



Banking by the use of handheld devices & gadgets like Smart-phones, Tablets (Using Banking Applications & Widgets that are Based on Mobile Operating Systems like Android etc)

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ABSTRACT: In the last few years the consumers in India have used 2.5G cellular technology to access the internet using technologies like GPRS, Edge etc and the consumers have begun to realize the power of having Internet access anywhere in the world. With these technologies people are now able to access their bank accounts using their cell phones. A third of mobile phone users say that they may consider performing some kind of financial transaction through their mobile phone. But most of the users are interested in performing basic transactions such as querying for account balance and making bill payment. The paper discusses the various ways of using mobile banking on smart phones, tablets etc & the future applications.

I. INTRODUCTION

In the last few years the consumers have used 2.5G cellular technology to access the internet using technologies like GPRS, Edge etc and the consumers have begun to realize the power of having Internet access anywhere in the world. With these technologies people are now able to access their bank accounts using their cell phones. Based on a survey conducted by Forrester, mobile banking will be attractive mainly to the younger, more "tech-savvy" customer segment. A third of mobile phone users say that they may consider performing some kind of financial transaction through their mobile phone. But most of the users are interested in performing basic transactions such as querying for account balance and making bill payment.

Mobile banking / M-Banking / SMS Banking etc is a term used for performing balance checks, account transactions, payments etc. via a mobile device such as a mobile phone. Mobile banking today is most often performed via SMS or the Mobile Internet.

II. MODES OF MOBILE BANKING

Mobile banking enables the bank's existing customers to be directed to use the mobile channel for banking and payment transactions through the following modes:

* Phone banking leveraging the bank's Tele-banking

*Mobile banking facility requested by sending SMS request in prescribed format

*Browser-based mobile banking –By registering for mobile banking through the bank's Internet banking site

*Downloadable-client based mobile banking

A. Phone banking leveraging the bank's Tele-banking– This allows mobile banking via the IVR Technology or via the banks call center.

B. Mobile Banking via SMS: Mobile banking facility using SMS request started with SMS Alerts & graduated to sending SMS in prescribed format in a specific sequence do complete a banking task.

This module empowers customers to subscribe and receive alerts on multiple channels such as e-mail, SMS, voice, fax and Internet. It enables the customer to subscribe to alerts and choose a delivery channel. The module also allows the customer to set preferences for alerts and configure 'do not disturb' timings. The module supports the following:

- Personalized alerts
- Alerts from multiple back-end systems
- Batch or real-time alerts
- Alerts digest

Some banks also provide the facility of Mobile Banking Alerts where you can get regular updates of transactions in your account as they happen. These include: -Credits to your account (you choose a threshold credit amount, above which you'd like to be alerted)

-Debits to your account (you choose a threshold debit amount, above which you'd like to be alerted)
 -Cheque returned (Get to know every time a cheque deposited in your account is returned).

A specific sequence of SMS messages will enable the system to verify if the client has sufficient funds in his or her wallet and authorize a deposit or withdrawal transaction at the agent. When depositing money, the merchant receives cash and the system credits the client's bank account or mobile wallet. In the same way the client can also withdraw money at the merchant: through exchanging sms to provide authorization, the merchant hands the client cash and debits the merchant's account.

Example of Mobile Banking through SMS [1]: Mobile Banking with SMS is conducted through SMS codes sent to a particular number as directed by your bank. You will receive the response in the form of a text message on your mobile phone screen within a few seconds. For example to get details of your HDFC bank account you will use codes like HDFCBAL, HDFCTXN, HDFCSTM, HDFCSTP<6 digit cheque no.>, etc. for balance enquiry, last transaction details, account statement, stop cheque payment etc. respectively. It works in this manner that the message sent by you travels from your mobile phone to the SMS Centre of the Cellular Service Provider, and from there it travels to the Bank's systems. The information is retrieved and sent back to your mobile phone via the SMS Centre, all in a matter of a few seconds.

C. Browser-based mobile banking:

Mobile Banking also offers various functionalities for consumer and corporate banking leveraging GPRS or WAP-based transmission. An indicative list of features is:

- Account management and requests
- Bill payments, Local payments and transfers
- Transaction approvals for corporate customers
- Merchant payments and reversals for POS, telephonic or internet-based purchase transactions
- Support for administrative tasks like secure mails to relationship manager, approvals, password change, data synchronization and self-audit

Mobile banking solution empowers retail and corporate banking customers with access to banking services through SMS and GPRS/WAP-enabled handsets, leveraging a single platform. It offers both mobile commerce (m-commerce) and mobile

payments within the DNA of mobile banking, with built-in support for merchant-initiated payments and reversals, in addition to customer-initiated payments and reversals. Leveraging recent technological advances in the mobility space, the mobile banking solution empowers banks with the means to innovate by easily deploying new services, with improved time to market.

SBI Freedom [1] – Your Mobile Your Bank

Away from home, bills can be paid or money sent to the loved ones or balance enquiries done anytime 24 x 7!!! That is what SBI Freedom offers -convenience, simple, secure, anytime and anywhere banking.

The service is presently available on java enabled mobile phones over SMS/ GPRS/ WAP as also non java phones with GPRS connection. The service can be availed over the free GPRS facilities offered by various mobile service providers. The services for other non-Java mobile phones are under development and will be offered using Unstructured Supplementary Services Data (USSD).

The following functionalities will be provided in the Phase I:

- a. Funds transfer (within and outside the bank –using NEFT)
- b. Enquiry services (Balance enquiry/ Mini statement)
- c. Request services (cheque book request)
- d. Bill Payment (Utility bills, credit cards)
- e. M Commerce (Mobile Top Up, Merchant payment, SBI life insurance premium)

D. Downloadable-client based mobile banking:

With 3G telephony entering the Indian market this 2011 and also the smart-phones becoming cheaper with the entry of Android OS based smart phones & tablets, we will see new banking applications from bank in form of special programs called Rich Clients downloaded to the mobile device and installed, it embeds the Banking option on your device menu. Such Mobile banking solution can service both retail and corporate consumers including the SME customer segment of banks.

Smartphone- It is a mobile phone that offers more advanced computing ability and connectivity than a contemporary basic feature phone. Smartphone's may be thought of as handheld computers integrated within a mobile telephone.

A Smartphone can be considered as a Personal Pocket Computer with mobile phone functions, because these devices are mainly computers, although much smaller than a desktop computer. Additionally a Personal Pocket Computer is more personal than a desktop computer.

Smartphone run complete operating system software providing a platform for application developers. A Smartphone usually allows the user to install and run more advanced applications such as email, office applications etc. Growth in demand for advanced mobile devices boasting powerful processors, abundant memory, good camera, larger screens, and open operating systems has outpaced the rest of the mobile phone market for several years.

Examples of smart phones are Apple's iPhone 4, Nokia's N-8, Motorola's Droid, Samsung's Galaxy S, LG's Optimus, Blackberry's Torch & HTC Hero.

Tablet personal computer (tablet PC)

It is a portable personal computer equipped with a touch screen as a primary input device and designed to be operated and owned by an individual. Tablets may use virtual keyboards and handwriting recognition for text input through the touch screen. All tablet personal computers have a wireless adapter for Internet and local network connection. Software applications for tablet PCs include office suites, web browsers, games and a variety of applications. However, since portable computer hardware components are low powered, demanding PC applications may not provide an ideal experience to the user.

Examples of popular tablets are Apple iPad, Samsung's Galaxy Tab, Blackberry's Playbook, Dell's Streak etc.

Open source Mobile Operating system

Operating systems that can be found on Smartphone's include Nokia's Symbian, Google's Android, Apple's iOS, RIM's BlackBerry OS, Microsoft's Windows Phone, Linux, Palm/HP's WebOS, Samsung's Bada, Nokia's Maemo and MeeGo among many others. Android, Bada, WebOS and Maemo are built on top of Linux, and iOS is derived from the BSD and NeXTSTEP operating systems, which are all related to Unix.

The open source mobile OS are Apple iOS, Nokia's MeeGo, Google's Android etc.

Apple's iOS

Apple's iOS runs on iPhone & recently introduced the iPad in 2010 which re-invigorated the tablet computer market. The device is similar to the iPhone and larger, it is capable of accessing the web, viewing photos and videos, gaming, word processing and printing wirelessly, reading with eBooks and subscribing to newspapers and magazines. The latest version is iOS 4.

Nokia's Maemo and MeeGo

Nokia entered the tablet space with the Nokia 770 running Maemo, a Debian-based Linux distribution custom-made for their Internet Tablet line. The product line continued with the N900 which is the first to add phone capabilities. Intel co-developed the lightweight Moblin operating system following the successful launch of the Atom CPU series on netbooks.

MeeGo is a new operating system developed by Intel and Nokia supports Netbooks, Smartphones and Tablet PCs. In 2010, Nokia and Intel combined the Maemo and Moblin projects to form MeeGo.

Google's Android (operating system) and Chrome OS

Android is a mobile operating system initially developed by Android Inc. Android was bought by Google in 2005. Android is based upon a modified version of the Linux kernel. Google and other members of the Open Handset Alliance (A consortium of 79 hardware, software, and telecom companies devoted to advancing open standards for mobile devices.) collaborated on Android's development and release. The Android Open Source Project (AOSP) is tasked with the maintenance and further development of Android. Unit sales for Android OS smart phones ranked first among all smart phone OS handsets sold in the world.

Android has a large community of developers writing application programs ("*apps*") that extend the functionality of the devices. There are currently over 200,000 apps available for Android. Android Market is the online app store run by Google, though apps can be downloaded from third party sites. Developers write primarily in the Java language, controlling the device via Google-developed Java libraries. Python, Ruby and other languages are also available for

Android development via the Android Scripting Environment. Google released most of the Android code under the Apache License, a free software and open source license. The Android operating system software stack consists of Java applications running on a Java based object oriented application framework on top of Java core libraries running on a Dalvik virtual machine featuring JIT compilation. Libraries written in C include the surface manager, OpenCore media framework, SQLite relational database management system, OpenGL ES 2.0 3D graphics API, WebKit layout engine, SGL graphics engine, SSL, and Bionic libc. The Android OS can be used as an operating system for cell phones, net books and tablets, including the Dell Streak, Samsung Galaxy Tab and other devices. The world's first TV running Android, called Scandinavia, has also been launched by the company People of Lava.

Software development on android using Software development kit

The Android software development kit (SDK) includes a comprehensive set of development tools. These include a debugger, libraries, a handset emulator (based on QEMU), documentation, sample code, and tutorials. Currently supported development platforms include computers running Linux (any modern desktop Linux distribution), Mac OS X 10.4.9 or later, Windows XP or later. The officially supported integrated development environment (IDE) is Eclipse (currently 3.4 or 3.5) using the Android Development Tools (ADT) Plugin, though developers may use any text editor to edit Java and XML files then use command line tools (Java Development Kit and Apache Ant are required) to create, build and debug Android applications as well as control attached Android devices (e.g., triggering a reboot, installing software package(s) remotely). Android applications are packaged in .apk format and stored under /data/app folder on the Android OS (the folder is accessible to root user only for security reasons). APK package contains .dex files (compiled byte code files called Dalvik executable), resource files, etc.

Mobile Banking Services that can be offered on smart phones, tablets etc via applications & widgets are: Account Information

1. Mini-statements and checking of account history
2. Alerts on account activity or passing of set thresholds
3. Monitoring of term deposits
4. Access to loan statements
5. Access to card statements

6. Mutual funds / equity statements
7. Insurance policy management
8. Pension plan management
9. Status on cheque, stop payment on cheque
10. Ordering check books
11. Balance checking in the account
12. Recent transactions
13. Payment Due date (functionality for stop, change & deleting of payments)
14. PIN provision, Change of PIN and reminder over the Internet
15. Blocking of (lost, stolen) cards

Payments, Deposits, Withdrawals, and Transfers

1. Domestic and international fund transfers
2. Micro-payment handling
3. Mobile recharging
4. Commercial payment processing
5. Bill payment processing
6. Peer to Peer payments
7. Withdrawal at banking agent
8. Deposit at banking agent

Especially for clients in remote locations, it will be important to help them deposit and withdraw funds at banking agents, i.e., retail and postal outlets that turn cash into electronic funds and vice versa. The feasibility of such banking agents depends on local regulation which enables retail outlets to take deposits or not.

Investments

1. Portfolio management services
2. Real-time stock quotes
3. Personalized alerts and notifications on security prices
4. mobile banking

Support

1. Status of requests for credit, including mortgage approval, and insurance coverage
2. Check (cheque) book and card requests
3. Exchange of data messages and email, including complaint submission and tracking
4. ATM Location

Content Services

1. General information such as weather updates, news
2. Loyalty-related offers
3. Location based services

Mobile Banking Software Example

Infosys technologies have developed a solution ¹MConnect that is an indigenously developed middleware, which orchestrates mobile transactions

between users' devices and the universal banking solution from Infosys named Finacle. Mobile banking solution functions in tandem with disparate host systems, core banking solutions, payment networks and third-party applications. Infosys MConnect handles the multiplicity of form factors and access mechanisms on multiple devices to provide a context-adaptable view to the transaction server. This presents banks with a powerful channel to service customer segments ranging from the mass affluent to the under-banked or unbanked, surmounting the challenge posed by the diversity of mobile devices. The solution supports synchronization of customers' own data on their mobiles without re-downloading the application for downloadable client-based mobility. It empowers banks to capitalize on their existing Internet transaction and support capabilities to extend it to the mobile world, in practically real time. This ushers in the advantages of reduced integration by leveraging common interface messages, maintenance and deployment costs.

Reliance Infocomm [2], India

When Reliance Infocomm, India rolled out its CDMA network, (at the time the mobile market in India was still in its infancy, and data services were almost never heard off) it made sure that all handsets supported Java. The Reliance application platform, also known as R-World brought Java compatibility even to the lower end phones. Reliance used a novel way to overcome the memory limitations of lower-end mobile phones, which hampered deploying of multiple standalone J2ME based clients. Instead of storing applications statically on their cell phones, users access a single menu based application called R-World, which connects them to the Reliance servers. Using the menu based user interface, mobile users select the application, which they want to run and download them over-the-air to their cell phones. These applications are then executed locally on the mobiles. Reliance has tied up with two of the popular private sector banks, HDFC and ICICI, to provide a host of their enquiry and transaction based mobile banking services through its R-World environment.

iMobile [3] (ICICI BANK & AXIS BANK)

iMobile is a small software called Rich Client Based Application, that is downloaded on your mobile phone. When installed on your phone, it embeds the ICICI Mobile Banking option on your phone menu. iMobile ensures security through secure authentication. To access your account using your

mobile phone without using 'key words', download iMobile.

The application covers Savings Bank, Demat, Credit Card and Loan accounts. We continually add services on the application which are made available through an upgrade link available within it. You can pay your utility bills and insurance premium through this facility. Place service requests and access the help menu for further information on your mobile. ICICI Bank offers this facility free* of charge to customers.

Banking Services that can be offered in future on smart devices:

iphone application [4]

Customers at Chase Bank have a new way to deposit checks: Just snap, snap and tap. Chase has introduced an iPhone application allowing consumers to deposit cheques with the camera-enabled smart device, which means no more trips to a local bank branch or ATM or hassling with deposit slips. Customers simply use their phone's camera to snap pictures of the front and back of the endorsed check and electronically send them to Chase. The bank responds with a text message that says the images have been successfully uploaded. The customer can keep the physical cheques with him for record or even destroy them after a certain period if he wishes to. The service is free, but depositors must be enrolled in Chase's online banking program to use the mobile app.

LG Telecom, South Korea [5]

In terms of the evolution of services being offered on mobile applications, South Korea is showing the way. The big push came when LG Telecom Ltd., the smallest of Korea's three mobile service providers teamed up with the Kookmin bank to launch the 'Bank on' service. Under this scheme mobile users were able to use smart chips embedded in cell phones for accessing all of the transaction and enquiry based services. The chip-based service automated the authentication of users when they accessed their bank's financial services to make the whole process much faster and convenient. The icing on the cake came with the ability of these chip enabled cell phones to be used simultaneously as cash cards. There are already about lac's of infrared readers adapted to take payment directly from mobile phone handsets in Korea. Users can use their cell phones to pay for everything, from restaurant bills, travel tickets, merchandise and even haircuts. Such applications can be the future of banking to come.

SUMMARY

With 3G telephony entering the Indian market this 2011 and also the smart-phones & tablets running on open source OS like Android becoming cheaper & their number increasing each day, we will see more & more people use new & innovative banking applications from banks in form of special programs called Rich Clients downloaded to the mobile device & installed, it embeds the Banking option on your device menu. Mobile banking solution empowers retail and corporate banking customers with access to banking services offering both mobile commerce (m-commerce) and mobile payments within the DNA of mobile banking, with built-in support for merchant-initiated payments and reversals, in addition to customer-initiated payments and reversals. Leveraging recent technological advances in the mobility space, the mobile banking solution empowers banks with the means to innovate by easily deploying new services, with improved time to market.

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