


MOBILE BANKING

REPORT OF THE TECHNICAL COMMITTEE




RESERVE BANK OF INDIA
January 2014


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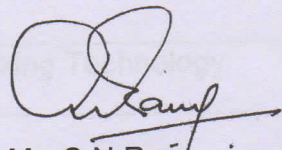
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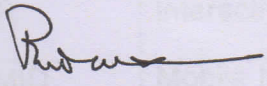
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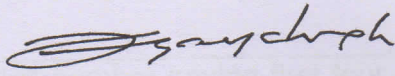
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Abbreviations

ATM	Automated Teller Machine
BC	Business Correspondents
CBS	Core Banking System
CDMA	Code Division Multiple Access
DFS	Department of Financial Services
DoT	Department of Telecom
DTH	Direct-To-Home
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
IDRBT	Institute for Development and Research in Banking Technology
IFSC	Indian Financial System Code
IMG	Inter-Ministerial Group
IMPS	Immediate Payment Service (NPCI)
IVR	Interactive Voice Response
MMID	Mobile Money Identifier (It is a seven digit number having first four digits as bank code and remaining three as random number)
MPFI	Mobile Payment Forum of India
M-PIN	Mobile PIN
NFS	National Financial Switch
NPCI	National Payments Corporation of India
OTA	Over the Air
OTP	One Time Password
PAN	Permanent Account Number
PSS	Payments and Settlements Systems
QOS	Quality of Service
RTGS	Real Time Gross Settlement
SIM	Subscriber Identity Module
SMS	Short Messaging Service
STK	SIM Application Tool Kit
MNO	Mobile Network Operators
TRAI	Telecom Regulatory Authority of India

UIDAI	Unique Identification Authority of India
URL	Universal Resource Locator
USSD	Unstructured Supplementary Service Data
VAS	Value Added Services
WAP	Wireless Application Protocol

Executive Summary and key recommendations

1. The developments in mobile telephony, as also the mobile phone density in the country, with over 870 Mn subscribers, presents a unique opportunity to leverage the mobile platform to meet the objectives and challenges of financial inclusion. By harnessing the potential of mobile technology, large sections of the un-banked and under-banked society can be empowered to become inclusive through the use of electronic banking services.

2. Dr. Raghuram Rajan, on taking over as Governor, Reserve Bank of India (RBI) on September 4, 2013, had stated that there was substantial potential for mobile based payments and that a Technical Committee would be set up to examine the options / alternatives, including the feasibility of using encrypted SMS-based funds transfer utility, for expanding the reach of mobile banking in the country. Accordingly, a Technical Committee was constituted by the Reserve bank of India under the Chairmanship of Shri B. Sambamurthy, Director, Institute for Development and Research in Banking Technology, to study in-depth the present challenges faced in mobile banking, the adoption of particular technologies to meet the requirements of banks as well as vast numbers of mobile users and draw up a road-map for implementation of the solutions.

3. During its deliberations, the Committee examined the present challenges faced by banks for greater adoption of mobile banking as also the issues faced in enabling greater access to the USSD channel by banks. It is pertinent to indicate here that the Committee considered these challenges with specific reference to millions of financially excluded populace of the country having no access to formal financial services, and recommended certain mobile banking solutions, such as multilingual USSD and IVR access channel, STK based common mobile banking application, etc., keeping this segment in mind. Another pertinent point to note is that user of mobile banking services is referred in this Report as “customer” – present and future -, both of banks and MNOs in the same breath.

4. The Report is divided into six chapters which include Overview of mobile banking, the SMS based channel, the USSD channel, the Application based channel, Technical solutions and the way forward and finally the Recommendations. Some of the recommendations are given below:

- (i) Banks need to explore other means of facilitating customer/user registration process for mobile banking which does not require a visit to the bank branch. The potential of inter-operable ATM networks and business correspondent arrangements has to be effectively harnessed towards meeting this objective. Committee felt that standardization is required in (a) User registration for mobile banking, (b) User authentication process, and (c) User interfaces. Recognising the crucial role that customer/user awareness plays in

adoption of any technology for financial transactions as well as the need for optimal utilization of resources, the Committee is of the opinion that joint customer education programs by banks will go a long way in facilitating usage of mobile banking.

(ii) Mobile Network Operators (MNOs) need to see a business model in it for themselves and play out their role in ensuring mobile banking reaches its full potential by cooperating with banks in their endeavor to provide the appropriate technology / channel to the targeted users. Mobile banking can result in customer stickiness and reduce churn for MNOs. Mobile banking can increase revenue to MNOs and reduce costs to banks. The current solutions already provided by banks and various technological alternatives available can be put in place through a concerted effort between banks and telecom service providers.

(iii) Common mobile banking applications and common technological platforms need to be built for reaping the benefits of “network effects”. While bank-specific applications and individual platforms have a major role in building brand loyalty, an alternate uniform/common platform, interoperability and similar seamless transactional experience to the users/customers of all banks would encourage mobile banking.

(iv) The Government of India can explore the options of offering fiscal incentives / economic subventions to the stakeholders in order to ensure participation of various players to offer the solutions recommended here in this Report. The committee would like to draw attention to similar law “Lei Do Bem” (Law of the Goods)¹ enacted by Brazil in Oct 2013 which mandates that smart phones give visibility to Brazilian made apps by either pre-loading phones with these homegrown apps or providing a dedicated marketplace on smart phones to display them. Similar intervention in India can support and incentivise the relevant stakeholders to either “pre burn” common mobile banking application on mobile handsets / SIM cards or send “over the air” using dynamic STK to facilitate financial transactions. This is a “build-it-they-will-come” approach.

5. Further important and **key recommendations** made in the report are listed below. The approach is to offer a “product in a box” that covers the entire process of SIM card registration, enrolment, authentication until the customer begins to use mobile banking.

- a) The customer may not be required to visit the bank branch for mobile number registration. Alternate channels for mobile number registration may be made available, such as interoperable ATM network across banks as well as the BC

¹ <http://thenextweb.com/la/2013/11/11/legislating-innovation-brazil-good-law-much/>

/ agent network using biometric authentication, so that the customer can register the mobile number conveniently.

- b) The process of M-PIN generation may also be simplified and standardized without necessitating a visit to the bank branch by the customer, so that the customer can be on-boarded in an easy manner and start transacting using mobile payments, and reduce barriers to entry.
 - The customer may be able to set and change his M-PIN from the handset itself using authentication parameters defined by the banks permissible by their security guidelines.
 - The customer may have the facility to set or change the M-PIN from at least one additional channel (apart from mobile handset itself as mentioned in point a above) such as Phone Banking, IVR, ATM, Internet Banking.
- c) Banks may implement multiple channels (application, SMS, USSD etc.) for mobile banking so that options are available to all types of customers with any type of handsets with suitable level of security.
- d) For better authentication of the transaction by the bank, MNOs could facilitate the mobile banking transaction by providing the mobile number from where transaction is originated when customers transact using mobile banking application (Currently the mobile number in the header is suppressed).
- e) For facilitating funds transfer using mobile banking, the remitting customer may be facilitated to effect person-to-person funds transfer using just the mobile number and bank or just the Aadhaar number of beneficiary.
- f) Customer may be able to make merchant payment using just his mobile number and M-PIN/OTP on the merchant interface. The M-pin can be only interfaced on acquiring bank's interface such as USSD, Application etc. for security reasons. The merchant based interfaces can accept OTP (One-Time Password) for authentication.
- g) Every bank may offer OTP services on SMS request with the standard syntax of SMS such as "MOTP XXXXXX" to the short or long code. (XXXXXX – last 6 digits of the account number). This will help to expand the use of OTP in mobile payments.
- h) Limit of unsecured transaction (without end to end encryption) may be raised from the existing Rs.5000/- to Rs.10000/- subject to having certain velocity checks at the bank side. The banks may take the decision of limit

enhancement depending on their security policy and internal risk management control measures.

- i) To overcome the challenges faced by each bank in tying up with a large number of MNOs, and to facilitate the reach and usage of mobile banking through USSD, there is a need for common USSD gateway for mobile banking. A common USSD Gateway based mobile banking service offers an opportunity to provide convenient, cost effective and user friendly payment option for all customers and thus a very convenient mechanism for banks for furthering financial inclusion objectives of Government of India.
- j) Banks and MNOs may initiate pilots using white-label multi – bank STK application which can be distributed using application on SIM that allows SMS encryption. Customers, merchants, agents of any bank can transact through this interface.
- k) MNOs may support,
 - Application loading on new SIMs – Single mobile banking application may be made available all new SIMs which uses encrypted SMS for transaction processing.
 - Application loading on existing SIMs – Single mobile banking application may be made available across all existing SIMs in SMS encrypted environment through dynamic STK and the common mobile banking application can be pushed over-the-air.
- l) The large corporates, third party players and MNOs, handset manufacturers / resellers may initiate pilot programs to develop the single multi-bank mobile banking applications which can use published public keys of the banks / banks' agents for encryption. The common application may be developed by reputed organizations having successful track record in this field.
- m) Similarly, the common application may be pre-loaded in the handset – the mandate to be issued by Govt. of India to all handset manufacturers / resellers in India. Handset manufacturers to burn the application on all new handsets.
- n) The committee feels for effective and efficient implementation of providing mobile banking facilities to the customers it is imperative that the banks staff is well versed and thoroughly trained in various aspects of the mobile banking. For this workshop may be conducted for top officials including the chief executive of the banks; training program may be conducted during induction programs and probationary officer courses. Banks may also periodically conduct refresher courses to ensure staff is abreast with latest developments in these fast paced technology areas in mobile banking.

- o) The committee also feels banks must continue to invest in handholding and educating customers to increase the awareness of various aspects of mobile banking. Banks collectively may invest in marketing and advertising for widespread promotion of mobile banking.

Acknowledgements:

The Committee is thankful to all subject matter experts and others who made presentations before the members to brief them of their view points and indicate the general direction and path ahead for mobile banking. The Committee feels privileged and grateful to have had presentations made by Prof. Ashok Jhunjhunwala of IIT, Madras, Chairman of MPFI, Shri Rajesh Bansal of UIDAI, Shri Patrick Kishore, Prof. V.N. Sastry, Dr. N. Raghu Kisore from IDRBT and representatives of various stakeholders in the ecosystem. The Committee is thankful to Shri Suresh Sethi from Vodafone and Shri Ram Rastogi and Shri Dheeraj Bharadwaj both from NPCI for their active participation in the deliberations. Finally, the Committee would like to place on record their appreciation of the secretarial and editorial support provided by Ms. Radha Somakumar, DPSS, RBI in ensuring early completion of this Report.

Chapter 1

Mobile Banking: Overview and Current status

Introduction:

1. The Payment and Settlement Systems Act, 2007 empowers the Reserve Bank of India to authorize and regulate entities operating payment systems in the country. The Vision Document for Payment and Settlement Systems of the RBI has, over a period of time, placed importance on the move towards electronic payments and thereby a 'less-cash' society. Towards this end, the Bank has been promoting and nurturing the growth of various modes of electronic payments including the prepaid payment instruments, card payments, mobile banking etc.

2. The Payment Systems Vision Document 2012-15¹, reflects the commitment towards provision of safe, efficient, accessible, inclusive, interoperable and authorised payment and settlement systems in the country. The performance indicators of various payment system segments show that, during 2012-13 the share of paper-based instruments in the volume of total non-cash transactions has been lower than that of electronic payments. In addition to the growth in volume as well as value processed by RTGS, the retail electronic segment too has registered a significant growth of 35.2 percent in volume and 54.9 percent in value. Though overall volume of transactions in mobile banking is low, there has been significant growth in the volume this year as compared to previous years.

Mobile banking: Regulatory framework and current status

3. Recognising the potential of mobile as a channel for offering financial services in the country, the Reserve Bank issued the first set of guidelines on mobile banking in October 2008². The bank-led model was considered suitable for the country with a mandate to banks such that all transactions should originate from one bank account and terminate in another bank account. At this time, a few banks had already started offering information based services like balance enquiry, stop payment instruction of cheques, transactions enquiry, location of the nearest ATM/branch etc. through this medium.

4. The guidelines issued by RBI in October 2008, permitted banks to facilitate funds transfer from one bank account to another bank account, both for personal remittances and purchase of goods and services. Banks were directed on the regulatory/supervisory issues, registration of customers for mobile banking, to ensure technology standards, interoperability, interbank

¹ RBI Payment System Vision Document (2012-15) - <http://www.rbi.org.in/scripts/PublicationVisionDocuments.aspx?Id=664>

² Mobile Banking Transactions in India – Operative Guidelines for Banks - <http://www.rbi.org.in/scripts/NotificationUser.aspx?Id=6387&Mode=0>

clearing and settlement arrangements for fund transfers, customer grievance and redressal mechanism and transaction limits in an attempt to ensure safe, secure transfer of funds.

5. Under extant regulatory prescriptions, there is no monetary restriction on fund transfer effected through mobile banking as it is left to the risk perception of each bank and policies approved by their respective Boards. However, end-to-end encryption for transactions in excess of Rs. 5000/- has been mandated by RBI. Similarly, mobile as a channel for funds transfer from a bank account for cash payout to a beneficiary who does not have a bank account at ATMs/BCs- Rs 10,000 per transaction with a cap of Rs 25,000/-per beneficiary has also been permitted by RBI (under the Domestic Money Transfer guidelines).

6. In line with these guidelines, banks have been offering mobile banking services to their customers through various channels such as SMS, USSD channel, mobile banking application etc. However, real time inter-bank mobile banking payments has been facilitated through the setting up of the Interbank Mobile Payment Services (IMPS), now termed as Immediate Payment Service, and operated by the NPCI with the approval of the Reserve Bank of India. The IMPS has enhanced the efficiency of mobile banking by enabling real time transfer of funds between bank accounts and providing a centralised interbank settlement service for mobile banking transactions. The IMPS has also been enhanced to support merchant payments using mobile phones to promote less cash society. The committee considered options of using mobile for the merchant payments whereby the merchants on initiating the payment request completes the transaction by accepting an OTP generated by customer on his mobile. The committee also considered a standard and simple process to generate OTP across all banks.

7. Under the PSS Act, the Reserve Bank has given approval for mobile banking services to 80 banks³, of which 64 have commenced operations. The customer base of banks who have subscribed to mobile banking services stands at nearly 30 million as of October 2013.

8. In recent years, the mobile banking has been reflecting a growing trend (albeit the low volumes) with the volume and value increasing by 108.5% (53.30 million in 2012-13 vis-à-vis 25.56 million in 2011-12) and 228.9% (Rs.59.90 billion in 2012-13 vis-à-vis Rs.18.21 billion in 2011-12) respectively. The trend in usage of Mobile Banking in the last three years is given below:

Year	No. of Users (Million)	Volume (Million)	Value (Billion Rs.)
2010-11	5.96	6.85	6.14
2011-12	12.96	25.56	18.21
	(117.45%)	(273.139%)	(196.58%)
2012-13	22.51	53.30	59.90
	(73.69%)	(108.53%)	(228.94%)

Note: figures in brackets indicate the growth over the previous year.

³ List of Banks permitted to provide Mobile Banking service in India - http://www.rbi.org.in/scripts/bs_viewcontent.aspx?id=2463

9. Mobile telephony in India has a huge potential with 873.4⁴ Mn mobile connections as on 30.06.2013 in the country, of which about 350 Mn are in rural areas. The number of subscribers who access Internet by wireless phones has grown to about 143 Mn. With sizeable proportion of households (41.3%) not having a bank account⁵, and large unbanked sections of population residing in the villages (as per Census 2011, only 54.4% of rural households had access to banking services), mobile banking offers a huge opportunity for banking industry to leverage upon the mobile density in the country.

10. The country has a subscriber base of 870 Mn, and around 450 Mn bank accounts. The estimates for active SIMs vary, but there are only 22 Mn active mobile banking customers. In terms of per-transaction or per-branch costs, mobile banking transaction is economical compared to the traditional banking channels and hence there is need for banks to encourage the mobile banking channel in a big way keeping in mind the long term economic gains. The committee has deliberated the ways and means to make mobile as preferred, convenient and economical channel for accessing the banking service for all the banking customers. Put another way,

➤ Unique mobile subscribers	350 to 550 million ⁶
➤ Aadhaar numbers issued	510 million ⁷
➤ Bank account holders	589 million ⁸
➤ Bank account holders using ICT based channels	182 million
➤ Number of mobile banking customers	22 million

Evidently, the large mobile subscriber base has not been leveraged for financial inclusion.

Challenges faced by banks in providing Mobile Banking to the customers

11. Despite the potential for mobile banking and the regulatory provisions enabling greater use of mobiles as a channel for financial services in general, and for financial inclusion in particular, banks are facing some challenges in taking mobile banking to the desired level. These challenges are essentially in two fronts – (A) Customer enrollment related issues and (B) Technical Issues.

A. Customer enrollment related issues are:

- a) Mobile number registration
- b) M-PIN generation process

⁴TRAI consultation paper on 'USSD Based mobile banking services for financial inclusion' - <http://www.trai.gov.in>

⁵ Financial inclusion, Department of Financial Services, June 2013, website – <http://financialservices.gov.in/banking/overviewofefforts.pdf>

⁶ GSMA "The India Mobile Economy Report", Oct 2013 <http://www.gsmamobileeconomyindia.com/>

⁷ <http://pib.nic.in/newsite/PrintRelease.aspx?relid=101036>

⁸ Crisil "An Index to measure India's progress on Financial Inclusion", June 2013

- c) Concerns relating to security is a factor affecting on-boarding of customers
- d) Bank staff education
- e) Customer education

Mobile number registration

12. For a customer, in order to conduct a mobile payment transaction, his/her mobile number needs to be registered with the bank. The process for mobile number registration is implemented differently across banks. Currently, the process for mobile number registration involves the following:

- a) Customer mandatorily needs to go to the bank branch for most of the banks to register his number and fill in the application form (paper-based). After verification, his number gets registered in the CBS and in the bank's Mobile Banking system.
- b) Some leading banks have provided the facility for customer to register mobile number at their bank's ATMs using 2FA authentication of ATM card + ATM PIN

13. In both the above cases, the customer needs to physically go to the branch / ATM in order to register their mobile number, which acts as a barrier in many cases, besides delaying the entire process. Further, even where the above process of registration through ATMs is provided, it is restricted to the use of own-bank ATMs and the same is not possible at present by going to any other bank ATMs. The process for mobile number registration needs to be simpler for customer to get on-boarded.

M-PIN generation

14. M-PIN is the second factor of authentication that customer needs to use in order to conduct mobile banking transaction. Customer needs M-PIN from his respective bank in order to get started with mobile payments. Currently, the process for M-PIN generation is implemented differently across banks, and involves the following:

- a) For most banks, after the mobile number registration at branch / any bank ATM, customer receives M-PIN via SMS on their registered mobile number. In certain cases, customer receives the M-PIN through postal mail.
- b) Some leading banks have provided the facility for generating and changing M-PIN from the handset itself using the mobile banking application and providing the authentication parameters as required by the bank (e.g. Debit card details such as Debit card number, ATM PIN, expiry date). These inputs are captured and sent through registered mobile number, for the purpose of M-PIN generation.
- c) Some leading banks have also provided the facility to generate and change M-PIN through alternate channels such as IVR, ATM, and Internet Banking. Customer may be able to make merchant payment using just his mobile number and M-PIN/OTP on the merchant interface. The M-pin can be only interfaced on acquiring bank's interface such as USSD, Application etc. for security reasons. The merchant based interfaces can accept OTP (One-Time Password) for authentication.

- d) Every bank must offer OTP services on SMS request with the standard syntax of SMS such as “MOTP XXXXXX” to the short or long code. (XXXXXX – last 6 digits of the account number). This will help to expand the use of OTP in mobile payments.

Concerns related to security

15. One of the major factors affecting customer on-boarding and usage of mobile banking services is the concern relating to security of transactions effected using the mobile phone. While mobile banking application is an end-to-end encrypted channel, the other access channels viz. SMS, USSD, IVR, are not end-to-end encrypted. However, in order to enjoy the higher level of security available in the application-based mobile banking, the customer’s handset has to be GPRS-enabled.

16. Since SMS facility is available on all handsets, the issue of security can be addressed if the SMS can be encrypted end-to-end, thus allaying any concerns relating to lack of security in this channel.

17. In addition to this, another important aspect adding to the concerns on the part of customers relate to how their complaints and grievances will be addressed for transacting on this channel – whether through their bank or through their mobile service provider.

Bank staff training

18. The committee feels for effective and efficient implementation of providing mobile banking facilities to the customers it is imperative that the banks staff is well versed and thoroughly trained in various aspects of the mobile banking. For this workshop may be conducted for top officials including the chief executive of the banks; training program may be conducted during induction programs and probationary officer courses. Banks may also periodically conduct refresher courses to ensure staff is abreast with latest developments in these fast paced technology areas in mobile banking.

Customer education

19. The committee also feels banks must continue to invest in handholding and educating customers to increase the awareness of various aspects of mobile banking. Banks collectively may invest in marketing and advertising for widespread promotion of mobile banking.

B. The **technical aspects** which are posing a challenge relate to:

- a) Access channels for transactions
- b) Cumbersome transaction process
- c) Coordination with MNOs in mobile banking eco-system

Access channels for transaction

20. Once the customer mobile number is registered and M-PIN is generated, customer may use any of the access channels provided by the bank for conducting mobile banking transactions. Currently, while most banks have provided mobile banking application and SMS

facility as access channels, a few banks have also provided other access channels such as USSD, WAP, IVR, etc. some banks also provide a combination of a few of these channels (application + SMS, application + USSD) for offering better security.

21. Some of the issues faced in this regard are:

- a) In the case of mobile banking application, the applications need to be continuously upgraded to keep pace with newer compatible handset and operating systems.
- b) In the case of SMS access channel, while it is available to all users (with all types of handsets) for conducting mobile banking transactions, the channel is not secure end-to-end and hence there are limits on the amounts that can be transferred using this channel without encryption. Further, the SMS also gets stored in the 'sent items' of handset, including the confidential M-PIN. The customer also needs to know the syntax for doing any transaction through SMS.
- c) As far as the USSD channel is concerned, though it is menu-driven, interactive, user-friendly for transactions, and is available on GSM network (92.77% of the subscribers)⁶ and no information is stored on the handset, the major challenge is that it is not available to the customers on CDMA network. The USSD session per se does not offer any additional security to the transactions other than the basic security available in the GSM channel.
- d) The IVR channel, independent of the handset can be used by all customers – it is menu-driven, interactive and user-friendly, the information does not get stored on handset, services can be offered in multiple languages (beneficial for financial inclusion), the voice prompts and simple numeric inputs making it easier for customers to adapt, etc. However, this channel is again not end-to-end encrypted and the IVR infrastructure has to be built by the banks offering this service, thus involving cost considerations.
- e) The WAP site can be accessed by any handset provided the customer has active data connection.

Cumbersome transaction process

22. In the present scenario, with various banks offering various channels for their customers to undertake mobile banking transactions, the user experience is certainly not uniform across banks / channels. The customer is required to provide different set of inputs (authentication parameters) for each type of access channel, thus making the entire transaction process cumbersome.

23. Currently using IMPS, for effecting a person-to-person funds transfer, the remitting customer can provide details of the beneficiary by providing one of the three identifiers - Mobile number and MMID of the beneficiary; IFSC + Account Number; Aadhaar Number. Since MMID-based input required that the beneficiary should also be registered for mobile banking with his bank, the options of IFSC+Account Number was provided to facilitate the

⁶ The telecommunication tariff (fifty sixth amendment) order 2013 no. 5 of 2013 www.trai.gov.in

customers making inter-bank mobile transactions. From financial inclusion perspective, input of beneficiary's Aadhaar number has also been provided since August 2013.

24. Similarly, a merchant / enterprise, it is difficult to inform customer on how to make the payment, since every bank process is different. Customer education is an issue because of the above.

Coordination with MNOs in mobile banking eco-system

25. In order to offer a more secure and better user experience to their customers through their mobile banking channels, banks need a greater level of coordination with the telecom service providers. Some of these areas are:

- a) For better authentication of the transaction by the bank, MNOs could facilitate the mobile banking transaction by providing the mobile number from where transaction is originated when customers transact using mobile banking application (Currently the mobile number in the header is suppressed).
- b) Greater extension of support by MNOs to all banks for providing USSD services.
- c) Facilitation by the MNOs for banks to offer a more secure mobile banking to their customers through SIM Took Kit (STK) application on SIM card for securing the mobile banking transactions.

Recommendations

26. In order to address the above challenges, a multi-pronged approach with concerted involvement of all stakeholders is necessary. In this context, the following solutions are recommended for addressing the customer acquisition related challenges as well as the technical aspects.

Recommendations for customer enrollment:

- a) The customer may not be required to visit the bank branch for mobile number registration. Alternate channels for mobile number registration may be made available, such as ATM network across banks as well as the BC / agent network using biometric authentication, so that the customer can register the mobile number conveniently. In the case of first time registration of mobile number, appropriate security safeguards may be put in place by the banks.
- b) The mobile number registration process, including the registration form may be made uniform, across all banks, so it helps with uniform customer experience. Social media propagation of the registration process will bring more customers to this channel.
- c) The process of M-PIN generation may also be simplified and standardized without necessitating a visit to the bank branch by the customer, so that the customer can be on-boarded in an easy manner and start transacting using mobile payments, and reduce barriers to entry.

- The customer may be able to set and change his M-PIN from the handset itself using authentication parameters defined by the banks permissible by their security guidelines.
 - The customer may have the facility to set or change the M-PIN from at least one additional channel (apart from mobile handset itself as mentioned in point a above) such as Phone Banking, IVR, ATM, Internet Banking.
- d) M-PIN may be generated from the registered mobile number through secure access channels such as mobile application, SIM STK application by using authentication parameters such as debit card credentials (debit card number, ATM PIN, expiry date) required by bank.
- e) For customers using other channels, M-PIN may be generated through bank's phone banking facility or IVR, or even the ATM channel, after verification of credentials (e.g. mobile number, debit card number, ATM PIN, account number, date of birth, PAN number, details of last transaction, etc). Further, these channels may also be offered as additional channels to those customers who use the mobile application or SIM STK application.

Recommendations for Technical Issues:

- a) Banks may implement multiple channels (application, SMS, USSD etc.) for mobile banking so that options are available to all types of customers with any type of handsets with suitable level of security.
- b) In case of application-based mobile banking, encrypted SMS facility may be provided to all customers as an additional channel so as to enable them to perform transactions in a secured manner, including high value transactions, irrespective of whether data connectivity is available or not.
- c) For facilitating funds transfer using mobile banking, the remitting customer may be facilitated to effect person-to-person funds transfer using just the mobile number and bank or just the Aadhaar number of beneficiary.
- d) Customers may be enabled to use mobile banking service through the use of a single or common USSD number / SMS short/long codes / IVR number / mobile application across all banks. This will facilitate easier customer education and uniform transaction process across all banks.
- e) Limit of unsecured transaction (without end to end encryption) may be raised from the existing Rs.5000/- to Rs.10000/- subject to having certain velocity checks at the bank side. The banks may take the decision of limit enhancement depending on their security policy and internal risk management control measures.
- f) For better authentication of the transaction by the bank, MNOs could facilitate the mobile banking transaction by providing the mobile number from where transaction is originated when customers transact using mobile banking application (Currently the mobile number in the header is suppressed).

The recommendations for other issues relating to USSD and SIM Tool Kit are dealt with in detail in subsequent chapters.

Chapter 2

Mobile Banking : SMS based channel

Introduction

1. SMS is a popular and widely used channel in mobile phones. It is ubiquitously available in all handsets irrespective of make and model and also GSM and CDMA enabled handsets. Most customers are very conversant with the SMS channel and use the same for various services including the short messaging. Many popular mobile VAS services such as Cricket, Jokes, Horoscopes, etc. are based on SMS and used widely by customers.

Current status of SMS-based mobile banking

2. Given the advantages offered by SMS channel, many banks have offered mobile banking services through the SMS channel. This includes non-financial services such as Balance Enquiry, Mini statement, Cheque Book Request, Transaction Alerts, etc., and financial services such as funds transfer, mobile / DTH recharge, Bill payments, etc.

3. In order to avail mobile banking services over SMS, customer needs to send the request with a keyword and parameters to SMS short code or long code number, for e.g. for Balance Enquiry, customer can send SMS BAL to 5667766 (short code) or 9212167766 (long code). The request is sent to the respective bank server, and customer receives the response via SMS. Similarly in order to perform funds transfer using the IMPS platform, customer can send SMS “IMPS <Beneficiary account number> <Beneficiary IFSC> <Amount> <M-PIN> <Remarks>” to bank short code or long code. The request is forwarded to the bank server, the bank server processes the transaction, and sends response to customer via SMS.

Challenges faced

4. Following are some of the challenges faced with SMS channel for mobile banking by the banks:

- a) Customer needs to know the exact syntax of SMS for performing transaction.
- b) The syntax becomes complex when (i) bank adds more transactions which will end up as different keywords and (ii) when more input parameters are needed to complete the transaction. Under these conditions, it is also difficult to communicate and educate the customer to use the syntax.
- c) The SMS channel is not end-to-end encrypted without having an application on the handset to encrypt the entire SMS. There is a transaction limit as per RBI mobile banking guidelines, of Rs 5,000/-⁷ per transaction without end to end encryption.

⁷ Mobile Banking Transactions in India – Operative Guidelines for Banks - <http://www.rbi.org.in/scripts/NotificationUser.aspx?Id=6387&Mode=0>

- d) The SMS remains in the readable form within the sent items on the mobile phone. In case the custody of the customer's handset is obtained, will result into the risk of losing the confidential information to initiate the financial transactions.
- e) The SMS short code or long code for sending SMS transactions is different for each Bank, and needs to be communicated to customer

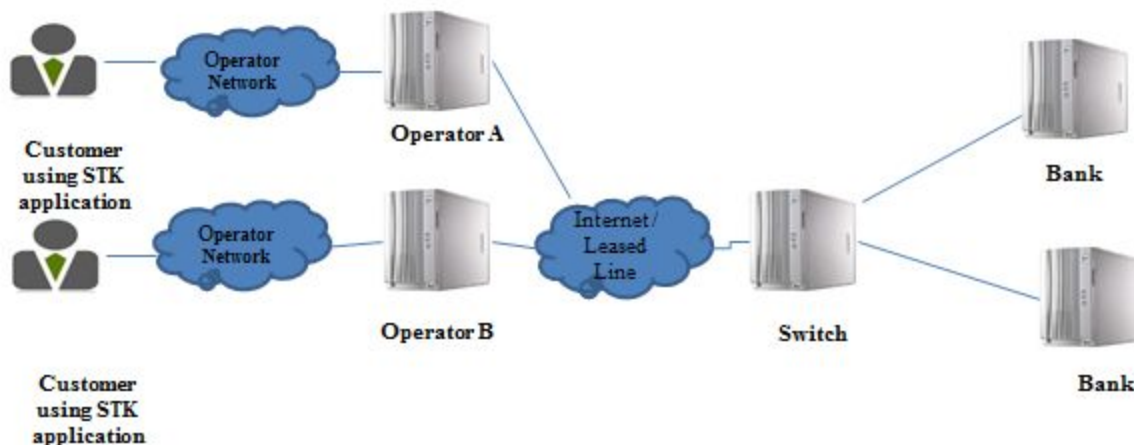
Because of above challenges, the SMS based mobile banking has not picked up adequately, despite the advantages offered by SMS channel.

Recommended solution for SMS based mobile banking channel

5. The solution as envisaged to resolve the above issues is to use the common mobile banking application which will enable the use of encrypted SMS messages for mobile banking transactions:

- a) The common mobile banking application preferably using STK (SIM Tool Kit) application for mobile banking.
- b) This common application may be standard menu-driven and interactive, and can be used by all banks so that users can perform transactions conveniently without the need to remember or know the SMS syntax.
- c) The STK application encrypts the SMS before sending, so as to ensure end-to-end security, and can be used for transactions of higher values.
- d) User does not need to know the SMS short code or long code number, the STK application will encapsulate that information and send encrypted SMS to pre-defined number.

Common STK application architecture



The detailed description of the infrastructure requirements for the common STK solution is given the subsequent chapter on technical solutions.

Chapter 3

Mobile Banking-USSD based channel

Introduction:

1. Unstructured Supplementary Service Data (USSD) is a protocol used by GSM cellular telephones to communicate with the telecom service provider's systems. USSD can be used for WAP browsing, prepaid callback service, mobile-money services, location-based content services, menu-based information services, and as part of configuring the phone on the network.

2. USSD messages are up to 182 alphanumeric characters in length. Unlike Short Message Service (SMS) messages, USSD messages create a real-time connection during a USSD session. The connection remains open, allowing a two-way exchange of a sequence of data. This makes USSD more interactive and advantageous than services that use SMS.

Advantages of USSD:

3. The USSD platform which is MNO dependent can be efficiently used by the mobile banking platforms due to the following advantages:

- a) USSD works on all GSM phones irrespective of make, model or service provider – thus all phones including low end phones are capable of handling this.
- b) It does not require any application/software to be downloaded to the handset.
- c) It is interactive in nature – and thus enables complex transactions as well which may not be possible through SMS.
- d) It is a session based communication i.e. it does not store any data on the phone and transaction terminates as the session end.
- e) USSD utilizes the same capability as the voice calls hence has the coverage most of the parts of the country having GSM voice call coverage.
- f) It is safer and much faster than traditional SMS based transactions (recent TRAI guidelines on Quality of Service indicates two seconds as acceptable response time requirement for the USSD session^{8 9}).
- g) It can support multiple languages which is very useful for effective financial inclusion roll out.

Current Status of USSD Implementation

4. Realizing the benefits and potential of USSD based mobile banking, some of the banks have launched USSD based mobile banking services e.g. State Bank of India, Canara Bank, ICICI Bank, with the help of telecom aggregators who in turn have tied up with few MNOs. For

⁸ TRAI – The Mobile Banking (Quality of Service) (Amendment) Regulations, 2013 (13 of 2013) dated 26th Nov 2013 - <http://www.trai.gov.in/Content/RegulationUser.aspx?id=0&qid=3>

⁹ TRAI – The Mobile Banking (Quality of Service) Regulations, 2012 (8 of 2012) dated 17th April, 2012 - http://www.trai.gov.in/Content/Regulation_Version.aspx?REG_ID=111&id=0&qid=0

instance, ICICI Bank has tied up with Idea, Aircel, Tata Docomo, Reliance and MTNL for offering USSD platform to its customers on their GSM network.

5. National Payments Corporation of India (NPCI) has implemented the common USSD gateway with the single short code *99# to offer the USSD channel of mobile banking for all banks. Even though a large number of banks are participating in the common USSD gateway, only two MNOs are operational which is limiting the use of the services being extended to all bank customers.

TRAI regulations and initiatives on USSD channel to be available for mobile banking

6. The Inter-Ministerial Group (IMG) was constituted on November 19, 2009 to work out the relevant norms and modalities for introduction of mobile based delivery model for delivery of basic financial services and to enable finalization of a framework to allow financial transactions using mobile phones.

7. The IMG had, among other things, recommended that TRAI may draw up guidelines to ensure high availability of associated communication services in mobile banking. Accordingly, based on a consultation with stakeholders, TRAI had issued the ***Mobile Banking (QOS) Regulations, 2012 on April 17, 2012***. Broadly, these regulations mandated that the access providers (telecom companies) shall, among others, (a) facilitate banks to use SMS, USSD and IVR to provide banking services to its customers (b) deliver the message generated by the bank or the customer within the time frame specified (within the response time of less than 10 seconds for SMS, IVR, WAP and STK, and in less than 2 seconds for USSD); the expiry time for SMS was stated to be 72 hours (c) ensure that the customer is able to complete the transaction in not more than two stage transmission of the message in all cases (d) maintain the record of mobile banking messages for six months for audit purposes.

8. Subsequently, the above regulations were extended (on November 26, 2013) to include authorized agents of banks acting as the aggregation platform providers to use SMS, USSD and IVR to provide banking services. Similarly, since it was realized that completion of transaction in two stages may not be possible for every kind of transaction on a mobile banking menu, the matter was examined and TRAI has increased the completion stages to five stages (from the earlier two stages).

9. The IMG framework envisages opening of the mobile-linked 'no-frills' accounts, which would be operated using mobile phones and the customer would be able to perform five basic transactions – cash deposit, cash withdrawal, balance enquiry, transfer of money from one mobile-linked account to another, and transfer of money to a mobile-linked account from a regular bank account.

10. The mobile banking ecosystem comprises of two distinct sectors – the financial services sector and the telecom sector – both of who are governed by two separate sets of regulations. In order to make financial transactions available for the unbanked population,

USSD-based mobile channels can be effectively deployed, as has already been launched by certain banks like SBI, Canara Bank, ICICI Bank in partnerships with some telecom service providers.

11. The final outcome is that TRAI^{10 11} has mandated that a pay-per-use charge within the ceiling tariff of Rs.1.50 per USSD session would be payable by the subscriber upon establishment of an outgoing USSD session, regardless of whether the session results in a successful or a failed banking transaction.

Recommendations: The way forward for USSD

12. The USSD channel based offering of mobile banking services may take following paths in future:

Bank-specific USSD offering

13. The recent TRAI guidelines, it is open to banks to tie up with MNOs to offer these services directly to their customers by getting into arrangements with each of the MNOs. This may be done by the bank with each of the MNO or their service providers. With this, the customer dialing the USSD code will reach the bank's own menu, and the transactions will be routed to the bank directly by MNO. However, in such cases, this facility is extended only to bank customers who are also the subscribers of those MNOs with whom the bank has tied up for USSD channel.

Implementation of common USSD gateway for mobile banking

14. To overcome the challenges faced by each bank in tying up with a large number of MNOs, and to facilitate the reach and usage of mobile banking through USSD, there is a need for common USSD gateway for mobile banking. A common USSD Gateway based mobile banking service offers an opportunity to provide convenient, cost effective and user friendly payment option for all customers and thus a very convenient mechanism for banks for furthering financial inclusion objectives of Government of India.

15. The committee also recommends that the implementation of the TRAI regulations must be expedited by all the stakeholders.

Benefits of a common USSD gateway

16. It will offer a common platform for all banks thus eliminating the need for banks to establish individual infrastructure for this channel. Common USSD short code e.g. *99# can be used by customers, merchants, and agents for performing mobile banking transactions.

17. Customers can avail following standard menu and transaction services through common USSD gateway to perform operations such as generation and changing the M-PIN, person to

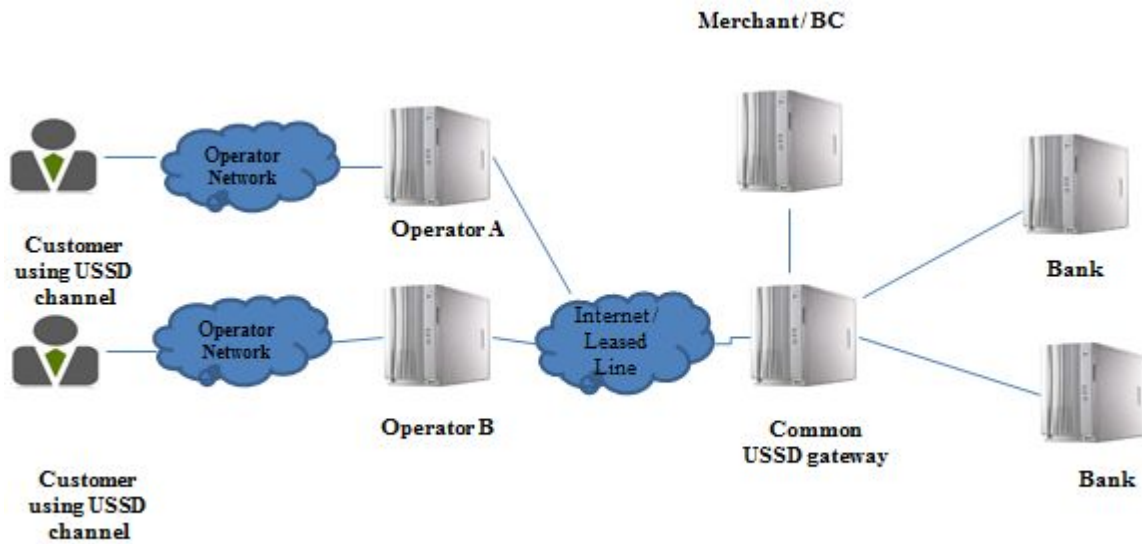
¹⁰TRAI Press Release on Tariff for USSD and Mobile Banking (Quality of Service) Regulations, 203 - <http://www.trai.gov.in/WriteReadData/WhatsNew/Documents/PR%20-%20USSD%20based%20mobile%20banking%20services-New26112013.pdf>

¹¹TRAI – The Telecommunication Tariff (Fifty Sixth Amendment) Order, 2013 dated 26th Nov 2013 - <http://www.trai.gov.in/Content/RegulationUser.aspx?id=0&qid=2>

person funds transfer transactions as well as merchant payments, other banking services such as Balance Enquiry, Mini Statement, Cheque Book Request, etc., value added services such as Mobile top-up, DTH top-up, Bill Payments etc., other transactions including OTP Generation, Mandate Creation etc.

18. The merchants can also benefit from initiating USSD payment message to receive payments from customer (using just customer mobile number and bank) on common USSD platform

Common USSD gateway architecture



Chapter 4

Mobile Banking-Application based

Introduction

1. All banks who have received the approval from RBI for mobile banking are offering the application-based mobile banking channel to their customers. Customers can download the mobile banking application and perform variety of services including the following:

- a) Non-financial transactions such as Balance Enquiry, Mini statement, Cheque Book request
- b) Financial transactions such as Funds transfer, mobile / DTH recharge, bill payments, etc

2. The mobile application is offered on various platforms such as Java, Symbian, Blackberry OS, Windows, Android, Apple iOS, etc. Many Banks have made the mobile application available in the app stores such as Google, Apple, Blackberry, etc for easy search and download by the customers.

Advantages of the application based mobile banking

3. Following are the advantages of the application based mobile banking,

- a. Applications once downloaded are easy to use for the customers who are proficient in using the smart phone based applications.
- b. Banks have made these applications compliant with most of the latest operating systems covering the large range of smart phones in use.
- c. It has been experienced by the banks that once customer has used the application-based mobile banking, he continues to use the same unless there is a change of the handset and/or mobile number.
- d. The application-based mobile banking can also communicate using SMS and GPRS (Data) channels with the mobile banking system of the bank.

Challenges faced of the application based mobile banking

4. Following are some of the challenges faced with application-based channel for mobile banking by the banks:

- a) Banks need to develop and test the application on the variety of handsets and operating system version combinations (in excess of 1,000 combinations). It is very difficult for banks to develop, test and roll out such an initiative for mobile banking services

- b) Customer needs to have compatible handset for download and installation of mobile application which is normally communicated to the customers by means of bank website
- c) Customer needs to have GPRS subscription in order to download application and perform transactions
- d) In case of any enhancement or change, customer needs to upgrade the application

Because of the above challenges, the application-based mobile banking has not picked up to the desired levels.

Recommended solution

5. Following are some of the recommended solutions

- a. Common application for mobile banking may be standardized across all banks and having minimum required transaction set for all banks. This would also facilitate in educating the bank customers.
- b. Mobile banking application may allow transaction over SMS, USSD and GPRS channels also. (The mobile banking application may encrypt the SMS before sending, so that it is end-to-end secure, even for transaction of higher value.)
- c. This application can be used by any user (customers, merchants, agents) irrespective of the bank with which they have an account

6. Customers can avail the standard menu and transaction services through common mobile application which includes operations such as Generation and changing M-PIN, person to person funds transfer using only mobile number, banking services such as Balance Enquiry, Mini Statement, Cheque Book Request, etc., merchant payments, value added services such as Mobile top-up, DTH top-up, Bill Payments etc.

Benefits of Common mobile application

7. All the challenges in point 4 above can be overcome by common mobile banking application

Recommendations – Application based mobile banking

8. The Common mobile application may be developed and distributed (refer chapter 5) which may have standard common menu containing the minimum and most required transaction set.

Chapter 5

Mobile Banking –Technical Solutions & the way forward

Introduction

1. In order to leverage upon the mobile density in the country and to make the vision of mobile banking as a channel for financial inclusion, it is imperative to explore new and more cost effective solutions for mobile banking. The Technical Committee formed by RBI was advised to evaluate and analyse the options/alternatives including the feasibility of using encrypted SMS/USSD based mobile banking.

2. The broad terms of reference of this Committee were as follows:

- a) Conduct in-depth study of the challenges faced by the Banks in taking mobile banking forward to desired level
- b) Study the challenges faced by banks in introducing USSD channel and suggest solutions, if any, to take this forward
- c) Consider the advantages / challenges of having a single application across all handsets in an SMS encrypted environment
- d) Any other optimum solution that would make mobile banking ubiquitous in the country
- e) Draw up a road-map for implementation of the solutions recommended

3. There is no gain-saying the fact mobile banking is an ideal solution to accelerate financial inclusion in terms of Availability, Accessibility and Affordability and as such it needs to be integrated to the banks' business and operating models. Increasing the adoption of Mobile banking would help the objective of less cash society with huge benefits to all stakeholders. Hence, banks ought to redesign their business and operating process to accelerate the adoption of Mobile banking, with process change being a critical success factor. The potential of mobile banking is of epic proportions and with right kind of investments in awareness / education, the adoption of mobile banking would gain traction.

4. Accordingly, in line with its mandate, the committee has outlined below some of the technical solutions which, when implemented by banks and MNOs, would facilitate faster and effective adoption of mobile banking in the country. These technical solutions include:

- a. Platform: Common USSD gateway (as explained in chapter 3)
- b. STK:
 - i. MNOs or SIM manufacturer burning the common mobile banking application (to be developed) in all the new SIMs to be distributed in India.

- ii. MNOs transmitting the common mobile banking application over the air (OTA) using dynamic STK facility for existing SIMs.
- c. Application: Common application development and burn on the every new handset sold in India
- d. Application: Common application development and distribution by third parties

5. While the first option deals with development of a common technical platform to facilitate connectivity between multiple banks and multiple MNOs (thus providing the benefit of network effect to the banks' mobile banking customers), the second options / solutions essentially deal with the distributional aspects of the secure solution by means of STK to the end-users. The actual development of the application could be done by any third party solution provider.

6. Following are the distribution mechanisms of the secure mobile banking application to the customers:

STK application on Operator SIM

7. STK application can be embedded on operator SIM and can be distributed to customers by the MNOs. Keys necessary for encryption are stored in the SIM. Transmission of data can be either SMS or GPRS (data) channel. STK application on operator SIM can be used by any customer, irrespective of handset. The STK application can be standard menu-driven, interactive and user-friendly.

Advantages:

- a) Supports all standard phones and SIMs
- b) Secure SMS and data communication channels usage
- c) Customers, merchants, BC agents of any bank can transact through this interface.

Challenges:

- a) For the existing SIMs the operator needs to support the dynamic STK so that the application can be downloaded over the air (OTA) which is technically feasible but may be difficult for the older version of the SIM's. The space availability on the older SIM cards needs to be examined.

Mobile banking application: development and distribution by third parties

8. Mobile banking application can be developed and distributed to customer by trusted third parties, MNOs and handset manufacturers / resellers. Transmission of data shall be through SMS or GPRS channel. Banks / agents need to publish the public keys which can be used by the third parties to encrypt the data. Keys necessary for encryption are stored in the mobile application. The application can be simple, menu-driven, interactive, and user-friendly.

9. The mobile application (multi-bank application) can be developed and distributed by large corporates, third party players, MNOs and handset manufacturers / resellers. MNOs can burn the STK in the new SIMs with common mobile banking application or send the STK over the air for existing SIMs provided such SIMs are technically compatible to receive such STK over the air.

10. Third parties for e.g. LIC, Railways, MNOs, handset manufacturers / resellers who provide goods or services on credit / hire-purchase can develop and deploy such applications. They can build value added services such as reminders for bill payments, and may even advertise/cross sell for other products.

The advantages are as follows:

- a) For large merchants, this shall offer uniform experience across all customers having different banking relationship
- b) Customers can use the single interface for the multiple banking relationship
- c) Secure transactions and can use SMS and GPRS channels seamlessly with enhanced transaction limits

Recommendations – Mobile banking – Technical Solutions

11. Banks and MNOs may initiate pilots using white-label multi – bank STK application which can be distributed through application on SIM that allows SMS encryption. Customers, merchants, agents of any bank can transact through this interface.

12. MNOs may support,

- a. Application loading on new SIMs – Single mobile banking application may be made available all new SIMs which uses encrypted SMS for transaction processing.
- b. Application loading on existing SIMs – Single mobile banking application may be made available across all existing SIMs in SMS encrypted environment through dynamic STK and the common mobile banking application can be pushed over-the-air.

13. The large corporates, third party players and MNOs, handset manufacturers / resellers may initiate pilot programs to develop the single multi-bank mobile banking applications which can use published public keys of the banks / banks' agents for encryption. The common application may be developed by reputed organizations having successful track record in this field.

14. Similarly, the common application may be pre-loaded in the handset – the mandate to be issued by Govt. of India to all handset manufacturers / resellers in India. Handset manufacturers to burn the mobile banking application on all new handsets.

Chapter 6

Mobile Banking- Summary of Recommendations

Introduction

1. The developments in mobile telephony as also the mobile phone density in the country, with over 870 Mn mobile phone subscribers, presents a unique leverage to meet the objectives and challenges of financial inclusion. By harnessing the potential of mobile penetration, large sections of the un-banked and under-banked society can be empowered to become inclusive through the use of electronic payments. In order to address the above challenges, a multi-pronged approach with concerted involvement of all stakeholders is necessary. In this context, the following solutions are recommended for addressing the customer acquisition related challenges as well as the technical aspects.

Recommendations for customer enrollment:

2. To simplify the customer adoption for mobile banking

- a) The customer may not be required to visit the bank branch for mobile number registration. Alternate channels for mobile number registration may be made available, such as interoperable ATM network across banks as well as the BC / agent network using biometric authentication, so that the customer can register the mobile number conveniently. In the case of first time registration of mobile number, appropriate security safeguards may be put in place by the banks.
- b) The mobile number registration process, including the registration form may be made uniform, across all banks, so it helps with uniform customer experience. Social media propagation of the registration process will bring more customers to this channel.
- c) The process of M-PIN generation may also be simplified and standardized without necessitating a visit to the bank branch by the customer, so that the customer can be on-boarded in an easy manner and start transacting using mobile payments, and reduce barriers to entry.
 - o The customer may be able to set and change his M-PIN from the handset itself using authentication parameters defined by the banks permissible by their security guidelines.
 - o The customer may have the facility to set or change the M-PIN from at least one additional channel (apart from mobile handset itself as mentioned in point a above) such as Phone Banking, IVR, ATM, Internet Banking.
- d) M-PIN may be generated from the registered mobile number through secure access channels such as mobile application, SIM STK application by using authentication

parameters such as debit card credentials (debit card number, ATM PIN, expiry date) required by bank.

- e) For customers using other channels, M-PIN may be generated through bank's phone banking facility or IVR, or even the ATM channel, after verification of credentials (e.g. mobile number, debit card number, ATM PIN, account number, date of birth, PAN number, details of last transaction, etc). Further, these channels may also be offered as additional channels to those customers who use the mobile application or SIM STK application.
- f) Customer may be able to make merchant payment using just his mobile number and M-PIN/OTP on the merchant interface. The M-pin can be only interfaced on acquiring bank's interface such as USSD, Application etc. for security reasons. The merchant based interfaces can accept OTP (One-Time Password) for authentication.
- g) Every bank may offer OTP services on SMS request with the standard syntax of SMS such as "MOTP XXXXXX" to the short or long code. (XXXXXX – last 6 digits of the account number). This will help to expand the use of OTP in mobile payments.
- h) The committee feels for effective and efficient implementation of providing mobile banking facilities to the customers it is imperative that the banks staff is well versed and thoroughly trained in various aspects of the mobile banking. For this workshop may be conducted for top officials including the chief executive of the banks; training program may be conducted during induction programs and probationary officer courses. Banks may also periodically conduct refresher courses to ensure staff is abreast with latest developments in these fast paced technology areas in mobile banking.
- i) The committee also feels banks must continue to invest in handholding and educating customers to increase the awareness of various aspects of mobile banking. Banks collectively may invest in marketing and advertising for widespread promotion of mobile banking.

(It is proposed that above recommendations may be acted upon within 6 to 12 months)

Recommendations for Technical Issues:

3. To address the technical issues the following course of action is recommended
 - a) Banks may implement multiple channels (application, SMS, USSD etc.) for mobile banking so that options are available to all types of customers with any type of handsets with suitable level of security.
 - b) In case of application-based mobile banking, encrypted SMS facility may be provided to all customers as an additional channel so as to enable them to perform transactions in a secured manner, including high value transactions, irrespective of whether data connectivity is available or not.

- c) For facilitating funds transfer using mobile banking, the remitting customer may be facilitated to effect person-to-person funds transfer using just the mobile number and bank or just the Aadhaar number of beneficiary.
- d) Customers may be enabled to use mobile banking service through the use of a single or common USSD number / SMS short/long codes / IVR number / mobile application across all banks. This will facilitate easier customer education and uniform transaction process across all banks.
- e) Limit of unsecured transaction (without end to end encryption) may be raised from the existing Rs.5000/- to Rs.10000/- subject to having certain velocity checks at the bank side. The banks may take the decision of limit enhancement depending on their security policy and internal risk management control measures.
- f) For better authentication of the transaction by the bank, MNOs could facilitate the mobile banking transaction by providing the mobile number from where transaction is originated when customers transact using mobile banking application (Currently the mobile number in the header is suppressed).

(It is proposed that above recommendations may be acted upon within 6 to 12 months)

Recommended solution for SMS based mobile banking channel

4. The solution as envisaged to resolve the above issues is to use the common mobile banking application which will enable the use of encrypted SMS messages for mobile banking transactions:

- a) The common mobile banking application preferably using STK (SIM Tool Kit) applications for mobile banking.
- b) This common application may be standard menu-driven and interactive, and can be used by all banks so that users can perform transactions conveniently without the need to remember or know the SMS syntax.
- c) The STK application encrypts the SMS before sending, so as to ensure end-to-end security, and can be used for transactions of higher values.
- d) User does not need to know the SMS short code or long code number, the STK application will encapsulate that information and send encrypted SMS to pre-defined number.

Recommendations: The way forward for USSD

5. The committee also recommends that the implementation of the TRAI regulations must be expedited by all the stakeholders.

Bank-specific USSD offering

6. The recent TRAI guidelines, it is open to banks to tie up with MNOs to offer these services directly to their customers by getting into arrangements with each of the MNOs. This may be done by the bank with each of the MNO or their service providers. With this, the customer dialing the USSD code will reach the bank's own menu, and the transactions will be routed to

the bank directly by MNO. However, in such cases, this facility is extended only to bank customers who are also the subscribers of those MNOs with whom the bank has tied up for USSD channel.

Implementation of common USSD gateway for mobile banking

7. To overcome the challenges faced by each bank in tying up with a large number of MNOs, and to facilitate the reach and usage of mobile banking through USSD, there is a need for common USSD gateway for mobile banking. A common USSD Gateway based mobile banking service offers an opportunity to provide convenient, cost effective and user friendly payment option for all customers and thus a very convenient mechanism for banks for furthering financial inclusion objectives of Government of India.

(It is proposed that above recommendations may be acted upon within 12-18 months)

Recommendations – Application based mobile banking

8. The Common mobile application may be developed and distributed (refer chapter 5) which may have standard common menu containing the minimum and most required transaction set.

Recommendations – Mobile banking – Technical Solutions

9. Following technical solutions are recommended

- a) Banks and MNOs may initiate pilots using white-label multi – bank STK application which can be distributed using application on SIM that allows SMS encryption. Customers, merchants, agents of any bank can transact through this interface.
- b) MNOs may support,
 - o Application loading on new SIMs – Single mobile banking application may be made available all new SIMs which uses encrypted SMS for transaction processing.
 - o Application loading on existing SIMs – Single mobile banking application may be made available across all existing SIMs in SMS encrypted environment through dynamic STK and the common mobile banking application can be pushed over-the-air.
- c) The large corporates, third party players and MNOs, handset manufacturers / resellers may initiate pilot programs to develop the single multi-bank mobile banking applications which can use published public keys of the banks / banks' agents for encryption. The common application may be developed by reputed organizations having successful track record in this field.

Similarly, the common application may be pre-loaded in the handset – the mandate to be issued by Govt. of India to (a) all handset manufacturers / resellers in India. Handset manufacturers to burn the mobile banking application on all new handsets (b) to MNOs requiring them to either burn the STK in the new SIMs with common mobile banking application or send the STK over the air for existing SIMs provided such SIMs are technically compatible to receive such STK over the air.

(It is proposed that above recommendations may be acted upon within 12-18 months)

ANNEX 1**Names of members of the RBI Technical Committee for Mobile Banking**

S.No.	Name	
1	Mr B. Sambamurthy Director, IDRBT	Chairman
2	Mr Pulak Kumar Sinha General Manager – Payment Systems, State Bank of India	Member
3	Mr Rahul Joshi Joint General Manager – Mobile Banking and Payments, ICICI Bank	Member
4	Mr Anand Rao Vice President – Alternate Delivery Channels, Axis Bank	Member
5	Mr Dilip Asbe Chief Operating Officer, National Payments Corporation of India	Member
6	Mr Anthony Thomas Chief Information Officer, Vodafone India	Member
7	Mr C. N. Ram Ex - Chief Information Officer, HDFC Bank	Member
8	Mr Pravir Vohra Ex – President and Group – Chief Technology Officer, ICICI Bank	Member
9	Mr Vijay Chugh, Chief General Manager, Department of Payment and Settlement Systems, Reserve Bank of India	Member Secretary