolidation and majority share of the spectrum will be in the purview of existing MNO's. Thus an industry wide consolidation would leave fewer big players dominating the industry with sizeable profit margins.

6. MNO led banking model would be a win-win situation for all the key stakeholders namely the MNO, banks and the government.
    a) MNO's are appropriately suited to reach the last mile to give access to the basic financial services for the poor. MNO being the prominent stakeholder in this model would primarily earn revenue based on the transaction made by the registered users.
    b) MNO led banking model might be seen as threat to the banks, but it is not exactly so because MNO would be essentially targeting the customers in the rural India where the banks could not effectively reach. Also MNO would not be directly competing with banks because MNO would be allowed only to provide basic financial services.
    c) Banks would be at the back end and would earn revenue, whenever the retailer buys or sells e-money; they have to pay the transaction fees to make a deposit

or withdrawal with the bank. Also bank would benefit from the spread it makes from the money deposited by MNO and its retailers.

d) For the government the objective of financial inclusion will be achieved by getting the poor into the mainstream and giving them access to basic financial services.

Thus we see that an MNO led model would be a win-win situation for all the key stakeholders in the proposed model.

4. Proposed Framework

4.1. Mobile e-money
Individuals will use e-money in place of hard cash at all the access points – to make purchases, to transfer money etc,. This would mean replacing hard cash with e-money in the hands of people. Therefore it is important that e-money should satisfy some basic properties of physical money to be robust and fool proof. Some important characteristics of e-money should be[25]

➢ **Double Spending** :
Must allow spending of e-cash only once, safeguards must be in place to prevent counterfeiting

➢ **Transferability:**
It should be independent and portable i.e. it should be freely transferable between any two parties regardless of network, software/hardware or storage mechanism. And most importantly it should be convenient.

➢ **Divisibility:**
With divisibility we mean the ability to make change. So e-money will come in rupees or smaller denominations that can make high-volume, small-value transactions on the Mobile phone practical.

Mobile e-money will be stored like fungible talktime, which is separate from the airtalktime, provided already by the MNO. MNO would issue e-money to the individual in exchange for cash deposit, which is held in an account under the individual's name. Individuals can spend the e-money for all kinds of transactions, if they know the UID number of other party with whom they are transacting. Transactions like buying commodities, buying airtalktime, paying utility bills, transferring money to other mobile e-money accounts etc can be easily done. Individuals can access their mobile e-money accounts using a simple SMS based application on their mobile phones.

4.2. Opening of mobile e-money account
Any individual interested in opening mobile e-money account has to approach the retail shop, working on behalf of MNO or the correspondent of MNO. The necessary documents to open mobile e-money account should be similar and not as stringent as the current KYC norms of banks. A step by step process for enabling e-money account is shown below (Figure 5).

Enabling Mobile E-money account:

1. Customer has to approach the nearest retailer shop or the correspondent of MNO to enable the mobile e-money account.
    Customer gives his UID number, biometrics, mobile number and other KYC details to the retailer/Correspondent of MNO.
2. Retailer/Correspondent sends the information electronically to the MNO.
3. MNO sends request to verify the customer's details to UIDAI server through SWITCH.
4. MNO verifies the UID number and biometrics of the customer with the UIDAI Server.
5. Mobile e-money account is created by MNO.
6. MNO stores the mobile e-money account details, customer's mobile number and UID number in the Account Mapper.
7. Both the customer as well as the retailer/correspondent is intimated via message on their mobiles.
8. MNO sends a pin number to the customer on his mobile for making future transactions with his/her mobile e-money account.

Figure 5: Enabling Mobile e-money account
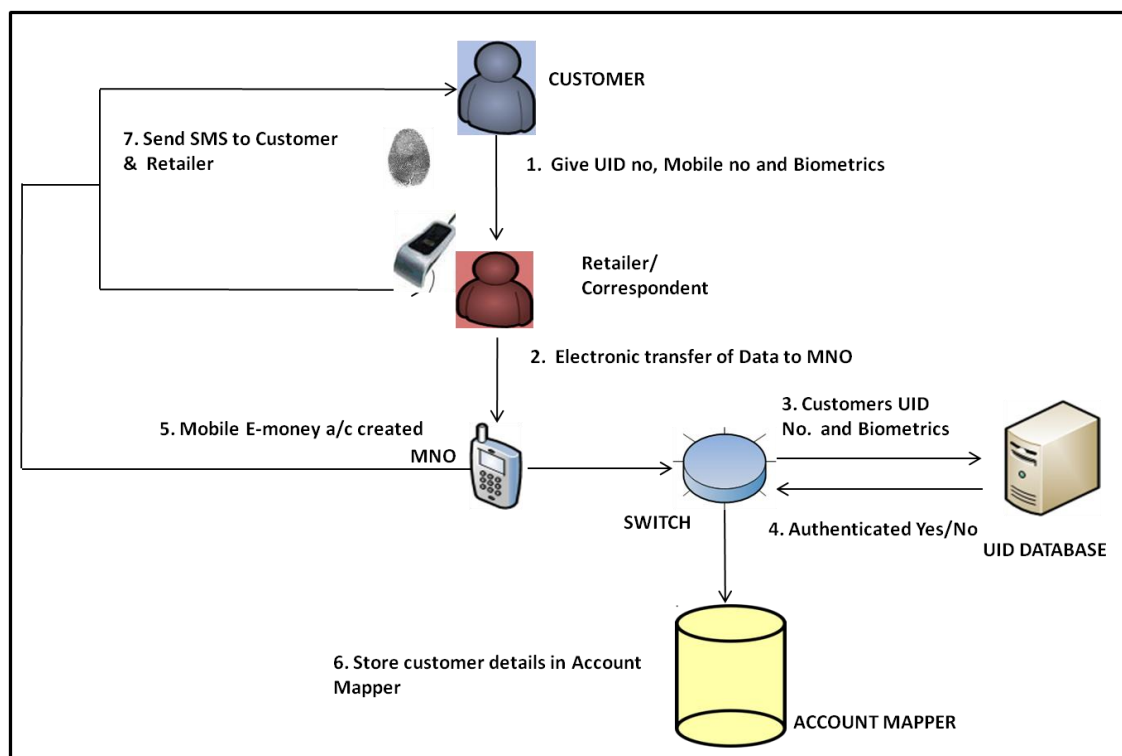
4.3. Transactions over the mobile e-money account

A customer should be able to perform the following basic transactions over a mobile e-money account:

 ➢ Cash Deposit
    Over the counter through a retailer or correspondent of MNO
 ➢ Transfer Money
    Person to Person transfer using mobile phone

Person to Person transfer for purchase of goods & services
- ➢ Withdraw Cash
  Over the counter through a retailer or correspondent of MNO
- ➢ Balance Enquiry
  Balance or Statement of last N transactions

4.4. Infrastructure components

Branchless banking by MNO using Mobile e-money account needs following infrastructure in place.

- ➢ **UIDAI**

  UIDAI is setting up the infrastructure for enrolment and storage of the resident's demographic as well as biometric information. UIDAI will provide real time online authentication of identities in a cost effective and ubiquitous manner for MNO.

- ➢ **SWITCH**

  A switch will be required to facilitate real time transactions routing between MNO's, UIDAI, Account Mapper and monitoring system. This switch will help in executing large volume transactions of small value between individuals in the same network of MNO or between 2 individuals in 2 different networks. Switch should be capable of talking with UID authentication service so that it can verify the identity of the customer when enabling mobile e-money account. Switch would also query the Account Mapper with UID number to obtain the details like mobile e-money account number, to proceed with transactions like cash transfer and cash withdrawal.

- ➢ **Account Mapper**

  Account Mapper is the most crucial component in this model of e-money transfers. It is essentially a database of all the citizens who have enabled their mobile e-money accounts. The Account Mapper links the various identifiers of a given individual. In the simplest form, a row would be created against each individual, when he/she enables his mobile e-money account, the row would have the UID number, the mobile number and the mobile e-money account number. Account Mapper is a shared repository by all the MNO's who want to enter into the business of providing financial services through mobile phones. The responsibility of setting up of Account Mapper and the Switch can be taken up by organizations like NPCI.

- ➢ **Monitoring System**

  A monitoring system would be present to track all the e-money transactions and report those suspicious transactions which pose the threat of money laundering and funding terrorist activities. The exact mechanism by which the monitoring system would work is not discussed in detail in this paper.

- ➢ **MNO's Infrastructure**

  MNO can provide basic financial services using his existing mobile phone value chain. Resources used for providing mobile services can be used to provide basic financial services. For example existing retailers who work on behalf of MNO for mobile recharge can be used as cash-in/cash-outlets. MNO would also require other critical infrastructure components like switches, customer management systems, auditing trails, reporting etc,.

4.5.   Indicative transaction process

An indicative transaction process is shown for the following cases, which are very basic in nature for providing financial services.

Cash Deposit (Figure 6)**:**

Consider the case when retailer and customer belong to the same MNO. Following are the steps involved in the process of depositing cash.

1. Retailer gets the information about UID number and the amount to be transferred from customer.
2. Retailer sends the information to MNO through the SMS based application.
3. MNO has the database of all the individuals who have enabled mobile e-money accounts under it, by using UID number, MNO gets the details of mobile e-money account number of customer.
4. It then performs the appropriate action of debiting retailer's e-money account and crediting customer's e-money account.
5. An SMS is sent to both customer and retailer involved in the transaction.

Figure 6: Cash Deposit (Retailer and Customer belong to same MNO)
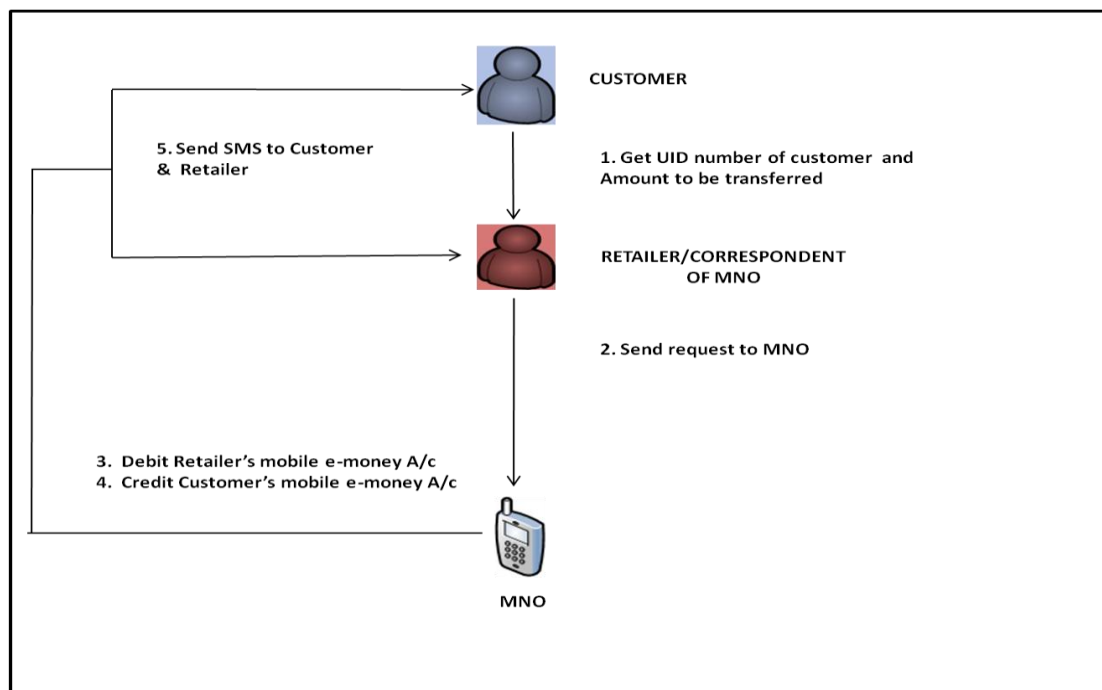
Now consider the case when retailer and customer belong to different MNO's. Following are the steps involved in this scenario (Figure 7).

1. Retailer gets the information about UID number and the amount to be transferred from customer.
2. Retailer sends the information to its MNO (which is referred as MNO(R)) through the SMS based application.
3. Since the customer belongs to different MNO (customer's MNO is referred as MNO(C)), MNO(R) cannot access the details of customer. So MNO(R) sends request to the SWITCH, with details of the customer to perform the transaction.
4. SWITCH upon receiving the request, gets information (mobile e-money account number) about the customer by performing a query on the Account Mapper using the customer's UID number.
5. SWITCH then directs the MNO(C) to perform the credit operation on the customer's mobile e-money account.
6. MNO(R) receives intimation from the SWITCH about the transaction whether it was successful or not.
7. MNO(R) then performs debit operation on the e-money account of the retailer.
8. SMS will be received by both the customer and the retailer from their respective MNO's.

Figure 7: Cash Deposit (Retailer and Customer belong to different MNO's)
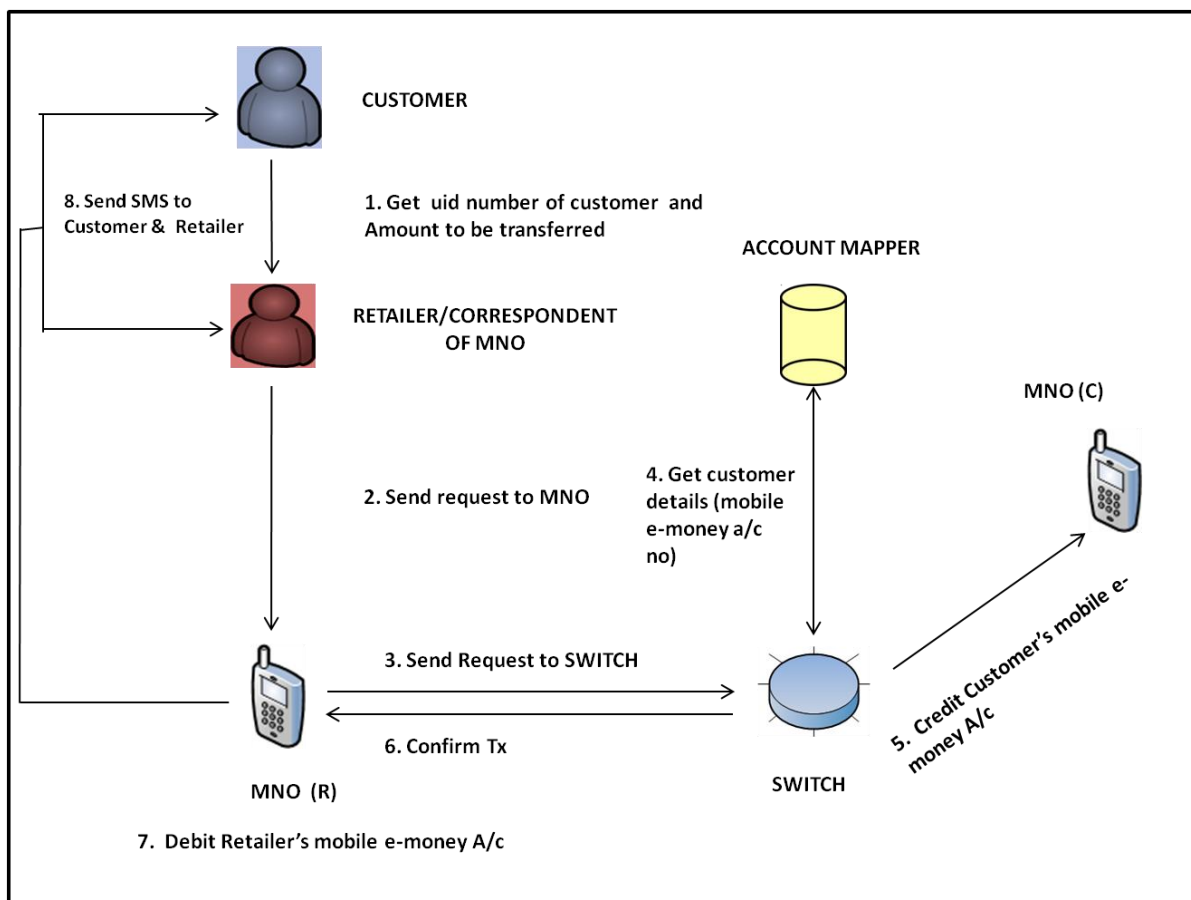
Cash Transfers (Figure 8)**:**

Any person with basic knowledge of operating mobile phone should be able to do cash transfer independently without any help from retailer. In the initial stages, handholding and support must be given by the retailers/ Correspondent in training individuals on operating mobile e-money accounts.

Consider the case when both the beneficiary and the customer involved in the transaction belong to the same MNO. In this case following step by step process would take place

Figure 8: Cash transfer (Both the customer and the beneficiary belong to the same MNO)
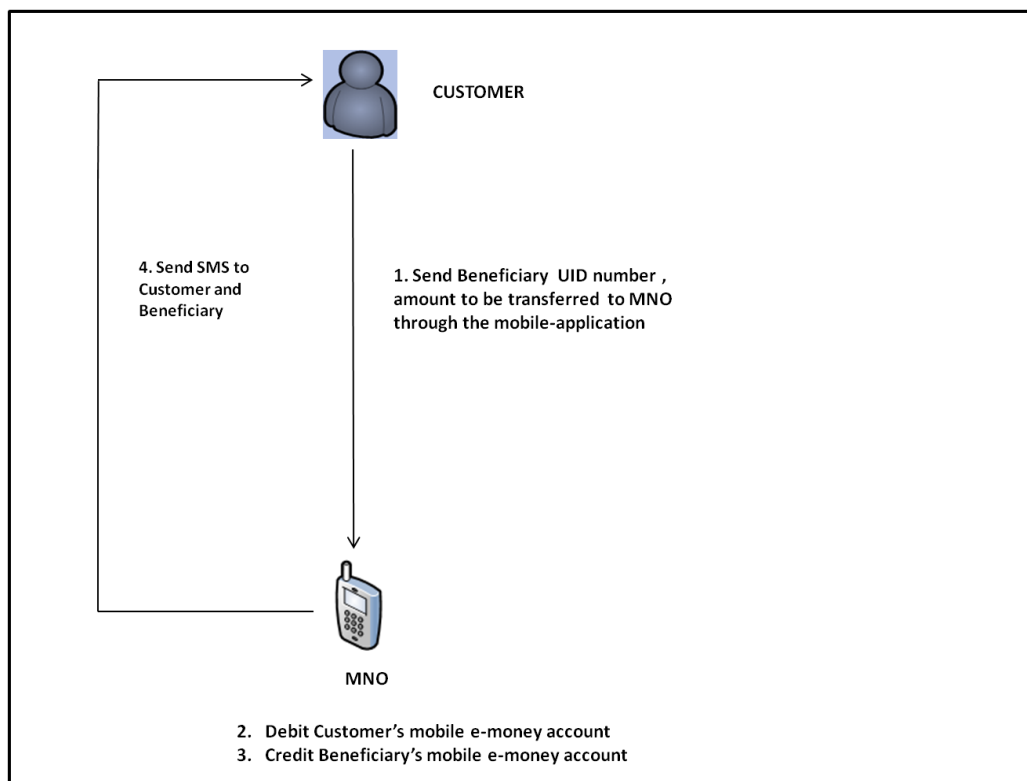

1. Customer enters the UID number of the beneficiary and the amount to be transferred, in the SMS based application (which is installed on the mobile phone).
   Since the beneficiary also belongs to the same MNO, MNO gets the details of the beneficiary like e-money account number directly, by doing query on its own database using UID number.
2. MNO debits customer's mobile e-money account.
3. MNO Credits beneficiary mobile e-money account.
4. An SMS is sent to both the beneficiary and the customer about the transaction status.

Now consider the scenario when the beneficiary and the customer belong to different MNO's (Figure 9).

1. Customer enters the UID number of the beneficiary and the amount to be transferred, in the SMS based application. This data is then received by MNO of the customer (referred as MNO(C)).
2. Since the beneficiary belongs to different MNO, MNO(C) sends request to SWITCH to get the details of the beneficiary like e-money account number, and perform the transaction.
3. SWITCH performs query on the Account Mapper and gets the details of the beneficiary like mobile e-money account number.
4. SWITCH then directs the MNO of beneficiary (referred as MNO (B)) to perform credit operation on the e-money account of beneficiary.
5. MNO(C) receives intimation from the SWITCH about the transaction whether it was successful or not.
6. If the transaction is successful, then MNO(C) does debit operation on the mobile e-money account of the customer.
7. An SMS is sent to both the beneficiary and the customer from their respective MNO's.

**Figure 9:** Cash transfer (Customer and beneficiary belong to different MNO's)
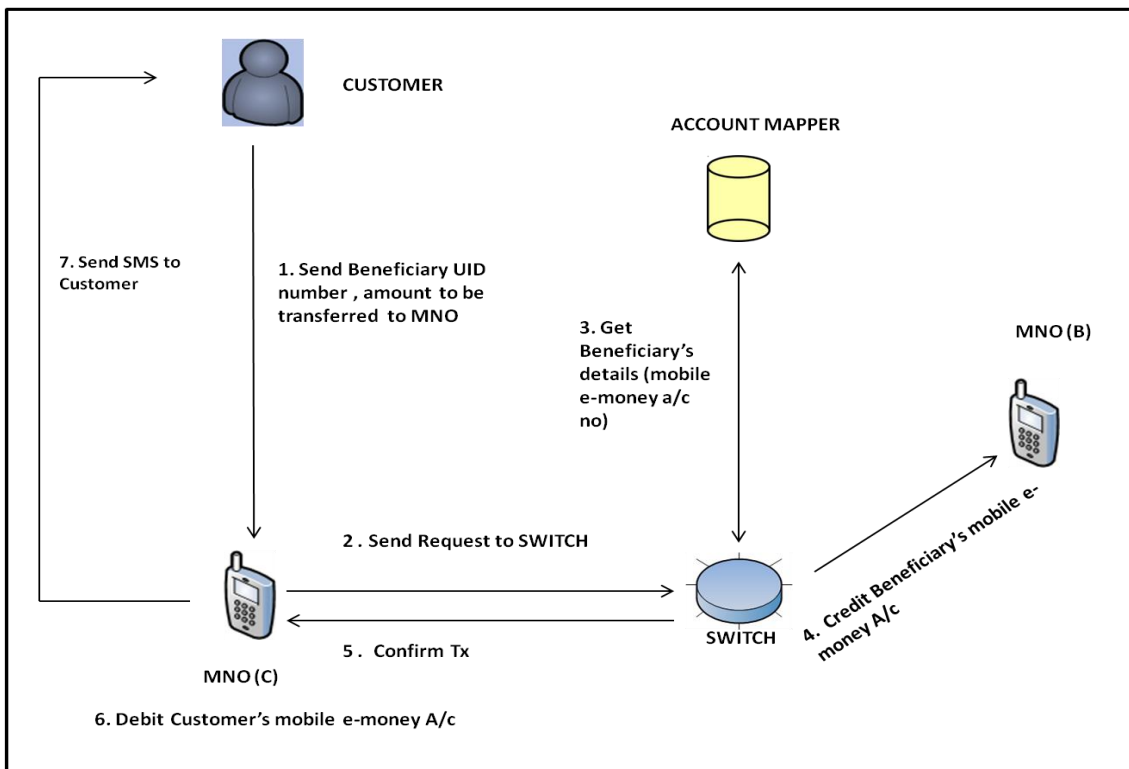
Cash withdrawal (Figure 10)**:**
The process for cash withdrawal is as follows

1. Customer approaches the retailer's shop and requests for cash withdrawal.
2. Customer enters the retailer's UID number and the amount to be withdrawn in the SMS based application.
3. The request reaches MNO.
4. MNO debits customer's mobile e-money account.

5. MNO credits retailer's mobile e-money account.
6. An SMS confirmation is sent to both the customer and the retailer.
7. Retailer hands over cash to the customer.

Figure 10: Cash Withdrawal
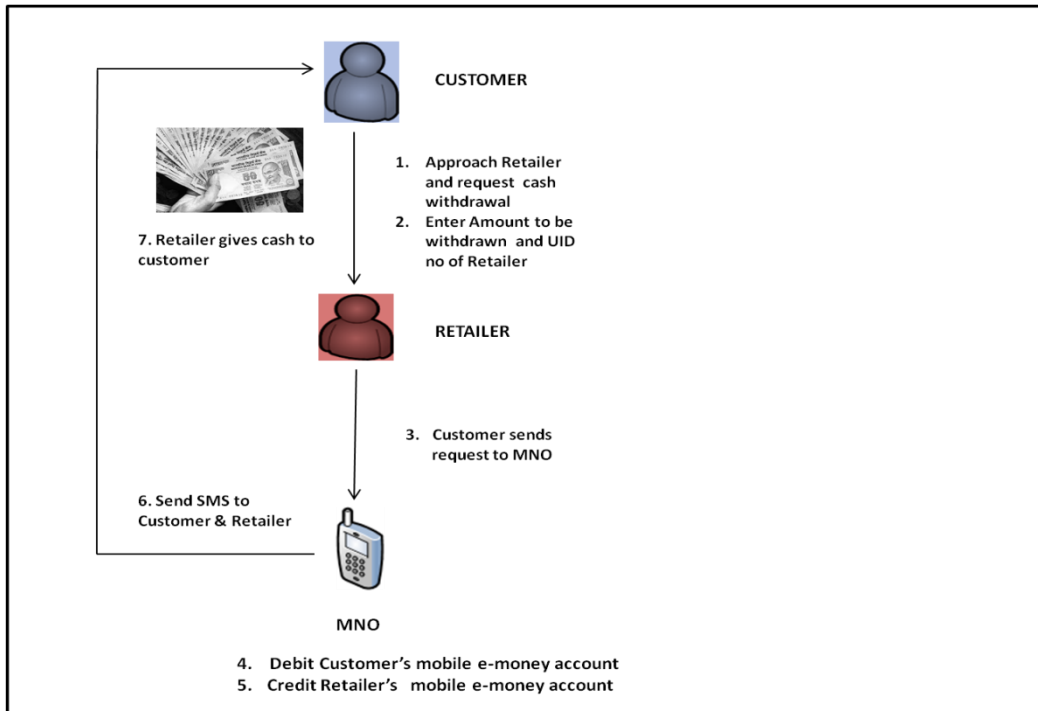
4.6.   Integration with existing banking world

The framework developed for mobile e-money ecosystem should smoothly integrate with other similar financial systems. The Account Mapper links the various identities of an individual, like UID number, bank account number, mobile number, mobile e-money account number etc,. as shown in the figure below.

Account Mapper				
UID	**Bank**		**Mobile No#**	**E-money Account No#**
	Routing No#	Account No#		
1164 2234 8945 5562	345678901	200612356	9487476265	111345677

A policy driven approach can be used by the individual, in which the individual can set policies as to which account (Bank account/ Mobile e-money account) to use for what type of transactions. A mobile e-money account holder can transfer money to another target individual by simply using the UID number. A command like the one shown below could be issued in the SMS application by the customer.

Transfer_Money(From_UID, To_UID, Amount);

The target individual would then receive money in any of the bank or e-money accounts based on the policy setting.

4.7.   Role of Retailer / Correspondent of MNO

Individual retailers (Shops were mobile recharge is done) will play a crucial role in this model in terms of providing services to the customers. In this respect they will have the following responsibilities.

> ➢ Will act as e-money supplier by taking hard cash.
> ➢ Will act as hard cash providers by taking e-money.
> ➢ Retailer would be responsible to enable mobile e-money account.
> ➢ Interface with customer, provide basic handholding and play a role in promoting the financial literacy through mobile e-money transfers.

4.8.   Role of other small business entities

Local retailer including kirana stores play an important role in the model. It is very important to build the credibility and increase the acceptance of mobile e-money for payments on purchase of commodities. This can be done by establishing trust, showing benefits of using such a system to all the entities in village. The buyer will use the UID number of the shop owner to transfer e-money for purchasing commodity. Instant message confirmation will be sent to both. It should be noted that kirana shop owner can now go to the retailer operating on behalf of MNO to get hard cash, if needed.

4.9.   Distinguishing the role of Bank and MNO

MNO plays the principal role in the MNO led banking model. All the aspects of banking like account opening, account maintenance, cash-in/cash-out etc., will be performed by MNO. Clearly the ownership of customer lies with the MNO in this model.   Banks will be at the back end of the model, without any direct interaction to the customer.

MNO should deposit the equivalent of e-money issued in the banks, this would limit the margin MNO would otherwise get by intermediation spreads. This is the price MNO pays for not having to incur extra cost of obtaining full banking license. Thus banks are at the back end of the model accepting deposit from the MNO in the form of a pooled account mechanism. This would transfer the risk of investment of funds from MNO to the bank, which is already governed under the regulation of banking laws.

MNO earns the interest from its deposit in the bank, which can be passed on to the customers of MNO to make it profitable and attractive to the customers. This would also encourage the customers of MNO to use e-money accounts as a place to store and earn interest.

5. Potential Applications

5.1. Government Payments

The UID number, Aadhaar has the potential to become the universal linkage for disbursing government payments in various schemes involving payments to citizens such as the National Rural Employment Guarantee Scheme (NREGS), Janani Suraksha Yojana etc. A direct credit in the mobile e-money account of the beneficiary would cut down the cost of intermediaries and also avoid operational level bureaucracies and corruption at grass root level in public service offices. Using our proposed framework, the concerned government department could issue instruction to the mobile network operator with the individual's Aadhaar number and the amount to be transferred. In order to get Government payments directly to the mobile e-money account, the citizen first needs to register the mobile number (on which e-money account is enabled) or UID number with government agency managing the scheme. MNO can get the individual's required details (mobile number) by making a query in the Account Mapper and e-money would be thus transferred to the individual instantly.

6. Analysis of the framework

6.1. Understanding the risks involved

The four important risk factors as identified by the World Bank paper "Integrity in Mobile Phone services" are anonymity, elusiveness, rapidity, and poor oversight. The proposed framework attempts to address these risks and also suggest a comprehensive approach in dealing with the majority of these issues.

➤ **Anonymity**: It is the risk of not knowing a customer's actual identity. The Proposed model is based on the UID number which mitigates the risk of anonymity. UID number tagged to every account tracks all transactions and fulfils the objective of complete traceability and accountability. This prevents illegal transactions or money laundering activities to a great extent.

➤ **Elusiveness**: It is the ability to disguise mobile transaction totals, origins, and destinations. It can be diminished by enhanced customer profiling, monitoring, and reporting. Since measures like limiting the number of accounts per customer and number of transaction per month and limit on mobile e-money balance would prevent abuse of users with multiple e-money accounts, we intend to include this feature in the proposed model. Besides, an MIS system in this process would help in monitoring and reporting the mobile e-money accounts operated by particular MNO.

➤ **Rapidity**: It is the speed with which illicit transactions can occur. Mobile e-money transactions are usually conducted in real time, which makes them very difficult to monitor. Individuals can initiate transactions at any time. Since different steps involved in the transaction occur very quickly in the order of fractions of a second (sending instruction from mobile phone through the wireless network to the MNO, authentication of the individual, accessing the account, processing the transaction, and the transaction clearance and settlement) the rapidity of the transaction does not give

MNO enough time to suspend a suspicious transaction until more information is obtained. This risk can be mitigated by flagging certain types of transactions with integrated internal control systems.

➢ **Poor Oversight**: Transparent guidelines, clear regulations and licensing with effective risk supervision of MNO's can help making the system more transparent and accountable. In the proposed model both the banking regulator, RBI and the telecom regulator, TRAI play a major role, so they should leverage their respective areas of expertise and agree on the areas of responsibility. This would be help in mitigating the risk of Poor Oversight over MNO to a large extent.

6.2.   Revenue Sharing Mechanism

Revenues earned through this model are required to be shared between different players so as to make the system sustainable as well as profitable for all stakeholders. Table 4 describes a recommended structure for sharing of revenues between various players in the whole ecosystem.

Following simple calculation exemplify revenue sharing details of the proposed framework. Lets take the case of Andhra Pradesh, as of July 2011 there were around 45million wireless subscribers. Let's assume that a particular MNO has a market share of about 40% in wireless segment, And of this 40% wireless segment, rural share is say 30%. Then the revenues generated would be as follows

Assuming initially the e-money accounts are opened free of cost.

1. Revenue to the retailer for basic financial transactions like balance enquiry, cash withdrawal and cash deposit, assuming it is 2 % of total transactions
   Say 20 transactions are done by a user per month
   Then revenue earned by the retailers of MNO in Andhra Pradesh (rural) would be Rs. 2.88 million. If there are 1000 retailers then revenue per retailer would be Rs. 2880 per month.
   Note that here the assumption is that for any amount of transaction the retailer is paid only 1%, if the retailer is paid in terms of value of transactions performed then the revenue to the retailer would be much higher.
2. Revenue to MNO, assuming it is 1.5% of total transactions, would be Rs. 2.16 million per month
3. Revenue to NCPI (for maintenance of Account Mapper and SWITCH), say 0.4% of total transactions would be Rs. 576,000 per month.
4. Revenue to UIDAI, say 0.1% of total transaction, would be Rs. 144,000 per month

6.3.   Regulatory Issues

In India, at present MNO's are prohibited from issuing e-money to the public. MNO's can get into partnership with the banks and offer the saving accounts which are operated by banks. Several models which are possible based on the partnership between MNO and bank were discussed in section 4.   After thorough introspection it was found that model 4, MNO led banking model was worth considering. For this model to implement there would be need for new regulations, to allow MNO's to enter in the banking sector.

Table 4: Revenue Sharing

Services/Players	A/c Opening	Deposit Withdrawal Transfer/ Remittance	Balance Enquiry
Retailer/Corres—pondent	Compensation to cover customer education costs	Compensation to at least cover cash management costs, which will include costs of maintaining 100% coverage for all transactions, adequate liquidity to avoid running out of cash at the retail outlet as also the costs of secure movement of cash from remote retail outlets to MNO	Compensation to Cover Transaction Costs
MNO		Main player in the framework. 1. Revenue earned on per transaction basis 2. Interest Income from Deposits in Bank	
SWITCH		Operation Expenditure derived from MNO on the basis of number of transactions executed	
Account Mapper		Operation Expenditure derived from MNO on the basis of number of transactions executed	
UIDAI		May charge fee for authenticating customer details during account opening and whenever authentication service is required	

RBI should lay down appropriate regulatory mechanism to deal with all the concerns in the MNO led banking model. The e-money license which will be issued to the MNO should clearly define the role and permitted activities of the MNO. MNO's should be prohibited from engaging in intermediation of funds or asset transformation. The risk arising out of investment of funds should be transferred to fully prudential regulated banks through pooled account mechanism. RBI must also ensure that any liabilities issued by the MNO, is fully covered by the pooled account mechanism. The aspect of ownership of customer should be addressed very clearly by defining that MNO be the sole company responsible for all customer grievances.

The concerns about money laundering and financial terrorism could be handled by infusing strong security and authentication mechanisms that are provided by Government initiative of Project Aadhaar. The UID-based micropayments offer stronger compliance with Anti Money Laundering laws, both to the MNO offering financial services and the regulator. Since a person's

UID will be tagged to every transaction, the regulator achieves full traceability and accountability. Thus, no trade-off is made between inclusion and security.

Other dimension in laying down the regulatory framework should involve fixing the tariff structures for MNOs offering basic financial services on mobile phone, ensuring that it is affordable by the poor and unbanked while it still remains profitable for MNOs.

6.4.   Financing the project

Apart from the investment by MNO, government would need to develop a supportive ecosystem for the model to viable and profitable for MNO. At the initial stage as the private players need support from the government through policy initiatives and investments to help them set up back end infrastructure like Account Mapper, REMIT and other ancillary installations. This could be partly supported by NPCI which is incorporated to provide a national infrastructure for payments and settlements in the country.

The Universal Service Obligation Fund (USOF) created by the New Telecom Policy of 1999, can be availed as a source of investment by the Government for building telecom infrastructure in rural areas (and thus taking initiatives to further enhance the rural wireless subscriber base). As per current date the USOF position[26] is provisionally at Rs. 14157.01Cr at the beginning of F.Y. 2010-11 which could be effectively utilised to fund this project in initial stages.

The Committee on Financial Inclusion under Dr.C.Rangarajan[27] proposed to set up funds for meeting the cost of developmental and promotional interventions under the head "Financial Inclusion Fund", and another exclusive fund to meet the cost of technology adoption under the head "Financial Inclusion Technology Fund" with an approximate overall corpus of Rs. 500 crores each. In the Union Budget for 2010-11, the corpus of these funds was enhanced by Rs. 100 crores each. These funds can be effectively used to help in developing a pilot project program to develop mobile e-money banking transactions involving MNOs.

7. Comparison with other similar models

M-PESA model of Kenya being offered by Safaricom (an affiliate of Vodafone), is similar in many aspects to the proposed model. The proposed model like M-Pesa model is designed to enable users to complete basic banking transactions without the need to visit a bank branch. The service enables the users to deposit and withdraw money, transfer money to other users, pay bills, purchase airtime.

One crucial difference between the proposed model and the M-Pesa model is of the identity and authentication mechanism. The proposed model is based on the unique identity number issued by UIDAI, which provides online authentication of identities. Nowhere in the world is their model which provides online authentication of identities based on finger prints and iris scan. This strong authentication mechanism ensures that genuine and real individuals would only get registered as customers.   Also the UID based model provides compliance with anti money laundering laws both to the regulator and the MNO.

In the proposed model a single number, UID number of the individual will be used to transactions. The proposed model smoothly integrates with the existing banking world. An individual can transfer money from e-money account to the bank account and vice-versa. Similar service is also provided by M-Pesa model of Kenya.

8. Conclusion

- Inclusive growth must not suffer on the insistence of a particular model. Regulator must allow other promising models to be developed which provide extensive reach and easy accessibility as that of the case with MNO based banking model.
- An MNO based banking model developed using UID, would address all the issues of identity and authentication mechanism. Moreover, the proposed UID based model offers stronger compliance with anti money laundering laws both to the regulator and the MNO.
- For this model to be implemented successfully, the regulator should be proactive, in developing policies for allowing MNO's to issue e-money, a supportive ecosystem by building infrastructure (Account mapper and SWITCH).
- A pilot project must be tested before developing the complete model. Learning's from the M-PESA model of Kenya can be used to perform the test run.

References

1. Selected Asian Economies: Real GDP, Consumer Prices, Current Account Balance, and Unemployment – World Economic Outlook (WEO) by IMF, September 2011
2. Development Strategies for Inclusive Growth in Developing Asia – by Prof Justin Yifu Lin, Peking University and Hong Kong University of Science and Technology.
3. World Bank definition of Inclusive growth http://siteresources.worldbank.org/INTDEBTDEPT/Resources/468980-1218567884549/WhatIsInclusiveGrowth20081230.pdf ; Retrieved on September 9, 2011
4. Report of Committee on financial inclusion, RBI, 2008; From ww.rbi.org; Retrieved on September 5, 2011
5. Microfinance India , State of the Sector Report – 2009 , Sage publications http://www.accessdev.org/downloads/State_of_the_Sector_Report_2009.pdf Retrieved on September 21, 2011
6. Presentation by Dr K.C. Chakrabarty, Deputy Governor RBI , 26th Skoch Summit Mumbai, June 2 ,2011. From www. rbi.org ; Retrieved on September 20, 2011
7. Financial inclusion : State of the sector report , 26th Skoch Summit 2-3rd June 2011, Mumbai, From www.skoch.org; Retrieved on September 19, 2011
8. Financial inclusion : state of the sector report , 26th Skoch Summit 2-3rd June 2011, Mumbai, From www.skoch.org; Retrieved on September 19,2011
9. Report of Inter Ministerial Group on Framework for delivery of basic financial services using mobile phones, 2011; From www.mit.gov.in; Retrieved on July 1, 2011
10. Section 10 on "UID-enabled micropayment architecture" - In the report of UID Strategy Overview - "Creating a unique identity number for every resident in India". From http://uidai.gov.in/ ; Retrieved on August 29, 2011
11. Annual Report of TRAI 2009-2010 and Information note to the Press (Press Release No. 35 /2011) ; From http://www.trai.gov.in/traiannualreport.asp ; Retrieved on August 31, 2011

12. http://uidai.gov.in/
13. Mr.Nandan Nilekani at FICCI Seminar on 'Aadhaar' http://businesstoday.intoday.in/story/aadhaar-numbers-uid/1/18203.html ; Retrieved on September 1, 2011
14. RBI's website www.rbi.org.in/
15. UIDAI's website http://uidai.gov.in/
16. NPCI about IML at http://www.npci.org.in/24x7.aspx,
    For complete information on IML visit: http://www.thehindubusinessline.com/todays-paper/tp-money-banking/article1048212.ece?ref=archive
17. Scenarios for branchless banking in 2020 by CGAP and DFID , http://www.cgap.org/gm/document-1.9.40599/FN57.pdf ; Retrieved on August 31, 2011
18. Transforming Access to Finance in Developing Countries through Mobile Phones: Creating an Enabling Policy Framework by Mr. Ignacio Mas, Senior Advisor, Bill & Melinda Gates Foundation, Draft submitted to Banking and Finance Law Review, May 2011
19. www.cgap.org/gm/document-1.9.49702/Building_viable_agent_networks_in_India.pdf ; Retrieved on September 26, 2011
20. SPANCO appointed as BC to SBI
    http://www.thehindubusinessline.in/bline/2011/01/21/stories/2011012151530700.htm ; Retrieved on September 1, 2011
21. m-banking, m-remittances ; Case studies from the Philippines ; Michael Trucano (infoDevICT and Social Sector Innovation Specialist); From
    http://siteresources.worldbank.org/INTAFRSUMAFTPS/Resources/m-banking_m-remittances_case.. Retrieved on September 27, 2011
22. M- Pesa Presentations at http://www.safaricom.co.ke/index.php?id=959 ; Retrieved on September 20, 2011
23. Presentation by Dr. K.C. Chakrabarty, Deputy Governor, Reserve Bank of India at St. Xavier's College September 6, 2011 , From www. rbi .org ; Retrieved on September 21, 2011
24. DoT to seek TRAI views on exit policy for mobile firms ,
    http://www.thehindubusinessline.com/industry-and-economy/info-tech/article2285716.ece ; Retrieved on August 1, 2011
25. www.simovits.com/archive/dcash.pdf ; Retrieved on   September 2, 2011
26. www.nicf.gov.in/ppt/USO_Constituton_Admin.ppt ; Retrieved on September 26, 2011
27. NABARD News letter, July 2008, From http://nabard.org/fileupload/Display_Newletters.aspx ; Retrieved on September 26, 2011

Appendix

Indicative transaction process

Cash transfer from mobile e-money account to savings bank account
1. Customer enters the UID number of the beneficiary and the amount to be transferred, in the SMS based application. This data is then received by MNO of the customer.
2. MNO sends request to the SWITCH to get the details of the beneficiary like to savings bank account number to proceed with the transaction.
3. SWITCH performs query on the Account Mapper and gets the details of the beneficiary.
4. SWITCH then directs the bank of beneficiary to perform credit operation on the savings bank account.
5. MNO receives intimation from the SWITCH about the transaction, whether it was successful or not.
6. If the transaction is successful, then MNO does the debit operation on the mobile e-money account of the customer.
7. An SMS is sent to both the beneficiary and the customer from their respective MNO's.

Figure A1: Cash transfer (Mobile e-money to Savings bank account)
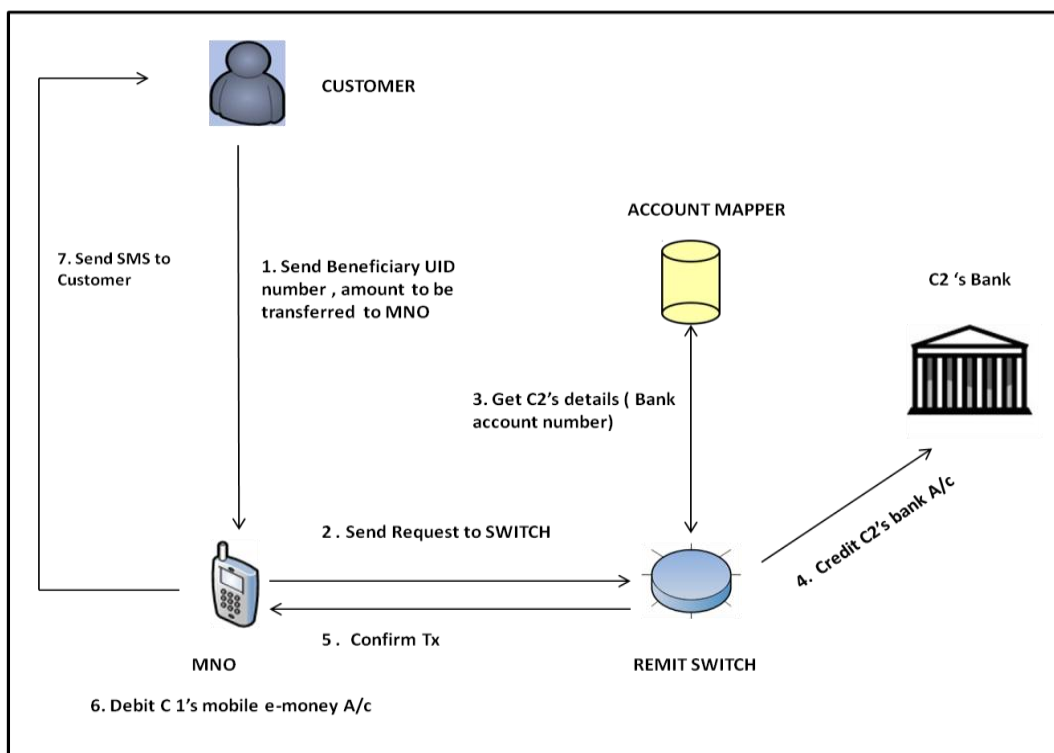
Balance Enquiry

1. User selects balance enquiry option in the sms based application. A request will be sent to the MNO.
2. MNO responds with the details of the last N transactions.

Figure A2: Balance Enquiry

CUSTOMER

1. Select Balance Enquiry Option

2. Balance enquiry information sent to Customer

MNO